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Gender Equality and Medical and Dental Academic Researchers in West Africa Igualdad de Género e Investigadores Académicos en Medicina y Odontología en África del Oeste

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Tesis Doctoral

GENDER EQUALITY AND MEDICAL AND DENTAL ACADEMIC RESEARCHERS IN WEST AFRICA
IGUALDAD DE GÉNERO E INVESTIGADORES ACADÉMICOS EN MEDICINA Y ODONTOLOGÍA EN ÁFRICA DEL OESTE

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Dr. Guillermo Zohar Martínez Pérez

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Tesis Doctoral presentada al Departamento de Fisiatría y Enfermería de la Facultad de Ciencias de la Salud para optar al título de Doctora por la Universidad de Zaragoza, España

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Dr. Guillermo Zohar Martínez Pérez, del Departamento de Fisiatría y Enfermería, en la Facultad de Ciencias de la Salud (FCS) de la Universidad de Zaragoza,

INFORMA

Que la tesis Doctoral titulada "Gender Equality and Medical and Dental Academic Researchers in West Africa (Igualdad de Género e Investigadores Académicos en Medicina y Odontología en África del Oeste", que presenta Dña. Morenike Oluwatoyin Ukpong para acceder al título de Doctora por la Universidad de Zaragoza, ha sido realizada bajo mi dirección académica.

Que la doctoranda ha demostrado no solo un excelente empeño en la calidad científica a lo largo de todo el proceso, sino también un compromiso con la trasferencia del avance de conocimiento que ha ido incorporando en su proyecto de investigación y sobre todo una implicación en el desarrollo, participación y respeto por la comunidad de investigadores médicos con la que ha trabajado. Sin duda, se trata de un claro ejemplo del compromiso ético que la persona investigadora debe tener con las comunidades sujetas a estudio, en un trabajo que destaca por su honestidad, responsabilidad hacia las personas y apuesta por la justicia social. El avance de conocimiento en las Ciencias de la Salud, desde el trabajo empírico y la evidencia, se demuestra en todo el trabajo que, en su conjunto, se presenta en esta Tesis Doctoral.

Que la presente memoria de Tesis se corresponde con el Proyecto de Tesis Doctoral presentado y aprobado en su día por el correspondiente órgano responsable y cumple las condiciones exigidas para que la doctoranda Dña. Morenike Oluwatoyin Ukpong pueda acceder al título de Doctora por la Universidad de Zaragoza.

Y para que así conste, firmo el presente informe en Zaragoza a 19 de noviembre de 2023.

Dr. Guillermo Zohar Martínez Pérez

Índex

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Resumen (Castellano)

Antecedentes

El involucramiento de las mujeres en investigación está aumentando. Sin embargo, existen obstáculos significativos que continúan impidiendo su plena participación. A pesar de la implementación de políticas de género en África del Oeste para mejorar la representación institucional de las mujeres, el impacto de esas políticas no ha sido explorado. En Nigeria, se ha producido un cambio favorable en las conversaciones sobre desigualdad de género en instituciones académicas y de investigación. Sin embargo, en el conjunto de la región de África del Oeste, Nigeria incluida, no se ha realizado un análisis de las tendencias en liderazgo y productividad en investigación relacionadas con las desigualdades de género. Nuestra comprensión de los factores que favorecen el progreso de las mujeres en investigación y sector académico es todavía limitada.

Introducción

En Nigeria, en el año académico 2018/2019, había 86,885 trabajadores masculinos no académicos y 51,671 trabajadores masculinos académicos. En contraste, el conjunto de trabajadoras femeninas en el mismo año académico era de 46,869 trabajadoras no académicas y de 16,009 trabajadoras académicas. Esta disparidad se observa de igual modo en instituciones de investigación médica y odontológica. Como factor contribuyente a esta brecha de género, es importante reconocer los desafíos a los que las mujeres en investigación en salud se enfrentan. Para abordar esta situación, es esencial mejorar la comprensión sobre los factores que contribuyen a la desigualdad de género en los roles de liderazgo y en la producción científica en el marco de las instituciones de investigación médica y odontológica.

En un inicio, en esta tesis se exploraron las posibles causas detrás de las disparidades de género en los resultados de investigación en África del Oeste, para pasar a continuación a examinar las disparidades de género en el sector académico médico y odontológico en Nigeria. Finalmente, se profundizó en el entorno académico y de investigación en odontología con el fin de generar evidencia sobre las diferencias de género en la producción científica.

Esta investigación está basada en varios marcos teóricos que reconocen la influencia de las instituciones patriarcales en el avance hacia la igualdad de género en educación superior. Se consideró la igualdad de género como un concepto que denuncia la discriminación sistemática a las personas basadas en características como el género, el status económico, la etnicidad, o las creencias religiosas. La igualdad de género, en este contexto, implica que cada individuo, independientemente de sus atributos, debería tener iguales oportunidades para la educación, aprendizaje, alcance de metas y éxitos. El alcance de la igualdad de género es un derecho humano

básico. La transformación de normas y valores culturales que perpetúan la desigualdad de género en sociedades patriarcales requiere la participación activa de todos los individuos de una sociedad. La tecnología, el acceso a la información y la comunicación al público sobre la igualdad de género pueden jugar un rol clave en el fortalecimiento de los y las trabajadoras del sector académico para promover una transformación social.

Esta tesis se fundamentó en cuatro teorías, incluyendo el marco de igualdad de género de USAID (2008) que incluye cuatro dimensiones de igualdad de género en el sector académico. De esas cuatro dimensiones, esta tesis se enfocó en dos: la igualdad en el acceso y la igualdad en los resultados externos. El acceso incluye aspectos como la admisión inicial, la persistencia, la asistencia, y la retención en el sistema educativo. La igualdad en resultados externos se examina según el nivel de productividad y participación en las instituciones académicas y de investigación médicas y odontológicas.

La segunda fue la teoría de Fagenson, que reconoce que el progreso académico de las mujeres está influido por factores sistémicos y sociales, y que reconoce que las actitudes culturales y sociales hacia los roles de género impacta la percepción sobre las responsabilidades en el trabajo.

La tercera fue la lente feminista institucionalista, que permite profundizar en las percepciones sobre la desigualdad de género en las instituciones de investigación en Nigeria. Esta lente facilita el análisis de género de las instituciones y el análisis del impacto de género en las estructuras de poder, en los comportamientos, y en el rol que juegan las estructuras, procesos, valores y normas institucionales informales.

Finalmente, en la investigación de diferencias de género en la producción científica, la investigación se basó en la teoría de las literaturas académicas, que considera el leer y escribir como prácticas sociales influenciadas por el contexto, la cultura y el género. Esta teoría también reconoce el sector académico como un lugar que se caracteriza por una distribución desigual de poder. La producción científica, en este contexto, se conceptualiza en función del alcance de las publicaciones dirigidas a un público académico que los y las investigadores producen.

Objetivos

Objetivo Principal

El objetivo principal de esta tesis doctoral es: entender los obstáculos y las oportunidades que se encuentran las investigadoras y los investigadores, en el sector académico de África del Oeste – con una mirada especial a Nigeria – con el fin de poder apoyar a mujeres cis y trans en la construcción y consolidación de su carrera profesional en investigación.

Objetivos Secundarios

Los objetivos secundarios de esta tesis doctoral son:

a. Identificar los obstáculos que impiden el progreso de las mujeres investigadoras en el sector académico de Nigeria.
b. Explorar cómo las investigadoras y los investigadores perciben las disparidades de género en las instituciones de investigación médica y odontológica en Nigeria.
c. Analizar los procesos de toma de decisiones que son empleados en instituciones de investigación médica y odontológica en Nigeria para hacer frente a las desigualdades de género.
d. Explorar perspectivas acerca del establecimiento de entornos favorables al cambio para las investigadoras médicas y odontológicas.
e. Identificar estrategias para mejorar la presencia y la representación de las mujeres en el área de investigación científica.

Metodología

En esta tesis se empleó un enfoque de métodos mixtos utilizando diseños de investigación observacionales. Los participantes del estudio eran miembros del cuerpo docente de universidades públicas y/o privadas de África Occidental, que crecieron en África Occidental, podían leer y comunicarse en inglés, se definían a sí mismos como investigadores académicos dedicados a la docencia de áreas médica y dental y con acceso a los estudiantes en los últimos tres años, que eran mayores de 18 años, y que estaban dispuestos a dar consentimiento informado en el momento en que fueron invitados a participar en cualquiera de las fases de esta tesis. Se excluyó del estudio a las personas que no cumplían con los criterios de inclusión, así como a los participantes potenciales que sí cumplían con los criterios de inclusión pero que estaban demasiado enfermos para dar consentimiento informado para participar en actividades de recogida de datos. Ninguna persona que cumpliera con los criterios de inclusión fue excluida como participante debido a su color de piel, estatus social o económico, religión, etnia, nacionalidad y/o afiliación política.

El proyecto fue realizado en cuatro fases consecutivas. Primero, un estudio cualitativo transversal tuvo lugar entre junio y septiembre de 2020 en cinco países de África del Oeste (Ghana, Senegal, Burkina Faso, Níger, y Mali). Se realizaron videollamadas para entrevistar a investigadores en salud que eran miembros de instituciones académicas y de investigación. Se usó técnicas de análisis temático para analizar las transcripciones de las entrevistas, poniendo énfasis en los obstáculos que impiden el progreso profesional de las investigadoras femeninas de la región.

En segundo lugar, se realizó una investigación cualitativa transversal entre marzo y julio de 2022, en Nigeria, para profundizar en las perspectivas de los investigadores con respecto a las desigualdades y disparidades de género en el progreso profesional y la trayectoria de los investigadores médicos y dentales en Nigeria. Se desarrollaron temas para facilitar una exploración

integral y matizada del área de estudio. Las perspectivas que emergieron de este análisis se clasificaron alrededor de los siguientes temas centrales: experiencias de desigualdad de género; obstáculos y oportunidades relacionados con la edad y el género en la investigación; y las diferencias de edad y género en las recomendaciones para promover la igualdad de género en la investigación y el mundo académico.

En tercer lugar, entre abril y mayo de 2023, se realizó un estudio cualitativo descriptivo para recopilar datos a través de ocho entrevistas en profundidad en las que participaron investigadoras de alto nivel que anteriormente habían ocupado puestos de liderazgo en instituciones de investigación médica y odontológica en Nigeria. La selección de los participantes se basó en un grupo de 20 mujeres docentes elegibles de universidades nigerianas, que ocupan funciones directivas y contribuyen activamente a la promoción, diseño, ejecución y difusión de investigaciones biomédicas, clínicas y socio-epidemiológicas en Nigeria. Las entrevistas se realizaron a través de videoconferencia, y las transcripciones de sus entrevistas se analizaron mediante un enfoque de análisis temático.

En cuarto lugar, en junio de 2022, se llevó a cabo un análisis bibliométrico para evaluar las disparidades en productividad, influencia, tendencias de colaboración y autoría entre los investigadores en el campo de la odontología en Nigeria. Se realizó una búsqueda y análisis de artículos escritos por investigadores odontológicos nigerianos y publicados entre 2012 y 2021. Se examinaron los registros de publicaciones dentro de la base de datos Web of Science (WoS) relacionados con investigadores de odontología y ciencias bucales. Se recopilaron datos sobre las diferencias entre investigadores e investigadoras en la producción científica, impacto académico, patrones de colaboración y roles de autoría (incluida la primera, la última y la autoría como autor para correspondencia). El análisis también incluyó la cuantificación de las publicaciones en revistas según su clasificación en cuartiles dentro del área temática (Q1-Q4).

Para la realización de la primera fase del Proyecto de tesis se obtuvo aprobación del Comité Nacional de Ética de Investigación en Salud de Senegal (0000050/MSAS/DPRS/CNERS). La aprobación ética para la realización de la segunda y tercera fase se obtuvo del Instituto de Salud Pública, Universidad Obafemi Awolowo, Ile-Ife (Nigeria) (IPH/OAU/12/1617). No fue necesaria aprobación ética para la realización del análisis bibliométrico.

Resultados

Los hallazgos de este proyecto de tesis son presentados en un total de cinco artículos.

“Barriers of West African women scientists in their research and academic careers: A qualitative research”. Se realizaron entrevistas con 30 investigadores (21 investigadoras y 8 investigadores) de Ghana, Senegal, Burkina Faso, Níger, y Mali. La edad de los participantes se encontraba entre 30-56 años, y su experiencia investigadora variaba de 5 a por encima de 30 años.

En primer lugar, se identificaron cuatro temas sobre barreras para el desarrollo profesional de las investigadoras. El primer tema giró en torno a los obstáculos ambientales y relacionados con la familia (p.ej., las normas de género que asignan a las mujeres la responsabilidad principal de las tareas domésticas y que reducen el tiempo que pueden dedicar a las actividades de investigación). El segundo tema se centró en culturas organizacionales y políticas institucionales insensibles al género, que exacerban las disparidades de género e impiden el progreso de las mujeres hacia roles de liderazgo. En tercer lugar, se destacó la necesidad de que las mujeres en investigación participen en programas de empoderamiento que tengan como objetivo mejorar su resiliencia y sus capacidades de toma de decisiones. Las estrategias existentes para abordar los desafíos que enfrentan las mujeres en el mundo académico a menudo se centran principalmente en sus relaciones con sus cónyuges. El cuarto tema se refiere a las percepciones individuales del éxito profesional y personal. Muchas investigadoras se perciben a sí mismas como igualmente competentes que sus homólogos masculinos y creen que no deberían sufrir discriminación de género en sus carreras.

"A qualitative insight into researchers' perceptions of gender inequality in medical and dental research institutions in Nigeria". Este estudio descriptivo recogió información de 54 profesionales médicos y odontológicos que participaron en entrevistas en profundidad. La muestra de estudio estaba compuesta por un 48% de investigadoras y un 52% de investigadores, con edades entre 33 y 62 años, la mayoría de los cuales estaban casados y con un número de hijos entre 1 y 5. El análisis giró alrededor de tres temas centrales. Primero, había un dominio masculino institucionalizado dentro de las instituciones de investigación médica y dental. En segundo lugar, hubo un cambio en la narrativa respecto de la igualdad de género en la investigación y las actividades académicas. En tercer lugar, las mujeres impulsaban cada vez más la presión por el cambio dentro de las instituciones de investigación. Las investigadoras médicas y odontológicas desafiaban los valores androcéntricos dominantes en la producción de conocimiento dentro de sus áreas de estudio. Las mujeres cuestionaron los valores patriarcales arraigados que dan como resultado un menor número de mujeres en prácticas médicas y dentales, una reducción de la producción de investigación de las mujeres y una representación femenina limitada en puestos directivos superiores dentro de estas áreas científicas.

"Generational differences in perspective about gender inequality in medical and dental research institutions in Nigeria". Este también fue un estudio descriptivo que generó datos secundarios del estudio cualitativo que incluyó a 54 participantes. La muestra incluyó un 65% de encuestados menores de 50 años, de los cuales el 22% habían alcanzado el rango de profesor o docente universitario. El estudio identificó diferencias en las perspectivas basadas en divisiones generacionales y de género. Entre la generación más joven, tanto hombres como mujeres compartían una visión común sobre la desigualdad de género en los puestos de liderazgo y las oportunidades de investigación, lo que perjudicaba particularmente a las académicas. Hicieron hincapié en la necesidad de un cambio desde una perspectiva de derechos humanos. Por el

contrario, la generación anterior mostró opiniones divergentes. Los hombres reconocieron la presencia de desigualdad de género en el liderazgo y las oportunidades de investigación, pero propusieron cambios basados en la mercantilización de las mujeres. Las mujeres mayores manifestaron puntos de vista tradicionales sobre la desigualdad de género. Las recomendaciones para el cambio propuestas incluyeron la eliminación de las barreras a la educación de las niñas, que restringen su acceso a oportunidades de desarrollo de capacidades.

"Female Health Researchers Interrogation of Research Findings on Male Dominance and Women's Research Productivity in Nigeria". El estudio exploratorio entre las investigadoras senior que fueron entrevistadas para entender su opinión sobre los hallazgos del estudio cualitativo de la fase 2, generó que surgieran cuatro temas adicionales. Estos temas arrojaron más luz sobre los patrones de predominio masculino dentro de las instituciones académicas y de investigación, las disparidades de género en el acceso de las mujeres a dichas instituciones, el entorno y los recursos necesarios para promover el avance de las mujeres a puestos directivos, y los factores que contribuyen a las diferencias de género observadas en productividad de la investigación. Si bien los participantes reconocieron la creciente presencia de mujeres en el mundo académico de investigación médica y odontológica, no hubo consenso en que un mayor número de primeras autorías femeninas correspondiera a un aumento proporcional de autorías jóvenes. Se identificaron las prácticas sociales patriarcales como posibles contribuyentes a la menor participación de las mujeres en la investigación colaborativa dentro de la academia de odontología.

Gender differences in dentistry and oral sciences research productivity by researchers in Nigeria: Se identificaron 413 autores únicos que publicaron un total de 1222 artículos sobre odontología y ciencias bucales en Nigeria entre 2012 y 2021. En particular, un porcentaje ligeramente mayor de mujeres publicó en revistas de los cuartiles Q2 y Q3, mientras que un porcentaje mayor de hombres publicó en revistas del cuartil Q4, aunque estas diferencias no fueron estadísticamente significativas. Las mujeres tuvieron un promedio ligeramente mayor de citas por autor en comparación con los hombres (25,0 frente a 14,9), pero esta diferencia no era estadísticamente significativa. Un mayor porcentaje de artículos publicados por hombres incluían colaboradores internacionales (27,4% frente a 25,1%) y nacionales (46,8% frente a 44,7%), pero estas diferencias no fueron estadísticamente significativas. Un mayor porcentaje de mujeres figuraban como primeras autoras (26,6% frente a 20,5%), mientras que un porcentaje significativamente mayor de hombres figuraban como últimos autores (23,6% frente a 17,7%). Además, un porcentaje ligeramente mayor de mujeres que de hombres figuraban como autores para correspondencia (26,4% frente a 20,6%).

Recomendaciones y Conclusiones

Los hallazgos de esta investigación subrayan la naturaleza multifacética de las disparidades de género en las instituciones de investigación de África Occidental. Revela desafíos a los que las mujeres investigadoras se enfrentan debido a las desigualdades de género en la estructura social y que deben ser abordados por las autoridades de las instituciones. Esta investigación destaca que las normas tradicionales de género que asignan a las mujeres la responsabilidad principal de las tareas domésticas limitan significativamente el tiempo que pueden dedicar a su investigación.

Este desequilibrio presenta una barrera importante para el avance profesional de las mujeres, y la conciliación de la vida laboral y familiar para las investigadoras en África Occidental está determinada principalmente por las desigualdades de género. Muchas mujeres se consideran igual de competentes que sus homólogos masculinos y esperan no sufrir discriminación en sus carreras. Estas percepciones contribuyen a la determinación de las mujeres de superar las barreras. Las estrategias existentes para abordar las disparidades de género en el mundo académico a menudo se centran en las relaciones de las mujeres con sus cónyuges en lugar de abordar cuestiones sistémicas. Las culturas y políticas institucionales que no tienen en cuenta adecuadamente las disparidades de género exacerban los desafíos que enfrentan las mujeres para alcanzar puestos de liderazgo. Estos sistemas obstaculizan el progreso de las mujeres dentro de las instituciones de investigación.

Si bien existe la creencia de que se están logrando avances, aún queda trabajo por hacer para crear un entorno de apoyo para las investigadoras en Nigeria. Es evidente que hay un patrón profundamente arraigado de dominio masculino en las instituciones de investigación médica y dental de Nigeria, y este dominio impregna los procesos de toma de decisiones y perpetúa las desigualdades de género. Sin embargo, las mujeres cuestionan cada vez más los valores androcéntricos en la producción de conocimiento y cuestionan los valores patriarcales que obstaculizan la representación femenina en roles de alto nivel. Además, las investigadoras médicas y odontológicas están impulsando activamente el cambio dentro de las instituciones de investigación, así como abogando por un entorno más equitativo e inclusivo.

Las inversiones con perspectiva de género en educación para investigadores e investigadoras más jóvenes pueden facilitar este proceso. Abordar la desigualdad de género en las instituciones de investigación médica y odontológica de Nigeria mediante inversiones en investigadores más jóvenes requerirá acciones estratégicas, con la esperanza de que las generaciones más jóvenes impulsen el cambio.

Las acciones fundamentadas en políticas que aborden las cuestiones del desequilibrio de género en los resultados de la investigación dentro del mundo académico en Nigeria también deben tener en cuenta la notable diferencias en la autoría en la publicación de artículos de acceso abierto y las posibles razones de las disparidades observadas. Una posible razón puede ser que las normas tradicionales de género provocan una salida de investigadores varones del mundo académico para

obtener ingresos. Aunque los hallazgos del estudio sugieren que hay muchas más mujeres como investigadoras jóvenes e investigadores hombres como mentores, no hubo consenso sobre la interpretación de este hallazgo. Se necesitan más investigaciones para exponer los peculiares matices culturales asociados con la variabilidad de género observada en los resultados de la investigación de los investigadores odontológicos en Nigeria.

Finalmente, esta tesis doctoral subraya la influencia de la vida familiar y social en las trayectorias de las investigadoras en África Occidental. Los hallazgos de este proyecto pueden contribuir al desarrollo de intervenciones destinadas a promover la igualdad de género en el desarrollo profesional de las investigadoras en África Occidental. La implementación de acciones estratégicas es vital para fomentar la igualdad de género en las instituciones de investigación médica y odontológica en Nigeria, con la expectativa de que las generaciones de investigadoras más jóvenes, a medida que accedan a roles de liderazgo, impulsen activamente los cambios necesarios.

Summary

Background

Women's engagement in research is growing. Nevertheless, substantial obstacles continue to hinder their involvement in research. Despite the implementation of gender-friendly policies aimed at improving the representation of women in West African institutions, the impact of these policies in these countries remains unexplored. Conversations concerning gender inequality within research and academic institutions in Nigeria are experiencing a positive shift. However, there is an absence of an analysis of trends related to gender disparities in research productivity and leadership throughout the region, including Nigeria. Our understanding of the factors that enable women's advancement in research and academia is also limited.

Introduction

In Nigeria, there were 86,885 non-academic male staff and 51,671 academic male staff in the 2018/2019 academic year. In contrast, the female workforce comprised 46,869 non-academic and 16,009 academic staff members in the same academic year. This gender disparity also extends to medical and dental research institutions. Within this broader gender gap, it is important to recognize that women in health research face disproportionate challenges. To tackle this issue, it is essential to understand the factors contributing to gender inequality in research productivity and leadership roles within medical and dental research institutions.

This thesis project initially explored potential causes for gender disparities in research outputs in West Africa. It then focused its lens on examining gender disparities within Nigeria's medical and dental research academia. Finally, it focused on the dental research academia to generate objective evidence regarding gender differences in research productivity. This project was rooted in multiple theoretical frameworks that recognize the influence of patriarchal institutions on advancing gender equality in higher education. It viewed gender equality as a concept encompassing systematic discrimination based on gender, economic status, ethnicity, religious beliefs, and more. Gender equality, in this context, means that every individual, regardless of their attributes, should have equal opportunities for education, learning, achievement, and success. Achieving gender equality is a fundamental human right. Shifting cultural norms and values that perpetuate gender inequality in patriarchal societies requires the active involvement of all individuals in society. Technology, improved access to information, and public communications regarding gender equality can significantly enhance faculty members' readiness for change.

This thesis project was guided by four research theories, one of which was the 2008 USAID gender equality framework that comprises four dimensions of gender equality within academia. This

thesis project primarily focused on two dimensions: equality of access and equality of external results. Access encompasses initial enrolment, persistence, attendance, and retention within an educational system. Equality of external results was conceptualized as the level of productivity and engagement within the medical and dental academic and research institutions.

The second was Fagenson's theory, which acknowledges that societal and systemic factors influence women's career progression and recognizes that cultural and social attitudes toward gender roles impact perceptions of job responsibilities.

The third was the feminist institutionalism analytical lens to delve into perceptions of gender inequality within research institutions in Nigeria. This lens facilitated the examination of gendered institutions and their impact on the gendering of structures of power behavior and the role played by institutional informal structures, processes, values, and norms.

Finally, when investigating gender differences in research productivity, the study was guided by the academic literacy theory, which views reading and writing as social practices influenced by context, culture, and genre. This theory also recognises academia as a place characterised by unequal power distribution. In this context, research productivity was conceptualised as the extent to which a researcher produces publications targeted at an academic audience.

Objectives

Primary Objective

The primary objective of this doctoral thesis was to understand the obstacles and opportunities for female and male academic researchers to support cis and trans women in building and consolidating professional research careers in West Africa with a focus on Nigeria.

Secondary Objectives

The secondary objectives of this doctoral thesis were to:

a. Identify the obstacles hindering the progression of female researchers in Nigeria's academic landscape.
b. Explore how researchers perceive gender disparities within Nigeria's medical and dental research institutions.
c. Examine the decision-making processes employed to address and navigate gender inequities within medical and dental research institutions in Nigeria.
d. Explore perspectives on establishing a conducive environment for female medical and dental researchers.
e. Identify strategies for enhancing the underrepresented presence of women in scientific

research.

Methodology

A mixed-methods research approach was employed in this thesis project using observational studies designs. Study participants included in the study were faculty members in public and/or private universities in West Africa who were raised in West Africa, able to read and communicate in English, defined themselves as academic researchers in the health medical and dental education, had access to students as a lecturer (engaged in teaching in the university in the past three years), were over 18 years of age, and were willing to provide signed informed consent at the time they were approached and invited to participate in any of the phases involving human beings as research participants. People not meeting the inclusion criteria and potential participants who met the inclusion criteria but were too ill at the time of study to participate in data collection encounters. No person meeting the inclusion criteria was excluded as a participant because of their skin colour, social or economic status, religion, ethnicity, nationality, and/or political affiliation.

The project was conducted in four subsequent phases. First, a cross-sectional qualitative study took place between June-September 2020 across five West African countries (Ghana, Senegal, Burkina Faso, Niger, and Mali). Video calls were used to interview health researchers from academic or research institutions. Thematic analysis was used to analyse the interviews' transcripts, focusing on the obstacles impeding the career advancement of female researchers in the region.

Second, a cross-sectional qualitative research design was implemented between March and July 2022 in Nigeria to delve into the perspectives of researchers regarding gender inequalities and disparities in the career progression and trajectory of medical and dental researchers in Nigeria. Themes were developed to facilitate a comprehensive and nuanced exploration of the phenomena under scrutiny. The emerging perspectives from this analysis were classified into the core themes: experiences of gender inequality, obstacles and opportunities related to age and gender in research, and age and gender differences in the recommendations for promoting gender equality in research and academia.

Third, between April and May 2023, a descriptive qualitative study was undertaken to gather data through in-depth interviews involving eight senior female researchers who previously held leadership positions within Nigeria's medical and dental research institutions. The interviewees were selected based on a pool of 20 eligible female faculty members at Nigerian universities who occupy managerial roles and actively contribute to the promotion, design, execution, and dissemination of biomedical, clinical, and socio-epidemiological research within Nigeria. The interviews were conducted over WhatsApp-supported videoconference with these participants, and their interview transcripts underwent thematic analysis to derive meaningful insights.

Fourth, in June 2022, a bibliometric analysis was carried out to evaluate disparities in productivity,

influence, collaboration trends, and authorship roles among researchers in the field of dentistry and oral sciences in Nigeria. Specifically, this involved a search and analysis of articles authored by Nigerian dentists and published between 2012 and 2021. The publication records within the Web of Science (WoS) database related to dentistry and oral sciences researchers were scrutinised. Data was gathered on gender-based distinctions in research output, academic impact, collaborative patterns, and authorship roles, including first, last, and corresponding authorship. The analysis also included quantifying journal publications according to their quartile ranking within the subject area (Q1-Q4).

Ethics approval for the conduct of the first phase was obtained by the Senegalese National Health Research Ethics Committee for this study (0000050/MSAS/DPRS/CNERS). Ethics approval for conducting the second and third phases was obtained from the Institute of Public Health, Obafemi Awolowo University, Ile-Ife, Nigeria (IPH/OAU/12/1617). No ethics approval was necessary to conduct the bibliometric analysis.

Results

The findings of this thesis project are presented in five articles.

Barriers of West African women scientists in their research and academic careers: A qualitative research: A series of interviews were conducted with 30 researchers, comprising 21 female researchers and nine male researchers, who hailed from Ghana, Senegal, Burkina Faso, Niger, and Mali. The age spectrum among the participants spanned from 30 to 56 years, and their research experience encompassed a range of 5 to over 30 years. First, four key themes were identified as barriers to the career development of women researchers. The first theme revolved around family-related and environmental hindrances. Gender norms that assigned women the primary responsibility for domestic tasks reduced the time they could allocate to research pursuits. The second theme centered on gender-insensitive organisational cultures and institutional policies, which exacerbated gender disparities and impeded women's progress towards leadership roles. Thirdly, the need for women in research to engage in empowerment programs was highlighted. These programs aimed to enhance their resilience and decision-making capabilities. Existing strategies for addressing the challenges women face in academia often primarily focus on their relationships with spouses. The fourth theme pertained to individual perceptions of professional and personal success. Many women perceived themselves as equally competent as their male counterparts and believed they should not encounter gender discrimination in their careers.

A qualitative insight into researchers' perceptions of gender inequality in medical and dental research institutions in Nigeria: This description study generated information from 54 medical and dental professionals who took part in the in-depth interviews. The sample comprises 48% females and 52% males, with ages ranging from 33 to 62 years, and most of them were married, with the number of children reported by the interviewees ranging from 1 to 5. The study analysis

generated three core themes from the interviews conducted. First, there was institutionalised male dominance within medical and dental research institutions. Second, there was a shifting narrative regarding gender equality in research and academic pursuits. Third, women were increasingly driving the call for change within research institutions. Female medical and dental researchers challenged the mainstream androcentric values in knowledge production within their fields. They questioned the entrenched patriarchal values that resulted in fewer female medical and dental trainees, reduced research output by women, and limited female representation in senior managerial roles within these fields.

Generational differences in perspective about gender inequality in medical and dental research institutions in Nigeria. This was also a descriptive study that generated secondary data from the primary study, including 54 participants. The sample included 65% of respondents younger than 50, and 22% had reached the professorial cadre. The study identified differences in perspectives based on generational and gender divisions. Among the younger generation, males and females shared a common view on gender inequality in leadership positions and research opportunities, particularly disadvantaging female academics. They emphasized the necessity for change from a human rights perspective.

Conversely, the older generation exhibited divergent opinions. Males acknowledged the presence of gender inequality in leadership and research opportunities but proposed changes based on commodifying women. Older females adhered to traditional views regarding gender inequality. Recommendations for change included removing barriers to education for girls, which restrict their access to capacity-building opportunities.

Female Health Researchers Interrogation of Research Findings on Male Dominance and Women's Research Productivity in Nigeria. The explorative study among senior female researchers who were interviewed to share their opinions regarding the study findings above generated four additional themes. These themes shed further light on the patterns of male dominance within research and academic institutions, the gender disparities in women's entry into such institutions, the necessary environment and resources to promote women's advancement into managerial positions, and the factors contributing to the observed gender differences in research productivity. While participants acknowledged the increasing presence of females in the medical and dental research academia, there was no consensus that a higher number of first female authorships corresponded to a proportional increase in junior authorships. Patriarchal social practices were identified as potential contributors to the lower participation of females in collaborative research within the dental academia.

Gender differences in dentistry and oral sciences research productivity by researchers in Nigeria: Our analysis identified 413 unique authors who published 1,222 articles on dentistry and oral sciences in Nigeria between 2012 and 2021. Notably, a slightly higher percentage of females

were published in Q2 and Q3 journals, while a greater percentage of males were published in Q4 journals, although these differences were not statistically significant. Females had a slightly higher average number of citations per author than males (25.0 vs. 14.9), but this difference was not statistically significant. A higher percentage of papers published by males listed international collaborators (27.4% vs. 25.1%) and domestic collaborators (46.8% vs. 44.7%), but these differences were insignificant. Significantly, a greater percentage of females than males were listed as first authors (26.6% vs. 20.5%), while a significantly greater percentage of males than females were listed as last authors (23.6% vs. 17.7%). Additionally, a slightly higher percentage of females than males were listed as corresponding authors (26.4% vs. 20.6%).

Recommendations and Conclusions

These research findings underscore the multifaceted nature of gender disparities in the research institutions in West Africa. It reveals challenges women researchers face due to gender inequalities in the social structure, which institutions' authorities must address. It highlights that traditional gender norms that assign women the primary responsibility for domestic tasks limit the time they devote to their research.

This imbalance presents a significant barrier to the career advancement of women, and gender inequalities primarily shape the intersection of work-life and home-life for female researchers in West Africa. Many women perceive themselves as equally competent as their male counterparts and expect to be free from career discrimination. These perceptions contribute to women's determination to overcome barriers. Existing strategies for addressing gender disparities in academia often focus on women's relations with their spouses rather than tackling systemic issues. Institutional cultures and policies that do not adequately account for gender disparities exacerbate the challenges faced by women in reaching leadership positions. These systems hinder women's progress within research institutions.

While there is a belief that progress is underway, a considerable amount of work remains to be done to create a supportive environment for female researchers in Nigeria. A deeply ingrained pattern of male dominance is evident within the medical and dental research institutions in Nigeria, and this dominance permeates decision-making processes and perpetuates gender inequalities. However, women are increasingly challenging androcentric values in knowledge production and questioning patriarchal values that hinder female representation in senior roles. In addition, female medical and dental researchers actively drive the call for change within research institutions and advocate for a more equitable and inclusive environment.

Gender-sensitive educational investments in the younger male and female researchers may facilitate this process. Addressing gender inequality in medical and dental research institutions in

Nigeria through investments in younger researchers will require strategic actions, with hopes that younger generations will drive change.

Policy-informed actions addressing the issues of gender imbalance in research outputs within the academia in Nigeria should also take cognisance of the notable gender difference in authorship in the publication of open-access articles and the possible reason for the observed disparity. A possible reason may be that traditional gender norms cause an efflux of potential male researchers out of academia to make income. Though the study findings suggest that there are many more females as junior researchers and male researchers as mentors, there was no consensus on the interpretation of this finding. Further research is needed to expound on the peculiar cultural nuances associated with the observed gender variability in the research outputs of dental researchers in Nigeria.

Finally, this doctoral thesis underscores the influence of family and social life on the trajectories of female researchers in West Africa. The findings from this project can contribute to developing interventions to promote gender equality in the career development of women researchers in West Africa. Implementing strategic actions is vital to fostering gender equality in medical and dental research institutions in Nigeria, with the expectation that younger generations, as they access leadership roles, will actively drive the necessary changes.

List of abbreviations

AAWORD	Association of African Women for Research and Development
BCA-WA-ETHICS	Building Capacities in Gender Mainstreaming for Ethics Committee Members from Senegal to West Africa
CEF	Commonwealth Education Fund
COVID-19	Corona Virus Infectious Disease - 2019
EC	European Community
ECLAC	The Economic Commission for Latin America and the Caribbean
ECOWAS	Economic Community of West African States
IIAS	Ife Institute of Advance Studies
OECD	The Organization for Economic Cooperation and Development
SADC	The Southern African Development Community
STEM	Science, Technology. Engineering, Mathematics
TDR	Tropical Diseases Research
UNDESA	United Nations Department of Economic and Social Affairs
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNESDOC	UNESCO Digital Library
UNFPA	The United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund
WOS	Web of Science

1. Background and Justification

Gender equality can be defined as a state of balanced rights, impartial treatment, equitable access to opportunities and outcomes, as well as a just distribution of advantages, rewards, and chances among men, girls, boys (cis- and trans-women), and non-binary genders (SADC, 2008). This concept has profound implications for human development and is essential for socio-economic stability in all countries. It also holds the potential to mitigate the impacts of environmental degradation and climate change while simultaneously fostering peace and social justice (Turquet, 2021). Among various dimensions of social development, gender equality catalyzes progress in science, education, and health (Equal Measures 2030, 2019) and is a key driver for achieving the Sustainable Development Goals (United Nations Women, 2018).

Within this context, medical and dental academics occupy a pivotal role in social development through their engagement in scientific research, education, and healthcare. They contribute to global and national economic advancement by studying diseases, preventive measures, developing medications, vaccines, diagnostics, and effective public health strategies. Their responsibilities within research organizations, educational institutions, pharmaceutical companies, and healthcare agencies often entail training others and advancing scientific knowledge to enhance disease control and overall quality of life (Study.com, 2020). In this regard, medical and dental health researchers have the potential to make substantial contributions to human development by championing processes that promote gender equality.

Female medical and dental health academics in Africa may have personally encountered gender inequality in patriarchal societies. Therefore, they are well-positioned to work towards Sustainable Development Goals 5 and 10, to “Achieve gender equality and empower all women and girls” and to “Reduce inequality within and among countries,” respectively (United Nations, No Date). This encompasses endeavours to support girls' and women's access to primary, secondary, and tertiary education and create educational environments that aid in their successful completion of secondary and higher education. Consequently, female researchers in the medical and dental field can actively challenge and reshape the structural factors contributing to women and girls' vulnerability, particularly by advocating for increased female participation in scientific endeavours.

While international, regional, and national agreements and policies exist to address gender inequality in Africa, disparities persist. Women's enrollment in science, engineering, and technology in public higher education institutions remains notably lower than men's in certain regions, and the representation of women researchers in Sub-Saharan Africa is limited (SADC, 2016; UNESCO, 2019). Little is known about how female medical and dental health academic researchers in West Africa leverage these transformative opportunities. Medical research and education in Sub-Saharan Africa are predominantly university-driven, and while significant progress has been made in some regions, challenges remain, including gender representation and

faculty retention (Mullan et al., 2012; World Health Organisation and TDR, 2015).

However, there remains a significant dearth of knowledge concerning utilising these potentially transformative opportunities by female medical and dental health academic researchers in West Africa. Research endeavours in medical science are often undertaken by academics within medical and dental schools, a requirement that can also serve as a promotional criterion. Regrettably, Sub-Saharan Africa's contribution to global research output remains marginal, accounting for less than 1% of the total, starkly contrasting its 12% share of the global population. The growth in Sub-Saharan research output is predominantly fueled by advancements in health sciences research, indicating a yearly growth rate of approximately 4%, which now comprises 45% of all regional research output (World Bank and Elsevier, 2014).

Many governments in West Africa have adopted national strategies to expand human resources for health, enhance medical education, and bolster physician capacity. Yet, the external brain, which sees faculty members seeking opportunities abroad, presents a distinct challenge to the stability and progress of medical education. Furthermore, the internal brain, involving the loss of physicians and medical school faculty to non-governmental organisations, poses an additional hurdle to medical education and public health systems. Compounding these challenges, medical schools find it challenging to compete with the salaries and benefits offered by non-governmental organisations (Mullan et al., 2012). Additionally, training graduate medical doctors with the proficiency to undertake research presents another set of difficulties (Chen et al., 2012).

These challenges extend to unequal gender representation within the health research landscape in West Africa. Despite women scientists' pivotal role in development, they remain significantly underrepresented in research and development endeavours. Women scientists often find themselves clustered in lower-level roles with restricted leadership opportunities. They are more frequently positioned as lecturers and assistant researchers, while the number of professors, research directors, and principal investigators in significant studies remains notably limited (World Health Organisation and TDR, 2015).

Though a notable increase in medical science research has predominantly stemmed from purposeful investments in enhancing research capabilities, including initiatives led by institutions within Africa itself (Kasprowicz et al., 2020), the impact of these investments on gender disparity is not well known. These capacity-building endeavors hold substantial promise, offering the potential to significantly address the continent's healthcare challenges and foster health research with a distinct focus on Africa. Furthermore, these initiatives can facilitate the training of proficient healthcare professionals, thus potentially elevating health outcomes. However, despite the evident wealth of scientific talent present in Africa, it remains essential to emphasise the critical role of nurturing and training on addressing the gender disparity in research productivity, as underscored by the World Bank and Elsevier (2014).

Therefore, this continental commitment to capacity building presents an avenue for cultivating context-specific strategies to tackle gender disparities prevalent within the research domain on the continent. Women's contributions to research output are consistently lower than men's (Huyer, 2015; Larivière et al., 2013). Women's contributions to scientific publications are often constrained by responsibilities related to care work, household chores, limited mobility, and teaching commitments that tend to become more burdensome with age (Beaudry et al., 2023). Women in Africa, as in all societies/continents/countries, often have to be content with cultural norms that expect them to marry young, have several children (Tsikata, 2007), and adhere to the traditional gendered division of labour within households (Arthur and Arthur, 2016). However, when the opportunities are equal, women are not less productive than men (Beaudry et al., 2023).

The university setting plays a key role in attaining medical research and education advancements. In Africa, the progress has predominantly been propelled by Eastern and Southern Africa, while Western and Central Africa have fallen behind. Despite this, research output has exhibited a discernible rise over time. However, the quantity of output remains limited when considering its potential global contribution to the betterment of the region's populace. Analysis indicates that collaborative research between West African nations has yielded minimal research output. Notably, the influence of cross-regional collaboration on research output in West Africa surpasses collaboration within the same region (Eniayejuni, 2020). Sadly, there are significant gender differences in research collaborations, with more men than women participating in collaborative research (Aksnes et al., 2019).

Nigeria, the most populous country in Africa, has the highest research productivity in West Africa (Hassan et al., 2018). Its research output has experienced growth, mainly from the public, environmental, occupational, and health sectors. However, these contributions exhibit comparatively lower research impact and limited international collaboration than other West African nations (Hassan et al., 2018). Within academic institutions, females demonstrate lower productivity levels and hold fewer leadership positions, as evidenced by Oloruntoba and Ajayi (2006), though little is known about gender disparity in medical and dental sector research.

Questions, therefore, arise about whether female researchers encounter distinctive challenges and barriers that hinder the creation of conducive environments for gender-diverse students to envision and accomplish their aspirations. Exploring potential career pathways that enable female medical and dental health academics to access and optimise these transformative opportunities for gender-inclusive education and career progression is vital. Additionally, the socio-cultural context within which female medical and dental health academics operate may influence decisions about addressing gender inequality within academic institutions.

2. Introduction

2.1. What is Gender?

Gender comprises socially constructed norms, ideologies, behaviours, and roles linked to the identities of women, men, girls, and boys (Heise et al., 2019; Cislaghi et al., 2020). It represents a socially constructed concept with distinct roles that differ across societies and evolve across eras (Heise et al., 2019; Cislaghi et al., 2020). Culture defines gender through verbal and nonverbal cues, marking socially accepted behaviours within stereotypes. These cues persist within communities and are strengthened through media exposure and at the household level through interpersonal interactions (Oakley, 1972).

Gender operates within a hierarchical structure, resulting in inequalities that coincide with additional social and economic disparities, as well as various forms of discrimination encompassing age, disability, ethnicity, geographical location, gender identity, sexual orientation, and socioeconomic status, among other factors (World Health Organisation, ND). This phenomenon encompasses intersectionality, acknowledging the interconnectedness and interplay of numerous forms of discrimination and oppressive systems associated with the identities of women, men, girls, and boys (Crenshaw, 2017; OECD Library, 2023). These systems of oppression reinforce each other and are mutually constructed, thus acknowledging the intertwined systems of structural power and control that lead to discriminatory outcomes (Kelly et al., 2021; Al-Faham Ferree, 2018; Davis and Ernst, 2019). Gender, in essence, provides a lens through which we can examine the influence of societal norms and power dynamics on the experiences and prospects of various groups according to their gender. This perspective is crucial in the context of development, as it deeply influences matters such as poverty, educational access, political representation, service provision, economic assets, political avenues, household and societal influence, and the impact of violence (Kangas et al., 2015).

Gender interacts with, yet is distinct from, sex. Sex pertains to the biological and physiological distinctions among females, males, and intersex individuals, such as chromosomes, hormones, and reproductive organs. Separately, gender identity signifies people’s deeply ingrained, internal, and personal perception of their gender, which may or may not align with their physiological attributes or assigned sex at birth (World Health Organisation, 2020).

The concept of gender took shape through Ester Boserup's influential work in the early 1970s, challenging the notion of women as passive beneficiaries of development. She advocated for recognising women's contributions that had been overlooked, and this call expanded to encompass structural shifts in the global political economy. This evolution aimed to incorporate women into development (Women in Development) and make them integral to development (Women and

Development). Subsequently, the push for Gender and Development emerged, focusing on broader inequities and imbalanced relationships (Rathgeber, 1989).

Advocates of Gender and Development have, therefore, called for a more profound comprehension of the socially constructed foundation of gender disparities and the ramifications these disparities have on relationships between women and men. They contended for an enhanced understanding of power dynamics and the gender-specific nature of systems and institutions that impact the lives of individuals (Kangas et al., 2015). This necessitated a shift where systems are restructured to embody gender equality, moving beyond the mere assimilation of women into the prevailing patriarchal framework (Kangas et al., 2015). These advocacy drives try to reshape public policies and enhance their execution and delivery through well-defined programs that actively drive changes in institutional administrative systems. The anticipated outcome of policy and program adjustments is to benefit different genders through targeted initiatives. Implementing shifts in institutional and administrative systems will require training to empower these mechanisms to explicitly integrate gender as a criterion for development planning and organisational efficiency (Subrahmanian, 2004a).

The plea for Gender and Development has resonated through numerous international agreements, regional platforms, and conferences, with the most impactful instance being the 1995 4th World Conference on Women in Beijing (Ministry of Foreign Affairs, the People's Republic of China, 2014). This conference spurred nations into pledging to institute mechanisms for promoting women's rights, which was achieved through formulating national action plans, gender strategies, and legal frameworks. In 2000, these nations reaffirmed their dedication to mitigating gender disparities via the United Nations Millennium Declaration, prominently embodied in Millennium Development Goal 3, which emphasised advancing gender equality and women's empowerment (United Nations. No Date). The ongoing commitment of nations to gender parity is further evident through its representation in Sustainable Development Goal 5, which focuses on achieving gender equality and empowering all women and girls. Its primary aim is to address and eliminate gender disparities in various aspects of life and promote the rights and opportunities of women and girls worldwide. Sustainable Development Goal 5 is not just a standalone goal: it's a catalyst for advancing all the other 16 Sustainable Development Goals (Renaud et al., 2022).

Over time, nations have made headway in spotlighting women's concerns and experiences within development initiatives, domestic legislation, and political choices. However, this emphasis on gender matters frequently lacks consistency and adequate funding, thus failing to establish gender equality as a pivotal aspect of national programs and policies. The insufficient emphasis on addressing gender inequality by nations has hindered the progression towards transforming unequal and unjust power dynamics (Kangas et al., 2015).

Regrettably, the concept of 'Gender' often becomes confined to the realm of sexual differences, rigidly framed as two distinct and separate categories – women and men. Anything that deviates from this established framework is frequently dismissed by numerous policymakers, health program planners, development aid workers, and researchers (Cornwell, 2007). In some exceptional cases, there is the third concept of gender known as intersex. The framing of intersex individuals can, however, vary and is often complex and multifaceted as they often may not neatly fit into societal norms or expectations associated with traditional gender roles (Mazzuca et al., 2020).

This fixed understanding of gender gives rise to a set of normative categories frequently shaped more by the concerns of development actors than by the women they intend to assist (Cornwell, 2007). Although this framing redirects attention towards women's rights and empowerment, offering a potential path forward to exposing and altering unjust power dynamics, it can shift the focus away from broader issues of social and economic fairness, concentrating instead on the self-improvement of the individual. This shift disconnects the 'gender agenda' from the endeavour to address the interconnected facets of power (Cornwall, 2007).

This framing also neglects to acknowledge the diverse spectrum of gender identities, which encompasses male, female, transgender, gender-neutral, non-binary, agender, pangender, genderqueer, two-spirit, third gender, and various other expressions, or a combination thereof (Kuper, Nussbaum and Mustanski, 2012). Presenting gender discussions solely as a dialogue between females and males fails to recognise and encompass the challenges faced by non-normative or non-hegemonic gender identities within a world characterised by gender inequality. By limiting gender empowerment agendas to the female-male dichotomy, other gender identities are inadvertently excluded from the framework of gender equality advocacy. Additionally, these agendas disregard the diversity of ways in which individuals experience and embody a male/female identity within their lives.

There are contextual variations in the processes and outcomes linked to gender inequalities that have not been adequately integrated into the gender advocacy agenda. Conversations on gender have predominantly occurred at the national level, with limited reach to districts and communities where development initiatives could more accurately address the specific needs and priorities of various gender groups. Moreover, these gender discussions have been mainly confined to the development "industry," thus narrowing the scope of engagement for a remarkably diverse process. Frequently, these discussions are steered by interest groups that set agendas rather than being led by the individuals for whom interventions are being devised (Subrahmanian, 2004a).

The concept of a gender transformative agenda has often been construed as a drive to amplify visibility and allocate resources to women rather than serving as a genuinely political and transformative agenda. Governance and politics are pivotal for comprehending and scrutinising

the shifts towards sustainability. However, regrettably, governance and politics within gender transformations have received inadequate attention. The analytical frameworks behind advocating for gender mainstreaming have proven weak, and insufficient attention has been directed towards the organisational structures that hinder translating policies into practical implementation. This limitation has curtailed the effectiveness of gender advocacy programs in various contexts, including low- and middle-income countries (Kanji and Salway, 2000; Whitehead, 2003; Subrahmanian R, 2004b). The transformative agenda is, therefore, pushed through gender equality frameworks.

2.2. The Concept of Gender Equality

Gender equality signifies that everyone can follow any career, lifestyle, or personal interest they are capable of and inclined to, without bias. It underscores the idea that gender should not lead to disparities in rights, chances, or societal inclusion but rather that these ambitions and necessities are equally esteemed (Human Rights Career, No Date). Gender equality further suggests that the distinct economic, social, and cultural roles and opportunities attributed to various genders by diverse societies should not give rise to varying expectations that hinder one's pursuits and aspirations (UNFPA, 2005).

Gender equality, embodied as Sustainable Development Goal 5, is a pivotal global commitment towards eradicating gender-based disparities and promoting a just and inclusive world. This goal, set forth by the United Nations, recognises that gender inequality persists in various forms across the globe, impeding social progress and sustainable development (United Nations, No Date). The essence of this goal lies in ensuring that women and girls are afforded the same rights, opportunities, and resources as their male counterparts (Malhotra et al., 2009). It addresses the multifaceted dimensions of gender inequality, including economic and educational disparities perpetuated by discriminatory cultural norms (Alvarez and Lopez, 2013). Achieving gender equality extends beyond statistical parity; it involves dismantling deep-rooted structural inequalities, biases, and stereotypes, even in academia (Llorens et al., 2021).

Pursuing Sustainable Development Goal 5 involves empowering women and girls to thrive in all spheres of life, including education, employment, and political participation. It advocates for breaking down barriers that hinder progress and limiting potential. By investing in girls' education and promoting women's economic empowerment, societies can unlock the potential of half the population, fostering sustainable growth and development (OECD, 2012). When women are empowered, families are healthier, communities are more resilient, economies are stronger, and societies are more harmonious. Gender equality effectively enhances the collective capacity to tackle challenges such as poverty, hunger, and climate change. In embracing Sustainable Development Goal 5, governments, institutions, and individuals commit to transforming norms, policies, and practices perpetuating gender disparities (OECD, 2023).

Gender equality is assumed to be an aspirational endeavour characterised by its visionary nature. It centers on achieving substantive equality, aiming to rectify disadvantages rather than insisting solely on identical treatment, recognising that uniform treatment might not prevent equitable mistreatment. Rooted in a fundamental notion of dignity, it strives to confront stigmatisation, biases, indignity, and violence (Fredman and Goldblatt, 2015). This pursuit is guided by the principle of expanding benefits rather than achieving parity through removing advantages, a concept known as 'levelling down' (Fredman and Goldblatt, 2015).

Pursuing a gender-neutral future acknowledges that barriers to equality are deeply entrenched within institutional and societal frameworks. Therefore, gender equality seeks to transform these structures, which perpetuate gender disparities, by reconfiguring the distribution of power and resources, transcending mere rectification of the actions of those responsible for gender inequity (Fraser, 2003). Additionally, this pursuit recognises the significance of amplifying the voices of marginalised genders, viewing it as a political and social process for addressing injustices (Fraser, 2003).

Gender equality constitutes an essential human right embodied in the principle of equality enshrined within international human rights instruments. Universal Declaration of Human Rights Article 2 asserts that all individuals are entitled to rights and freedoms without any form of discrimination, such as based on race, color, sex, language, religion, political or other opinions, national or social origin, property, birth, or other status (United Nations General Assembly, 1948). Similarly, the International Covenant on Economic, Social, and Cultural Rights mandates State parties to ensure that Covenant rights are exercised without discrimination, as outlined in the Universal Declaration of Human Rights (United Nations General Assembly, 1966, article 2(2)). The International Covenant on Civil and Political Rights requires States to uphold Covenant rights without distinction (United Nations General Assembly, 1966, article 2). The International Covenant on Civil and Political Rights and the International Covenant on Economic, Social, and Cultural Rights, under Article 3, emphasize the 'equal right' of women and men to enjoy all rights outlined in the respective Covenants.

The Convention on the Elimination of All Forms of Discrimination against Women addresses women specifically, defining 'discrimination against women' as any differentiation, exclusion, or restriction based on sex that aims to impair or nullify the recognition, enjoyment, or exercise by women, irrespective of their marital status, of human rights and fundamental freedoms in various spheres (United Nations General Assembly, 1979, article 1)

These agreements have been integrated and implemented within countries across West Africa. The original Economic Community of West African States (ECOWAS) Treaty was officially ratified in May 1975 (Edi, 2007). Upholding human rights is a central tenet driving ECOWAS' pursuits, as it stands as one of the core principles guiding the organisation's objectives. ECOWAS,

conceived as a regional integration effort, was designed to facilitate the realisation of the right to development (Ebobrah, 2020). A supplementary protocol adopted by ECOWAS in 1985 took a more explicit stance on the organisation's role in advancing human rights. It defined fundamental human rights in alignment with those acknowledged by the Universal Declaration on Human Rights, giving considerable attention to these rights within the protocol (ECOWAS, 1979).

By 1991, ECOWAS extended its commitment to human rights, referencing 'universally recognised international instruments on human rights and the African Charter on Human and Peoples' Rights' (United Nations, 1991). The 1993 protocol used more unequivocal language to articulate human rights provisions. The revised Treaty, specifically Article 4 (g), acknowledged the 'promotion and protection of human and peoples' rights following the African Charter on Human and Peoples' Rights' as a fundamental principle guiding the Community's objectives (ECOWAS, 2016). The 1993 protocol also included a pledge that ECOWAS member states who are 'signatories to the African Charter on Human and Peoples' Rights' commit to collaborating towards achieving the instrument's goals (ECOWAS, 2016).

Like other nations, ECOWAS member states pursue gender equality due to their recognition of its potential contributions to human development. Gender equality fosters the involvement of individuals of various genders within the business realm. Research has demonstrated that gender diversity enhances innovation and productivity within organisations. Gender equality provides an equal platform for all individuals to partake in governance systems, enabling them to access increased opportunities for financial stability, dignified employment, and economic independence (ECLAC, 2019).

Nigeria stands among the ECOWAS member states where the pursuit of gender equality is experiencing gradual advancement. Gender roles in Nigeria are intricately woven by religious beliefs, cultural practices, individual lifestyles, and upbringing (Holmes, 1994). Various religions concur on respecting women and recognising their pivotal role in family dynamics, particularly highlighting their roles as mothers and wives. However, these religious viewpoints do not necessarily endorse complete gender parity with men, refraining from advocating for complete equality (Sibani, 2017). Despite observable strides towards gender equality in the professional sphere within the country, deeply ingrained cultural norms and societal expectations continue to foster gender inequality. These norms and expectations manifest through shared notions regarding suitable forms of play and education during childhood, perpetuating distinct ideals of boyhood and girlhood (Aries, 2015).

Yet, gender equality plays a vital role in mitigating the risk of encountering various forms of violence, ensuring that everyone can actively contribute to and influence the establishment of sustainable peace and resilience. Furthermore, gender equality is instrumental in ensuring that all individuals, regardless of gender, share equal benefits in disaster prevention, conflict resolution,

and humanitarian efforts (Human Rights Career, No Dateb.)

Moreover, gender equality catalyses socio-economic sustainability and is a barrier against environmental degradation and the impacts of climate change. It is a foundation for fostering peace social justice, and reducing the likelihood of internal conflicts. Additionally, gender equality can potentially propel advancements in science, education, and health, ultimately contributing to societal progress (Equal Measures 2030, 2019).

Pursuing gender equality significantly intersects with health outcomes (Roxo, 2021). By ensuring equal opportunities and reducing the risk of violence, gender equality contributes to improved mental and physical health for all individuals (Trask, 2016). Additionally, gender equality within healthcare leadership and research can lead to more comprehensive and inclusive healthcare policies and practices. Within the Sustainable Development Goals, gender equality is intricately linked to Sustainable Development Goal 3, which focuses on good health and well-being. A more equitable distribution of resources, opportunities, and rights through gender equality can positively impact health outcomes, such as maternal and child health, access to healthcare services, and the overall well-being of populations.

Gender equity is frequently deliberated in conjunction with gender equality due to several compelling reasons, which include the understanding that the health disparities that result from gender inequity are unnecessary and avoidable while also being characterised as unfair and unjust (Whitehead, 1992). While gender equality represents the ultimate objective, the pursuit of gender equity plays a pivotal role in addressing deep-seated biases and disparities within society. This pursuit is instrumental in rectifying historical injustices, ultimately paving the way for substantive and enduring gender equality. This involves remedying disadvantages, combatting stigma, prejudice, humiliation, and violence, overhauling institutional and social frameworks that sustain gender disparities, and fostering the inclusive participation of all genders in social and political dialogues (Equal Measures 2030, 2019). Effectively, equity serves as the foundation for achieving equality, as it embodies the "just treatment for both women and men, taking into account their distinct needs." At the same time, equality remains the goal; equity is a mechanism to reach that goal.

Despite advancements witnessed in recent decades, the world is falling short of the projected targets for achieving gender equality by 2030 (United Nations Department of Economic and Social Affairs Sustainable Development, 2022). Sustainable Development Goal 5.1 seeks to eradicate discrimination against women and girls worldwide. At the same time, Sustainable Development Goal 5.5 aspires to ensure complete and meaningful involvement, along with equal prospects for leadership at every echelon of decision-making in political, economic, and public spheres (United Nations Department of Economic and Social Affairs Sustainable Development, 2022). Presently, a staggering 178 nations maintain legal barriers that hinder women's comprehensive economic

engagement. Shockingly, almost 2.4 billion women globally do not possess the same economic rights as men. Furthermore, at the existing pace of advancement, it is anticipated to take an additional 140 years before women achieve proportional representation in authoritative and leadership positions within workplaces (United Nations, 2023). However, Sub-Saharan Africa has made the most progress regarding women's representation in management, reaching 38.2% in 2021 (United Nations, 2023).

As of the conclusion of 2018, no nation achieved the highest global rankings across all the monitored objectives, including health, gender-based violence, climate change, and professional matters. Sub-Saharan Africa exhibited the weakest performance, registering an index score of 51.1 out of 100. The leading ten countries included Finland, Sweden, Norway, Netherlands, Slovenia, Germany, Canada, Ireland, and Australia. Notably, out of the lowest twenty countries, seventeen were in Sub-Saharan Africa, and five of the least-performing ten countries were situated in West Africa, namely Sierra Leone, Liberia, Mauritania, Nigeria, and Mali (Equal Measures 2030, 2019).

Nonetheless, there appears to be substantial potential for notable advancements in West Africa if the obstacles tied to gender-related barriers in research productivity are recognised and rectified. In 2017, Senegal, a West African nation, secured a position among the top 10 global countries for its strides in gender equality initiatives, with women comprising 42% of its governmental representation (Equal Measures 2030, 2019). Countries such as Burkina Faso, Cabo Verde, Gambia, Ghana, Guinea-Bissau, Mauritania, Senegal, and Sierra Leone have successfully bridged the gender gap in primary school enrollment (Ferrant, 2018). Nevertheless, across the region, women invest six times more time than men in unpaid care work, encompassing tasks like cooking, cleaning, water and firewood collection, and caregiving for children, the sick, and the elderly. This ratio drops to as low as two times more in Nigeria and soars to as high as 17 times more in Mali (Farrent, 2018). Despite advancements in fostering gender equality within the West African context over the past years, there remains considerable potential for further progress if the underlying reasons for existing disparities are identified, and concerted efforts are directed toward resolving these gaps.

The disparities, obstacles, and complexities surrounding gender equality in West Africa, including Nigeria, are intricately tied to the challenges of achieving legal parity. An illustrative instance is that 30 nations globally have stipulated reservations to Article 16 of the Convention on the Elimination of All Forms of Discrimination against Women, citing the regulation of matters concerning equality in marriage, divorce, marital property ownership, and inheritance by Sharia law (Freeman, 2009). Governments in West Africa have endorsed instruments such as the Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, the African Youth Charter, and the African Charter on the Rights and Welfare of the Child (Farrent, 2018).

While these legal frameworks align with their commitments to advancing gender equality, customary practices and legal gaps frequently erode women's rights, as observed in nations like Nigeria (Farrent, 2018). One such undermining mechanism in Nigeria is the Sharia law, which perpetuates a patriarchal society and fosters female subordination, consequently providing men with the opportunity to burden women with domestic responsibilities and manual labor, thus bolstering the social standing of men (Beverly and Boyd, 2000; Bossaller and Leimeier, 1994). However, addressing gender disparities in labor force participation could substantially contribute to a 31% increase in Nigeria's gross domestic product (Farrent, 2018).

While these legal frameworks align with their commitments to promoting gender equality, customary practices and legal gaps frequently undermine women's rights, as evidenced in countries like Nigeria (Farrent, 2018). One such undermining instrument in Nigeria is the Sharia law, which promotes a patriarchal society and female subordination, which promotes the opportunity for men to over burden women with domestic chores and manual labour, which uplifted the social status of men (Beverly and Boyd, 2000; Bossaller and Leimeier, 1994). Yet, closing gender gaps in labour force participation would substantially increase incomes by up to 31% of the gross domestic product in Nigeria (Farrent, 2018). Conversely, it is estimated that gender gaps cost the economy some 15% of gross domestic product (Cuberes and Teigner, 2016; Farrent and Kolev, 2016).

Acknowledging the constraints inherent in achieving gender equality through legal arguments stems from the law's inability to address more deeply ingrained forms of inequality within institutions. Striving for gender neutrality would involve attempting to meet benchmarks established within a social system inherently skewed by gender biases. The pursuit of such standards becomes restricted and disempowering when there isn't a gender-based comparison to be made. A case in point is issues tied to pregnancy, which are specific to women. Consequently, there are no male-oriented standards to aspire to in matters related to maternal considerations when seeking equality under the law based on treating 'like' as 'like' (Fredman, 2011; MacKinnon, 1987). Legal appeals for equality are also curtailed if no individual or state entity can be proven to be 'at fault' (Fredman and Goldblatt, 2015). Unfortunately, those most adversely impacted by the limitations of seeking legal equality include women (Fredman, 2016).

The notion of substantive equality emerged as a response to the gaps in pursuing legal equality. Substantive equality acknowledges gender differences and directs attention toward rectifying disadvantages rather than gender neutrality. It prioritises reshaping existing structures over conforming to already "privileged" gender categories, seeks to elevate standards rather than lower them, and strives to bring about change even without identifying specific offenses (Fredman 2002; 2011). The necessity to shift from the legal principle of treating similar cases equally to a more substantial understanding of gender equality has been adopted by several Supreme Courts within various countries. It has also gained traction at the international level despite facing challenges in

its legal interpretation due to the lack of institutional mechanisms, policies, and facilities (Fredman, 2016).

2.3. Gender Inequality and West Africa

West Africa thrived as a society where gender balance was a fundamental aspect. In pre-colonial Africa, the equilibrium between male and female representation extended into both the spiritual and physical realms. The concept of power and authority was intricately linked among the West African people, forming an inseparable connection between the tangible human world and the intangible spiritual realm. This belief system elucidates West Africa's deep-rooted faith in the perpetual cycle of life and the concept of reincarnation (Achebe, 2018).

Leadership and power were not foreign concepts to women in West Africa during the pre-colonial era. Instead, the roles of males and females were complementary rather than subservient, with each gender managing and overseeing their respective affairs. Both male and female figures in positions of authority drew their political power from their association with the spiritual world (Achebe, 2018).

A noteworthy characteristic of pre-colonial African systems was the presence of female titleholders occupying prominent positions within the political hierarchy. The prevalence of female leadership in the political structure, facilitated by matriarchal systems, was a defining trait of these ancient societies. It's worth noting that this system of female leadership predates many other systems in the world order (Farrar, 1997; Clarke, 1984; Van Sertima, 1984). In the pre-colonial era, women held a higher social status than men, as attested by Diop (1991).

The traditional West African world comprises two distinct types of societies: centralised and small-scale. In the centralised societies, rulers consist of kings and queens (queen mothers), while in small-scale societies, male and female elders assume leadership roles. Both genders, men and women, actively engage in labor, and either can take on the role of warriors (Achebe, 2018).

Two examples illustrate the organised representation of women in West African society: the Queen Mother in Asante, Ghana, and the Iyalode in Yoruba land, Nigeria. Asante, Ghana, is a prime example of the dual-sex political system found in numerous West African communities. Within Asante, both male and female governing bodies existed. Queen mothers held positions as co-rulers in Asanteland, their authority stemming from the matrilineal structure of the society. Queen mothers played crucial roles, such as electing the king, who required approval from the traditional council. They advised the king on state, tradition, and religion, ensuring that taboos were respected. Notably, they held the exclusive right to criticise and admonish the King publicly. Furthermore, queen mothers undertook judicial responsibilities and oversaw matters related to female governance (Aidoo, 1977).

In Yorubaland, Nigeria, the Iyalode occupied a similar esteemed position. This role was attained through elections and encompassed judicial powers and control over substantial economic resources. The Iyalode served as the voice of women in government and coordinated their activities. The Iyalode was representative of the significant number of women actively involved in the political affairs of numerous kingdoms in Yorubaland (Denzer, 1994).

Colonialism marked the initiation of the decline in gender equality within both village life and the realm of politics, with women enduring the most substantial erosion of their influence and authority (Agbaje, 2919). Colonisation introduced European moral and legal norms, legislations, and punitive measures that excluded the decision-making process. Instead, young men who established connections with colonial masters were appointed warrant chiefs in societies without centralised structures (Joireman, 2011). Matters once adjudicated by women and their associations now fell under the jurisdiction of colonial courts. In this altered landscape, women were notably absent as warrant chiefs or court members and not considered for roles as court messengers, interpreters, clerks, or policewomen (Achebe, 2018).

In addition, implementing Western education through formal schooling introduced avenues for training in traditionally deemed masculine fields, such as carpentry and printing. Consequently, this exclusionary approach limited women's participation in these educational opportunities (Ricketts, 2013). Among the few girls who attended missionary schools, the curriculum centered on teaching domestic tasks like cooking, childcare, cleaning, and sewing - skills viewed as essential for marriage and motherhood. This educational framework gradually eroded the pre-colonial education that had prepared females for roles in both private and public spheres.

The missionaries' biased perspective against West African women aligned with Victorian ideology, asserting that women possessed feeble intellects, were incapable of mastering subjects considered masculine, and were meant to confine themselves to domestic roles. Additionally, the institution of religious marriage introduced the usage of the title "Mrs.," replacing the customary practice of West African women identifying themselves by their mother's first name. This change further contributed to the diminishing recognition of women's identity (Achebe, 2018).

The economic disempowerment of women has been the primary pathway through which the patriarchal society in West Africa has evolved (Ricketts, 2013). Colonialism entrenched a pattern of subordination, particularly concerning authority decisions. The economic empowerment of men and their elevated position in political and social spheres led to women's increasing dependency on economically empowered males (Jawondo and Oshewolo, 2020). This inequality in the labor market extends into the home. Discriminatory customary and religious norms directly affected matters such as inheritance, property ownership, divorce and widowhood rights, and resource access, further solidifying the economic gap between genders. These norms that disempower

women are particularly pronounced in present-day rural West African communities, where men's economic advantage over women and men's dominance in political and social contexts are glaring (Aderinto, 2001).

Many women striving for economic independence are hindered by social institutions that impose barriers such as cultural constraints on women's mobility, limited resource rights, physical insecurity, gender bias in favor of sons, and restricted civil liberties. For instance, a woman seeking an agricultural loan may be required to provide collateral in the form of land predominantly accessible to men (Jones et al., 2010). Given the prevalent opportunities for males, families often invest more in boys, perceiving them as future earners and caregivers. This sets in motion a harmful cycle where boys grow up with higher status and better income prospects within the household compared to girls. This cyclic process is reflected in the deeply entrenched practices of the patriarchal society (UNICEF, 2006).

Patriarchal systems, unfortunately shape the definitions of masculinity and femininity and perpetuate the disparities between freedom and subjugation (IIAS, 2019). The patriarchal West African society hosts a range of masculine models, each with varying degrees of influence and control over women. Some forms of masculinity are less inclined toward violence, placing a greater emphasis on men's responsibilities and positioning them in supportive and collaborative relationships with women. Others are heavily based on exercising dominance and control over women, often measuring men's success and honor through their ability to exert authority over women. Consequently, violence or the threat thereof is strategically employed to establish dominance over women, reinforce gender hierarchy, and penalise deviations (Conwell, 1983). The communal cultural model of masculinity often exhibits men's power and dominance over women, with violence being resorted to when verbal persuasion fails (Wood et al., 2007). The authority conferred upon men through patriarchy also empowers them to use violence as a means of discipline (Wood et al., 2008).

Structural transformation is imperative to achieve more secure and dignified livelihoods for girls and women. This transformation should aim to provide opportunities without subjecting them to systems of discrimination rather than merely integrating them into such systems.

2.4. Gender Inequality, Education and West Africa

Africa has achieved noteworthy strides in educational attainment. The average gross enrollment ratio for primary schools escalated from 68% in 1990 to 98% in 2015, with the enrolled student count soaring from 63 million to 152 million. Despite this expansion in primary school enrollments, many children remain excluded from education. Approximately 52.3 million primary and lower secondary school children (6–14 and 7–15) are not attending school, constituting 45%

of the global out-of-school child population (Bashir et al., 2018). Essential educational outcomes like literacy, although fundamental, are not universally achieved. A substantial literacy gap persists between males and females, with Western Africa exhibiting the most substantial gender disparities (Bashir et al., 2018).

This gender gap raises concerns, especially considering the burgeoning youth populations in the region. Unlike most other continents, which experienced rapid population growth, West Africa's population remained stagnant until the late 19th century. The population began a significant ascent only at the start of the 20th century, coinciding with improved health and medical conditions. Since then, the West African population has surged by nearly 3% annually, from 40 million in 1930 to 290 million in 2005. Projections indicate that the population will reach 430 million by 2020 and could surpass half a billion by 2040 (the Sahel and West African Club/OECD, 2006). Therefore, harnessing the potential of this burgeoning young population becomes crucial for both poverty alleviation and economic development.

Facilitating access for the large young population in West Africa is imperative for regional economic growth and development. Over the years, illiteracy rates have markedly declined, plummeting from 81% in 1970 to 44% in 2001. Notably, youth illiteracy rates decreased from 68% in 1970 to 25% in 2001, with West African women's education showcasing commendable progress compared to other developing nations (Sahel and West African Club/OECD, 2006). Despite these advancements, the region still exhibits high rates of exclusion of children from education, with the worst figures attained by the end of 2018 and exclusion increasing as children transition from primary to secondary to tertiary education (UNESCO, 2019). The exclusion rate for girls exceeds the rate for boys. Given these circumstances, prioritizing girls' education remains paramount [UNESCO, 2019]. Table 1 below presents the primary school education profile for West Africa.

Table 1: Primary school enrolment in Countries in West Africa disaggregated by sex in 2009*

Country	Proportion of children enrolled	Proportion of male children enrolled	Male persistence to last grade	Proportion of female children enrolled	Female persistence to last grade
Benin	94%	97%	35%	84%	33%
Burkina Faso	63%	67%	50%	59%	62%
Cape Verde	95%	97%	89%	94%	91%
The Gambia	64% (2008)	62%	80%	66%	88%
Ghana	72%	72%	81%	72%	82%
Guinea	67%	72%	67%	62%	65%

Guinea-Bissau	49%	58%	9%	41%	7%
Cote D'Ivoire	56%	61%	83%	50%	81%
Liberia	41%	45%	48%	42%	44%
Mali	64%	69%	64%	58%	59%
Mauritania	72%	71%	63%	73%	66%
Niger	51%	57%	63%	45%	66%
Nigeria	64%	71%	62%	58%	67%
Senegal	71%	69%	56%	72%	60%
Sierra Leone	45% (1983)	52%	24%	37%	25%
Togo	89% (2008)	94%	54%	84%	51%

*Latest figures available at the World Bank Data Base (https://data.worldbank.org/indicator/SE.PRM.PRSL.FE.ZS?locations=ZG)

For numerous women, ensuring the education of their female children offers a path out of the entanglements of gender inequality they confront. Conversely, men often view the education of their male offspring as an avenue to escape poverty, given the better employment prospects and higher wages typically available to boys. In households where financial resources for supporting children's education are constrained, the final say often lies with the breadwinner—the male head of the household. Consequently, the education of male children tends to take precedence over that of their female counterparts. This micro-level bias in gender-skewed decision-making is fortified by societal, cultural, economic, and political contexts, which make the preference for educating male children easier to justify. However, the push to realize children's human right to education, particularly in ways that foster engagement with industry, technological advancement, and research, still lags (Equal Measures 2030, 2019).

Moreover, implementing Structural Adjustment Programs designed to revitalise Sub-Saharan African economies and enhance their competitiveness in the global market has resulted in chronic poverty, reduced living standards, and decreased life expectancy (Thomson et al., 2017). The adverse impacts of these programs have disproportionately affected women and girls. The economic decline experienced by parents and guardians has led to many girls being pulled out of school to generate income for the family, often through the sale of goods in markets or neighborhoods (Obasi, 1997).

This skewed prioritisation, favouring boys for ongoing education and assigning girls to support domestic chores, was deeply rooted during the initial introduction of education into West Africa by foreign missionaries and colonising governments (Graham, 1971; George, 1976). The

educational objective for girls was primarily to prepare them for domestic roles, while boys were educated to secure the family's livelihood (Graham, 1971). The heavy burden of homecare borne by girls, their responsibilities for tending to sick family members, and their engagement as domestic servants in coastal cities or neighbouring countries for supplementary income have all contributed to limiting girls' access to education (Plan UK, 2009). Nonetheless, girls' education holds substantial importance, as it leads to intergenerational benefits: educated mothers are more likely to advocate for educational opportunities for their children and have better health outcomes in the family (Kamanda, Madise, and Schnepf, 2016). Each additional year of formal education a mother completes results in her children staying in school for an extra one-third to one-half year (UNESDOC, 2013).

Despite the commitment of West African governments to achieve universal primary education, the enrollment of girls in schools remains low. Table 1 presents a summary of the proportion of children enrolled in primary schools and the percentage of those enrolled who reach the final grade. Across most West African countries, the enrollment rate for girls is lower than for boys. Moreover, primary school completion is particularly challenging for girls in the region.

Various educational policy reforms have been introduced to enhance girls' education. For instance, in Ghana in 1987, the country implemented Free, Compulsory Universal Basic Education to expand access and improve equity, quality, and sustainability in education (Girls' Education Unit, 2002). In 1997, the Girls' Education Unit was established within the Ministry of Education to address the disparity between girls and boys, enabling girls to benefit fully from free and compulsory education. While gender parity between girls and boys has been nearly achieved at the early childhood education level, the gap widens from primary school through junior high and high school levels, with the starkest discrepancy evident at high school and post-secondary levels (Ghana Statistical Service, 2002). Additionally, more girls tend to drop out of school (Johnson and Kyle, 2001). This situation is mirrored in Nigeria. Although the government launched the Universal Basic Education policy to provide free and compulsory education for all Nigerian children from primary to junior secondary school levels, inequalities in school enrollment persist. Early child marriage significantly hinders female education, with the national literacy rate for females trailing behind that of males. Like other countries in the region, the domestic role expectations placed on girls limit their opportunities for completing their education (Bunche, 1934), resulting in declining enrollment as girls advance in their education. Early child marriage plays a substantial role in this trend (UNICEF, 2003b).

Gender inequality becomes deeply ingrained within societies, propped up by traditions and religious support for male dominance. This gives rise to a collection of beliefs and myths that explain and justify the situation (Cusack, 1999). Such myths include rationalising the denial of education to girls, ostensibly to prevent early pregnancies and family shame. Additionally, some hold the belief that women achieving the same level of education as men is a disgrace to the

community, as they might remain unmarried or marry foreigners. For parents who hold these views, early marriage is deemed the solution, ostensibly to preserve traditions (Offorma, 2009).

Culture is wielded as a tool of oppression, manipulated to perpetuate inequality and gender injustices against women, who then internalise and endure these biases (Kolawole, 1998). The coexistence of legislative reforms alongside customary laws weakens the legitimacy of gender equality frameworks, allowing culture, religion, and tradition to persist and propagate gender inequality. What's more, the value of formal education for women's economic prosperity, particularly in markets where illiteracy and semi-illiteracy prevail, often goes unrecognised (Dolphyne, 2000). Moreover, gender equality frameworks in education in West Africa have been hindered in their effectiveness, as in many cases, teaching methods and environments continue to reinforce and perpetuate gender inequality and negative stereotypes rather than challenging them. This approach undermines the positive potential of education in advancing women's rights (CEF, 2009).

However, the education of girls emerges as a potent tool for development. For every extra year of a mother's education, the chances of infant mortality decrease by 5-10%. Offspring born to mothers with at least a secondary education have a twofold likelihood of surviving beyond the age of 5, in contrast to those born to mothers lacking education (Bado and Sathiya, 2016). The progress in women's education is accountable for 50% of the decline in child fatalities between 1990 and 2009 (United Nations, No Date). A child brought into the world by a literate mother boasts a 50% higher probability of living beyond age 5. Sub-Saharan Africa could have saved around 1.8 million children's lives in 2008 had their mothers received secondary education at a minimum (Bado and Sathiya, 2016). Elevated wages, agricultural earnings, and productivity—crucial for alleviating poverty—are intertwined with improved education for women involved in agriculture and each additional year of education beyond primary schooling reaps amplified advantages, providing enhanced prospects, choices, and outcomes for both girls and women (Karam, No Date). Completing secondary education also strongly corresponds with postponed marriages and later onset of initial pregnancies (UNESDOC, 2013).

The 1990 United Nations Convention on the Rights of the Child promotes universal education for all children, irrespective of gender. However, early child marriages in rural areas and teenage pregnancies in urban areas often undermine the political opportunities created by these conventions in many West African countries. Marriage is frequently seen as incompatible with continued schooling, and teenage marriage is sometimes seen as a way to preserve chastity. As puberty approaches, families often withdraw their daughters from school, and other parents may refuse to enroll them due to concerns about teenage pregnancy. Early marriage is often justified by invoking religion and culture, even though it violates girls' rights to a promising future and perpetuates the feminisation of poverty, gender inequality, and disempowerment (Otoo-Oyortey and Pobi, 2003).

2.5. Gender inequality, Social Exclusion, and Discriminatory Practices

A noteworthy concern revolves around the discourse on gender equality, which often neglects to incorporate the essential elements of acknowledging and embracing diverse gender identities in the global equality narrative, as well as in West Africa, where discrimination based on sexual orientation and/or behavior is a tangible issue. Sexual orientation refers to an individual's romantic and sexual attraction to others (American Psychological Association, 2012), encompassing their core sense of being male, female, or existing outside the conventional male/female binary, also known as gender identity (Lev, 2013).

Gender minorities frequently experience societal exclusion, economic marginalisation, and discriminatory barriers to education (United Nations, 2011). In the discourse on gender equality, it's imperative to recognise equality as a stance against discrimination rooted in gender, race, age, physical ability, and ethnicity (Twomey and Harris, 2012).

The human rights battle for gender minorities has centered on their entitlement to protections mandated by international human rights law. These encompass rights to life, personal security, privacy, freedom from torture, arbitrary arrest and detention, freedom from discrimination, freedom of expression, association, and peaceful assembly. However, much of the focus on rights has centered around the right to life, safety, and citizenship, with less emphasis on the equality considerations for other rights, such as education. Legal battles have predominantly addressed equality concerns due to the historical criminalisation of certain sexual behaviours through colonial-era laws (Epprecht, 2008). These laws, which criminalise same-sex conduct, systematically marginalise gender and sexual minorities, contributing to poorer health outcomes (Hatzenbuehler, 2014). However, there is inadequate documentation of discrimination and its repercussions on the education of gender minorities in West Africa. In various parts of the world, gender minority youth subjected to bullying and exclusion are more likely to abandon their education compared to those who receive support from school authorities (Human Rights Watch, 2020). Gender minorities are also over four times more likely to miss school than heterosexual students, primarily due to feelings of insecurity resulting from the experience of stigma and bullying (Massachusetts High School Students Survey, 2009; Berlan et al., 2010; Earnshaw et al., 2018). Moreover, they tend to exhibit early disparities in academic achievement and have heightened propensities for truancy and subpar grades (Russell et al., 2001; Birkett et al., 2014). Truancy is strongly linked to depression and anxiety symptoms in gender minorities—a challenge more prevalent among gender minorities than among cis-gender individuals (Borgogna et al., 2019; Müller and Daskilewicz, 2018).

Gender inequality is closely linked to the experience of social exclusion, which encompasses being marginalised from various domains, including markets, services, and societal spaces. Markets

encompass credit access, housing opportunities, employment prospects, and land ownership. Services encompass a wide spectrum, including communication, education, access to electricity, healthcare, social safety nets, transportation, and technology. The concept of space pertains to diverse realms, including social, political, and cultural spheres (Das and Espinoza, 2020). Exclusion is a multifaceted process that curtails individuals' and groups' capabilities, opportunities, and dignity, preventing them from participating fully in society. This exclusion has far-reaching and often unforeseen consequences for individuals, groups, the broader society, and the economy (Das and Espinoza, 2020). Women and gender minorities frequently face exclusionary practices that hinder them from realising their potential, leading them to reject systems they perceive as endorsing exclusion. This can result in missed opportunities, even those offered by systems such as education (Das and Espinoza, 2020). Furthermore, exclusion can foster the use of violence to assert dominance over subordinate groups, as physical abuse is frequently rationalised by intricate sets of beliefs and taboos that uphold societal norms (National Academy of Science, 2018). These norms create a "logic of exclusion" that marginalises those who challenge sanctified norms, often leading to incidents of bullying and mistreatment of gender minorities within educational systems (Dauvergne and Lindy, 2019).

Hence, the discourse on gender equality is inextricably linked with conversations about embracing diversity, promoting social inclusion, and eradicating discriminatory practices. Within this context, the educational system holds a strategic position to drive societal change and address gender inequality. However, several challenges persist in the West African educational landscape, including low enrollment rates, weak institutional and administrative frameworks to advance gender equality in education, and inadequate in-country policies and programs that promote gender equality. These factors collectively hinder the effectiveness of the educational system in West Africa in tackling gender inequality, resulting in the perpetuation of unequal norms and practices.

2.6. Gender transformative opportunities in higher education institutions in West Africa

The interconnection between attaining higher education and a nation's economic competitiveness, poverty reduction, social mobility, social justice, and labour productivity is strategic (Nelson and Phelps, 1966; Rodrik, 2006). Higher education provides value to employers due to the enhanced ability to learn quickly, adapt to changing economic conditions, embrace innovation, leverage emerging technologies, and exhibit improved problem-solving and communication skills (Coulombe et al., 2004). Additionally, tertiary education is crucial in fostering good citizenship, enriching one's life by broadening horizons (National Planning Commission, 2011), and a commitment to social justice (Roberts and Allen, 1997).

One of such social justice transformation agenda is the pursuit of gender equality. Effective gender equality transformation relies on government policies and universities' dedication to gender equality policies (Mazibuko, 2006). Political endorsements often catalyse policy changes, and education reform initiatives are frequently intertwined with political dynamics. Governments in West African nations have committed to ensuring girls' inclusion in the education system. However, the real challenges persist within homes, schools, and communities where socio-cultural beliefs sustain gender inequality and where the battles for change must be strategically waged (Karam, No Date).

The gendered dimension of education assumes a critical role, given the direct link between literacy and women's empowerment. Education empowers girls and women to effectively exercise their limited legal rights [Karam, No Date]. Despite the narrowing gender gap in primary and secondary education completion, access to higher education remains a hurdle for many women in West Africa. Initiatives like the Universal Basic Education Scheme have been introduced to facilitate girls' completion of primary education and access to secondary and higher education. Nevertheless, the disparities in accessing higher education persist. The gender-based inequalities in educational opportunities can lead to insecurity, as those deprived of education are distanced from avenues to counter their deprivation (Karam, No Date).

Gaining meaningful access to higher education programs proves to be a challenging endeavour. In numerous societies, females bear the weight of domestic duties, childcare, and reproductive roles—responsibilities not shared by their male counterparts. These tasks create formidable barriers hindering their pursuit, admission, and completion of advanced education. The specific obstacles at each stage of higher education access are contingent on the context and necessitate comprehensive evaluation, documentation, and confrontation. The Ebola outbreak in West Africa serves as a stark illustration of how gender disparities significantly impede women's educational attainment. Amid the crisis, women were not only expected to care for their ailing parents (World Health Organisation, 2016) but also faced the necessity of abandoning schools and higher learning institutions to tend to familial obligations (Fawole et al., 2016). The unequal distribution of family, household, and caregiving duties must be examined to empower women in their professional trajectories (Mbaye et al., 2019). Additionally, addressing challenges like early pregnancies, forced marriages, maternal health issues, and unequal domestic and caregiving burdens is imperative for achieving equitable gender access to higher education (Karam, No Date).

Upon completing higher education, when women embark on scientific careers, their communities and society stand to gain from their novel and inventive contributions to science. The participation of women in scientific fields amplifies the voices of the most susceptible, enhancing the potential to cater to their needs and reshaping the underlying determinants. This potential has proven effective in combating diseases linked to poverty, where women's input enriches the formulation and execution of health research, thereby translating outcomes into policies that align with the

concerns of marginalised and vulnerable groups, encompassing children, the elderly, and those dependent on them (UNDESA, 2020).

The groundwork should be laid during their school years to cultivate opportunities for women to pursue scientific careers after higher education. Higher education institutions must go beyond mere policy proclamations of commitment to gender equality. A comprehensive transformation in perceptions and values surrounding gender parity is essential, necessitating mentoring to help implement genuine change. Mentorship facilitates the transition from policies to practice, offering indispensable support in building the capacity and competence of institutions and their staff through interconnected activities (CEF, 2009).

Moreover, mentorship programs led by faculty members can substantially bolster the efforts of women and gender minorities seeking scientific careers, acting as a potent catalyst for gender revolution within higher education establishments (Allen et al., 2008; Meschitti and Smith, 2017). In this context, mentoring is a mentor's offline assistance to aid the mentee in pivotal transitions within knowledge, work, or thinking (Megginson et al., 2006). It's a developmental association (Schramm, 2004). Within academia, mentorship should facilitate the mentee's comprehension of the organizational landscape and career prospects, mitigate isolation, and facilitate access to pertinent networks. This process can significantly enhance the career trajectory of women in academia, particularly those pursuing scientific vocations (Meschitti, 2017). Consequently, mentorship initiatives should be harnessed as a potent mechanism for confronting the fundamental causes of gender inequality norms.

The imperative lies in harnessing and strategically nurturing gender transformation opportunities for women who enter higher educational institutions in West Africa. These efforts should empower the burgeoning young population of the region to instigate the necessary changes. If appropriately formulated policies and opportunities are implemented, gender parity could play a pivotal role in propelling development and notably diminishing poverty. Despite West Africa's population swelling to roughly three times its size in 1971, its economic prospects appear promising. Six out of the 18 countries within the region secured spots in the top 10 for real gross domestic product growth in Africa in 2018—namely, Côte d'Ivoire, Senegal, Burkina Faso, Ghana, Benin, and Guinea (the Sahel and West Africa Club, 2019). Remarkably, these nations also excel in ensuring the girl child's access to higher education within the region.

An agenda for gender equality among students in higher institutions will also confront the gender-based inequality challenges the institution's staff faces. Historically, the university landscape has been dominated by men (Bagilhole and Goode, 2001). Women remain underrepresented at senior levels, notably in science, technology, engineering, mathematics, and medicine (EC, 2016). Women grapple with exclusion from crucial networks (van den Brink and Benschop, 2014), often veering into distinct career paths compared to their male counterparts and enduring heightened

stress and isolation within the university environment (Price et al., 2009; Todd et al., 2008; Quinlan, 1999). Female participation in research across West Africa is alarmingly low, as evidenced by the meager proportions in countries like Guinea (9.8%) and Togo (9.3%) (UNESCO, 2019a).

While concrete empirical data might not presently exist to illustrate the amplified difficulties encountered by female academics in West Africa when initiating, developing, and nurturing a career within an academic setting primarily dominated by males, the indications are notable. These indications include a higher prevalence of workplace harassment for women compared to men (Raj, Johns, and Jose, 2020; Otterbach, Sousa-Poza, & Zhang, 2021; ILO, 2022;), the receipt of comparatively less impactful letters of recommendation (Schmader, Whitehead, & Wysocki, 2007; Dutt et al., 2016), an increased allocation of time to student-related responsibilities (Winslow, 2010), challenges in securing doctoral or postdoctoral sponsorships (Ley & Hamilton, 2008; Pohlhaus et al., 2011; Hamilton, Tétreault & Lund, 2013), limited representation in international scientific gatherings (Jones et al., 2014; Nittrouer et al., 2017; Mehta et al., 2018; Débarre, Rode and Ugelvig, 2018), diminished acknowledgment of their achievements, and barriers hindering their progression to senior administrative roles (van den Brink and Benschop, 2012), among other factors (Corona-Sobrino, 2020). Collectively, these indications propose potential explanations for the apparent divergence in productivity levels between male and female academics.

In response to these challenges, African women are mobilising resources to bolster mentor-protected relationships, education and training, networking, microfinance, and communication and dissemination initiatives. One example is the Senegalese Association of African Women for Research and Development (AAWORD, 1982). These endeavours aim to provide young women researchers with the necessary confidence to recognise their substantial potential for success and to make significant contributions in fields like science, technology, engineering, mathematics, and medicine (Kwedi Nolna et al., 2017; Leke, 2017; Leke and Kwedi Nolna, 2016).

For the gender transformation agenda in higher institutions encompassing female students and faculty members, the emphasis must be on empowerment that fosters respect for diversity, social inclusion, and the eradication of discriminatory practices both within academic institutions and in the broader society. The yardstick for assessing the quality of education in West Africa should incorporate its gender-transformative aspects, given the substantial impact such an agenda can wield on individual and societal well-being, economic growth, and regional development. Context-specific and well-grounded theoretical research is indispensable to identify and address barriers women scientists face in building and consolidating their careers within West Africa.

2.7. The intersections of gender, education, health, and academia in West Africa

Higher institutions with poor gender-transformative educational programs often experience a skewness in student intake, academic staff research productivity, and an imbalance in gender representation in their leadership (Wong, 2000). There is gender inequality in health research productivity and gender bias in medical and public health education institution leadership (Wong, 2000).

Gender inequality, an enduring problem across various sectors of society, manifests itself prominently in the academic realm, particularly in research productivity. In health research, a field critical for advancing public well-being through scientific innovation and discovery, gender disparities persist as formidable obstacles to progress. In the sphere of global health research, patterns emerge where men are more likely to assume the roles of primary and senior authors (Shah et al., 2021), while women often encounter challenges in being acknowledged as authors, even when they have made substantive contributions to research publications (Larivière et al., 2013; Smith, Hunt, and Master, 2014). Despite a growing trend of including women as primary and senior authors, their representation remains modest, accounting for only 37% of the total publications (Filardo et al., 2016). The perpetuation of this gender imbalance can be attributed to structural inequities and barriers, encompassing the underrepresentation of women in leadership roles and the additional responsibilities placed upon them in domestic and caregiving roles (Pinho-Gomes et al., 2020; Bali et al., 2020). While numerous studies have emphasised the imperative of achieving equity and diversity in authorship representation, both in low- and middle-income countries and high-income countries (Ginther et al., 2018; Broderick and Casadevall, 2019), only a few have delved into the distinctive challenges related to medical and dental research in West Africa.

Understanding gender disparity in medical and dental research in West Africa is critical for several reasons, not only as a matter of justice but also as a necessity for promoting scientific excellence, improving healthcare outcomes, and fostering a more inclusive and equitable research community. It has far-reaching implications for healthcare, policy, and the future of scientific research in the region. Promoting gender equally in medical and dental research helps to ensure the reflection of gender differences in research pursuit, and this better promotes representation in findings and the application of findings. This helps to make societies richer and more secure (Lattouf, 2017).

Yet, women in West Africa continue to face challenges in everyday life: less household decision-making power (Ilesanmi, 2018), greater exposure to sexual violence (Ouedraogo, Scodellaro and Trinitapoli, 2022), adverse reproductive healthcare outcomes (Ogundele, Pavlova and Groot, 2020), and less labour market participation (Mbaye and Gueye, 2018). These structural vulnerabilities are reflected in the workplace and may, therefore, reflect in the workplaces in the health sector, including the health sector research enterprise. The gender wage gap remains high in countries in West Africa like Nigeria: women earn 77% less than men in rural areas in Nigeria,

with up to 70% of the gender pay gap explained by differences in workers' characteristics, including education, occupation, and sector (van den Broeck, Kilic and Pieters, 2023).

2018 the national adult literacy rate stood at 62.02%, with a notable gender disparity. Specifically, the male literacy rate was significantly higher at 71.26% compared to the female literacy rate of 52.55% (countryeconomy.com, ND). In Nigeria, the average representation of women in executive positions is 20%, while at the board level, it is slightly higher at 23% (Ogunyale, 2021). This underrepresentation can be attributed to societal expectations that often pressure women to adhere to traditional gender roles, such as marriage and child-rearing. Additionally, the absence of gender-sensitive workplace policies further compounds women's challenges regarding professional opportunities and compensation within Nigeria (Oluwole, 2021). It's important to note that gender equity issues are not unique to Nigeria and are prevalent across many countries. Therefore, the insights from the Nigerian context may have relevance and applicability in other nations throughout the region.

Gender bias also extends to the leadership of medical and public health educational institutions (Khan et al., 2019). Although women in leadership roles positively impact the recruitment and retention of women in the workforce and the prioritisation of women's issues that have been historically underrepresented (Down et al., 2016), the number of women occupying decision-making positions remains significantly low. As of 2019, women constitute 70% of the global health and social care workforce but occupy only 30% of leadership roles (World Health Organization, 2016). While global health initiatives prioritise interventions aimed at improving women's health, there is a dearth of research on the gender gap within the health research workforce, particularly in low-income and middle-income countries (Dhatt et al., 2017), where gender disparities tend to be more pronounced than in high-income countries (Asi and Williams, 2020). These gendered stereotypes in the workplace reflect the patriarchal societal structures in which these institutions are embedded, presenting a formidable challenge for women seeking to advance their careers (Salem and Yount 2019). This gender disparity, as identified by several authors (Ginther et al., 2018; Broderick and Casadevall, 2019), raises concerns regarding equitable employment practices and remuneration within medical and dental health research programs.

2.8. Gender inequality and the health research enterprise in West Africa

The involvement of women in research is on the rise, as evidenced by data emerging from regions in the global north. According to statistics provided by Elsevier, within the European Union, approximately 41% of scientists are women. However, regarding women's representation among investors, the figure drops significantly to only 12% (Slovak Liaison Office for Research and Development, 2017).

Despite these advancements, women and girls continue to experience underrepresentation in science, technology, engineering, and mathematics (STEM), as reported by the United Nations Climate Change (2018). Moreover, as women progress in their academic careers, they still encounter increasing underrepresentation, a point highlighted by the Slovak Liaison Office for Research and Development in 2017.

It's worth noting that the representation of women in academia varies depending on the specific domain. For instance, more women are in the life and health sciences, while men dominate the physical sciences. Women often allocate more time to teaching and less to research activities. Furthermore, women typically apply for smaller research grants than their male counterparts (Thompson-Burdine et al., 2019). Additionally, there is a notable shortage of women in leadership positions such as research coordinators or principal investigators (Thompson-Burdine et al., 2019),

Various obstacles impede women's involvement in research, and these challenges have been identified through research and academic studies (Thompson-Burdine et al., 2019; Boutillier and Laperche, 2007). Some prominent barriers include the absence of gender equity and supportive strategies within numerous research and academic institutions. Additionally, gender bias in the employment process tends to implicitly favour men, contributing to the unequal representation of women. Insufficient institutional oversight regarding women's participation in research and academia further exacerbates this issue. Moreover, the absence of institutional measures to facilitate work-life balance for female researchers has a detrimental effect (Slovak Liaison Office for Research and Development, 2017). Furthermore, women often encounter delays in completing their doctoral studies and establishing a robust publication record. These setbacks can be attributed to prevailing gender and social norms (Boutillier and Laperche, 2007).

Significant disparities exist in the representation of female researchers, as highlighted by data from the African Development Bank (Ruiz and José, 2016). For instance, Guinea lags significantly behind, with only 6% of researchers being women, Mali at 10.6%, and Côte d'Ivoire at 16.5% (Ruiz and José, 2016). This disparity is also evident in Senegal, where women are not adequately represented in the research community, especially in decision-making bodies within academic and research institutions (Sarr and Wade, 2017). In 2019, women accounted for only 29.3% of academic staff across all disciplines nationwide (UNESCO, 2019a). In Niger, women comprised a mere 10% of university teaching staff in 2005 (Huyer, 2016), while in Ghana, they constituted 20% of health researchers in 2010. Burkina Faso had 27.7% of women personnel in medical science research in 2010, and in Mali, women represented just 14.9% of health researchers in 2006 (Huyer, 2016).

Efforts have been made to enhance women's representation in research by developing gender-friendly policies. Initiatives such as the Gender and Affirmative Action Implementation Centre, tasked with implementing gender policies in institutions like Kenyatta University, have been

established (Doroba, Muhwezi, and Modungwa, 2015). Additionally, projects like the "Projet d'Appui à la Promotion des Enseignantes Chercheures du Sénégal" aim to improve women's access to research funding in Senegal (Senegal Ministère de l'enseignement supérieur, 2022). The African Union and Microsoft have also collaborated to create an International Centre for Girls' and Women's Education in French-speaking African countries (UNESCO, 2019b). Furthermore, the Women in Global Health Program works in Francophone countries in West Africa to support the development of skills of current and future members in leadership, empowerment, and networking. Nonetheless, gender mainstreaming in development policies and programs remains insufficient, particularly in Francophone West Africa, where gender disparities in the education sector persist (UNESCO, 2019b).

The societal expectations that limit women's roles in research and academia can significantly impact their performance and, consequently, their opportunities for professional advancement (National Academy of Sciences, No Date). However, women's participation in global research is indispensable, as it enhances the chances of addressing women-specific health issues (UNESCO, 2019a). Furthermore, compelling moral, ethical, and justice arguments support diversity in research, as diverse teams are known to generate more innovative problem-solving solutions and provide a broader perspective (National Academy of Sciences, no date; Hamulyák, 2020).

Nevertheless, there has been limited discourse about the gendered processes within organisations contributing to the issues described thus far. This has led to an assumption that research institutions and academia are gender-neutral and devoid of gendered practices (Acker, 1990). The lack of recognition regarding how sexuality shapes work processes in academic institutions and the influence of cultural practices on these processes has been inadequately discussed and addressed. This oversight can be attributed to the organisational processes being grounded in the experiences and perspectives of men (Smith, 1979), the failure of structural reforms to incorporate feminist viewpoints (Michael and Rothschild, 1987), and the failure to acknowledge that gender-insensitive institutional policies, procedures, and interactions foster these practices, rather than them being mere individual anomalies (Acker, 1990).

While there is a growing body of literature on women in research, there remains a dearth of research, especially in academia, particularly in the West African context. Moreover, there is a growing recognition of the masculine genderisation of research institutions' operations (Phillips and Imhoff, 1997). This genderisation may be assumed to exist in West African research organisations due to the patriarchal nature of many West African societies. Although some progress toward gender equality has been made, it is not consistent globally, particularly within STEM faculties, and the contextual variations in expressions of gender inequality are often underexplored. Understanding these context-specific expressions is crucial for developing tailored responses to address inequalities in different settings. The fundamental question is whether research and academic institutions in West Africa mirror societal gender relations and

representations and whether they influence gender constructs at both the organisational and individual levels, consequently impacting the career progression of women researchers.

2.9. Gender inequality and the research enterprise in Nigeria

Medical and dental researchers play a pivotal role in shaping society's development, contributing significantly to various domains such as gender studies, education, and research (Folayan, 2022). Their impact extends to economic growth by fostering a deeper understanding of diseases, promoting medical advancements, including vaccines and diagnostics, and disseminating effective public health information. These researchers are also responsible for training others, furthering scientific progress, supporting disease eradication, and ultimately enhancing the overall quality of life. Despite these opportunities, the potential for medical and dental researchers, particularly women, to fully harness these benefits through the promotion of gender equality remains largely untapped.

Within the West African context, female medical and dental researchers encounter substantial challenges that hinder their ability to make optimal contributions to individuals and society (Sougou et al., 2022). In this region, female researchers grapple with entrenched gender norms and values that predominantly assign women to domestic and caring roles, reducing the time available for research activities (Sougou et al., 2022). This phenomenon may explain why women tend to allocate more time to teaching and less to research when compared to their male counterparts (Thompson-Burdine et al., 2019): the extra hours required for research are occupied with domestic and caring activities (Parlak et al., 2021). Additionally, the prevalence of gender-blind organisational cultures and institutional policies creates formidable barriers, impeding women's progress towards leadership positions and diminishing their opportunities for active participation in scientific endeavors (Sougou et al., 2022; Thompson-Burdine et al., 2019). Moreover, female medical and dental researchers might divert their attention from challenging these gender-blind systems as they invest substantial effort in maintaining relationships with their male partners (Sougou et al., 2022).

Comparable to research institutions globally, gender disparities persist in the research output of medical and dental researchers, with men often producing a greater number and higher quality of research outputs than their female peers (Nygaard, Aksnes, and Piro, 2022; Bozeman and Gaugghan, 2011; van den Besselaar and Sandström, 2016). This trend can be attributed, in part, to the higher enrollment of male students in medical and dental research programs on a global scale (Ayers et al., 2008; Gallagher, Patel, and Wilson, 2009). Additionally, more male students opting for pre-college science tracks during secondary education further contribute to this disparity (Makarova, Aeschlimann, and Herzog, 2019). Consequently, the prevalence of men both in medical and dental research institutions and in managerial positions mirrors a complex

sociological phenomenon that perpetuates patriarchal practices through exclusionary strategies, reinforcing male dominance (Riska, 2010; García-González, Forcén, and Jimenez-Sanchez, 2019).

Although limited information is available regarding the gender distribution of researchers in Nigeria, existing evidence suggests a gradual increase in the number of women in dental institutions, rising from 36.2% in 2003 to 42.5% in 2013 (Chukwumah and Uweni, 2017). However, male predominance in enrollment persists (Chukwumah and Uweni, 2017). Gender disparities are also observable in specialised fields, with a consistent increase in women occupying leadership positions (Chukwumah and Uweni, 2017). Nevertheless, this upward trajectory in female participation within dental academia may not fully mirror the situation in medical practice. For instance, Ogunbodede identified a discrepancy in the increase in the number of practicing female dentists compared to female medical practitioners over ten years. While the percentage of dentists rose from 15% to 35% between 1981 and 2000, the increase among medical practitioners only increased from 15% to 19% (Ogunbodede, 2004). Similarly, the number of male doctors in Nigeria consistently doubled that of female doctors between 2017 and 2019 (Statistica, 2022a). Although male dentists do not double the number of female dentists, the gap still favors men, with 810 male dentists compared to 555 female dentists (Statistica, 2022b).

Nonetheless, achieving gender equality transcends mere numerical adjustments, as this approach would remain time-bound and perpetuate societal inequality. Simply reducing the gender gap does not guarantee a transformation of the current paradigm. Previous studies have highlighted that increasing female representation in science education can disrupt the status quo, resulting in more women assuming senior positions (Kilminster et al., 2007; Cook and Glass, 2014; Carnes et al., 2015; Glass and Cook, 2016). The envisioned shift in gender representation within research institutions and research managerial positions must be underpinned by a collective commitment to enhancing research quality, benefiting society, and ensuring the active participation of women (OECD, 2011).

2.10. Gender differences in research productivity

Research productivity garners substantial attention from the academic community and policymakers alike. This heightened interest stems from the recognised and well-established link between scientific research productivity and a nation's intellectual prosperity and economic advancement (Jaffe et al., 2020). This linkage arises from the intricate interplay of technological progress, national economic growth, and research endeavours (Wang, 2007). Furthermore, a nation's development is intricately woven with its citizens' physical and psychosocial well-being, which, in turn, relies heavily on research outputs (Veenhoven, 2009), a notion underscored by the Commission on Health Research for Development (1990). This intricate web of interdependencies underscores the paramount importance of biomedical, socio-epidemiological, and clinical research within the academic sphere (Bonaccorsi and Secondi, 2017). The quest to comprehend and

enhance these fields holds increasing significance for academic institutions and research oversight bodies.

Academic research disseminated through publications stands as a widely recognised benchmark for evaluating the performance and accomplishments of faculty members. Furthermore, it is a measuring stick for university excellence (Paulden, 2021). Research productivity is conventionally gauged by the quantity of published articles in indexed databases (Albers, 2015; Heng, 2020). Remarkably, high-income countries exhibit commonalities in the relative importance of various research disciplines and their contributions to economic development, with health-related disciplines consistently ranking among the top five in research output (Jaffe et al., 2020). Conversely, low-income countries channel their research efforts primarily into agriculture, veterinary medicine, immunology, and medicine (Jaffe et al., 2020). This strategic emphasis aligns with the pressing global need for food security and managing infectious diseases (Baer-Nawrocka and Sadowski, 2019).

One pivotal factor that significantly influences research productivity is gender. Gender disparities within academic circles have been extensively documented across industrialised and developing economies. These disparities encompass disparities in acquiring research grants and awards, participation levels in the scientific workforce, attainment of senior and leadership positions, and publication and citation rates (Knobloch-Westerwick et al., 2013; Geraci et al., 2015; Leslie et al., 2015; Astegiano et al., 2019; Huang et al., 2020). Notably, men tend to produce more research publications throughout their careers and receive higher citation rates—this phenomenon is often referred to as the "Matilda Effect" (Rossiter, 1993). Several factors contribute to these disparities, including those related to family responsibilities (Stack, 2004), the time allocated to committee work, teaching, and mentoring students (Misra et al., 2012; Babcock et al., 2017), gender bias in the peer review process (Helmer et al., 2017), and unequal allocation of research resources (Duch et al., 2012). Women researchers also tend to publish fewer papers in fields where research is costlier (Duch et al., 2012) and are less likely to be listed as the first or last author on research papers (West et al., 2013). In addition, gender-based violence, including sexual abuse and harassment, within power relationships, makes women leave academia (O'Callaghan, Shepp, Kirkner, & Lorenz, 2022).

Furthermore, a gender gap in research productivity is exacerbated by disparities in the perceived value of each publication, with women often receiving approximately 10% fewer publication credits per paper due to metrics that disproportionately favor men (Atkinson & Standing, 2019; Nygaard et al., 2022). These gender disparities persist even among elite scientists, including those in Africa (Sá et al., 2020). An analysis of research productivity in Nigeria reveals increased scientific publications over the past two decades, accounting for over half of West Africa's total publications (Confraria and Godinho, 2015; Odeyemi et al., 2019). However, international collaborations remain limited compared to other West African countries (Hassan et al., 2018).

Research publications in Nigeria have been predominantly skewed towards the environmental, health, public, and occupational domains (Igiri et al., 2021). Interestingly, on average, female researchers produce more publications than their male counterparts (10.8 vs. 9.7) (Igiri et al., 2021).

In its nascent stages, dentistry is an area where these gender-related factors may impact women's capacities to publish and disseminate their research findings. Dentistry, encompassing the study of oral health and oral diseases, holds a critical position within the medical field and significantly contributes to economic development. A country's human and economic development correlates with dental research productivity (Allareddy, 2015). Untreated oral diseases increase the risk of adverse health conditions (Sabbah et al., 2019). Analysing the distribution of research publications and the factors influencing this productivity is pivotal. Such an analysis will illuminate opportunities to enhance research outputs among dentistry and oral sciences researchers in low-middle-income countries like Nigeria, where the discipline's relative importance in national growth and development is profound.

2.11 Study Justification

Documentation concerning gender disparities in health research productivity in West Africa, including Nigeria, remains limited despite suggestive evidence pointing to these discrepancies. Nigeria boasts a substantial academic landscape, hosting five specialised research institutions alongside 170 universities, comprising 79 private universities, 43 federal universities, and 48 state universities (Sasu, 2023). In the 2018/2019 academic year, most of the workforce in Nigerian universities was male, with approximately 86,885 non-academic male staff members and 51,671 academic male staff members. In contrast, the female workforce comprised 46,869 non-academic and 16,009 academic staff members, representing only one-third of the male academic staff (Statistica, 2022).

However, a geographical bias in gender research results in incomplete knowledge of region-specific gender disparities in the organisation of medical and dental health institutions. Recognising these gender gaps in health research productivity holds significant importance for several compelling reasons, including the need to address the gender roles that predispose women differently to diseases that have received insufficient research attention. Introducing a gender perspective into these discussions generates new knowledge and skills that promote responsive actions to the healthcare needs of women.

Understanding the factors that contribute to gender inequality in research productivity and leadership within medical and dental research institutions will provide the necessary evidence for advocacy and drive the changes required to rectify these imbalances, promoting the establishment of gender equality practices. The study delved into how academics and members of higher

education institutions monitor and address gender-based disparities in enrollment in medical and dental education, as well as the steps taken to combat gender disparity in faculty enrollment. It also examined strategies to support those at risk of dropping out of school and programs for students who need to interrupt their studies to attain grade-level equivalencies and potentially re-enter the formal education system.

Furthermore, this study explored how Nigerian medical and dental school faculty members and school authorities address gender stereotyping. This includes teacher training, the integration of gender equality into the curriculum, the inclusion of marginalised gender groups, and the promotion of an open-classroom system that fosters democratic student governance and encourages active leadership roles free from gender biases.

The study focused on dental academia in Nigeria to facilitate the correlation of gender and institution data with each of the authors listed in the study. This enabled a targeted analysis of gender disparities in research productivity. The Principal Investigator's familiarity with the field allowed for the identification of authors and communication with respective institutions to inquire about the gender of the listed authors.

2.12. Theoretical frameworks for the study on the role of academics in advancing gender equality in academic institutions in Nigeria

In the quest to construct a theoretical framework that enriches our comprehension of gender equality and the potential contributions of academics in West Africa and Nigeria to its promotion, our initial focus will be on an in-depth examination of the influence exerted by patriarchal institutions, which includes local customs and practices. This examination centers on how these institutional structures impact the active participation of women in the governance of educational institutions at the higher level. This, in turn, has far-reaching consequences for the realisation of gender equality across several critical dimensions: access to education, educational outcomes, the dynamics of the learning process, and the achievement of external milestones. This understanding forms the bedrock for challenging and reforming deeply rooted behaviours and societal norms that have historically hindered women's aspirations and life choices within Nigerian higher education institutions.

Gender equality, in its broader context, is situated within the paradigm of social exclusion, a systematic form of discrimination based on various attributes such as gender, economic status, ethnicity, religious beliefs, and place of residence, among others. Essentially, gender equality signifies that all individuals, regardless of their socio-cultural attributes, should possess equal opportunities to access education, learn, excel academically, and prosper as adults. It is fundamentally perceived as the inalienable right of every human being to have the opportunity to

realise their human rights, contributes to societal progress, and benefit from economic, social, cultural, and political development.

For this study, we adopt a comprehensive gender equality framework as the lens through which we analyse the theoretical underpinnings of our research. This framework encompasses four interrelated dimensions of gender equality within education. These dimensions explored equality of access to institutional support and leadership roles. This dimension underscores the necessity for all gender identities to be afforded equitable access opportunities. In this context, access spans a wide spectrum, encompassing not only initial enrollment but also considerations like persistence, regular attendance, and sustained retention within the educational system. Furthermore, this dimension extends to encompass equitable access to research opportunities and positions, particularly within medical and dental academic and research institutions.

We also explored the concept of equality in the learning process. This dimension pertains to how gender considerations influence pedagogical methods and the school environment. It is recognised that these factors significantly impact both what students learn and how they learn it. Under this dimension, it is essential that all students, regardless of their gender identity or other intersecting factors, receive impartial treatment, equitable attention, and equal educational opportunities. Moreover, fostering a safe, supportive learning environment that is free from psychological, physical, and sexual harassment is paramount. Eliminating stereotypes and gender bias is also integral to this dimension, ensuring that educational institutions serve as platforms for young individuals to acquire positive and healthy behavioural models. This involves challenging detrimental gender norms that have historically impeded academic achievement and influenced life choices.

In addition, we explored equality in educational outcomes. This dimension underscores the imperative that equal opportunities should be extended to achieve educational outcomes. These outcomes should be determined by students' talents and efforts rather than their gender. This entails ensuring that the duration of an individual's educational journey, academic qualifications, and the attainment of diplomas remain unaffected by their gender. Moreover, the evaluation mechanisms for individual achievements should be devoid of gender bias. Classroom dynamics should not restrict children's future career choices and earning potential.

Furthermore, the study investigated equality in external outcomes through research productivity. This dimension pertains to the level of productivity and engagement within the workplace, particularly within the context of medical and dental academic and research institutions. Achieving gender equality in external achievements implies that all individuals, irrespective of gender, should be able to perform and excel in their professional roles, contribute effectively, and thrive in their careers. This extends to leadership positions and involvement in institutional governance that promotes gender equality.

Figure 1 presents a visual representation of the conceptual framework for this study, adapted from the 2008 USAID Gender Equality Framework. It illustrates the four dimensions of gender equality under examination in this study. Interventions designed to address these dimensions will be evaluated based on the four principles of substantive equality: combating stigma, stereotypes, prejudice, and violence; rectifying disadvantages; enhancing voice and participation; and accommodating differences while achieving structural change.

The theoretical framework adopted in this thesis project demonstrates a nuanced understanding of the complexities surrounding gender equality in patriarchal societies. It acknowledges that achieving meaningful change necessitates a multifaceted approach that considers cultural shifts in norms and values, which have historically perpetuated gender inequality. The framework recognises that addressing deeply ingrained gender inequality in patriarchal societies requires the active engagement of various stakeholders, including women, men, and gender minorities. Their involvement is essential in all phases and aspects of the transformation process. This inclusive approach acknowledges that individuals from diverse social and ethnic backgrounds can contribute unique perspectives and experiences to the efforts to achieve gender equality.

It also recognises that sustainable change is deemed most effective when it originates from within society. This principle emphasises that the initiatives and strategies for promoting gender equality should be locally owned and operated. This means that the affected communities and institutions, including educational establishments, must lead in driving change. It also implies that the solutions should be tailored to the society's specific cultural and contextual nuances.

While change must be locally led, it is also recognised that external dynamics, such as partnerships with development organisations and policymakers, play a crucial role in supporting and facilitating change initiatives. These external actors can provide resources, expertise, and advocacy that complement the efforts of local stakeholders. Collaboration between internal and external actors can lead to more effective and sustainable outcomes.

The framework acknowledges the transformative potential of technology and improved access to information in advancing gender equality. Through educational tools, online resources, and communication platforms, technology can enhance awareness and education on gender equality issues. Improved access to information empowers individuals with the knowledge to challenge and change discriminatory practices.

Public discourse and dialogue around gender equality are recognised as powerful agents of change. When gender equality becomes a topic of public discussion, it can influence societal attitudes and perceptions. Public discourse challenges existing norms and encourages critical reflection on gender-related issues. These public discourses and access to information can influence the

perceptions and actions of members of the academia. Importantly, the framework asserts that faculty members within educational institutions may already possess the capacity to contribute significantly to reshaping the realities of gender inequality. Despite patriarchal practices, faculty members can play pivotal roles in promoting gender equality within their institutions. They are seen as potential change agents who can lead by example, challenge gender bias, and advocate for inclusive policies and practices.

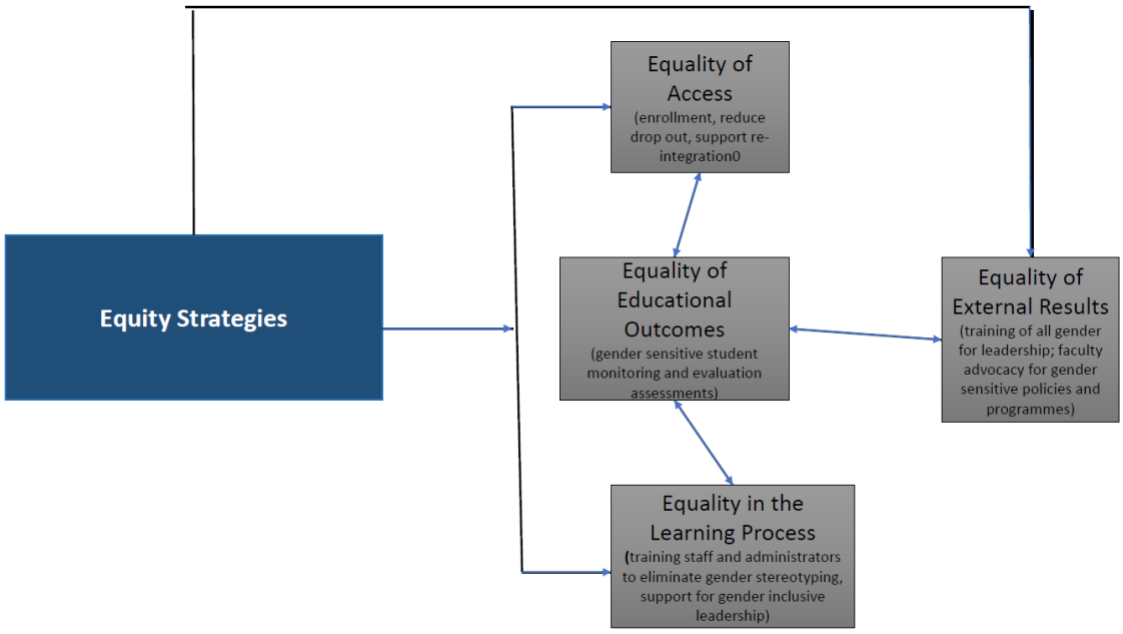

Figure 1: Conceptual framework on four dimensions of gender equality in higher education institutions.

The research conducted within this framework aims to identify and understand the contemporary manifestations of gender relations and patriarchy within the specific context of medical and dental educational systems in Nigeria. By pinpointing these manifestations, the research sets the stage for targeted interventions that address the root causes of gender inequality within these institutions. The framework also recognises that solutions to gender inequality can vary in scope and timeframe. Some solutions may be relatively immediate and pragmatic, while others may require long-term efforts to reshape societal norms and institutions fundamentally. The research aims to identify and propose both short-term and long-term practical and effective strategies within Nigeria's context of medical and dental education.

Furthermore, this study is firmly grounded in Fagenson's theory, which sheds light on how a complex interplay of societal and systemic factors shapes women's career progression within any organisation. It emphasises the profound impact of cultural and social norms regarding gender roles on the perception of job responsibilities and roles (Fagenson, 1990). The study's design and

execution consider the pervasive challenges women face in fields such as science and technology, where their representation often encounters systematic devaluation, undermining, and marginalisation through a process commonly referred to as genderisation. This process casts shadows on their employment prospects, the narrative surrounding their contributions to these fields (Hearn and Husu, 2011), their access to familial support, or conversely, their vulnerability to family-related discrimination (Husu, 2005). It's important to note that in many Nigerian communities, the familial and societal milieu tends to perpetuate gender subordination, further exacerbated by socio-cultural norms that operate within institutional frameworks, often relegating women to subordinate positions under male guidance (White et al., 2014). Within these institutions, gender biases and stereotypical tendencies persist, as barriers to women's progress (Ampofo, Beoku-Betts, and Osirim, 2008).

Moreover, in exploring how gender inequality is perceived within research institutions in Nigeria, we adopted a feminist institutionalism analytical lens. This analytical framework facilitates a comprehensive examination of gendered institutions and the profound influence they exert (Ampofo, Beoku-Betts, and Osirim, 2008). The feminist institutionalism analytical approach enriches our understanding of the gendered dimensions that permeate structures of power and behaviour, as well as the intricate roles played by informal institutional structures, processes, values, and norms (Martínez Pérez et al., 2015; Blais and Martineau, 2006). It allows us to scrutinize how informal institutions interact with formal systems, shaping these interactions through gendered rules, actors, and outcomes, ultimately giving rise to gendered results. Furthermore, this analytical approach provides a valuable theoretical perspective that unveils the dynamics of gendered power relations and illuminates the processes that render these power dynamics visible.

Lastly, in examining gender disparities in research output productivity, our theoretical underpinnings find their basis in the academic literacies theory. This theory regards reading and writing as social practices that are subject to variation depending on context, culture, and genre (Barton and Hamilton, 1998). We view academia as a domain where power distribution is often skewed, with certain groups enjoying more privilege and influence (Lea and Street, 2006; Lillis and Scott, 2007). Within this context, research productivity is conceptualised as the extent to which a researcher generates publications intended for an academic audience (Odeyemi et al., 2019). To evaluate productivity, we employed bibliometric measures that impartially credit and tally publications, regardless of the author's gender. However, we acknowledge that cultural nuances that promote gender inequality can also manifest in women's productivity compared to men. These cultural nuances encompass ethnicity, class, and ability, impacting the definition and distribution of gender roles within the academic sphere. Consequently, women may often find themselves disproportionately engaged in administrative tasks within academia and may encounter difficulties in resisting involvement in lower-prestige endeavours (Baker, 2010; van den Brink and Benschop, 2012; O'Connor and O'Hagan, 2015; Coate and Howson, 2016; Morley, 2016).

In summary, the theoretical frameworks employed in this thesis project enabled the study to adopt a holistic approach to address gender inequality within patriarchal societies. It emphasises the importance of inclusive involvement, local ownership, external support, technology, public discourse, and the agency of individuals, including faculty members, in driving meaningful change. This framework guides the research in its mission to uncover gender disparities and propose feasible solutions within the specific educational context of Nigeria.

3. OBJECTIVES AND HYPOTHESIS

3.1. Research questions

- What barriers do women researchers encounter in their professional advancement within West Africa?
- How do scientific researchers perceive gender inequality within research institutions in Nigeria, particularly in the context of medical and dental research institutions?
- Are there gender-based disparities in productivity, impact, collaboration patterns, and authorship positions among researchers in the field of dentistry and oral sciences in Nigeria?
- What insights can be gained from female health researchers regarding research findings related to male dominance and the research productivity of women in the realm of medical and dental research academia in Nigeria?
- Are there divergent viewpoints across different generations concerning the persistence of gender inequality within medical and dental research institutions in Nigeria?

3.2. Primary Objective

The primary objective of this doctoral thesis was to understand the obstacles and opportunities for female and male academic researchers to support cis and trans women in building and consolidating professional research careers in West Africa with a focus on Nigeria.

3.3. Secondary Objectives

The secondary objectives of this doctoral thesis are:

a. Identify the obstacles hindering the progression of female researchers in Nigeria's academic landscape.
b. Explore how researchers perceive gender disparities within Nigeria's medical and dental research institutions.
c. Examine the decision-making processes employed to address and navigate gender inequities within medical and dental research institutions in Nigeria.
d. Explore perspectives on establishing a conducive environment for female medical and dental researchers.
e. Identify strategies for enhancing the underrepresented presence of women in scientific research.

3.4. Hypothesis

Structural, organisational, and socio-cultural elements collectively obstruct both female and male medical and dental health academic researchers in Nigeria from gaining access to the resources and opportunities required to advance gender equality in pursuing careers in medical and dental research within the country for girls and women.

4. METHODOLOGY

4.1. Study Design

This doctoral thesis project was a descriptive, observational, cross-sectional mixed-method research in design, which involved the use of qualitative and quantitative methods for data collection, analysis, and reporting of results.

4.2. Population

Medical and dental academic researchers of all gender identities employed in educational institutions across West Africa that provide training for medical and dental students were approached as participants in this doctoral thesis project.

4.3. Eligibility Criteria

Inclusion criteria

Faculty members in public and/or private universities in West Africa who:

1. Who were raised in West Africa (for Phase 1) or Nigeria (for Phase 2 and 3),
2. Who was able to read and communicate in English (for any thesis project phase) or in French or Portuguese (for Phase 1, exclusively),
3. Who defined themselves as academic researchers in health, medical, and dental education,
4. Who had access to students as lecturers (engaged in teaching at the university in the past three years),
5. Who were over 18 years of age, and
6. Who were willing to provide signed informed consent when approached and invited to participate as research participants.

Exclusion criteria

People were not meeting the inclusion criteria, as well as potential participants who did meet the inclusion criteria but were too ill at the time they were invited to participate in any project-related data collection encounters.

No person meeting the inclusion criteria was excluded as a participant because of their skin colour, social or economic status, religion, ethnicity, nationality and/or political affiliation.

Recruitment material

No recruitment material (for example, leaflets, brochures, posters, or Facebook posts) was used.

4.4. Management of refusal to participate

If a selected individual was not interested in participating in this research, they were asked why they refused. It was important to document these grounds for refusal. If potential participants refused to participate because they feared confidentiality breaches or stigma and discrimination because of their participation, these concerns were discussed with them. The study learned how to address these concerns, and further measures were implemented to address these concerns when recruiting new participants.

To gain a more comprehensive understanding of the representativeness of the consenting participants in the qualitative phase (see description of Phase 2 below) within the context of the general population, we sought to gather demographic data and professional information from all individuals who were approached for participation but opted not to consent. For these non-consenting individuals, we extended a request to furnish us with their socio-demographic details along with the reasons underlying their decision to refuse participation. This information was systematically documented using a "Refusal to Participate Form" (available in Annex 3).

4.5. Recruitment of the consenting participants

The doctoral thesis project was conducted in four phases. Specific details on the sampling strategy and data collection per phase are described below in subsection 4.6. Irrespective of which phase the approached participants took part in, each participant was requested to sign an informed consent form before engaging in any data collection encounter.

All data collection encounters took place over the Internet or conventional landline. Participants in teleconference and telephone interviews were requested to provide signed consent via email before engaging in the thesis project as participants and, again, provide verbal consent at the start of the interview recording (Phases 1 to 3). The consent forms are available as annexes 1 and 2.

At the point of recruitment, all participants were assigned a unique identification number that allowed the anonymisation of the information they provided during the data collection encounters. Their eligibility criteria and socio-demographic data information were recorded in a study recruitment journal as annex 3. The questions on the sociodemographic variables were embedded within the interview guides, and it was optional for the participants to answer them.

4.6. Data collection

Before sampling for potential participants and data collection activities, the doctoral thesis project was introduced to stakeholders engaged with developing policies and programmes for higher education institutions in West Africa and Nigeria. These were 12 experts who were familiar with the context of gender equality in research conducted in the region. These introductions were conducted for two purposes – to garnish academic institutions' support for the thesis project's conduct and to identify and engage critical stakeholders in its implementation. These introductions helped identify potential challenges with recruitment and data collection.

The expert consultation was held online in June 2021. Before the conversation commenced, all experts were provided with a concise one-page document outlining the core aspects of the research project, including a brief explanation of the conceptual framework, the operational definitions of gender equality (which refers to equal rights, responsibilities, and opportunities for individuals of all genders), and the discussion's overarching purpose. The insights and conclusions drawn from this expert consultation laid the foundation for the interview questions employed in the primary study.

After introducing the doctoral thesis project to these targeted stakeholders, sampling of potential participants and data collection encounters were conducted in four distinct phases.

Phase 1: Understanding of the context of women and research conduct in West Africa

In Phase 1, a collaboration[1] with researchers from Senegal, Mali, and Burkina Faso was established to conduct a cross-sectional qualitative study. This Phase 1 spanned the period from June to September 2020. Phase 1 aimed to collect data to achieve this doctoral thesis's primary objective, which was to 'understand the obstacles and opportunities for female and male academic researchers to support cis and trans women to build and consolidate professional research careers in West Africa with a focus on Nigeria.'

Phase 1 involved recruiting male and female researchers affiliated with academic and research institutions specialising in biomedical, clinical, and socio-epidemiological research across the West African region. Eligible participants had to be residents of West Africa, proficient in either French, Portuguese, or English, and engaged in work within the realms of health or social sciences. Participant selection was carried out through non-probability sampling methods. Participants were identified through the snowballing technique wherein the first recruited participants were asked to recommend others who could meet the inclusion criteria to participate in the study. The first participants, or 'seeds,' were conveniently sampled amongst the study co-investigators' acquaintances. Selected participants were approached by email or phone and invited to an in-depth

[1] Collaborators appear as coauthors in Article Number 1 in Section Results 5.1

interview.

Given the constraints posed by the COVID-19 pandemic at the time this Phase 1 was conducted, conducting face-to-face interviews was not feasible. Instead, in-depth individual interviews were conducted via video calls, utilising the Zoom platform as the communication medium. Before these interviews, participants provided informed consent as described above in sub-section 4.5.

The transcripts of these interviews underwent thematic analysis aimed at identifying recurrent themes that reflected participants' perspectives. This analysis gave the same value and consideration to participants' viewpoints regardless of gender, seniority in their institutions, and specific country of origin. The findings of Phase 1 are presented in Article Number 1: "Barriers of West African Women Scientists in their Research and Academic Careers: A Qualitative Research" (available in Section 5.1.)

Phase 2: Qualitative assessment of knowledge and perception of factors that limit women's science advancement in Nigeria

In this phase, an exploratory qualitative study was conducted to generate data to achieve the thesis project's secondary objectives. Specifically, Phase 2 was planned to collect data to (i) identify the obstacles hindering the progression of female researchers in Nigeria's academic landscape, (ii) explore how researchers perceive gender disparities within the realm of medical and dental research institutions in Nigeria; (iii) examine the decision-making processes employed to address and navigate gender inequities within medical and dental research institutions in Nigeria; (iv) explore perspectives on the establishment of a conducive environment for female medical and dental researchers; and (v) identify strategies for enhancing the underrepresented presence of women in the field of scientific research.

The methodology entailed conducting in-depth interviews. The research design embraced a descriptive, observational, cross-sectional approach, with data collection conducted between March and July 2022 in Nigeria.

The study's target population was male and female faculty members employed within academic and research institutions dedicated to Nigeria's biomedical, clinical, and socio-epidemiological research. For this Phase 2, eligibility criteria mandated that individuals be residents of Nigeria, possess proficiency in English, maintain affiliations with academic or research institutions in Nigeria within the realms of medical and dental sciences, and have reached a minimum age of 18 years.

The recruitment strategy blended purposive and snowball sampling techniques, assuring diversity by enrolling participants from various academic ranks within medical and dental institutions. Fellow researchers within these academic institutions were purposely identified by exploring the

institutions' directories and websites and invited to participate. Upon identifying a suitable candidate, the principal investigator-initiated contact via telephone, email, or WhatsApp. They elucidated the study's objectives, extended an invitation to an in-depth interview, and collaboratively scheduled a mutually convenient interview date. Before the interview session, written informed consent was diligently obtained from each participant. Once the consent form was completed and returned, the interviewee was officially enrolled as a study participant.

Post-interview, using the snowball sampling technique, those individuals who accepted participation served as a conduit to identify additional potential participants who conformed to the study's specified criteria. In instances where a prospective participant declined to participate, they were seamlessly replaced with another eligible candidate from the pool of researchers who had been initially identified via purposive sampling techniques.

The in-depth individual interviews were conducted through video calls, leveraging Zoom, Telegram, and WhatsApp platforms. These interviews were thoughtfully structured to capture the participants' perspectives concerning discernible gender disparities in the career progression and trajectory of medical and dental researchers within Nigeria. Additionally, the interviews were designed to scrutinise the gender-related impediments influencing the prospects of future female researchers to shape and redefine this trajectory actively. Language proficiency was not a hindrance, as interviews were conducted in English. Each interview session was audio-recorded. Participants were requested to enable video during the interviews to ensure privacy and transparency. An interview guide featuring open-ended questions provided the framework throughout the interviews, with interviewers diligently recording detailed notes.

The transcripts of these interviews also underwent thematic analysis, aimed at identifying recurrent themes that reflected participants' perspectives. The findings of Phase 2 are presented in Article Number 2: "A qualitative insight into Researchers' perceptions of gender inequality in Medical and dental research institutions in Nigeria" (available in Section 5.2.). The findings from this phase are also presented in Article Number 3: "Generational differences in perspective about gender inequality in medical and dental research institutions in Nigeria" (available in Section 5.3.)

Phase 3: Qualitative evaluation of results generated from Phase 2

As in Phase 2, an exploratory qualitative study was conducted in this phase to generate data to achieve the thesis project's secondary objectives. In Phase 3, eight senior female faculty members from Nigerian universities were purposely sampled and invited to participate. These women held managerial positions, advancing biomedical, clinical, and socio-epidemiological research in Nigeria. Participant sampling was assisted by examining higher education institutions' directories in Nigeria.

Approached women who consented to participate in Phase 3 were asked to partake in an in-depth interview. In-depth interviews with these eight participants were conducted during April and May 2023, utilizing WhatsApp video calls. The interviews focused on six overarching themes, namely:

1. The entrenched patterns of institutionalised male dominance within research institutions.
2. Aspirations and strategies for reshaping the discourse on gender disparities in research.
3. The role of women in driving awareness and change regarding gender inequality.
4. Interpretation and discussion of findings that indicated female dental authors had significantly higher citation numbers than their male counterparts.
5. The observation is that more male dental researchers excelled in mentorship and networking.
6. A greater proportion of female researchers were identified as first authors, many of whom held junior positions within the academic hierarchy.

As in Phase 1 and 2, thematic analysis was done on the transcripts of the interview encounters in Phase 3. The findings of Phase 3 are presented in Article Number 4: “Female Health Researchers' Interrogation of Research Findings on Male Dominance and Women's Research Productivity in Nigeria” (available in Section 5.4).

Phase 4: Quantitative assessment of the productivity of female academia in Nigeria

In this Phase 4, a bibliometric analysis was designed to gather additional information to frame further first secondary objective of this thesis project (i.e., to identify the obstacles hindering the progression of female researchers in Nigeria's academic landscape).

At this stage, 1,222 publications authored by 413 individuals over a decade, spanning from 2012 to 2021, were analysed. Authorships and contributions of researchers of both genders to indexed, peer-reviewed articles were analysed. In this analysis, authorship refers to an individual's contribution to a paper in which they are credited as a co-author. In cases where an author's name appeared multiple times within the same institution, the counts were consolidated, and the average category-normalised citation impact (CNCI) was computed. If an author had affiliations with multiple institutions, the counts were combined, and the CNCI was calculated based on the most recent affiliation, which was determined through communication with institution heads or designated contacts.

Key bibliometrics were sourced from the Web of Science (WoS) InCites database, which comprises articles within the research domain of Dentistry, Oral Surgery, and Medicine affiliated with Nigerian institutions. The WoS InCites database categorises publications by field and allows for classification based on citation information. The WoS InCites database serves as an extensive

digital repository of scholarly research spanning various disciplines, including life sciences, biomedical sciences, engineering, social sciences, arts, and humanities. It encompasses publications from as early as 1900 up to the present. At the time of this analysis, the database contained over 82 million articles, encompassing reviews, editorials, chronologies, abstracts, proceedings, and technical papers across 256 disciplines.

The findings of Phase 4 are presented in Article Number 5: “Gender differences in dentistry and oral sciences research productivity by researchers in Nigeria” (available in Section 5.5.)

4.7. Data processing and analysis plan

4.7.1 Qualitative data handling and analysis

The qualitative data generated throughout all project phases were transcribed verbatim. To ensure the accuracy and completeness of these transcriptions, the written records were carefully cross-checked against the original audio recordings.

All transcripts were securely stored in a Microsoft Word document protected by a password. This document could only be accessed using a designated, password-protected computer.

Each transcript began with a standardised header that included information on the context of the data collection encounter, such as the interviewer's name, interview date, interview language, participant's unique identifier number, interview location, start and end times, transcriber details, audio file information, and the project title. The unique identification numbers served to link the transcripts to the study participants’ recruitment log, where the participants' socio-demographics were recorded.

Personal identifiers, specific locations, or institution names where participants resided or worked were intentionally excluded from the transcripts to preserve anonymity.

All transcripts were securely uploaded to Dedoose©, a specialised platform for comprehensive qualitative analysis. Access credentials for Dedoose© were restricted solely to the doctoral candidate, who conducted coding and analysis. Access credentials were not shared with any other team member except the thesis director, who performed quality control assessments on the transcripts to ensure the absence of personal identifiers.

The analysis of the qualitative data, derived from consultative meetings and in-depth interviews, was guided by thematic analysis. The transcripts, in printed form and in Dedoose©, were subjected to multiple readings to identify recurring phrases and themes that effectively addressed the research questions and offered valuable insights. Initially, a data reduction table was crafted, encapsulating pertinent information pertaining to each explored question from the transcripts. Subsequently, commonalities and divergences in participants' responses were discerned. Certain

segments of the transcripts were then omitted to streamline the analysis, concentrating exclusively on data relevant to the research questions. The themes corresponding to each question were systematically identified, and a succinct compilation of pertinent quotations was developed per established practices.

In the final stages of each phase, an in-depth review of the transcripts was carried out to identify potential recall and social desirability biases, sensitive discussion topics, and emergent themes warranting further exploration in subsequent interviews. The concepts and analytical categories were derived from participants' expressions, respecting their perspectives and values regarding their lived experiences.

4.7.2 Bibliographic data handling and analysis

In analysing the bibliography, we gathered data concerning various indicators related to productivity, impact, collaboration, open-access publishing, and author positions. Data collected also included details of the authors in the academic publications.

The authors' genders were identified through various methods. Initially, the doctoral candidate's knowledge of certain authors' genders was used based on colleagues' familiarity. Additionally, cultural and religious gender associations with first names were employed to assign genders, assuming that specific names indicated a particular gender. This assignment was further validated by online image searches using the provided names and institutional affiliations. Furthermore, contacts were made with institution heads and key individuals to confirm the genders of listed authors whose contact information only indicated their institution. In cases where authors were associated with two institutions, both institution's contact persons were consulted to verify gender based on workplace identification. This institutional validation process ensured the accuracy of gender assignment, resulting in a 100% accuracy rate. Authors whose genders could not be identified were excluded from the analysis. A ten-year observation period was selected to ensure a comprehensive and robust dataset. Data on productivity indicators, impact, collaboration patterns, open-access publishing, and author positions were extracted and analysed thoroughly.

The study categorised academic manuscripts published over ten years based on the journals' rankings, using quartile ratings (Q1-Q4) from the WoC InCites database. Descriptive analysis included various aspects of authorship such as first and last authorship and corresponding authorship. Single-author papers were treated as first authorships.

Gender differences in publication percentages in journal quartiles and publication characteristics were analysed using chi-square tests. Differences in the number of documents, citations, and category normalised citation impact were compared using t-tests. Correlations between the percentage of first and last authorships were examined using the Pearson correlation coefficient, with the data split by gender. Statistical analysis was performed using SPSS version 23.0, and

significance was set at $p < 0.05$.

4.8. Ethical considerations

4.8.1. Senegalese Protocol Preparation

To prepare the research protocol for phase 1, the doctoral candidate was engaged as an external expert on the project "Building Capacities in Gender Mainstreaming for Ethics Committee Members from Senegal to West Africa" (BCA-WA-ETHICS, funded by the European and Developing Countries Clinical Trials Partnership) based on my practice experience as a bioethicist, a female, an academic and a history of working in Africa. The doctoral candidate's work experience with the Senegal National Ethics Committee Director (Samba Cor Sarr), Ndèye Marème Sougou, Elhadji M. Mbaye and Guillermo Z. Martínez-Pérez (Principal Investigator of BCA-WA-ETHICS) also facilitated further engagement with the team in the design and implementation of the project. The aim was to gather insights from West Africa that would help shape a Nigeria-specific protocol that focused more on women's experience in academia. The study protocol for Phase 1 of the thesis project was approved by the Senegalese National Health Research Ethics Committee (Reference: 0000050/MSAS/DPRS/CNERS).

4.8.2. Nigerian Protocol Preparation

To prepare the research protocol for Phase 2 and 3, findings from Phase 1 of the project were considered. In addition, during the protocol development stage, an expert consultation was conducted involving six male and six female researchers associated with medical and dental academic institutions. This diverse assembly comprised an equal representation of researchers who had prior experience working within the West Africa region and were hailing from various countries, including Belgium, Brazil, Malaysia, Iran, Nigeria, the United States of America, and Turkey. These researchers were furnished with a succinct one-page concept note delineating the core aspects of the study proposed for Phases 2 and 3.

In June 2021, the conference call was conducted. During the call, discussions primarily centered on exploring viewpoints concerning the scope of interventions that university faculty members could undertake across four pivotal dimensions of gender equality in education: equality of access, equality within the learning process, equality of educational outcomes, and equality in external achievements. The insights garnered from these researchers were pivotal in shaping the interview protocol and data collection methodologies that were proposed in the protocol for Phases 2 and 3.

The study protocol for Phase 2 and 3 was approved by the Obafemi Awolowo University Health Research Ethics Committee (Reference: IPH/OAU/12/1617).

4.8.3. Informed Consent

Across all phases involving human participants, informed consent was sought from all approached participants, adhering to a comprehensive procedure (annexes 1-4). The consent process encompassed the distribution of consent documents that consisted of an information form and its corresponding consent form.

Consent documents were not translated into autochthonous, non-colonizer languages. Consent documents were in English. However, for Phase 1 specifically, documents were also translated into French to cater to the needs of targeted participants in Senegal, Mali, and Burkina Faso.

The informed consent documents were thoughtfully designed to include a wide range of critical information. This encompassed elucidation of the study's purpose and objectives, identification of the organizations participating in the study, a thorough explanation of potential risks associated with participation, and a delineation of the possible benefits to the individual participant and the broader study community. Significantly, the documents delineated the protective measures implemented to safeguard the privacy and confidentiality of participants, estimated time commitment for study participation, the unequivocal right to withdraw from the study at any point without incurring any penalties, and the assurance of the right to decline to answer any questions that might cause discomfort.

The process of securing informed consent involved several steps. Before any teleconference, participants were furnished with the consent documents and encouraged to peruse them carefully. Additionally, participants were invited to raise any questions or seek clarifications from the doctoral candidate regarding the content of these documents. This preparatory phase was conducted several days before any teleconference. The doctoral candidate and her team engaged with participants through phone calls or videoconference software calls, addressing any inquiries they might have, and subsequently, requested that they sign the consent document. Participants were instructed to complete the signature process and forward the signed document via email.

At the commencement of any data collection encounter, the consent document was rearticulated to the participants, ensuring they had a comprehensive understanding of its contents. Subsequently, participants were asked to provide their verbal consent, recorded as an additional assurance of their willingness to participate in data collection.

4.8.4. Anonymity and Confidentiality

Measures were taken to ensure anonymity and confidential handling of the study data. Only personal identifiers were included in the consent documents. The phone and email address were only entered if, during the consent process, the individual expressed the wish to receive further

publications.

No personal information from the consent documents was entered into a database or used in a report. Consent documents were not shared with people outside the research team.

The study recruitment log helped ensure that all consenting participants met the eligibility criteria. This log included no personal identifier, but the unique identification number assigned in the consent documents. Sociodemographic data were only collected in the register if the people contacted agreed to have this data noted. This register was safely stored electronically. Study recruitment journals were not shared with anyone outside the research team.

All transcripts of audio recordings were kept on a password-protected computer and were uploaded only to Dedoose© software. A password also protected Dedoose©; only the doctoral candidate had references to access the transcripts for analysis. Recordings and transcripts were not shared with anyone outside the research team. The recordings were deleted once the data was analysed.

4.9.5. Individual and community level advantages and remunerations

There was no direct individual benefit from participating in the project phases. Participants were not offered compensation and were only helped when a spontaneous request for support for Internet fees was made.

Expected community benefits were explained to all participants during the consent process. Participants were informed about the content of the data collection encounters so that they could fully understand the information expected of them before agreeing to participate. They were told that the information would help inform the design of future programs and projects to improve gender equality considerations in the higher education programs for medical and dental schools in West Africa.

4.9.6. Potential Risks: Mitigation Plan

The potential risks of participating in the study were described to participants during the informed consent process. It was expected that participants' risks of harm and discomfort would not be greater than those usually encountered in their daily lives or when performing routine physical or psychological tests or exams. Mitigation measures to minimise the risk of social harm were followed.

All data collection encounters were conducted by the doctoral candidate or trained members of her team, who had professional experience as a dentist, as faculty, and as social scientists. The data handling plan was proposed and was shared with potential participants during the informed consent

process.

As part of the consent process, participants were reminded that they were free to answer any questions asked or to interrupt the interview at any time. Also, their participation or non-participation was not known to colleagues and supervisors, and it will not compromise their jobs or engagement in projects.

All participants were encouraged to conduct their interviews in a private location, free from intrusion. Videoconference meetings were held with the camera on. Neither the recordings nor the transcripts were accessible by anyone other than the study team. The recordings were deleted once analysed.

5. RESULTS

The results of this thesis project have been organised into five articles aimed for publication in peer-review, Scopus-indexed journals. The key findings from this thesis project are outlined below, with detailed explanations provided in each of the five articles presented in this section.

PHASE 1

Article I. Sougou NM, Ndiaye O, Nabil F, Folayan MO, Sarr SC, Mbaye EM, Martínez-Pérez GZ. Barriers of West African women scientists in their research and academic careers: A qualitative research. PLoS One. 2022 Mar 30;17(3):e0265413. DOI: 10.1371/journal.pone.0265413. PMID: 35353842; PMCID: PMC8967005. (Impact Factor JCR: 3.7 in 2022; MULTIDISCIPLINARY SCIENCES - SCIE Q2)

Highlights of the findings reported in this article include:

- The imposition of traditional gender roles that assign household duties to women resulted in a decreased amount of time available for their research pursuits.
- An organisational culture and institutional policies that lacked sensitivity to gender issues exacerbated gender disparities, hindering women's progress in achieving leadership roles.
- To address the challenges women face in academia, there is a need for empowerment programs that can enhance their resilience and decision-making abilities. Previous approaches mainly concentrated on improving women's relationships with their spouses.
- Numerous women view themselves as equally competent as their male peers and argue against the gender discrimination they encounter.

PHASE 2

Article II. Folayan MO, Olowokeere A, Lusher J, Aina O, Gascon A, Martínez-Pérez GZ. A qualitative insight into researchers' perceptions of gender inequality in medical and dental research institutions in Nigeria. PLoS One. 2023 Apr 5;18(4):e0283756. DOI: 10.1371/journal.pone.0283756. PMID: 37018320; PMCID: PMC10075448. (Impact Factor JCR: 3.7 in 2022; MULTIDISCIPLINARY SCIENCES - SCIE Q2)

Highlights of the findings reported in this article include:

- The perception of gender equality among women working in medical and dental research raises questions about the persistence of patriarchal values that contribute to a limited number of female medical and dental trainees, fewer research contributions from women, and a scarcity of women in senior or managerial roles within the medical sector.
- This perception also challenges the predominant androcentric values that have traditionally guided knowledge production in the medical and dental fields, enabling women to organise themselves as advocates for change.

Article III. Folayan MO, Obiyan M, Lusher J, Gascón-Catalán A, Martínez-Pérez GZ. Generational differences in perspective about gender inequality in medical and dental research institutions in Nigeria. (submitted for publication)

Highlights of the findings reported in this article include:

- Younger males and females largely shared similar views, indicating a convergence of opinions regarding gender inequality who acknowledged the existence of gender inequality and stressed the importance of actively promoting equal opportunities for women.
- Older males and females exhibited more divergent opinions. Some older males aligned their perspectives with the younger generation, showcasing a shared viewpoint on gender issues that recognised gender inequality but proposed addressing it through traditional gender stereotypes and the value placed on feminised virtues.
- On the other hand, older female participants appeared unaware of gender inequalities, considering existing norms as normal and advocating for women's career advancement solely based on merit within academia.

PHASE 3.

Article IV. Folayan MO, Undelikwo VA, Gascón-Catalán A, Martínez-Pérez GZ. Female Health Researchers Interrogation of Research Findings on Male Dominance and Women's Research Productivity in Nigeria. (submitted for publication)

Highlights of the findings reported in this article include:

- There was evidence suggesting an emerging declining trend in male participation in dental sciences publications, potentially influenced by their pursuit of more lucrative opportunities outside of academia.
- In addition, the higher likelihood of male dental academics engaging in international collaborations may be connected to societal constraints faced by their female dentists who, due to their gender roles, cannot actively engage with the rigors required for collaborative research.
- There was no consensus on the first female authorship being driven solely by junior female researcher roles or due to mentorship by more senior male researchers.
- Participants observed that gender equality appears to be more attainable within the dental academic sphere when compared to the medical field due to the flexible work hours that accommodate the social aspects of female academics' lives.

PHASE 4.

Article V. Folayan MO, El Tantawi M, Shamsoddin E, Martínez-Pérez GZ. Gender differences in dentistry and oral sciences research productivity by researchers in Nigeria. Front Oral Health. 2023 Apr 27;4:1059023. DOI: 10.3389/froh.2023.1059023. PMID: 37181153; PMCID: PMC10174437. (Impact Factor JCR: 0.8 in 2022; JCR Social Sciences, Mult Q2)

Highlights of the findings reported in this article include:

- Female authors had a significantly higher average number of publications than male

authors, a statistically higher average number of citations per author, and a greater percentage of them were listed as first authors than their male counterparts. Conversely, a higher percentage of males were listed as the last author.

- A significant correlation was observed between the percentage of articles where female authors were listed as first authors and those listed as last, which was not the case for male authors.
- A slightly higher percentage of females were listed as corresponding authors, while more males were listed as international and domestic collaborators.
- The findings suggest that there might be a larger presence of female dentists actively writing and publishing within the dental academic community in Nigeria. This could be attributed to cultural expectations, where men are often the family's primary breadwinners due to relatively low lecturer salaries. In contrast, male academics tend to focus on seeking grants and collaborative opportunities to supplement their income. This role often places them in the position of mentees under many female researchers, who are frequently listed as the primary authors of research papers. This hypothesis warrants further investigation.

5.1. Article 1: Barriers of West African women scientists in their research and academic careers: A qualitative research

PLOS ONE

RESEARCH ARTICLE

Barriers of West African women scientists in their research and academic careers: A qualitative research

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Data Availability Statement: Data cannot be shared publicly as per the authors agreement with the National Ethics Committee of Senegal. The transcripts and audio files containing the study

Abstract

Objective

This study aims to identify barriers to the professional advancement of women researchers in West Africa.

Methods

This was a descriptive, observational, cross-sectional qualitative study conducted between June and September 2020 in five West African countries (Ghana, Senegal, Burkina Faso, Niger and Mali). Interviews were conducted with 21 female and 9 male health researchers by video call. After transcription, the data was thematically analysed using an inductive process.

Results

Four themes associated with barriers to women's careers development were identified. First. was family- and environmental-related barriers. Gender norms that assign domestic tasks and responsibilities to women reduced the time they were able to dedicate to research. Second was gender insensitive organisational culture and institutional policies that deepened gender disparities and made it more difficult for women to attain leadership positions. Third was the need for women in research to undergo emancipation programs to strengthen their resilience and ability to make critical decisions as strategic approaches to address the challenges faced by women in the academia were a lot more focused on addressing their relationship with their spouse. Forth, was the individual intermediate perception of professional and personal success which for many women, they perceive themselves as competent as their male counterparts and should not be subject to the gender discrimination they experience.

data are confidential and cannot be shared unless the interested party is a member of the research team or signs a justified confidentiality agreement. For data access, please contact: Permanent Secretary of the National Health Research Ethics Committee Senegal. Phone: +221 773614212. Email: cnrs2008@live.fr.

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Conclusion

The web created between work-life and home-life for West African women researchers mainly as a result of the gender inequalities in the social structure will require more medium- and long-term strategic planning by institutional authorities to reduce gender disparities in research and academia. This work has highlighted the influence of family and social life on the professional lives of West African women researchers. The study could help contribute to the development of gender equality interventions for the career development of women researchers in West Africa.

Introduction

The participation of women in research is increasing as evidenced by data emerging from the global north. Statistics from Elsevier indicate that the proportion of female scientists in the European Union is 41% while women's representation among investors is only 12% [1]. Despite the progress made, women and girls continue to be under-represented in the fields of science, technology, engineering, and mathematics (STEM) [2]. Also, women researchers are still increasingly under-represented as they move up the ladder of an academic career [1]. The proportion of women represented in academia also varies depending on the domain, with more women in the life and health sciences while men were more dominant in the physical sciences. Also, women tend to spend more time on teaching and less time on research; in addition, women usually apply for smaller grants than men [3]. Furthermore, fewer women occupy leadership positions such as research coordinators or principal investigators [3].

Identified barriers to women's participation in research include the absence of gender equity and gender supportive strategies in many research and academic institutions [3, 4]. Other barriers include gender bias in the employment process which implicitly favours men, poor institutional monitoring of women's representation in research and academia, and the lack of institutional strategies to support work-life balance for women researchers [1]. Furthermore, women reportedly faced greater delays in completing their doctoral studies and producing a strong publication record, which could be attributed to gender and social norms [4].

In Africa, statistics on the percentage of women researchers show alarming disparities. In 2016, the overall percentage was 34%, but this figure hides great disparities that exist on the continent according to the African Development Bank [5]. In Cape Verde, for instance, 52% of researchers are women, 47% in Tunisia, and 40% in both of South Africa and Uganda. Guinea is at the other end of the spectrum with only 6% of researchers being women, followed by Ethiopia, where the rate is 7.6%, then by Mali with 10.6%, and Côte d'Ivoire with 16.5% [5]. The same dynamic is observed in Senegal, where women are poorly represented in the research community and even more so in the decision-making bodies of academic and research institutions [6]. In 2019, women represented only 29.3% of the academic staff, countrywide and all disciplines combined [7]. In Niger, women represented 10% of university teaching staff in 2005 [8], in Ghana, they represented 20% of health researchers in 2010, in Burkina Faso they represented 27.7% of personnel in medical science research in 2010, and in Mali women constituted only 14.9% of health researchers in 2006 [8].

Some efforts had been invested to improve women's representations in institutions in Africa by the development of gender friendly policies. These include the of the Gender and Affirmative Action Implementation Centre which was mandated to implement gender policies in some institutions such as Kenyatta University [9]; the effort at improving women's access to

research funding through the establishment of the "Projet d'Appui à la Promotion des Enseignantes Chercheures du Sénégal" (PAPES) [10] and the establishment of an International Center for Girls' and Women's education in Africa by the African Union and Microsoft located in the French-speaking African countries [11] Despite these efforts, gender mainstreaming in development policies and programs are still insufficient, and Francophone West Africa remains one of the regions with the greatest gender disparities in the education sector [11]. Women still face major obstacles in accessing higher education [12].

The limiting sociocultural expectations placed on women's role in research and academia can strongly affect their performance, and in turn, their opportunities for professional development [13]. Yet, women's participation in global research is essential. Women's participation in research increases the prospect of women's specific health issues being addressed [7]. In addition, there are important moral, ethical, and justice arguments in favour of diversity in research as diverse teams are reported to generate more innovative solutions to problems and provide a more holistic view in general [13, 14]. There has however been limited discussion about the gendered processes in organisations that have led to the productions of the phenomenon described so far thereby leading to an assumption that research institutions and academia are gender-neutral and asexual in its practices [15]. The poor recognition of the way sexuality had shaped the work processes in academic institutions and the imprint of cultural practices on these processes have also been poorly described, discussed and addressed. This has largely arisen from the grounding of organisational processes in the *working worlds and relations of men* [16]; the failure for organisational structures and structural reforms to be shaped by feminist perspectives [17]; and the failure to acknowledge that disrespectful gender behaviours emanate from the enshrined gender culture of the institution are not just the result of an individual anomaly but that gender blind institutional policies, procedures and interaction birth these practices [15].

This study not only acknowledges the growing body of literature on women in research but a dearth in the academia especially in Africa. There is a growing recognition of the masculine genderization of the operations of the research institutions [18]; and there may be an assumption of such genderized operations of African research organisations because of the patriarchal societies found in Africa. There has however been some progress towards gender equality howbeit this progress is not uniform across the globe especially in the Science, Technology, Engineering, and Maths (STEM) faculties; and the differences in expressions by context is also less often discussed. These differences in expression need to be understood to be able to develop context specific responses to the inequalities experienced in different contexts and settings.

This study built on Fagenson's theory that acknowledges that women's career advancement in any organization is influenced by societal and systematic factors; and that cultural and social attitudes toward gender responsibilities influences perceptions of job roles and responsibilities [19]. We also recognize that women's representation in science and technology is often systematically minimized, undercut, and undercounted through a genderization process that impacts their employment opportunities; the narrative of their contributions [20]; and impacts access to family-related support or predisposes them to family-related discrimination [21]. Many African communities the family and societal environment promote gender subordination [22] and thus, where socio-cultural norms operates within an institutional framework often place women under male tutelage [23]. Gender bias and stereotype tendencies persist within these African institutions [24].

The question is whether research and academic institutions in West Africa reproduce societal gender relations and representations and whether they influence gender constructs at the organizational and individual levels with an impact on the career advancement of women

researchers. In order to fill this gap in knowledge, this study aims to identify barriers to the career advancement of women researchers in some West African countries. The study aims to identify ways to improve on the inequitable representation of women in scientific research, therefore, contributing to higher diversity among researchers, which will, in turn, lead to higher quality research.

Materials and methods

Study design

This was a descriptive, observational, cross-sectional qualitative study. Data collection was done between June and September 2020.

Study population

The study population consisted of female and male scientists working in academic and research institutions that promote, design, conduct and/or disseminate biomedical, clinical and socio-epidemiological research in West Africa. Study participants were included if they reside in West Africa, can read and communicate in French, Portuguese or English (the three main official languages in the West African region), are members of academic or research institutions in West Africa working in health or social sciences discipline, and are over 18 years of age.

Sampling

Participants were recruited by non-probability sampling. The sample size was determined as the data was collected and analysed in an iterative process [25]. The aim was to seek a richness of information. Thus, the size was only known when saturation occurred and no more new information had been generated by interviews.

Data collection and analysis

In-depth individual interviews were conducted by video call using the Zoom platform. Consent forms were sent to the informants 24 hours in advance to obtain their signatures on the consent form. All interviews were recorded. An interview guide with open-ended questions was used during all interviews. Each interview lasted for an average of 60 minutes. The discussion guide explored six main topics as indicated in Table 1: information about the disease, relationship with healthcare professionals, daily life, social support, mood, and the future.

The data analysis was analysed by creating a theoretical corpus from the full transcripts of the interviews. The interviews were transcribed as the data was collected from the digital recording. The authors used thematic analysis through an objective and systematic analysis of the manifested content within the oral discourse [26]. An inductive analysis was done to explore the research objects [27]. After the transcription, the data was organised into evocative themes in relation to the interview.

The analysis of the coded data followed the following steps: 1) extraction of the different units of analysis from the participants' discourse using the Nvivo software, 2) horizontal analysis of the theoretical corpus in relation to the research objectives, 3) creation of the theory from the analysis of the coded data, and 4) validation of the meaning of the statements by triangulation of sources and methods. The data analysis was carried out using the NVivo 12 software.

Table 1. Interviews guide.

Please, we would like to listen to your opinions and experiences on:		
1	Professional career of researchers	*Can you tell me about your professional career as a researcher?*
2	Opinion on gender equality in the field of research	*What do you think about gender equality in the field of research?*
		How do you judge the policies of African academies in terms of gender equality?
		What are the organizations in African academies and research institutes doing in terms of gender equality?
3	Opportunities related to the gender and/or sex of the researcher	*What opportunities for development have you had during your career as a researcher.*
		(Probe discussions on opportunities received related to the researcher's gender)
		What is the comparison you can make between the trajectory of a female researcher and that of a male researcher (in terms of opportunities)?
4	Barriers related to the gender and/or sex of the researcher	*What barriers have you encountered during your career as a researcher? -*
		(Explore any theme on discrimination due to the researcher's gender in the academic environment)
		What are the environmental barriers that may impede the careers of women researchers? (Explore about the rôle of family and the social environment)
5	Difficulties of women researchers in their professional careers	*What are the difficulties encountered by women researchers in attaining positions of responsibility?*
		Can you share any personal experiences? (Ask question if discussant identified difficulties with career development)
		How would you compare the trajectory of a female researcher with that of a male researcher (in terms of difficulties)?
6	Recommendations for achieving gender equality in universities and research institutes	*Can you give us recommendations for improving gender equality in universities and research institutes?*
		What are the coping strategies employed by women researchers in the face of the difficulties and obstacles they encounter in advancing their careers?
		Are there other coping strategies that women researchers can adopt to build their careers in research?

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Ethics

Participation in this study was voluntary. Informed consent was obtained from all participants. The consent form was prepared and shared prior to any interview in the language chosen by the participant. The data collected was kept confidential. The identity of individuals who consented to participate was not included in the transcripts. The audio recordings were anonymised. In all uses of the results, anonymity was respected, with no identifying information on the notes and analysis materials. No remuneration was provided to the informants. The approval of the Senegalese National Health Research Ethics Committee was obtained for this study (0000050/MSAS/DPRS/CNERS).

Results

Interviews were conducted with 21 female researchers and 9 male researchers from Ghana, Senegal, Burkina Faso, Niger and Mali (Table 2). The age of the participants ranged from 30 to 56-years-old, their years of experience as researchers ranged from 5 years to over 30 years, and they all had a PhD or its equivalent.

Table 2. Sex-disaggregated and sociodemographic characteristics of participants.

Participants	Female N = 21	Male N = 9
Marital status		
Single	1	0
Married	19	9
divorced	1	0
Study level		
PhD	19	9
PhD Student	2	0
Master	0	0
Religion		
Muslim	18	8
Christian	3	0
Atheist	0	1
Age		
25–35 years	2	2
35–45 years	14	3
>45 years old	5	4
Years of professional experience		
0–5 years	3	2
5–10 years	11	5
Over than 10 years	7	2
Country Representation		
Senegal	18	7
Ghana	1	0
Bénin	1	2
Burkina Faso	1	0

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Though participants had diverse professional and personal life experiences, the four themes that resonated throughout the interviews reflected their perception of gender inequality in academia and research institutions irrespective of their country of origin as highlighted in Table 3.

Organisational culture and institutional policies and practices

Organisational culture and institutional policies and practices affect opportunities for women to advance their career. Organisational culture is defined as the underlying values, beliefs and principles that serve as the foundation of an organisation's management system, as well as the set of management practices and behaviours that both exemplify and reinforce these core principles [28]. Most of the interviewees identified that few women are working in most research institutions and organizations in West Africa. This discrepancy in gender representation in research institutions reflects the under-representation of women in schools in general and less so a situation that arises from discriminatory recruitment. Indeed, few women reached this level of university education where they could compete with men.

> *"At the University of Ziguinchor, at least for the example of 162 people, we are only 10 women professor-researchers".*
>
> (Female, 40 years old, Professor-researcher)

Institutional discriminatory practices were discreet and implicit. A number of the interviewees were not consciously aware of discriminatory practices in the organizational systems

Table 3. Summary of the thematic analysis of the main theme definitions and sub-theme categories.

Themes	Sub-topics
Organisational culture and institutional policies	Barriers: gender unequal environment, office politics, organisational barriers, workload, institutional policies, faculty track, promotion limitations, attrition
	Facilitators: leadership development, progress on diversity and inclusion, progressive change, opportunities for advancement, continuous training, opportunities for women
Family and environmental barriers	Barriers: position of women in the family, the position of women in society, unequal work-life balance, subordination in marital relationships
	Facilitators: prioritisation of work and private life, relationship, equitable roles and responsibilities in the marital relationship
Individual characteristic—intermediate perception of professional and personal success	Barriers: lack of confidence, personal limitations, behaviours based on perceived expectations, challenging gender biases, gender as a barrier
	Facilitators: self-efficacy, self-advocacy, hard work, career satisfaction, professional growth, positive reputation, gender as an opportunity
Resilience strategies of women researchers in the face of obstacles to career advancement	Perception of difficulties, career stagnation, slow career progress, personal strategies for dealing with obstacles, systemic strategies for dealing with obstacles

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and so discounted these practices as norms, and therefore were less able to report them during the interviews. Identified institutional gender discriminatory practices include the relegation of some subordinate roles to women such as taking meeting minutes while visible leadership roles were reserved for men.

Also, interviewees reported that the marital status of the female researcher plays a determining role in her being given leadership roles. For example, many leadership roles cannot be held by unmarried–single, divorcee–women; as being unmarried reportedly implied the woman has not acquired enough managerial skills to run an office. Also, unmarried women who hold leadership positions were touted as having gotten the job through sexual favouritism.

> *"I was a general secretary in a university union. So, I coordinated a trade union section and I got a number of negative things from that. For example, people said, 'Because she doesn't have a husband, she has time to fight for everything and anything. I also had to fight to safeguard my reputation which at one point was tainted by nasty rumours about how I got into that job. . .",*
>
> (Female, 49 years old, Professor-researcher)

Some discrimination was also reported concerning the right to maternity while men are not denied the right to paternity in any situation or circumstances.

> *"I was in a project in London, the project lasted two years and the motto was: no baby for two years. You're not allowed to have a child, you're not allowed to. . ."*
>
> (Female, 50 years old, Professor-researcher)

Many interviewees also reported difficulties in finding opportunities to advance their careers. They report that there are few gender-focused grants. In addition, they, like men, are confronted with the lack of funding opportunities for research in Africa.

Family and environmental barriers

This theme deals with the social environment that affects the freedom of creative expression of individuals in society. A society shares a set of morals and traditions and is characterized by collective activities, interests and behaviour [29]. When a member deviates from the established norms and patterns of the group, his or her behaviour is considered subversive and threatens the stability and security that others derive from group membership. This theme describes how the family and social environment interferes with the career development of women researchers.

Interviewees identified the gender roles ascribed to women in the family and society as a barrier to research career advancement. Women are nurtured to be home carers and thus, they play a central role in the life of their families as a wife and/or mother. The responsibility to care and cater for the needs of the immediate and extended family–the children, husband, and elderly–is time-consuming and leaves little time to address research career advancement needs including missing multiple opportunities for travels, collaborations, networking, and capacity building.

Husbands played a decisive role in the future of the wife's professional career. Many interviewees identified with the need to have an understanding husband to be able to have a successful research career. A researcher narrated how she was forced to give up a travel grant (a traineeship in a research department in Europe) after a year in order to 'look after her husband' when she was not yet a mother. Her husband had demanded she return. Another researcher noted:

> *"I had two maternities. It was very, very difficult. Then we have mobility grants that we sometimes can't use because we don't want to leave the country. We have children,. . .it was really an obstacle for me."*
>
> (Female, 37 years old, Professor-researcher)

The majority of the interviewees emphasised the difficulty of achieving a work-life balance as their life balance was skewed towards prioritizing raising and caring for the family due to the socio-cultural values placed on women as homemakers in West African. Some female researchers, therefore, chose to put their research careers on hold while supporting the growth and development of the family.

Male researchers corroborated this narrative of women prioritizing family responsibilities. This family support enabled men to devote quality time to their professional work. They recognized that the prioritization of family responsibilities–a responsibility not equitably shared with men—by women was at the expense of their research career.

> *"If the little family is happy, God is happy"*
>
> (Female, 42 years old, Professor-researcher)
>
> *". . .to women researchers, we say, "Find enough time. It's not your husband's job to look after the children or the kitchen. So they feel guilty. In fact, we need to change our mentality as African women because I don't think that's how it is in Europe. . .".*
>
> (Female, 42 years old, Professor-researcher)

The in-laws were also reported to influence the researcher's career. The in-laws were there to remind the woman researcher of her social duty towards her family and in-laws.

"Sometimes when my husband agrees that I can travel for scientific conferences, it is the in-laws who say that it is not possible, you can't be away all the time, etc."

(Female, 45 years old, Professor-researcher)

Interviewees also identified that women also have to handle societal roles assigned to women, from which female researchers were not exempt. Women were expected to attend family ceremonies and socialize with the extended family. These social rules resulting from the gender roles ascribed to women in the African society further depletes the time women can devote to research.

"*We have social obligations although being a female academic, you have to go to christenings, to that kind of stuff. . .*"

(Female, 48 years old, Professor-researcher)

Intermediate perception of professional and personal success

This theme deals with individual characteristics, which describe the dispositional, habitual and motivational traits discernible in an individual and which can help explain and predict certain behaviours [30]. Individuals vary in how they perceive and respond to obstacles. The women interviewed felt as competent as the men and felt that competency should be the main measure for assessment in the research enterprise.

"But sometimes it turns out that the woman has as many skills as the men, um, but nevertheless she is rejected because she is a woman. So if she has the same skills as the men, that's it and everything, and she has the knowledge, she must be given the place she deserves.

(Female, 36 years old, Professor-researcher)

Sadly, this is not the case. Many participants indicated that women have to cross multiple hurdles during their research career that have to do with perceptions of womanhood. This made what is an already inherently difficult field more challenging to manage as a woman. Women had to do a lot more to prove themselves and are consistently required to show commitment and professionalism because their work patterns do not conform to the academic research culture prescribed by men. This forced many women to conform to certain practices at the cost of personal values and interests. Women also needed to negotiate the gender stereotypical labelling of their moods and characters been modulated by female hormones as the quote below indicates:

"I know that anyway, the female touch can be really good. . . But, whenever there are a lot of women in a place sometimes. . . They are often a bit 'knife-edged, I don't know if it's hormones or what [laughs].

(Male, 40 years old, researcher)

"A woman should not speak loudly, should not challenge. . .It is expected that this is exactly the same in the professional spheres and this is problematic.

(Female, 36, Professor-researcher)

devote less time to research-related activities. This corroborates with Sayer who consider that women spend far more time on unpaid domestic work than men [34]. In addition, the subordination of women in African households [35] implies that women have to seek their husbands' approval and support to make a success of their research career. These constraints may have led several potential female researchers, who are less able to adopt the enumerated coping strategies identified by interviewees, to stay away from the research enterprise. This reaction may be a reason for the persistent gender disparities in research as a career in West Africa, especially in the field of biomedical research [31]. This merits further research and explorations.

Women also struggle to navigate their careers [36]. The study also illustrated the effect of organizational influences such as male-dominated networks, bullying and harassment [36] as research institutions in West Africa reproduce and mirror the acts of gender inequalities in society [37]. These institutions have organisational and institutional cultures that meet the needs of male professors and students [38]. Leadership patterns, beliefs, symbols, structures, ceremonies, power and information flows are modelled on male expectations and experiences [38]. Women, therefore, had the additional task of negotiating the male-dominated practices in the research enterprise as much as they had to negotiate for home-front support from spouse and family. For many women, these negotiations are too hard a price to pay and, therefore, are forced to relegate the career tussle to conform to gender norms and values. A few academic institutions, however, have programs supporting gender equity. Existing programs primarily target the individual or interpersonal level of the social ecological interaction [39].

The discourse on strategies to address challenges women face with their career trajectory development centred on spousal related actions that indicate the need for the empowerment of women to be able to emancipate themselves. Female emancipation refers to distancing oneself from certain family, matrimonial, or statutory constraints reserved for women, while empowerment refers to the multidimensional socio-political process of women themselves, who are individually and collectively aware of the relations of domination that they are seeking to transform [40]. Some women entrepreneurs in Togo, who, in order to devote themselves to their careers, have expressed the wish that their husbands take a second wife [41] as a polygamous union enabled them to relegate domestic tasks to a younger woman, thereby allowing them the needed time to devote to their careers [41]. Divorce was less often mentioned as a solution or a way of reclaiming their personal trajectory [42]. This may be due also to the concerns about societal stigma associated with not being married. In addition, not being married may compromise the career development they require, as *unmarriedness* deters from them being entrusted with leadership roles. This circle of events indicates the complexity of the decisions a female researcher in West Africa may have to make for the purpose of career advancement. While empowerment programs may help strengthen women's resolve to overcome the barriers to their research progress in the short term, more medium and long-term strategies are needed to overcome the limitations placed by the gender inequalities rooted within the research and academic structures.

One of the strengths of the study was the conduct of the research exploration across West Africa, a region with the same cultural values and perspectives. The findings, therefore, become applicable to the region and can facilitate support by regional bodies. The study, however, has a few limitations. The data collected was limited to self-reported information on research and academic advancement and gender-related experiences. The coding and analysis of this data were conducted in this context. Additional themes and perspectives derived from the content-rich narratives of the participants merit further exploration. The experiences of empowerment of women researchers in their homes would also benefit from further exploration in future studies. The data also covers only 5 of the 15 countries in West Africa. Despite

these limitations, the results provide findings of a regional context that informs on the gender disparity observed in the career trajectory of women in research, thereby, adding context to the global discussion on promoting gender equity in global research career development.

Conclusion

A complex set of factors has contributed to the gender inequality experienced by women in universities and research institutions in West Africa. The same complexity is reflected in the decision-making process by women researchers in an effort to extricate themselves out of the limiting web and make a success of their career. The gender insensitive organizational culture and institutional policies of these universities and research institutions make the extricating process laborious for women thereby causing many to succumb to the pressure to conform to gender expectations which jeopardizes their career development. A gender-sensitive change in organizational culture and institutional policies and practices may likely result in a significant increase in career research progression for women in research in West Africa. It is the authors' hope that this research will contribute to the development of a theory on the barriers and facilitators to the academic and professional advancement of researchers as well as to the development of evidence-based interventions to close the gender-related gaps in West African academic and research institutions.

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5.2. Article 2: A qualitative insight into researchers' perceptions of gender inequality in medical and dental research institutions in Nigeria.

PLOS ONE

RESEARCH ARTICLE

A qualitative insight into researchers' perceptions of gender inequality in medical and dental research institutions in Nigeria

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Abstract

Objective

The aim of the study was to gain a qualitative insight into scientific researchers' perceptions of gender inequality inside Nigerian research institutions through an investigation of how gender equality is enacted in medical and dental research institutions in Nigeria.

Methods

This descriptive and cross-sectional qualitative study probed decision-making around navigating gender inequity and explored opinions about how a supportive environment for female medical and dental researchers could be established. Data were collected through semi-structured telephone interviews with 54 scientific researchers across 17 medical and dental academic institutions in Nigeria between March and July 2022. Data were transcribed verbatim and analyzed using thematic analysis.

Results

Three core themes emerged: institutionalized male dominance in research institutions; changing narratives on gender equalities in research and academic enterprise; and women driving the conscience for change in research institutions. Female medical and dental researchers' perceived gender equality was challenging mainstream androcentric values in knowledge production within the medical and dental field; and queries the entrenchment of patriarchal values that promote a low number of female medical and dental trainees, fewer female research outputs, and few women in senior/managerial positions in the medical fields.

Competing interests: The authors have declared that no competing interests exist.

Conclusion

Despite the general view that change is occurring, a great deal remains to be done to facilitate the creation of a supportive environment for female medical and dental researchers in Nigeria.

Introduction

Gender equality is a visionary pursuit that carries an implication that economic, social, and cultural attributes and opportunities associated with different genders by different society should not confer difference in expectations that debar pursuits and aspirations, can positively influence individual and social development [1]. Moreover, equality is critical for the socioeconomic stability of countries as it promotes and guarantees peace and social justice. Three areas in which gender equality can foster progress is in science, education, and health [2]. Medical and dental researchers stand at the fulcrum of social development through their engagement in these three domains [3]. They also contribute to economic development through their work on understanding disease and promotion of medicine, vaccines, diagnostics, and effective public health messages. The work of scientists in research institutions often requires training others to advance science to support disease eradication and quality of life. This opportunity opened to medical and dental researchers through the promotion of gender equality has yet to be optimized.

In Africa, female researchers face greater challenges in the medical and dental health contexts limiting their ability to make optimal contributions to individuals and society [4]. For example, in West Africa, medical and dental researchers are faced with gender values and norms that assign women to domestic tasks and responsibilities that reduce the time they can dedicate to research [4]. This may explain why women spend more time teaching and less time researching, when compared with men [5]. Additionally, gender-blind organizational culture and institutional policies make it difficult for women to attain leadership positions and place them at risk of low opportunity for participation in science [4, 5]. Moreover, female medical and dental health researchers can become distracted from investing in the process of challenging the gender-blind systems by dedicating attention to preserving relationships with their male spouses [4].

Like many other gender-blind research institutions in and outside of Nigeria, including medical research institutions, men in research have a greater number and quality of research outputs than women who are in research [6–8]; and fewer women are seen in top-office in research institutions [9]. The tendency for this is high because of the large number of male medical and dental students [10, 11]. This is also driven by the high number of male students who pick a pre-college science track in secondary school [12]. The high number of men in medical and dental research institutions and the high number of men in managerial posts reflects a complex sociological phenomenon that enshrines these patriarchal practices through the use of gender exclusionary strategies that maintain the male monopoly [13, 14].

There is limited information on the gender distribution of researchers in Nigeria. The available evidence indicates that the number of women in dental institutions had steadily increased from 36.2% in 2003, to 42.5% in 2013. Thus, the predominance of intake of men remains [15]. There are clearly gender differences in fields of specialization with a steady increase in the number of women in leadership positions [15]. However, this increase in female participation in dental academia may not quite reflect medical practice. For example, Ogunbodede [16] indicated an observed discrepancy in the increase in number of practicing female dentists

versus practicing female medical practitioners over a 10-year period. While the number of dentists increased from 15% to 35% between 1981 and 2000, the increase for medical practitioners only shifted from 15% to 19%. Similarly, the number of male doctors in Nigeria is consistent with roughly twice the number between 2017 and 2019 [17]. Although male dentists do not double the number of female dentists, the number of male dentists (810) outweighs female dentists (555) [18].

A gender equality gap could not, however, be determined purely on grounds of numbers. This would be time-bound and to the continued detriment of developing an equal society. There is also no guarantee that a reduction in the number-gap would change the current paradigm. Prior studies have indicated that having more women educated in science not will change the status quo of more men holding senior positions [19–22]. The envisioned change in gender representation in the research institutions and research managerial positions needs to be driven by the collective concern and commitment to improving the quality of research outputs for the health and wellbeing of the society through the participation of women [23].

The theoretical perspective that informed the design of this study therefore, used a feminist institutionalism analytical lens that would enable the exploration of gendered institutions and their gendering effect [24]. The feminist institutionalism analytical approach enhances the exploration of the gendered dimensions of structures of power and behavior and the role played by institutional informal structures, processes, values, and norms. [25, 26]. It enables an analysis of how informal institutions interacts with the formal systems; through roles played by gendered rules, actors, and outcomes, to produce gendered outcomes. Also, the feminist institutionalism analytical approach provides a theoretical lens that allows for gendered power relations and the processes that makes such relations visible [25].

Despite it being apparent that gender inequality practices exist among professions, little is known about how female medical and dental health researchers use the potentially transformative opportunities that do come their way. Are there career trajectories that make it possible for female medical and dental health researchers to access and maximize their use of these transformative opportunities in education and career development? Does the cultural context of female medical and dental health researchers support the institutionalization of gender inequality in ways that limits their ability to facilitate gender equality in their profession?

The present study aimed to address these research questions in order to provide insight into the career advancements of medical and dental academic health researchers irrespective of their gender. This qualitative study investigated how gender equality is enacted in the medical and dental research field; and explored male and female researchers' perceptions of gender inequalities in medical and dental research institutions in Nigeria. It probed decision-making around navigating gender inequity within research institutions and explored opinions on how a supportive environment for female medical and dental researchers in Nigeria could be established.

Materials and methods

This study adopted an academic literacies perspective that accounts for context, culture, and genre [27, 28]. The theoretical framework applied in this study was the preference theory due to its appropriateness for exploring researchers' investment in efforts to mainstream gender considerations in institutional processes; whilst recognizing the need for women to simultaneously meet family and work responsibilities [29].

Study design, study site and study participants

This study formed part of a larger qualitative study that was conducted in Nigeria to determine barriers and ways to resolve gender equality in medical and dental research institutions in

Nigeria. Female and male faculty members of 17 universities in Nigeria took part in this research study between March and July 2022. Participants were able to read and communicate in the English language and defined themselves as academics in either the health, medical, or dental education field because they promote, design, conduct and disseminate biomedical, clinical, and socio-epidemiological research in Nigeria. All participants resided in Nigeria, were adult members of academic or research institutions working on health issues and consented to take part in a one-hour interview.

Sample size

It was estimated that three study participants would be recruited from each of the 17 institutions that hosted a medical and dental school in Nigeria. Therefore, 54 interview slots were allocated equitably amongst professors, readers, senior lecturers, and lecturers (the entire spectrum of designations in the academia in Nigeria). The slots were also divided equitably among dentists and medical personnel, and in a proportion of 2:1 for female: male interviewees. These designates were then randomly allocated to each institution as indicated in the S1 Table. This sample size was adjudged to be adequate to generate rich information; and allow for saturation to occur. With a non-response rate of 20%, it was anticipated that the final sample size for the in-depth interview will be 43. Saturation is often reached with a sample size of 12 persons when working with a homogeneous group like that for this study [30].

Sampling procedure

A purposive and convenience sampling was used to identify potential participants working in a medical and dental health academic institution and conducting research in that institution. The diversity of respondents was ensured by recruiting study participants from all the academic cadres in the medical and dental institutions.

Study participants were recruited through a combination of purposive sampling and snowballing. Peers of the principal investigator in each of the 17 institutions were contacted and asked to identify a possible respondent that fit the profile of respondent to be interviewed in their institution. If the interviewee met the inclusion criteria, the principal investigator contacted her/him by telephone or via Email/WhatsApp. The purpose and objectives of this study was explained, the interviewee was invited to take part in an in-depth interview and a date was scheduled for the interview. Before the scheduled date, written informed consent was sought. When the consent form was filled and sent back, the interviewee was then enrolled as a study participant.

At the end of each interview, participants were asked to share the name of a colleague who may be interested in the interview. That colleague was then contacted and the process for enrolment was repeated until the target number of participants had been reached. Whenever a study participant refused study participation, the participant was replaced by an eligible study participant in the pool of contacted researchers.

Study procedure

An interview schedule was adapted based on a focus group discussion held with a convenience sample of 12 researchers working in medical and dental academic institutions. These were six male and six female researchers from Belgium, Brazil, Malaysia, Iran, Nigeria, United States of America, and Turkey. These researchers had a history of working in the West Africa region. The expert consultation was held via a conference call in June 2021 and aimed to explore perspectives on the scope of intervention carried out by university faculty members on gender equality in education and professional development. Before the discussion took place,

participants received a one-page concept note about the main study, which included a brief description of the conceptual framework for the study; the working definitions of gender equality (people of all genders have equal rights, responsibilities and opportunities); and the aim of the discussion. The outcome of this discussion formed the basis of the interview schedule used in the main study.

In-depth interviews were conducted between March and July 2022 during the COVI-19 pandemic. Interviews were conducted using Telegram and WhatsApp video calls to identify interviewees perspectives on observed gender differences in career progression and trajectory of medical and dental researchers in Nigeria; as well as gender-related barriers to opportunities for changing this trajectory for future female researchers. Interviews were conducted between March and July 2022. All interviews were conducted in English and audio-recorded. Interviewees were required to switch on their video to enable the interviewer ensure the interview was being conducted in privacy. Notes were taken during the interview. The time range for the interview was 26 minutes to 71 minutes with a mean time of 55 minutes.

Data analysis

The purpose of data collection was to seek richness of information and to saturate all concepts and categories emerging from the in-depth interviews. After each interview, transcripts were transcribed verbatim, and were read and reread to reveal emergent themes. Table 1 presents ten broad topics that were explored through these interviews. Interviews were transcribed verbatim into a password protected Microsoft Word document accessible only via a single password protected computer. Anonymized transcripts of the recordings were checked to verify their accuracy and completeness compared to the audio recordings. Personal identifiers and names of places and institution were not transcribed.

Transcribed interview recordings were imported into Atlas.Ti and read and re-read to identify codes and categories using an inductive approach to code, analyze and report on [31, 32]. This process helped gain familiarity with the data and achieve new insights by analyzing for recurring themes and issues that represented answers to the questions; and to draw conclusions from the responses.

A codebook was inductively developed from themes that had been generated and from analytical questions intended to elicit a thorough, nuanced exploration of gender equality in medical and dental research. Coding and analysis were led by the first author of this report. A second qualitative researcher was consulted for extra coding to ensure inter-coder reliability during the process. The adoption of this particular approach ensured the identification and description of new codes and subthemes within the transcripts and this procedure continued until the point of saturation was reached.

During this coding process, novel codes that emerged from the data were included to review the initial generated codebook. The transcripts were again re-read using the new codebook. This approach was employed to develop categories, which were then explored and used when discussing the pre-conceived topics. The concepts and categories of analysis were defined using the words of the participants. Data were organized into key themes and subthemes generated by the coding process, and excerpts and illustrative quotes of general insights and of deviant cases from the transcripts were selected to substantiate the presentation of the key findings in this report. The informants' own words were also used to report the findings. Attention was paid to the researchers' reflexive journals to ensure that informant biases were not introduced. The Consolidated criteria for Reporting Qualitative research guidelines were considered.

Table 1. Ten broad topics included in the discussion guide.

Opinion on gender equality	What do you understand by gender equality? What are your thoughts about gender equality in research institutions? What do you think about gender equality in medical or dental health research area?
Opportunities related to the sex/gender of the researcher	What are the opportunities you've encountered during your medical or dental health research career? *Prompt about gender/sex-related opportunities* . . .do you think medical or dental researchers of the opposite sex encounter the same type of opportunities?
Sex and gender related research obstacles	What are the obstacles you've encountered during your medical or dental health research career? *Prompt about sex and gender related obstacles* . . .do you think medical or dental researchers of the opposite sex encounter the same type of obstacles?
Difficulties female researchers face in their professional career	What are the difficulties and challenges female researchers face to . . .receive an education as researchers? . . .lead their own research projects? . . .access funding, grants, scholarships? . . .publish? . . .combine academic and research work? . . .reach top management positions? In comparison with men: How are all these things similar or different?
Integration of 'gender perspective' or 'gender lens', 'gender approaches' in medical/dental research	Perception. . . 1. In their own research agenda In the medical/dental research agenda of colleagues in the same field
Professional experience with sex and gender mainstreaming in health research conduct	How have you practiced sex and gender mainstreaming in medical or dental health research? *Probe, what made it (not) possible; what where the challenges faced; what are the barriers created by knowledge, skills and access to resources; how were these barriers and challenges addressed; if they were not addressed, what made it challenging; has the societal perception of women had any significant influence; if yes/no, how? What spurred you to take such initiative.*
Recommendations for gender equality in research and academia	Can you give us recommendations on how to promote and institutionalize gender equality in research practices and in the academia?
Opinion of researcher regarding sex and gender mainstreaming in medical or dental health research conduct	We are going to talk about integrating gender and sex in medical or dental health research: What in your opinion are the opportunities there are with respect to giving considerations to sex and gender in health research planning and implementation? *Probe for opportunities that can be derived from the institution and from peers* What changes can result from integrating gender and sex into medical or dental health research practices? (Advantages disadvantages)
Female medical and dental health academic researchers' sorority and solidarity efforts in support of the elimination of gender inequality practices	How well have female colleagues been supported to succeed with their career as medical or dental health researcher? *Probe on the career progression pathway in the institution; how junior female colleagues have fared; what senior colleagues have done/can do to improve career progression of early career females; perception on how gender/sex dynamics have impacted on institutional and individual support; and what can be done to improve the current institutional and individual systems and practice to support early career medical and dental academia.* How do you feel about men joining women's efforts and initiatives to improve gender equality in medical dental research?

(*Continued*)

Table 1. (Continued)

Recommendations for better sex and gender mainstreaming in medical or dental health research conduct	Can you give us recommendations for better integration of gender and sex in medical and dental health research in West Africa? How feasible would it be to implement the recommendations you're suggesting? What would be necessary to convince women and men in medical dental research to pool time resources efforts to make reality all the transformations you suggest. . .

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Ethics

Ethics approval was obtained from the Institute of Public Health, Obafemi Awolowo University, Ile-Ife, Nigeria (IPH/OAU/12/1617). All informants signed an informed consent form.

Results

Participants' characteristics

Table 2 presents data on the sociodemographic profile of the 54 female and male medical and dental professionals who participated in the in-depth interviews. The sample presents 48% females and 52% males, with their ages ranging from 33 to 62 years (what of the age mean?). Participants were educated to postgraduate level and most of whom were married. The number of children of interviewees ranged from 1 to 5.

Table 2. Sociodemographic profile of participants (N = 54).

Characteristic	Male (n = 28)	Female (n = 26)
Age		
20–40	3	6
41–60	24	20
61–70	1	-
Marital status		
Single	-	2
Married	28	24
Profession		
Dentists	11	10
Medicine	8	5
Surgery	5	3
Basic sciences	4	8
Designation		
Professor	3	3
Associate Professor	4	2
Senior Lecturer	16	13
Lecturer I	3	6
Lecturer II	2	2
Number of children		
0	5	9
1–4	16	16
5	7	1

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Profile of refusals

An initial 44 (29 medical and 15 dental researchers; 30 females and 14 males) contacts were made. Of these, 12 (7 medical and 5 dental researchers; 10 women and 2 men) did not respond to contact made. One did not meet eligibility criteria, and eight (7 medical and 1 dental researchers; 4 females and 4 males) declined participation. The 21 consented respondents helped reach other participants through the snowballing process

Emergent themes

Three core themes emerged from the data that each reflected participants' perceptions on how female medical and dental researchers' make decisions to navigate the constraints within the research institutions in which they work; and how they act to promote a supportive environment for their female peers. These themes were: (1) Ingrained patterns of institutionalized male dominance in research institutions; (2) Hopes for a changing narrative on gender equalities in research; and (3) Women driving the conscience for change. These themes, along with the subthemes and extracts are presented in Table 3.

Ingrained patterns of institutionalized male dominance in research institutions. Women felt under-represented and men overrepresented in most fields in the medical and dental fields. Women expressed an opinion that the medical and dental fields are male-dominated and that women need to compete more with lower status positions, as one participant expressed:

> *'If you go to male -female enrollment in school, you will find out that the percentage is higher for males than females. Then, when you even come to the university, at least I can assert a guess that in my place, if we are like 35 doctors there will be like 7 females'* ***Dentist_male***

Interviewees of both genders perceived that the number of women in the medical and dental profession is increasing, though they remain underrepresented in managerial positions in universities in Nigeria and are less likely to be promoted or elected to managerial positions. Women identified that they had had to put in a lot of effort to demonstrate that they were capable of doing just as well as or even better than men as indicated by the following extract:

> *It was not a small battle to convince learned people like professors, medical doctors saying a female can do this. Even up until now, we are yet to have our female first Vice Chancellor.'* ***Basic Sciences_Male***

Table 3. Emergent themes, subthemes, and illustrative quotes.

Key themes	Sub themes	Illustrative quotes
Ingrained patterns of institutionalized male dominance in research institutions	• Underrepresentation of women in medicine and dental specialties • Underrepresentation of women in managerial positions Institutionalization of patriarchy and androcentric values	*There are far more male medical students than female medical students. Things are even worse in Northern region of Nigeria where male children are privileged. I think that's the foundation of the observed skewness in research. More women need to get an education to have greater opportunities in research*
Hopes for a changing narrative on gender inequalities in research	• Increased public discussion Speaking and 'acting up' for gender equality	*The present Provost of the College is female. Previously, they were males, I think now, we are beginning to have females. I think in the area of research, nobody is going to marginalize a female who has an idea*
Women driving conscience for change	• Female gender bias in grant opportunities Gender mainstreaming into research systems	*I've actually seen some grant and training calls specifically for female researchers. But at the same time that you need to dedicate to these calls are difficult to make out as a female at the age when you are eligible to apply. For example, when you are pregnant or you're breastfeeding, that's like 18 months of whatever program. At this time, you won't really be able to put in your best*

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As per the participants' opinions, gender inequality results in uneven power relations, entitlements, social values, responsibilities, and duties in patriarchal societies. The socialization process also affects how each gender perceives oneself and the power and influence they have. The majority of female researchers observed a male dominant culture in the medical and dental profession, which not only limits the opportunities for selection or nomination into leadership position, but also medical and dental specialization opportunities. As identified, men are perceived by female participants as afraid of women altering the status quo in academic and medical research:

'Because of socialization the moment you are born, your parents tell you how to conform to gender expectations. Females are socialized not to do things that are tedious. This influences even professional. You see females being discouraged from being a surgeon and encouraged to be things like pediatric dentist, dentist.' ***Medicine_Male***

Hopes for a changing narrative on gender inequality in research. Participants of both genders voiced increasing public discussions on gender, gender equality, gender bias and discrimination; that is making it possible for a gradual shift in gender-biased practices in the medical and dental fields. These public discussions for change are happening by female professionals who speak up and advocate for evidence-based changes to gendered practice. The active drives for gender equality in the medical and dental fields is resulting in the rising enrolment of women in medical and dental schools, despite enrolment still being largely dominated by men. Participants opined that there is a growing awareness of opportunities for women to pursue careers in medicine and dentistry:

'I will say that I think we have more of male researchers in medical and dental, but I think the trend is changing, there is also a male dominance in leading research but that is also changing because I think there is a lot of emphasis now on balancing the gender composition of researchers and also gender balance in recruitment. I think people are now thinking in that direction but before most of the research in medical and dental field include more of male than female as researchers and study participants. ***Dentist Male***

There were testimonies of three female medical and dental professionals being the first to hold key managerial positions. For these women, breaking the gender barrier was an effort to create the needed pathway to make it easier for other women to come on board:

'I was the first female consultant in the department, and the first female professor in the department'. You know most at times, if you are able to cross the first few hurdles, the rest becomes easier. So, maybe I'm the sacrificial lamb of the department. ***Surgeon_Female***

Women driving conscience for change. Participants of both genders identified that the selection criteria for many grant opportunities were biased towards women; a number of male participants felt this skew opportunity for women gave women advantages. These biased opportunities were efforts by the granting agencies to drive gender equality in the medical and dental research fields. Male and female respondents, however, opined that the opportunities were not gender biased, while one female researcher commented that the opportunities open to women are not real opportunities, as women are often not able to make the best of these opportunities:

'. . .an organization that gave gender differences in the cut-off age for application of grants– the cut-off age was lower for males than females. This was because the granting agency recognized that females start a lot later than males in their research career trajectory because of their social responsibility of caring for the babies and other unpaid care duties.'
Medicine_Female

Other opportunities for female researchers identified were gender mainstreaming into the composition of research teams not only for gender equality but also to improve the quality of the research outcomes, as diverse perspectives enhance the quality of the design and implementation of research. Gender mainstreaming was identified as important for many reasons, one of which for institutional building. Also, participants identified the need to build the capacity of women to be competitive, and for gender equality advocacy and sensitization of gender-blind research institutions.

To address barriers that prevent women from gaining access to tertiary education, professional research opportunities and promotion at the same rate as men. Few female and male participants identified the need for gender-sensitive policies that mainstream gender considerations in the appointments, recruitments, selection process of female medical and dental professionals into leadership roles; gender considerations in the access to grant opportunities; and opportunities for senior female mentoring of early career (female) researchers. Such policy drives and change can be achieved through the collaborative efforts of female medical and dental professionals. A few participants in this study proposed that gender study centers should be established within medical and dental institutions; and they be saddled to handle gender related issues:

'The establishment of gender centers will probably promote gender equality generally. They can also generate research-based evidence that can address the 'why', 'how' and the value added by promoting gender equality.' ***Medicine_female***

Overall, participants in this study argued for institutional policies that help to drive gender sensitivity. Data pointed to policies needing to promote gender equity at the managerial and administrative levels while focusing on skills and expertise. The opportunities should be open equitably to everybody.

Discussion

The current study identified a male dominance in the research outputs of medical and dental researchers in research institutions in Nigeria. This male dominance also reflects in the inequitable distribution of managerial positions of the institutions. The gendered operations of medical and dental research institutions is driven by the absorption of the societal patriarchal values. Individuals in this study expressed a paradigm shift driven by individual and collective bodies of women in academia driving a conscience for change. Other opportunities identified to drive the change process included enacting institutional policies that promote gender equality; establishing gender focused units in research institutions dedicated to implementing these policies; continued advocacy and awareness creation for the change to happen; mentorship by women for women and for men; and building the capacity for women to actively engage with others in the research enterprise.

A benefit of these findings is that they provide a contextual and rich foundation of evidence that supports prior research on the inequitable representation of women [4, 33, 34]. Moreover,

a focus on medical and dental research institutions has allowed a deeper exploration of contextual professional factors that may promote gender inequality in a research setting.

Indeed, participants in this study perceived gender inequality as enacted through institutionalization of societal patriarchal and androcentric values that may make domestic responsibilities and career breaks for domestic reasons have far more reaching impact on women's research outputs, and career progression; compared to their male counterparts. It is likely that poor environmental support for research in Nigerian institutions have more impact on women than men who are less able to access sponsored opportunities for capacity development due to the need to stay home even when these opportunities are presented [35]. For the same reasons, women may be less able to take up research grant opportunities even when grants are biased towards the selection of women, because of the care responsibilities they are encumbered with. These distractions from capacity building and empowerment opportunities during early career development years are challenging to catch up with in later years of a woman's career, which thereby increases the gender competency gap. The failure to adjudge years of home management as human managerial skills, and poor accounting of home care as work skills continue to make women fall behind in the ratings for skills to handle managerial offices.

Though institutional policies and advocacies can help to bridge these gaps, they are unlikely to be eliminated. Gender equality policies are challenging to implement, but when implemented, significant progress can be made with gender mainstreaming [36]. Gender-sensitive institutional policies in medical and dental research institutions, implemented by established gender focal units, may help to drive the shift towards gender equality in research outputs and numbers of female appointments into senior cadres. These policies will need to promote a gender sensitive review of assessment criteria for appointment and promotion. Further research is necessary to better understand how home-management skills can be rated, groomed and adapted as administrative skills. Efforts in these directions may help to eliminate the managerial position gender equality gap. This may also facilitate men in taking on home care roles in the knowing that they will not be worse-off for doing so.

Furthermore, participants' voices pointed to continued advocacy and awareness creation. One of the roles of the Medical Women's Association of Nigeria is to advocate for favorable policies for women, and they have done so successfully for many issues related to clinical practice [37]. One of which is for paid maternity leave. They have, however, achieved little in driving equality in the field of research. Women in academia may need to form pressure groups to address the issues peculiar to their needs. Pressure groups also need to partner and engage with men to promote gender equality; and advocate for new masculinities and for human rights. Advocacy seeks to narrow the gap between what is known to be effective, acceptable, and efficient and what is practiced [38]. It involves a combination of individual and social actions designed to gain political commitment, social acceptance, and system support for a particular goal or program. Though it is an effective strategy for producing policy change, it can be difficult and complex for those with limited power and resources [38]. Future work is vital for understanding how gender equality in research institutions has contributed to the attainment of the sustainable goal more generally.

While advocacy may bring about change, slowly, the mentorship of women by women and men allies in the gender equality fight could bring about substantial change in the research context [39]. Female mentors promote aspirations of other females to pursue the same career pathways through a feeling of belonging and confidence. Participants in this study reported views on mentoring actions, though, as such, are unclearly defined. The suggested efforts of reaching out to other women in medical and dental research, by those who explained that they have made it to more senior positions, can be institutionalized by research organizations, or bodies, of female professionals. The mentorship process could also facilitate building the

capacity of women to actively engage with others in research enterprise. However, mentorship is a non-formal educational system that should not replicate social norms, dominant values, or drivers that could otherwise entrench inequality and disempowerment of women by reproducing existing hierarchies and exclusions [40]. Training mentors on gender-sensitive mentorship strategies may help to avoid these possible risks.

One of the strengths of the study was the recruitment of study participants from Northern and Southern Nigeria thereby reflecting the views of male and female researchers from diverse cultural context in Nigeria. The study findings are therefore potentially comparable across research institutions in Nigeria. The study is, however, not without limitations. The data collected were limited to the perception of gender inequality in medical and dental research institutions and the coding and analysis of these data were conducted within this context. Additional themes and perspectives can be derived from the content-rich narratives of the participants; and this warrants further exploration as issues surrounding gender and cultural differences in light of gender equality in medical and dental research institutions are not fully understood. Differences in the perspectives of dental and medical researchers could also be examined separately, as the experiences of these two groups may differ.

Despite these potential limitations, results from the present study do provide insights that support a feminist institutionalist perspective that societal inequality is reproduced in political and social institutions such as higher institutions of learning [41]. Understanding how context specific institutional rules, processes and norms drives the enactment of gender inequality can help with the reform and improvement of institutional gender equality programs and strategies. This study is the first study to explore how and why gender inequality is enactment in medical and dental schools in Nigeria; and therefore, provides a framework to support possible gender reforms in these institutions.

In conclusion, medical and dental researchers perceive gender inequality as enacted in medical and dental research institutions in Nigeria through the entrenchment of societal, cultural and religious patriarchal values. These patriarchal values promote the low numbers of female medical and dental trainees, lower research outputs for female researchers when compared to that of male researchers, and fewer women in senior managerial positions. A lot still needs to be done to facilitate the creation of a supportive environment for female medical and dental researchers in Nigeria. This includes the development, monitoring and enforcing of newly created norms that assist in creating the needed support for gender equality. There is a necessity to establish a critical mass of gender experts in medical and dental research institutions who can design and promote effective mechanisms to promote gender equality practices in Nigeria.

Supporting information

S1 Table. Distribution of proposed 54 interviews by gender, rank and profession.
(DOCX)

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5.3. Article 3: Generational differences in perspective about gender inequality in medical and dental research institutions in Nigeria

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Abstract

Background: The discourse surrounding gender inequality within research and academic institutions in Nigeria is experiencing a positive shift. This study investigated the variations in opinions across different generations regarding the perpetuation of gender inequality in medical and dental research institutions in Nigeria.

Methods: This qualitative research study involved the perspectives of 54 male and female medical and dental staff from 17 universities in Nigeria. In-depth interviews were conducted in English between March and July 2022. Participants were selected purposively, and after each interview, participants were asked to refer colleagues who met the eligibility criteria for potential recruitment. The interviews were audio-recorded, transcribed verbatim, and anonymised. Inductive analysis was employed to generate themes. The respondents were stratified by age (below 50 years, 50 years, and above) and by sex at birth (male, female) for analysis purposes. The "younger generation" comprised participants below 50 years, while the "older generation" included participants aged 50 years and above. The emerged themes were categorised into four perspectives: (1) experiences of gender inequality in medical and dental research institutions; (2) obstacles related to sex and gender in research; (3) opportunities related to sex and gender in research; and (4) recommendations for promoting gender equality in research and academia.

Results: The study revealed inter-generational and intra-generational differences in perspectives. Among the younger generation, males and females shared a common view on gender inequality in leadership positions and research opportunities, particularly disadvantaging female academics. They emphasised the necessity for change from a human rights perspective. Conversely, the older generation exhibited divergent opinions. Males acknowledged the presence of gender inequality in leadership and research opportunities but proposed changes based on commodifying women. Older females adhered to traditional views regarding gender inequality. Recommendations for change included removing barriers to education for girls, which restrict their access to capacity-building opportunities.

Conclusion: Implementing strategic actions is essential to foster gender equality in medical and dental research institutions in Nigeria, with the anticipation that younger generations, when assuming leadership positions, will actively drive the necessary changes.

Keywords: Higher Educational Institution; Gender sensitivity; Generational gaps

Introduction

Gender inequality pertains to the unequal treatment, opportunities, and outcomes experienced by individuals based on their gender, often favouring one gender over the other [1]. It is a social and cultural construct encompassing disparities in economic, political, educational, social, and cultural domains rooted in societal norms, stereotypes, and power dynamics. These norms and dynamics assign distinct roles, expectations, and privileges to individuals based on gender [1-3]. Gender inequality is perpetuated through societal expectations and stereotypes regarding gender roles and behaviours, which can constrain individual choices and perpetuate discriminatory attitudes and practices [4, 5].

Perceptions and awareness regarding gender equality have changed, and different generations may hold distinct views and perspectives on the issue [6]. Older generations may have been raised when gender inequality was more prevalent and accepted. They may have directly witnessed or personally experienced explicit gender biases within research institutions, which can shape their perspectives on gender equality differently compared to younger generations. Gender bias, which contributes to inequity, has significant adverse effects on the careers, mental well-being, and work-life balance of underrepresented groups in academia, including those in the scientific field [7]. Furthermore, despite achieving nearly equal gender representation across disciplines at earlier career stages, gender inequality persists in more senior academic positions [8].

Gender bias can manifest implicitly, leading to automatic judgments of individuals based on discrimination, prejudices, and stereotypes without the individual's conscious awareness [9, 10]. It affects all women, but those whose gender intersects with other identities often experience heightened discrimination and greater adverse effects [11]. Gender bias also influences the enrolment of women in science programs across various countries [12, 13]. Gender stereotypes play a role in shaping how men and women define themselves and how others treat them, thereby perpetuating these stereotypes [14]. The combination of implicit perpetuation and acceptance of gender bias as societal norms contributes to the institutionalisation of practices, systems, and structures that enhance gender inequality within institutions. In environments where gender inequality is normalised, the likelihood of explicit expression of gender bias increases, wherein conscious and intentional evaluations of individuals are conducted with varying degrees of favouritism or disfavour [15].

Gender inequality practices are prevalent within Higher Educational Institutions [16]. However, education plays a vital role in achieving gender equality, and universities have the potential to act as influential agents for promoting gender equality in society. Unfortunately, there remains a persistent issue of inadequate gender integration across academic disciplines and activities and a lack of incorporation of gender perspectives into teaching and research within higher education institutions [17, 18]. The institutionalisation of gender inequality within medical and dental research institutions in Africa stems from the institutionalisation of male dominance, which

originates from patriarchal societal practices translating into routine administrative practices within these institutions. This institutionalised process leads to men in research having a greater quantity and quality of research outputs, while women in research face barriers to advancement and occupy fewer top positions within research institutions [19, 20].

In Nigeria, there is an evolving discourse surrounding gender inequality within research and academic endeavours, driven by women championing change within research institutions. Female medical and dental researchers are challenging the prevailing androcentric norms in knowledge production, questioning the entrenched patriarchal values that contribute to a lower representation of women in medical and dental training, fewer research outputs from women, and limited women in senior managerial positions within the medical field [21]. Interestingly, female dental researchers in Nigeria have demonstrated higher research productivity than their male counterparts, with more publications, higher citations per female author, and greater representation as first authors [22].

These efforts to reshape the gender narrative in Nigeria may reflect the perspectives of the younger generation, who have grown up in more progressive social environments with greater exposure to gender equality issues. The younger generation often receives more comprehensive education on gender equality and the importance of inclusivity, leading to heightened awareness and sensitivity towards these issues [23]. Consequently, they are more likely to perceive gender inequality as unacceptable and advocate for greater inclusivity and equity within research institutions. Education and awareness are pivotal in shaping attitudes towards gender inequality [24]. Therefore, the younger generation of medical and dental researchers may have stronger expectations for gender diversity in leadership roles. Conversely, older generations may have become accustomed to male-dominated hierarchies.

Research on generational gaps indicates a growing convergence in support for women's leadership, although younger generations tend to exhibit stronger support than older generations. However, a consistent generation gap persists in attitudes towards working mothers and the division of labour between public and private spheres, with younger generations showing greater support for gender equality and older generations holding onto more traditional views [25]. These findings suggest that cultural shifts in attitudes towards gender equality may not occur uniformly across all aspects. Therefore, it is crucial to investigate trends in evolving gender narratives.

This study aimed to examine generational differences in gender inequality within medical and dental research institutions in Nigeria. Specifically, the study aimed to explore variations in opinions regarding the perpetuation of gender inequality within these institutions across different generations. Additionally, the study sought to investigate generational differences in perceptions of gender bias in opportunities for leadership positions and the challenges female researchers face in their professional careers.

Methods

The data collection method for this study was previously outlined in a published study [21]. The current study involves a secondary analysis of qualitative data gathered from 54 male and female medical and dental staff members affiliated with 17 universities in Nigeria. The data collection took place between March and July 2022. All participants were adults residing in Nigeria and provided their consent to participate in the study. Participants were purposefully recruited from various academic positions within the medical and dental institutions to ensure a diverse range of responses. The interviews were conducted in English through telephone calls, email exchanges, or WhatsApp conversations. After each interview, participants were requested to refer a colleague who might be interested in participating, and those referrals were subsequently contacted to gauge their interest and obtain consent. In cases where participation was declined, a new participant was selected from the pool of eligible contacted and consenting individuals.

The interviews were transcribed verbatim, and they underwent a process of anonymisation. The transcriptions were then recoded and analysed using an inductive approach to identify and generate themes relevant to the study. To facilitate the analysis, the respondents were initially divided into two age groups: participants aged 50 and older were categorised as older, while those below 50 were classified as younger. Within each age group, further stratification was done based on the participants' gender, resulting in distinct categories for both male and female respondents.

Results

The participants were all drawn from 17 medical and dental institutions in Nigeria. There were 54 participants, of whom 52% were males, 46% were practicing medicine and basic sciences, 65% were younger than age 50, and 22% had reached the professorial cadre. Transcripts were inductively analysed, which elicited several perspectives on (1) the experience of gender inequality in medical and dental research institutions; (2) perspectives on sex and gender-related research obstacles; (3) perspectives on sex and gender-related opportunities; and (4) recommendations for gender equality in research and academia.

Experience of gender inequality in medical and dental research institutions

A previous report based on the primary data found that women in medical and dental research institutions in Nigeria perceived themselves as underrepresented, while men were perceived as overrepresented across various fields [21]. These had also been observed in prior studies [26, 27]. However, the current analysis reveals differences in perspective between and within generations. Among respondents below age 50, male and female participants shared a common view that male dominance persists in published manuscripts and leadership positions within research institutions. In contrast, respondents aged 50 and older held divergent opinions based on gender, with males acknowledging the existing male dominance in medical and dental research while acknowledging ongoing changes. At the same time, females perceived no gender disparity despite providing

suggestive information about gender equality within the system. The following illustrative quotes exemplify this contrast:

In most organisations, I think men are leading research purposes in most countries, especially in the sciences. This is because men have better educational opportunities than women, and I'm speaking about placing men in universities, research institutions, and organizations involved in one form of research or the other. Those educational opportunities have given men better opportunities to obtain grants and be involved in research, especially in the sciences. ***- DPH, Male, below 50 years***

There is also this saying that as a woman, you must be twice as good to be half as recognised, and it's our reality. It is a patriarchal society. You know it and live with it because you can't fight institutions that have been there since immemorial. – ***CS, Female, below 50 years***

I still believe that you see more men, more men are into research, though I can see more women coming in. ***- JA, male, 50 years and above.***

I would say there has not been any disparity. I'm one of the first females and flow easily with the males. I wouldn't say there was inequality. I was exposed to the same kind of facilities and the same kind of research they are doing; I don't think I was pushed aside as a female ***-EE, female, 50 years and above.***

Moreover, there were distinct differences in perceptions between the two generational groups regarding the reasons for including women on research teams. The younger generation believed that women should be included as research teammates based on principles of equality. On the other hand, men in the older generation viewed the inclusion of women as valuable because their inclusion could enhance research practices or as an activity that could improve the chances of securing grants.

I think both men and women can have equal rights, equal pay, the same opportunities in the workplace, and the same career opportunities and career development. Both men and women should have equal rights to carry out research and have the same opportunity in research. – ***AO, male, below 50 years.***

You see, most times, involving female researchers improves your chances of being considered for a research grant ***- JA, male, 50 years and above.***

I think the females seem to be more research-oriented. They are thorough. Research needs to be thorough, and it needs patience. The females seem more interested in research based on their qualities ***-LI, male, 50 years and above.***

In addition, older women expressed the perception that gender inequality is immutable and cannot be altered. They viewed gender inequality as a natural and inherent order of things.

I may not want to use the word equality for many reasons, but equity is what I want us to look at most of the time. We can never be equal. We are created differently. We all have our strengths and weaknesses, and are made specifically for each gender—**AA, *female, 50 years and above.***

Sex and gender-related research obstacles and difficulties

There was a consensus across generations and genders that females encounter numerous obstacles in their research careers, which impede their professional advancement. These obstacles include cultural expectations that place a higher emphasis on women's caregiving responsibilities for children and the household, resulting in limited time available for research and causing delays in career progression. The prioritisation of family commitments was also seen as a barrier for women in pursuing travel opportunities for capacity building, hindering their ability to stay at the forefront of knowledge. One participant noted that women are often overlooked as potential team members and are only consciously selected when they possess the required expertise and competencies. Furthermore, it was shared that men have an advantage in conducting community-based research due to negative community biases that question the professional competence of women. Another participant pointed out that women are frequently absent from spaces where ideas are exchanged and decisions are made within the dental and medical field, as cultural norms restrict their participation in gatherings primarily attended by men.

Females are shy about staying in the consultants' lounge, where most discussions, collaborations, and other things occur. That's where the exchange of ideas is. Everything practically takes place there. Even when things are being published, they start discussing them there. You meet many males when you go, and because of our social background, we don't easily mix up with them. - ***HA, female, below 50 years***

I went to a local government, had to introduce myself, and was ignored. They probably may not have ignored him if it was a male-male when he demanded to see somebody he could talk to there. - ***EE, female, 50 years and above***

I still believe women might not be able to get certain career posts because of their gender, and sometimes they might not be able to rise as much as they would have if they were not females. - ***AI, male, below 50 years.***

Sex and gender-related research opportunities

Participants expressed a consensus regarding the presence of sex and gender disparities in career development opportunities. It was widely acknowledged that an individual's network influences

the availability of opportunities, which tend to increase as one progresses in their career. Additionally, there was an agreement that men have greater access to information about these opportunities through their networks and are more likely to be able to capitalise on them. It was also recognised that men encounter fewer barriers when utilising these opportunities than women.

> *For example, in the department and in our lounge, where most of the consultants stay, that's where most discussions, collaborations, and many things occur. Everything practically takes place there … exchange of ideas … even when things are being published, they start discussing them there. I don't think females even go there because of the structure of the place. So, we are not free most of the time to join them. Most opportunities end up rallying round them, the opposite sex, intentionally or unintentionally.* ***HA, female, under 50 years.***

An older-generation male respondent identified that males might face many more financial challenges when taking career-enhancing opportunities. At the same time, a younger male respondent spoke of the many grant opportunities skewed to the advantage of females.

Recommendations for gender equality in research and academia

Participants of the younger generation expressed the need for proactive measures to increase the representation of women in academic spaces. They emphasised the importance of amplifying women's voices in policy formulation and advocating for a work environment that supports women. Furthermore, there was an acknowledgment of the significance of female mentors in driving the necessary changes and bridging the gender inequality gap.

On the other hand, some participants from the older generation, as well as a few participants from the younger generation, believed that addressing gender inequality requires changes in cultural and religious norms that perpetuate such inequalities. They highlighted the importance of improving girl child education and addressing religious sensitivities that restrict interactions between males and females, as well as promoting traditional gender roles.

One female participant from the younger generation suggested that promotion criteria should be adjusted based on gender, considering the additional societal responsibilities that women often bear. This would account for the slower pace of career progression for women than men. However, it was also mentioned that in some situations, women may face challenges in gaining elective opportunities due to the more significant number of male voters and prevailing patriarchal perspectives within the system.

Interestingly, a few female participants from the older generation and a male participant from the younger generation expressed that no gender inequality exists, as career progression is based solely on merit in the system.

Discussion

This study's findings revealed converging and diverging perspectives on gender inequalities within medical and dental research institutions in Nigeria across different generations. There was a convergence of opinions among males and females in the younger generation, whereas more divergence of opinions was observed between males and females in the older generation. Interestingly, some males in the older generation shared a convergence of opinion with the younger generation. It is worth noting that even in cases of convergence, there were variations in perspectives within the shared opinions.

The study revealed a notable shift in attitudes towards gender inequality among younger male and female participants, who acknowledged its existence and emphasised the importance of actively promoting equal opportunities for women. On the other hand, older male participants recognised gender inequality but suggested addressing it by promoting gender equality based on traditional gender stereotypes and the value attributed to feminised virtues. In contrast, older female participants seemed unaware of gender inequalities, considering the current norms as normal and advocating for career progression based solely on merits for women in academia.

Previous research has acknowledged the existence of generational differences in perspectives on gender inequality [25]. However, the present study provides new evidence that these generational differences also manifest within Nigeria's medical and dental research academia. This highlights the need for a detailed and nuanced analysis to understand the complexities surrounding the persistence of gender inequality and to address the slow progress in this area.

Gender equality is a fundamental human right and crucial for creating a peaceful, prosperous, and sustainable world. Despite some progress, the current trajectory is not on track to achieve gender equality by 2030 [28]. Achieving gender equality requires support for equal opportunities, resources, and choices for both men and women, enabling them to shape their lives, contribute to their communities, and drive sustainable development [29]. It is equally important to address gender inequality within the research career pathways of medical and dental professionals.

The study reveals that older female academics in the medical and dental field, who could play a pivotal role in driving change, seem entrenched in outdated perspectives on gender inequality, considering it an unchangeable norm. The traditional societal role ascribed to women as custodians of culture may contribute to resistance to change among older women, leading to a blind spot when recognising gender inequalities. Moreover, cultural and religious values can reinforce gender disparities and resistance to changes [30]. The older generation has experienced a different era with rigid gender roles and limited opportunities for women, resulting in a belief that significant transformation is unlikely or unattainable. These factors contribute to the perception that gender

inequality is a fixed norm, making older women hesitant or sceptical about challenging and changing deeply ingrained social norms and structures.

This persistence in upholding traditional gender norms by older women in medical and dental research institutions poses challenges for mentorship and creating professional networks that can support and guide younger female academics. While research suggests that male mentors may not be the best choice for female mentees [31], male mentors can still play a significant role in advancing the careers of female mentees by supporting their capacity-building and research skills. Male mentors should use their influence to promote workplace cultures of gender equality, provide gender-aware mentoring and coaching, and practice leadership that prioritises the well-being of others [32]. Without adequate support and mentorship, early-career female researchers may feel isolated, hindering their professional development. This, however, does not preclude the need to invest in education about gender inequalities and how it manifests in various institutions to wean the support of a few older women. Women who advance gender equality may be better able to play the role of mentors for early career researchers.

It is important to recognise that generational differences in perspectives on gender inequality can intersect with other factors, such as the socioeconomic background. Socioeconomic factors may influence individuals' awareness and understanding of the challenges faced at the intersection of multiple identities, leading to variations in intra-group perspectives. Additionally, societal progress toward gender equality is driven by generational shifts and broader social, cultural, and policy changes. However, the current study did not explore the influence of socioeconomic background on respondents' perspectives or analyse the impact of broader societal factors on their views. Further research is needed to understand the roles of these influences in shaping perspectives on gender inequality, particularly within the science profession, including medicine and dentistry [33, 34].

The younger medical and dental researchers recognize the importance of creating inclusive and equitable research institutions. They emphasise the need for collective efforts to foster dialogue, raise awareness, and implement policies that address gender disparities. Additionally, there is a growing demand for female academics with mentoring capabilities to drive the necessary change and bridge the inequality gap. Nigeria's medical and dental academia possesses a critical mass that can drive the desired change, but efforts must focus on building the competency to enact this change. Recent research outputs in dentistry in Nigeria suggest a positive shift [22], but a systematic process is needed to measure progress and ensure sustained improvement in medical and dental research institutions.

As expressed by the study participants, bridging the generational gap in gender equality practices can be achieved through the institution and implementation of policies and initiatives that promote gender diversity. This includes targeted recruitment efforts, family-friendly policies, and flexible

work arrangements. Providing mentoring and networking opportunities for female researchers is crucial for their professional development. Additionally, promoting gender awareness and sensitivity through training and education and fostering conversations and intergenerational dialogues can challenge and shift stereotypical beliefs about gender inequality. Such initiatives can inspire hope for change by showcasing positive examples and success stories. Moreover, it is essential to monitor institutional changes and evaluate evidence-informed interventions that address gender bias in research institutions.

In conclusion, the study highlights generational differences in opinions regarding gender inequality within medical and dental research institutions in Nigeria. While both younger men and women acknowledge the existence of gender inequality, older women seem unaware of it, and older men tend to promote gender equality through the commodification of femininity. Addressing gender equality in medical and dental research institutions in Nigeria requires strategic actions, anticipating that younger generations will actively drive change when assuming leadership positions.

Declarations

Ethics approval and consent to participate: Ethics approval was obtained from the Institute of Public Health, Obafemi Awolowo University, Ile-Ife, Nigeria (IPH/OAU/12/1617). Informed consent was obtained from participants after they were duly informed about the study's objectives, risks and benefits, voluntary nature of study participation, and freedom to withdraw from the study at any time. All study methods were carried out in accordance with the National Health Research Ethics Code governing research conduct in Nigeria.

Consent for publication: Not applicable.

Availability of data and materials: The transcripts for the current study available from the corresponding author **(**Morenike Oluwatoyin Folayan) on reasonable request.

Competing interests: Morenike Oluwatoyin Folayan is a sectional editor with the BMC Oral Health. All authors declare that they have no competing interests.

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Authors' contributions: The project was conceptualised by MOF. The data for the research was collected by MOF and MO. MOF conducted the data analysis. MOF, MO, JL, AG-Cand GZM-P read and contributed to several versions of the manuscript. All authors read and approved the final manuscript.

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5.4. Article 4: Female Health Researchers' Interrogation of Research Findings on Male Dominance and Women's Research Productivity in Nigeria.

Female Health Researchers Interrogation of Research Findings on Male Dominance and Women's Research Productivity in Nigeria

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Abstract

Background

A critical analysis of trends in gender disparities in research productivity and leadership would facilitate the advancement of women in academia. This study aimed to interrogate the research findings on male dominance and women’s research productivity in Nigeria's medical and dental research academia.

Methods

This was a descriptive qualitative study conducted between April and May 2023. Data were collected through in-depth interviews with eight senior medical and dental researchers who had held leadership offices in Nigeria's medical and dental research institutions. The interviews were conducted using WhatsApp video calls. The transcribed data was deductively analysed.

Results

The four themes that emerged from the analysis shed light on the patterns of male dominance within research and academic institutions, the gender disparities in women's entry into such institutions, the necessary environment and resources to promote women's advancement into managerial positions, and the factors contributing to the observed gender differences in research productivity. While participants acknowledged an increasing presence of females in the medical and dental research academia, there was no consensus that a higher number of first female authorships indicated a corresponding increase in junior authorships. Patriarchal social practices were identified as potential contributors to the lower participation of females in collaborative research within the dental academia.

Conclusion

Despite the efforts made and seeming successes achieved by women to address the gender inequality in research productivity and leadership within medical and dental research institutions in Nigeria, enhancing gender equality in research productivity will require the implementation of policies and programs that enhance deliberate system-wide gender-specific approaches that promote a more gender-balanced workplace.

Key words: Gender-sensitive; Gender equality; Education; Women; Research outputs

Introduction

Multiple studies have indicated that the organisational systems and structures in Africa perpetuate male dominance, influenced by patriarchal societal norms [1,2]. This male dominance extends to the field of health research, including in Nigeria, where rigid gender-based cultural norms assign women secondary roles, even in the workplace [3,4,5]. These cultural ideologies, along with institutional discrimination and prejudiced beliefs, contribute to gender inequality within hypermasculine health research organisations, such as university academia, where men hold disproportionate positions of power and have greater research outputs [6].

The interplay between research productivity and gender inequality is widely recognised, with persistent lower research productivity among women and slower progress toward leadership positions in the sciences [7,8,9,10,11,12]. Female researchers are significantly underrepresented in high-impact journals and rarely appear as first or last authors in leading publications [13,14]. Research productivity, measured by the number of publications per researcher [15], is a critical indicator of academic success and affects career progression, including the highly valued first and last author positions [16,17]. Furthermore, women are less likely to publish editorials in medical, global health, and public health journals [18,19,20]. Inequalities in research funding drive gender disparities in research productivity and are not adequately addressed in collaborative research efforts [21,22,23]. Despite national and institutional policies, the gender gap in research productivity remains largely unchanged [24,25].

Gender disparities in research productivity are also evident in Africa, where women science researchers face additional barriers due to the intertwining of work-life and home-life, patriarchal societies, and limited resources [26,27,28]. These factors prioritise women's family and social roles over their professional lives, leading to academic productivity taking a backseat and receiving less recognition [4]. Within health research institutions, male dominance is prevalent, although changing narratives are emerging, primarily driven by women [5]. However, inter-generational and intra-generational differences exist, with younger generations recognising gender inequality in leadership positions and research opportunities, older males proposing changes based on commodifying women, and older females upholding traditional gender roles and patriarchal systems [Folayan et al., personal communication]. In the field of dental research in Nigeria, we observed more women as first authors, often representing junior researchers, and fewer women as last authors, indicating principal investigators or research fund recipients [29].

To shed light on these findings and explore recommendations for sustainable positive changes toward gender equality in academia, we engaged top female academic researchers in Nigeria. Their perspectives and insights provide valuable guidance for achieving gender equality aligned with sustainable development goals in the academic setting.

Methods

Like our previous studies, we adopted an academic literacies perspective that considers the influence of context, culture, and genre [30,31]. However, in contrast to our previous studies, we employed the social dominance theory to investigate our previous findings further based on the preference theory [32,33]. The social dominance theory recognises the hierarchical positioning of social groups and acknowledges that members of dominant groups within this hierarchy may have disproportionate access to positive social value [34,35]. This theory acknowledges that group-based deprivation is perpetuated by systemic institutional and individual discrimination, leading to unequal distribution of resources [36]. Additionally, unified societal ideologies encompassing attitudes, beliefs, stereotypes, and values shape individual behaviours, establish new practices, dictate institutional norms, and reinforce existing hierarchies [36]. The theory also recognises the embedded factors within social systems that sustain unequal group-based social relations [34,36].

Given that Nigeria is a heavily patriarchal society characterised by deeply ingrained gender norms and inequalities that influence family structures, gender roles, social expectations, and power dynamics [37], we believe that the social dominance theory is particularly relevant for exploring the contextual factors contributing to gender inequality in health research organisations in Nigeria. Men hold primary power and authority as breadwinners and decision-makers, while women are relegated to subordinate roles with domestic and caregiving responsibilities [38]. By employing the social dominance theory, our study effectively reflects the contextual realities of gender disparities and the unique challenges faced by women in academia in Nigeria, particularly in terms of research productivity and career advancement. This study recognises the struggles individuals may face in trying to maintain social order and yet push against the institutions of the social orders seemingly set up to protect them [39].

Study design, study site, and study participants

This study was part of a larger qualitative research project conducted in Nigeria, aiming to identify barriers and potential solutions to address gender inequality in medical and dental research institutions. Senior female faculty members from universities in Nigeria who held managerial positions participated in this research study. Participants were required to have proficiency in reading and communicating in English and identify themselves as academics in health, medical, or dental education. They actively promoted, designed, conducted, and disseminated biomedical, clinical, and socio-epidemiological research in Nigeria. All participants were adult residents of Nigeria, and members of academic or research institutions focused on health-related issues. Before their involvement, participants provided informed consent and agreed to participate in a one-hour interview.

Sample size

The study recruited eight participants. The sample size was adequate to generate rich information as information saturation was reached while working with this homogeneous group of study participants.

Sampling procedure

A purposive and convenience sampling approach was employed to identify potential participants for this study. The target population consisted of female academics working in Nigeria's medical and dental health academic institutions, actively conducting research, and holding senior managerial positions. Additionally, potential participants who had not previously taken part in any data collection processes for previous studies conducted by the research team were included.

To identify potential participants, a list of 20 female academics who met the inclusion criteria was generated by the study's principal investigator (MOF). The principal investigator, having a good understanding of the fields and being well-informed about senior women in leadership positions within medical and dental institutions in Nigeria, was able to compile the list.

Contact was established with the 20 potential participants through phone calls, emails, or messaging platforms like WhatsApp. During these communications, the purpose and objectives of the study were explained, and the potential participants were invited to participate in an in-depth interview. Eight of the 20 potential participants consented to participate in the study.

Some potential participants did not participate for various reasons, including difficulty in reaching them (n=2), inability to allocate sufficient time for the study (n=6), and challenges in scheduling a suitable interview time (n=4). A specific date was scheduled for the interview with the consenting participants. Before the scheduled date, written informed consent was obtained from each participant. Once the consent form was completed and returned, the interviewee was officially enrolled as a study participant.

Study procedure

In-depth interviews were conducted in April and May 2023 using WhatsApp video calls. All interviews were conducted in English using a research guide. The interviews were audio recorded. The six questions explored during the interview are highlighted in Table 1 and were generated from the study findings from three publications conducted by the study team [5,40].

Table 1: In-depth discussion guide

S.no	Themes	Probing questions
1	Ingrained patterns of institutionalised male dominance in research institutions	A. Do you agree about male dominance in the health research field, and what are the reasons for your position? B. In what ways do you see male dominance ingrained in institutionalised practices in health institutions, and is there an observable pattern in this trend? C. Do you observe any significant gender differences in the managerial positions in medical research institutions, and what do you think is responsible for this?
2	Hopes for a changing narrative on gender equality in research	A. What are your perspectives on the impact of institutionalised male dominance in research institutions, and how can we change this? B. How has gender skewness in medical and dental research institutions affected grant access? C. How has gender skewness in the medical and dental research institution affected rates of manuscript publication?
3	Women are driving the conscience for change.	A. how valid and applicable is this statement in the medical and dental research institute? Explain your perspectives, please. B. What roles can policies play in promoting gender equality? What would you like to see in these policies, and how can these policies translate into programmes?
4	Female dental authors had significantly higher citations than men, suggesting higher quality publications.	A. What are your perspectives about the finding that female dental authors had a significantly higher number of citations than men, suggesting higher quality publications? B. How can you explain this finding?
5	Male dental researchers had a slightly higher percentage of articles listing international and domestic collaborators and significantly higher listing as last authors, suggesting that male authors may initiate and engage more in mentorship, networking, and partnership building.	A. what are your perspectives about these findings, and how can you explain the findings? B. Do you perceive any cultural nuances that may explain these findings?
6	A significantly higher percentage of females listed as first authors suggests that female dental researchers in Nigeria play more junior roles.	A. what are your perspectives about this finding, and how can you explain the finding? B. Do you perceive any cultural nuances that may explain these findings?

Interviewees were required to switch on their videos to enable the interviewer to ensure the interview was being conducted in privacy. Notes were taken during the interview. All the interviews took less than 33 minutes.

Data analysis

The primary aim of data collection was to capture a comprehensive range of information and ensure that all concepts and categories emerging from the in-depth interviews were fully explored. Following each interview, the audio recordings were transcribed verbatim, and the transcripts were meticulously reviewed and analysed to identify emergent themes.

The verbatim transcripts were securely stored in a password-protected Microsoft Word document, accessed only through a designated password-protected computer. Personal identifiers, names of places, and institutions were removed from the transcripts to maintain confidentiality. The anonymised transcripts were cross-checked against the original audio recordings to ensure accuracy and completeness. A data reduction table was also constructed, containing relevant information from the transcripts related to the five research questions. The analysts carefully examined and compared the participants' responses, noting areas of commonalities and differences for each question.

Some portions of the transcripts were omitted to streamline the analysis, focusing solely on the data pertinent to answering the research questions shown in Table 1 [41]. Themes related to each question were identified, and a concise selection of quotes was compiled. Furthermore, quotes that provided contrasting perspectives or divergent viewpoints were also noted to capture the breadth of participant responses.

Results

Four themes emerged from the deductive analysis: patterns of male dominance in research and academic institutions, gender disparities in women's entry into research and academic institutions, and enabling environment and tools to enhance female advancement into managerial positions.

Patterns of Male Dominance in Research and Academic Institutions

Multiple studies have provided evidence of male dominance within research and academic institutions, including those in Africa [42]. The participants in this study acknowledged the prevalence of male dominance across various aspects of work-life within academic institutions in Nigeria, including leadership positions. They attributed this trend to the historical advantage of males in entering academia earlier, which increased their likelihood of occupying managerial positions. However, it was noted by one of the respondents that this trend is beginning to shift, indicating a potential change in the dynamics of gender representation in leadership positions:

> *The males are the ones who have been in the profession for some time, and the females are now trying to catch up. Now, we are beginning to have female vice-chancellors, female Provosts, and more female Deans and Heads of Departments. We are starting to*

have female and Deputy providers in some medical institutions. We are gradually getting there (Participant 1)

Some respondents in the study attributed the observed gender disparity in managerial positions to the discrepancy in gender enrolment between primary and secondary schools. They highlighted that the percentage of female students decreases from primary to secondary to tertiary education levels, with only approximately 10% of eligible female students enrolled in tertiary education in Nigeria [43]. This disparity underscores the importance of encouraging and empowering female children at the primary and secondary school levels to aspire to attend university and have high aspirations to address this imbalance. Additionally, the gender disparity in leadership positions may also be influenced by the perception that women are incapable of effectively performing in such roles, and the perpetuation of men in authority is due to the high number of men continually voting themselves into office as reflected in the following quotes:

If men are more in class, they will be more in leadership positions. I think we should start to make sure that more girls come to secondary school and more girls come into the university (Participant 2)

Will the male now vote for the female even if she is nominated? They may not. We have had instances where there were female candidates, but the majority voted for the men. (Participant 3)

They feel that women who are in authority may not do well and that it's the men who can do it. I believe that in the future, things will change (Participant 4)

Respondents also noted the prevalence of male dominance in access to grants and manuscript publications. Despite the grant-making and manuscript review processes striving for fairness, transparency, and objectivity, female researchers continue to be underrepresented in receiving awards. This may be attributed to fewer female researchers applying for grants, submitting manuscripts, and having international and domestic collaborators. Respondents highlighted that these challenges stem from the difficulties women face in balancing their responsibilities at home with the demands of research productivity. Additionally, women may be hesitant to engage in these processes due to concerns about potential rejection, as reflected in the following quotes:

We have more men, but in terms of females, the family is always there. You have your children and your husband pulling you, and the effort you put into manuscript writing and publications may not be as much as that of the males (Participant 1)

T*he males tend to be more adventurous, engage with international research collaboration more readily, and are more positively disposed to negative comments than women. Being more emotional, women may fear rejection more than men (Participant 2).*

Respondents generally perceived that things were changing. Once the women break into new grounds and establish collaborations, they develop the boldness to launch out, as reflected in the quote:

> *Access to grants favours the female gender because many granting agencies try to encourage female participants. Most research grants require you to have a gender balance for the team. So, I think that the narrative is also changing* (Participant 5)

Gender Disparities in Women's Entry into Research and Academic Institutions

Respondents attributed the gender disparity in the health academic field to an imbalance in male-child education, which results in a larger number of males entering academia. Furthermore, it was observed that men often start their professional careers earlier than women. Respondents' emphasised the need for system-wide efforts to bring about a paradigm shift that promotes a more gender-balanced workplace. One respondent noted that although there is an increasing number of women pursuing medical education, the gender balance is more evident in dentistry than in medicine. Another respondent highlighted that the increasing number of educated women may not effectively close the gender gap as societal expectations continue to place domestic demands on women, thus limiting their professional progress.

> *I don't think male dominance is about research institutions because, back in school, it looked like there were always more males than females in the class. What we see in the institution reflects the disparity in the undergraduate days. My class had 19 undergraduates, and only 5 of us were girls. So now, I don't expect to get out of school, and the pattern will be different. (Participant 2)*

> *Dentistry has fewer specialties with fewer work hours. Women will like specialties that are more time-flexible for homecare. (Participant 6)*

> *Now and then, women take time off, during which their male counterparts continue to be productive. I also think that maybe most employers or maybe most research organisations too are skewed toward the male gender. (Participant 5)*

Enabling Environment and Tools to Enhance Female Advancement into Managerial Positions

Respondents emphasised the importance of intentionally nurturing a shift away from male dominance in health research institutions. This requires implementing gender affirmative actions, providing training opportunities, offering mentorship programs, creating a flexible work environment, and ensuring deliberate initiatives for capacity building and career progression. Many respondents highlighted the need for older female academics to mentor younger women despite the limited availability of senior female role models and concerns about work-life balance.

They also noted the importance of formal and informal mentoring support for young women pursuing surgical sub-specialisation. The workplace should enable women to aspire to their desired roles while recognising and valuing their societal contributions. Here are some representative quotes that reflect these perspectives:

> *I think the older female academicians should inspire the youngest ones through mentoring so that they can aspire to be prominent researchers and take up administrative positions. This will go a long way because many females do not have that mentoring. (Participant 6)*

> *I think females in managerial positions should be able to push for an enabling environment for the younger females who probably have many distractions or other real-life situations based around the workplace. Females should also champion each other, which supports women's achievements despite their family life. (Participant 5)*

> *Female academics should be able to come to the workplace with their babies as this can encourage increased productivity for young females who are often distracted by the need to care for children and, therefore, away from work. They only come back to work and play catch-up with the male gender (Participant 5)*

Gender Differentials in Citations, Article Listing, Collaboration, Mentorship, Networking, and Partnership among Academics

Publication of articles in scholarly journals is a strong indication of research productivity and expertise in a specific field, and it serves as a stepping stone for gaining recognition as a leading authority in that field [44,45]. Moreover, it plays a crucial role in career advancement, garnering recognition, and securing conference speaking engagements [46]. Additionally, the number of citations an article receives reflects the quality and relevance of the research content and publications [47]. While previous studies have revealed disparities in citation rates between male and female dental authors and researchers [48], our research findings demonstrate that female dental researchers have a significantly higher number of citations than their male counterparts [40]. Respondents attribute this trend to the recent changing narratives within academia, the increasing presence of female dentists engaged in research, as opposed to men who may be more focused on income generation for household support, and the competitive spirit exhibited by women who want to do better as reflected in the following quotes:

> *The men are more in business and private practice, making money, while many female dentists do academics and research in the institution. So, they will definitely publish more and get more citations comparatively (Participant 6).*

Females in dentistry and medicine are highly competitive, and we aim very high. I'm not just publishing for numbers; I publish to get my article into a high-impact journal (Participant 7).

Our findings also indicated that male dental researchers have a slightly higher percentage of articles listing international and domestic collaboration and partnerships [40]. Respondents have interpreted this as a reflection of a higher propensity of male authors to initiate and engage in mentorship, networking, and, ultimately, partnership building. Some respondents linked this disparity to male researchers having spent longer in the research field than women, cultivating the qualities needed to engage in international research. Also, respondents perceive that men are more adventurous with initiating international collaborations, as they are less averse to receiving negative responses. In addition, the need for female researchers needing to defer to their male spouse before initiating partnership and collaboration with another man poses challenges that are usually not well acknowledged or recognised. These perceptions are reflected in the following quotes:

Women are more emotional and may fear rejection more than men. So, they are less likely to want to initiate and find new international partnerships because of the fear of rejection (Participant 8).

Men are more fluid, so engaging in collaborations and partnerships might be easier (Participant 5)

You have a home, you have a husband, you have a child. If you have things to do, then you're partnering with me. Can you imagine a partnership with a male, for instance? Some Nigeria men can be very funny. Many women may not go into research partnerships with male peers because of the negative response they may receive from their spouse, whom they have to report too and take permission from for such engagements (Participant 6)

Our research noted that more female researchers were listed as first authors, which may reflect a lot more junior roles of female researchers in dental sciences in Nigeria and more males playing the lead role as mentors [40]. A few of the respondents did not agree that having a higher percentage of females listed as first authors suggests that female dental researchers in Nigeria play more junior roles, as shown in these quotes:

First, authorship is about the person who initiated the study. We must look at whether there is a definite trend or pattern in authorship. Sometimes, professors are not the last author but the first because they conceptualized the study (Participant 5).

The first authorship does not necessarily mean you're junior. I still write first authorship papers even as a professor (Participant 8)

Discussion

The interviews conducted with senior female health research academics in Nigeria further support the findings of our previous study. These findings suggest a prevailing male dominance in research academic productivity and leadership within Nigeria's medical and dental academia. However, there is evidence to suggest that this narrative is gradually changing. It was observed that fewer males are publishing in the dental sciences, possibly due to their inclination towards seeking better income-generating opportunities outside of academia. Additionally, male dental academics are more likely to engage in international collaborations, which may be influenced by physiological and societal limitations faced by females. However, the interviewees had no consensus regarding the higher number of females serving as first authors. It was not universally believed that this was solely due to junior female researchers being mentored by more senior male researchers.

Interestingly, the interviews shed light on new findings regarding the disparities in research productivity outputs. It was noted that gender parity seems more likely within the dental academia than in the medical academia. This is attributed to the dental field offering more flexible work hours that accommodate the social lives of female academics. Furthermore, the low number of female researchers was seen because of the disparity in access to primary, secondary, and tertiary education for girls in Nigeria.

The perspectives shared by senior female researchers in Nigeria reinforce the evolving narrative regarding male dominance in research productivity and academic leadership in the country. This suggests a broader and more nuanced shift in the discourse surrounding gender and research productivity [49]. Institutional and cultural changes are necessary to solidify these changing narratives further. These changes should foster intersectional equality and embrace the diverse perspectives and experiences that gender diversity brings to knowledge production [50]. Our previous research has observed a shift in culture among the younger generation of male and female academic researchers, reflecting changing perspectives on gender equality and increased institutional support for female academics (Folayan et al., personal communication). As such, there is the potential for the ongoing efforts by women to reshape the narrative to be reinforced by future institutional and cultural changes, particularly as the current younger generation of researchers assume leadership roles. It is important to monitor this possible shift in trends closely.

However, it is crucial to acknowledge that the narrative surrounding gender disparities in research productivity is multifaceted and requires a detailed examination to develop a comprehensive

response plan. A prior study conducted in Canada indicated variability in research productivity among surgical specialties [51]. Additionally, the gender disparity in research productivity appears more pronounced at the junior level than among the professorial cadre [52]. However, within dental academia, the increasing opportunities available to females may contribute to their advancement faster than their male counterparts despite their current underrepresentation in each academic rank [53]. The notion that certain health professions may facilitate higher research productivity among females, as evidenced by the findings of this study, warrants further investigation.

We identified three new narratives on dental science researchers in Nigeria. First, it was suggested that the dental profession allows more research time for females during working hours compared to the medical profession. The evidence suggests that female dentists must dedicate as much time to their work as male dentists [54]. Moreover, a gender transition in the medical and dental workforce is anticipated, with the transition occurring earlier in the dental workforce compared to the medical workforce [55]. Additionally, dentistry is classified as a caring profession, which tends to have a higher proportion of female professionals [56]. However, we found no evidence supporting that dentistry is inherently less time-consuming and promotes higher research productivity than medical specialties.

Second, another perspective shared by respondents is that there is a higher representation of females in dental academia due to better-paying opportunities outside of the research institution, which males tend to prefer. Previous studies have indicated that many female dentists work for salaries at universities and government institutions. At the same time, a higher proportion of both males and females engage in private practice, with more males specialising in certain areas [57,58,59]. It is important to note that these observations may vary geographically, and further research is needed to explore such variabilities. In addition, Women, in general, are more comfortable with lower-paying job opportunities and may be less driven by the pursuit of higher income [60,61]. The choice to prioritise family responsibilities for women and the societal expectation for men to serve as breadwinners in a patriarchal society like Nigeria may help explain the perception shared by the study respondents. It is crucial to conduct future studies to explore the perspective of a skewed representation of female dentists in academia and male dentists in private practice in Nigeria, considering the various factors that influence career choices within the profession.

Thirdly, respondents noted that females are less inclined to initiate international collaborations due to a fear of rejection and a lower likelihood of receiving support from their spouses for engaging with male research collaborators. While there is no specific research on gender differences in the fear of rejection related to research collaboration, there is suggestive evidence that females may be more sensitive to rejection due to their heightened sensitivity to social stimuli than males [62]. Previous studies on rejection sensitivity have primarily focused on intimate relationships. The

perception expressed by respondents in this study opens up a new avenue for exploration regarding the potential contribution of rejection sensitivity to the limited initiation of international collaborations by females. Additionally, the notion of male partner permission for female academic participation in collaborative research involving men is a novel perspective not previously reported in the literature. Previous studies have mentioned male partner involvement in female participation in research [63].

Further investigation into this aspect could shed light on its potential role as a contributing factor to the limited research productivity of females in patriarchal societies. Further research is recommended to delve deeper into the fear of rejection in research collaboration and its potential gender differences and explore the influence of male partner involvement on female researchers' participation in collaborative endeavours, particularly those involving male collaborators. Such investigations would help provide a comprehensive understanding of the barriers and challenges faced by female researchers and contribute to developing strategies for fostering greater gender equality in research productivity.

Finally, it is important to acknowledge that while women's efforts for gender equality in research institutions have shown some progress, there is a prevailing perception that more substantial actions are required, particularly at the lower education level, where girls' education is compromised. In Nigeria, there exists a significant gender disparity in terms of enrollment, retention, and completion of basic education for girls. Despite policies aimed at mitigating the risks associated with poor educational opportunities for girls, such as the Child Rights Act of 2003, implementing these policies remains inadequate [64]. Promoting girls' education is proposed to drive gender equality in research productivity further, as it can potentially enhance female engagement in the research enterprise. Efforts should be directed towards addressing the social, economic, and cultural barriers that hinder girls' access to education. By ensuring equal educational opportunities for girls and empowering them to pursue higher education, there is a greater likelihood of achieving gender equality in research institutions and promoting increased research productivity among women.

In conclusion, there appears to be a consensus that male dominance exists in research productivity and leadership within medical and dental research institutions in Nigeria. However, there is a growing perception that female research productivity and representation in leadership roles are steadily improving, driven by the efforts of women in the profession. Nevertheless, it is important to recognise that enhancing gender equality in research productivity requires implementing policies and programs that enhance educational opportunities for girls before reaching tertiary education. It is also crucial to acknowledge the complexity of various interconnected factors contributing to the observed gender disparity in research productivity among medical and dental researchers in Nigeria. Further research is needed to investigate previously unidentified factors

influencing the observed gender skewness in research productivity among dental researchers in Nigeria.

Declarations

Ethics approval and consent to participate: Ethical approval of the current study was obtained from the Human Research Ethics Committee at Institute of Public Health of the Obafemi Awolowo University Ile-Ife, Nigeria (IPH/OAU/12/1617). The protocol was designed in accordance with international and national research guidelines. All participants provided written informed consent before taking the survey.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

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Authors contributions: M.O.F conceived the study. The project was managed by M.O.F., A.G-C, and G. Z. M-P. Data curating was done by V. A. U. Data analysis was conducted by M.O.F and V.A. U. M.O.F. developed the first draft of the document. V.A. U., A.G-C, and G. Z. M-P read the draft manuscript and made inputs prior to the final draft. All authors approved the final manuscript for submission.

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5.5. Article 5: Gender differences in dentistry and oral sciences research productivity by researchers in Nigeria.

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Gender differences in dentistry and oral sciences research productivity by researchers in Nigeria

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Background: The aim of the study was to assess gender differences in the productivity, impact, collaboration pattern and author position of dentistry and oral sciences researchers in Nigeria.

Methods: We examined the Web of Science (WoS) publication records of dentistry and oral sciences researchers to assess gender differences in productivity, impact, collaboration and authorship pattern (first authorship, last authorship and corresponding author). The analysis included the number of publications in journals ranked based on their quartile rating amongst the journals in the subject area (Q1–Q4). Chi square was used to make gender comparisons. Significance was set at >5%.

Results: 413 unique authors published 1,222 articles on dentistry and oral sciences between 2012 and 2021. The number of WoS documents per female author was significantly higher than that per male author (3.7 vs. 2.6, $p = 0.03$). A non-significantly higher percentage of females authored papers in Q2 and Q3 journals and a higher percentage of males authored papers in Q4 journals. The number of citations per female author (25.0 vs. 14.9, $p = 0.04$) and the percentage of females listed as first authors (26.6% vs. 20.5%, $p = 0.048$) were statistically greater than men. The percentage of males listed as last authors was statistically greater than females (23.6% vs. 17.7%, $p = 0.04$). The correlation between the percentage of papers with researchers listed as first authors and that listed as last authors was not significant for males ($p = 0.06$) but was significant for females ($p = 0.002$). A non-significantly greater percentage of females were listed as corresponding authors (26.4% vs. 20.6%) and males were listed as international (27.4% vs. 25.1%) and domestic collaborators (46.8% vs. 44.7%). Also, there was no statistically significant gender difference in the proportion of articles published in open access journals (52.5% vs. 52.0%).

Conclusion: Though there were significant gender differences in the productivity, impact, and collaboration profile of dentistry and oral sciences researchers in Nigeria, the higher female research productivity and impact may be driven by cultural gender nuances that needs to be explored further.

KEYWORDS

open access publishing, author position, collaboration pattern, total citations, papers published, dentistry and oral sciences research

Introduction

Research productivity is a topic of interest for researchers. This is because scientific research productivity is linked to the intellectual wealth and economic progress of countries (1, 2). Conversely, the intellectual wealth and economic progress of countries is linked to the physical and psychosocial health and well-being of its citizens (3) which is driven by research (4). This nexus is not surprising since the primary objective of conducting research is to explore answers to questions that have social value (5). This nexus of inter-dependency of economic growth, health and research makes it increasingly important for academic and research regulatory systems to study and understand how biomedical, socio-epidemiological and clinical research performance in the university system could be improved (6).

Research performance can be measured through academic publication. The dissemination of academic publication is a proof of academic faculty members' performance and achievement, and an indicator of excellence for universities (7). The faculty member's academic performance is measured by the number of published articles in indexed databases (8, 9). One factor that affects research productivity is gender. Gender gaps in academia are well documented in industrialized and developing economies. These gender gaps include the inequity in earning grants and awards, participation in the scientific workforce, holding of senior and leadership positions and publication and citation rates (10–14). There are multiple evidences that men publish and are cited more often than women irrespective of the field of research (15). This is called the "Matilda Effect" (16).

Reasons for the "Matilda Effect" range from gender differences in family responsibilities (17) to more female dedicated time to serve on committees, teaching and mentoring students (18, 19), gender bias in peer review (20) and unequal resource allocation to male and female researchers (21). Also, females publish significantly fewer papers in research areas that require huge funding (21) and are less likely to participate in collaborations that lead to publications (22). They are also less likely to be listed as either the first or last author on a published article (22), and receive about 10% fewer publication points per publication than men (23). This disparity persists among elite scientists, including those in Africa (24).

In Nigeria, - there was a 60% increase in research publications between 2008 and 2017 (25, 26), and the average number of publications by women was more than that by men (10.8 vs. 9.7) (27). Research publications in Nigeria were heavily skewed towards the environmental, health, public and occupation domains (27), like Agriculture, Veterinary, Immunology and Medicine disciplines (1). This skewness aligns with the country's need for food security and infectious disease management (28). This is unlike the similarities in the relative importance of different research disciplines and their contributions to economic development in high-income countries (1).

An area of biomedical research in its infancy in Nigeria is dentistry. The academic pursuit in dentistry and oral sciences only started in 1965 with the establishment of the School of Dentistry, University of Lagos. Dentistry and oral sciences is an important discipline as the human and economic development of a country linearly correlates with dental research productivity (29). Oral health research advances the health of the population (30). It may however, be assumed that just like in the period of infancy of the medical and like in high-income countries, research productivity in dentistry may be favorably skewed towards men (30). An analysis of the gender distribution of publications in the field of dentistry and oral sciences in Nigeria, and the factors that influence the distribution will help support the establishment of gender supportive schools of Dentistry in the West Africa sub-region and other countries with profiles similar to Nigeria.

Our theoretical assumptions for this study were based on the academic literacies theory that treats reading and writing as social practices that vary with context, culture and genre (31); and the academia as a place where power is distributed unequally (32, 33). We conceptualized research productivity as the extent to which a researcher produces publications aimed at an academic audience (26). We assessed productivity using bibliometric measures that credit and count publications in the same manner regardless of the author's gender, but recognized that cultural nuances that promote gender inequality may also be reflected in the productivity of females when compared to males. Cultural nuances such as ethnicity, class and ability, influences how gender roles are proscribed in academia, with females being more engaged in academic housekeeping affairs and taking on low-prestige endeavours (34–38).

This study explored gender disparity in research productivity in dental science research in Nigeria. The aim was to assessing gender differences in the research productivity of dentistry and oral sciences researchers in Nigeria. The focus was on gender differences in research publications measured by productivity, impact, collaboration pattern, open access publishing and authorship pattern. The finding will guide the design and implementation of our next phase of research which is the qualitative explorations of the "why" and "how" the systems in the academia enables gender inequity in dentistry and oral sciences research productivity in Nigeria.

Materials and Methods

This was a bibliometric review of 1,222 articles produced by 413 individuals and published over the 10-year period preceding this analysis (2012–2021). The bibliometric review was conducted in June 2022 and the study data were obtained from the WoS InCites electronic database. The WoS InCites electronic database was used because of its global recognition as a credible and comprehensive database for bibliometric analyses (39, 40).

We conducted an analysis in the WoS InCites dataset using the Web of Science schema for Research Area (Dentistry, Oral Surgery & Medicine for this study), applying the following filters: time period from 2012 to 2021, location (Nigeria) and document type (Article). The analysis excluded documents like book chapters,

meeting abstracts, proceedings paper, meeting summary and others.

Data extraction were performed in three phases. The first phase was conducted by MET who searched the database for articles and downloaded the results as comma separated values (CSV) file. The results were then screened to ensure all required data were available. In the second phase, MET and MOF reviewed the titles and abstracts of the retrieved articles for suitability to ensure they met the inclusion criteria. In cases where there was conflict in the selection of an original article, the conflict was resolved through consensus building between the two authors. In the fourth phase, results were shared with ES for his review. Publications were retained when there was consensus between the three reviewers. The following information was extracted: authors' information (names and identity, document title, year of publication, journal title, volume, issue and page numbers, and citation count); bibliographical information (affiliations, serial identifiers of journal, language of original document, and journal publisher); and author keywords.

Authorship consists of a person and a paper for which the person is designated as a co-author (24). We included all authors listed in the Web of Science (WoS) InCites database for articles in the research area Dentistry, Oral surgery and Medicine affiliated with Nigerian institutions. This was possible as WoS InCites database classified all publications by field and enabled categorization of publications using citation information. This database is a digital archive of published scholarly research that spans the life sciences, biomedical sciences, engineering, social sciences, arts and humanities from 1900 to the present day (41). At the time of this analysis, the WoS InCites database had over 82 million articles, reviews, editorials, chronologies, abstracts, proceedings (journals and book-based) and technical papers in 256 disciplines. We focused on articles as type of publication because articles are used in university ranking systems (42). The articles in the WoS InCites database are derived from over 21,894 journals, 126,000 books and 226,000 conferences proceedings (43)].

Figure 1 is the flowchart of how we searched and identified the authors who published in Dentistry, Oral surgery and Oral medicine. When the name of an author was repeated in the same institution, we combined the counts of articles and averaged the category normalized citation impact (CNCI). When the author's name was repeated in more than one institution, we combined the counts and averaged the CNCI under the more recent affiliation identified through personal communication with heads of institutions or delegated key people. The names of some authors affiliated with the University of Ibadan were repeated with the University of Ibadan Teaching Hospital affiliation. We removed the later and kept only the affiliation of the university since the teaching hospital is a subset of the university.

We identified the sex of the authors based on one of the authors' (MOF) knowledge of some individuals who are colleagues. Also, the cultural and religious gendered connotations of the listed first name (22, 44) were used to ascribe gender with the assumption that that name is associated with a single sex

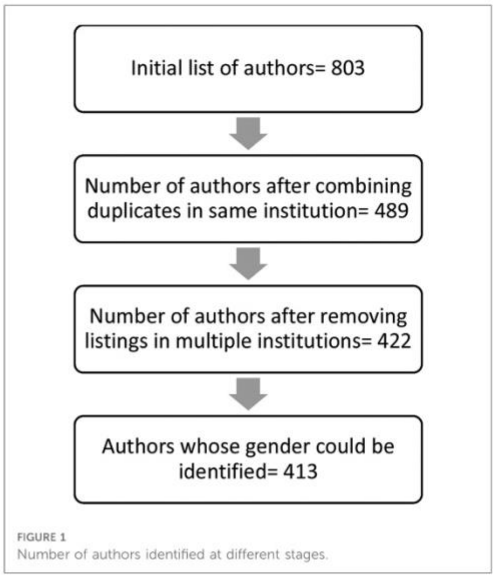

FIGURE 1
Number of authors identified at different stages.

(such as "Joseph", "Mustapha" or "Babatunde" for male and "Victoria", "Shekeerah" or "Yetunde" for female). We further corroborated the assigned sex by searching the web for pictures using the listed names and the institution address. We also personally contacted the heads of institutions and key institutional focal persons to identify the sex of listed individuals whose institutional contact addresses were written in the article. Where authors were affiliated with two institutions, we contacted the heads for both institutions to ascertain the workplace identification of the individual. We also used the institutional identification process to validate some of the individuals whom we have identified based on cultural and religious gendered connotations of the listed author's first name and we had 100% correctness in the sex assignment. We then determined the proportion of female authorships as the quotient between the number of female authorships and the total sum of male and female authorships presented as percentage.

We categorized the manuscripts published based on the ranking of the journals where the manuscript is published as indicated in the WoC InCites database. The journals ranking was based on their quartile rating amongst the journals in a subject area (Q1–Q4). Q1 journals are amongst the top 25% of a subject area, while Q4 journals are among the last 25% of a subject area. It also covered authorship (first and last-authorship as well as corresponding author). Single authorships were considered as first authorships.

We used an observation period of 10 years to provide larger and more robust datasets for each person. Data about the indicators of productivity, impact, collaboration pattern, open access publishing and author position were extracted and highlighted in Table 1 (45, 46).

TABLE 1 Definition of research indicators used in the study.

Indicator	Definition
Productivity	
WoS documents	Number of publications published in journals in WoS
Percentage in Q1 journals	(Count of documents in Q1 journals / count of documents in journals with impact factor)*100
Percentage in Q2 journals	(Count of documents in Q2 journals / count of documents in journals with impact factor)*100
Percentage in Q3 journals	(Count of documents in Q3 journals / count of documents in journals with impact factor)*100
Percentage in Q4 journals	(Count of documents in Q4 journals / count of documents in journals with impact factor)*100
Impact	
Times cited	Number of times the set of articles has been cited
Category normalized citation impact (CNCI)	Number of citing items divided by the expected citation rate for articles of the same document type, year of publication and subject area. It is a valuable and unbiased indicator of impact irrespective of age, subject focus, or document type. It allows comparisons between entities of different sizes and different subject mixes. A value of 1 represents performance at par with world average and values above 1 are considered above average and so on.
Percentage cited	Percentage of articles with at least one citation. It shows the extent to which other researchers utilize the research produced by an entity.
Collaboration	
Percentage international collaboration	Number of documents with international collaborations divided by the total number of documents represented as a percentage. It is an indication of ability to attract international collaborations
Percentage domestic collaboration	Number of domestic collaborations divided by the total number of documents represented as a percentage
Open access	
Percentage open access	Percentage of articles that are published using open access model including gold, hybrid gold, bronze, free to read, green published, green submitted, green accepted, and all green only.
Author position	
First author	The number of publications where the location is the location associated with its first author.
Last author	The number of publications where the location is the location associated with its last author.
Corresponding author	The number of publications where the location is the location associated with its reprint or corresponding author.

Based on articles, in the research area "dentistry, oral surgery and medicine", in the WoS core collection, in the period 2012–21.

Chi-square was used to compare gender differences in the percentages of publications in Q1–Q4 journals. Also, the gender differences in percentage cited, percentage of papers with international collaboration, percentage with domestic collaboration, percentage of publications in open access journal and percentage with first, last and corresponding author were compared using chi-square test. The number of WoS documents, number of citations, and CNCI were compared using t test. The percentage of papers with authors listed as first authors and those where they were listed as last authors were correlated using Pearson correlation coefficient after splitting the sample by gender. Significance was set at <5%. SPSS version 23.0 was used for statistical analysis.

Results

Table 2 shows the analysis of the 1,222 articles authored by researchers affiliated with Nigerian institutions indexed in the WoS database. There was an average of three papers per author and a greater percentage in Q4 than in Q3, Q2 and Q1 journals (22.1%, 15.6%, 14.2% and 10.7%). Most (77.3%) papers were cited with about 18.6 citations per author although the CNCI (0.60) was below the global average of 1. A greater percentage of papers listed domestic (45.8%) than international (26.4%) collaborators, and 52.2% of the articles published in open access journals. Less than one in four papers had authors listed as first (23.2%), last (20.9%) or corresponding authors (23.2%).

Table 2 shows that 669 (54.7%) articles were authored by males and 553 (45.3%) were authored by females. The total number of citations of articles authored by males was higher than that for articles authored by females (3,892 vs. 3,779).

The number of WoS documents per female author was significantly higher than the number authored per male author (3.7 vs. 2.6, $p = 0.03$). The number of citations per female author was significantly higher than the number of citations per male author (25.0 vs. 14.9, $p = 0.04$). A non-statistically significant higher percentage of females authored articles in Q2 and Q3 journals, a non-statistically significant higher percentage of males authored articles published in Q4 journals, and males had a non-statistically significant higher CNCI (0.61 vs. 0.59) and a non-statistically significant lower percentage of articles cited (75.8% vs. 79.0%) than females.

In addition, although a greater percentage of articles published by male than female authors listed international collaborators (27.4% vs. 25.1%) and domestic collaborators (46.8% vs. 44.7%), none of these differences were statistically significant. Also, there was no statistically significant gender difference in the proportion of articles published in open access journals (52.5% vs. 52.0%, $p = 0.91$). However, there was a statistically significantly greater percentage of females than males listed as first authors (26.6% vs. 20.5%, $p = 0.048$) and a statistically significantly greater percentage of males than females were listed as last authors (23.6% vs. 17.7%, $p = 0.04$). The correlation between the percentage of articles with researchers listed as first authors and the percentage listed as last authors was not significant among males (Pearson correlation = 0.12, $p = 0.06$) but was significant

TABLE 2 Comparison between male and female authors affiliated with Nigerian institutions regarding research productivity, impact, collaboration patterns, open access publishing and authorship patterns in dentistry and oral sciences.

Variables	Combined papers in the study			*p*-value
	All papers	By females	By males	
Productivity				
Number of Web of Science document (per author)[¶]	1,222 (3.0)	553 (3.7)	669 (2.6)	0.03
Percentage in Q1 journals	131 (10.7%)	59 (10.7%)	72 (10.8%)	0.96
Percentage in Q2 journals	174 (14.2)	87 (15.7%)	87 (13.0%)	0.24
Percentage in Q3 journals	191 (15.6%)	94 (17.0%)	97 (14.5%)	0.31
Percentage in Q4 journals	270 (22.1%)	113 (20.4%)	157 (23.5%)	0.31
Impact				
N citations (per author)[¶]	7,671 (18.6)	3,779 (25.0)	3,892 (14.9)	0.04
CNCI[¶]	0.60	0.59	0.61	0.84
Percentage cited	77.3%	79.0%	75.8%	0.63
Collaboration				
Percentage with international collaboration	26.4%	25.1%	27.4%	0.50
Percentage with domestic collaboration	45.8%	44.7%	46.8%	0.65
Percentage published in open access journal	52.2%	52.0%	52.5%	0.91
Author position				
Percentage first author	23.2%	26.6%	20.5%	0.048
Percentage last author	20.9%	17.7%	23.6%	0.04
Percentage corresponding author	23.2%	26.4%	20.6%	0.06

[¶]: *t* test used for comparison and χ^2 test used for all other comparisons.

among females (Pearson correlation = 0.25, $p = 0.002$). A greater percentage of females than males were listed as corresponding authors although the difference was not statistically significant (26.4% vs. 20.6%, $p = 0.06$).

Discussion

The findings of the current study suggest that although the number of male authors from Nigeria publishing articles in the WoS category of dentistry and oral sciences was greater than the number of female authors, the quality of the published manuscripts by females seems to be higher than that by males judging by the significantly higher number of citations. The slightly higher percentage of articles authored by males listing international and domestic collaborators and their significantly higher listing as last authors suggests that male authors may initiate and engage more in mentorship, networking and partnership building. The significantly higher percentage of females listed as first authors observed may suggest female dental researchers in Nigeria play more junior roles.

The study produced a specialty-focused assessment of research by gender for a lower middle-income country. It is one of the few publications on the productivity and impact of oral health researchers in a low-middle -income country and, to the best of our knowledge, the only bibliographic review published about researchers in the field of dentistry and oral sciences in Nigeria. There are a few limitations with the study design. We counted each article listing authors who met the inclusion criteria such that if two authors collaborated in one paper, the count of the article was 2. This may lead to the over-estimation of the number of articles published. We were unable to control for some confounders like length of career (47) because we did not have data on employment status. However, we assumed that this would affect both genders equally and as such, it was a missing variable that could only introduce minimal bias to the study. Also, we had no access to data on leave of absence due to reasons like parental care (a factor that is likely to affect women more than men), the sex proportion of the research workforce (and so the research productivity could not be weighted per sex), and the vast cultural, geographical, political and religious diversity of Nigeria (the gender roles and values that may affect sex differences in research productivity were not controlled for). Despite these limitations, the study findings provided some insights that may influence gender defined support for oral health researchers.

First, like prior studies, we found sex differences in the productivity and impact of research productivity, impact and collaboration pattern. Unlike prior studies (48, 49) conducted in high- and upper middle-income countries (50–52), female researchers had significantly higher research productivity and impact than male researchers. A prior report had also observed no gender difference in research productivity in the field of oral and maxillofacial surgery specialty (47). This observed reversal of gender differences in dental research productivity and impact when compared with reports from higher income countries, may be related to gender roles. Men are the breadwinners in many homes in Nigeria (53). The poor economic condition of the country over the last decade or more, may have made men pay less attention to article publications. The article processing fees for manuscript publications are not supported by research institutions in Nigeria. Nigeria is also one of the countries with

participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

MF conceptualized the study, involved with data management, wrote the first draft of the manuscript and consent to the final version of the manuscript for submission. MET conducted the data extraction, data analysis, read multiple versions of the manuscript for intellectual inputs and consent to the final version of the manuscript for submission. ES and GZM-P read multiple versions of the manuscript for intellectual inputs and consent to the final version of the manuscript for submission.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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6. DISCUSSION

In West Africa, research into gender relations is deeply rooted in examining mechanisms that contribute to women's exclusion, domination, or marginalisation within society and the workplace (Caffrey et al., 2016; Touré, 2011). This research project aligns with this framework and specifically investigates the obstacles within the academic and research environment that hinder women's full participation and development. While we observed that women in West Africa, like their counterparts in the Global North, face slower career development in research, the underlying reasons for this disparity may differ to some extent.

One of the notable strengths of this study is its comprehensive exploration of West Africa, a region that shares common cultural values and perspectives. Consequently, the findings hold applicability to the entire region and can facilitate support initiatives by regional organisations. Furthermore, these findings contribute to a contextual and robust foundation of evidence, reinforcing prior research on the imbalanced representation of women in research (Boutillier and Laperche, 2007; Milewski et al., 2005; Sathiparsad, Taylor, and Dlamini, 2008). Additionally, focusing on medical and dental research institutions allows for a deeper examination of contextual professional factors contributing to gender inequality in a research setting.

In the Nigerian segment of the study, a notable strength is the recruitment of participants from Northern and Southern Nigeria, representing the perspectives of male and female researchers from diverse cultural backgrounds. This approach enhances the potential for comparability of study findings across various research institutions in Nigeria. The study also provides a specialised assessment of research output by gender within a lower-middle-income country. It is one of the few publications examining the productivity and impact of dentists in academia in a lower-middle-income country and, to the best of our knowledge, the only one published to date concerning dentists in academia in Nigeria.

The study results offer insights into a regional context that elucidates the observed gender disparity in women's career trajectories in research. This adds valuable context to the global discourse on promoting gender equity in global research career development. Furthermore, the findings from the Nigerian segment of the study support a feminist institutionalist perspective that contends that societal inequality is perpetuated within political and social institutions, such as higher education institutions (Acker, 2006). Understanding how context-specific institutional rules, processes, and norms contribute to gender inequality enactment can inform institutional gender equality programs and strategies. This study is the first to explore the how and why of gender inequality enactment in medical and dental schools in Nigeria, thus providing a framework to support potential gender reforms within these institutions. Finally, the findings provide insights that may inform gender-specific support for oral health researchers.

6.1. Barriers to the career advancement of women researchers in some West African countries

The gendered roles attributed to women overseeing caring/domestic duties continue to be significant barriers to the participation and advancement of women in research. This finding aligns with the results of Milewski et al., who highlight the challenges women face in striking a balance between work and family life, which can lead to precariousness (Milewski et al., 2005). Our study underscores that women researchers often struggle to allocate sufficient time to their research and career development due to family responsibilities, which can limit their engagement in research-related activities. This resonates with the work of Sayer, who notes that women tend to spend more time on unpaid domestic work than men (Sayer, 2005). Furthermore, the subordinate roles of women within African households (Sathiparsad, Taylor, and Dlamini, 2008) necessitate seeking approval and support from their husbands to pursue successful research careers. These constraints may discourage many potential female researchers, especially those less able to adopt the coping strategies identified by interviewees, from entering the research field. This could be one of the reasons behind the persistent gender disparities in research careers in West Africa, particularly in biomedical research (Caffrey et al., 2016). This issue warrants further research and exploration.

Women also face challenges in navigating their careers (Kande, 2015). Our study sheds light on the impact of organisational factors, such as male-dominated networks, bullying, and harassment (Kande, 2015). Research institutions in West Africa often mirror and perpetuate gender inequalities prevalent in society (Howe-Walsh and Turnbull, 2016). These institutions have organisational and institutional cultures that cater to the needs of male professors and students (Rathgeber, 2013). Leadership patterns, beliefs, symbols, structures, ceremonies, power dynamics, and information flows are often modelled on male expectations and experiences (Rathgeber, 2013). As a result, women must contend not only with gendered expectations and responsibilities at home but also with the male-dominated practices within the research community. For many women, these negotiations pose a significant challenge, leading them to conform to societal gender norms and values rather than pursue their career ambitions. However, some academic institutions have initiated programs to promote gender equity, primarily focusing on the individual or interpersonal levels of social interaction (Carr et al., 2017).

Discussions about strategies to address the challenges women encounter in their career trajectories often revolve around actions related to spousal support. This highlights the need for women's empowerment to enable them to emancipate themselves from certain family, marital, or societal constraints typically imposed on women. Female emancipation involves distancing oneself from these constraints, while empowerment refers to a multidimensional socio-political process in which women individually and collectively become aware of and seek to transform relations of domination (Batliwala, 1993). Some women entrepreneurs in Togo, for instance, have expressed the desire for their husbands to take second wives in polygamous unions, which allows them to

delegate domestic tasks to younger women and create more time for their careers (Vampo, 2018). Divorce is less frequently mentioned as a solution or means of reclaiming personal trajectories, possibly due to concerns about societal stigma associated with being unmarried. Moreover, remaining unmarried may hinder their career advancement, as it may deter them from being entrusted with leadership roles.

This complex interplay of factors highlights the difficult decisions female researchers in West Africa may need to make to advance their careers. While empowerment programs can strengthen women's resolve to overcome short-term barriers, medium- and long-term strategies are required to address the entrenched gender inequalities within research and academic structures effectively.

An analysis using the 2008 USAID Gender Equality Framework highlights the multifaceted nature of gender disparities in research and academia in West Africa. It emphasises the importance of addressing individual-level challenges and the structural and societal factors contributing to these disparities to achieve gender equality in research and academia. The study's findings also align with Fagenson's theory, highlighting the complex interplay of family dynamics, organisational factors, and women's strategies for career development in West Africa. Fagenson's theory also emphasises the importance of balancing work and family roles for women's career development. The findings highlight that women in research often struggle to strike this balance due to family responsibilities and collaborate earlier reports (Milewski et al., 2005). This struggle can hinder their ability to engage in research-related activities, impacting their career progression fully.

Chauhan, Mishra, and Bhakri (2022) expounded that women face challenges in managing both their professional and family roles due to that lack of mentoring, perceived poor organisational support, the high workload of family responsibilities had a negative perceived negative effect on career success of women. However, using the lens of the academic literacies theory to evaluate this finding, we perceive that the struggle women researchers face in balancing their academic careers with family responsibilities often leads to sacrificing research activities given the limited time for combining family and research-related activities, align with the notion of academic writing as a complex literacy practice that requires skills to be taught (Elander et al., 2006). Women's struggles to engage in research due to family responsibilities can be seen as a barrier to participating in the academic discourse that reduces their competency to produce scholarly work. It is, therefore, possible to design innovative solutions that can facilitate research productivity skills acquisition within the context of women's lives that address this barrier.

This study also corroborates Fagenson's theory that acknowledges the unequal burden of unpaid domestic work that women often shoulder. The study findings indicated that women spend more time on domestic tasks, limiting their available time for research and career development. This suggests that traditional gender roles still affect how men and women manage work and family

interaction (Cerrato and Cifre, 2018; Sayer, 2005) and reinforces the understanding that women's additional responsibilities at home can hinder their career advancement.

Moreover, the study's findings indicate that the subordinate roles of women within households in West Africa, coupled with the necessity for women to seek approval and assistance from their husbands to pursue successful research careers, underscore the crucial role of family dynamics in shaping women's career paths. In alignment with Fagenson's theory, the study emphasises the vital importance of spousal support in women's career development, with this need being particularly pronounced in the West African context. Career-related support available to women at their home and workplace reduces the risk of women who enter the workforce quitting their jobs before they even reach the middle level to assume domestic responsibilities full-time (Pande & Moore, 2015; Catalyst, 2018).

However, it is important to highlight that the concept of support for women in medical and dental academia in Nigeria may differ from what is observed in other cultural contexts. For instance, professional women in Saudi Arabia emphasised the necessity of spousal support for achieving a work-life balance, which involved practical assistance in managing household responsibilities and childcare duties. On the other hand, financial support was becoming less significant and ranked as the least sought-after form of support from spouses (Alarifi and Basahal, 2023). Similarly, family or spousal support in India involves shared domestic responsibilities and chores, promoting a balance between family and career (Ramu, 1987). Moreover, receiving motivation and the ability to discuss work-related issues with family or one's spouse were emotionally uplifting and contributed to career advancement (Kang and Kaur, 2020).

It is worth noting that our study did not explore all potential aspects related to the role of spousal support in career advancement. However, the discussions on factors that boost women's careers in medical and dental academia in Nigeria highlighted men's active involvement in decision-making as a potential limiting factor when accessing career advancement opportunities. The discuss also did not highlight the place for shared domestic responsibilities but for exploring support to reduce the domestic responsibility ascribed to females. The support identified in this study underscores the limited agency of women in making pivotal decisions regarding their research career trajectories. Prior discussions on women's decision-making within African households had not previously explored this specific perspective. This study illuminates that even well-educated and socially advantaged women still grapple with limitations in their autonomy beyond immediate household needs. This intersection of gender with education and social advantage underscores the need for an intersectional feminist approach, which considers multiple dimensions of identity and power.

This finding calls for further in-depth exploration, especially in the context of the importance of women's empowerment and emancipation from societal constraints, as highlighted by Fagenson's

theory. It also aligns with the Academic Literacies theory's focus on the transformative potential of literacy practices, which requires that women become aware of and seek to transform relations of domination, a critical aspect of academic literacy development. The study findings indicated that there are considerations for local traditions to enhance women's ability to address the constraints traditions and cultural norms impose on women's career progression. Despite these identified constraints, the respondents did not pursue divorce as a solution.

This introduces the concept of empowerment as a multidimensional socio-political process and that academic literacy is not limited to writing and reading but extends to understanding and navigating complex socio-political dynamics within academic and research settings. It aligns with the idea that women may seek unconventional strategies to gain more control over their careers. It suggests that a lot more studies on women's empowerment, even among women in academia, may need to identify solutions using culturally relevant solutions. It also highlights the contextual nature of academic literacies, where individuals must adapt their literacy practices to specific social and cultural contexts. There are, however, remarkably few theories, if any, that support exploring women's empowerment and emancipation from societal constraints using indigenous knowledge. This study's findings open a new context for future exploration.

In addition, the study noted that research institutions in West Africa frequently replicate and sustain the gender inequalities that exist in broader society. This observation aligns with Fagenson's theory, which acknowledges that organisational and institutional cultures have the potential to either facilitate or impede women's career advancement. It also aligns with feminist institutionalism's view that institutions reflect and reinforce existing power structures, and that the male-dominated networks within these institutions engrains organisational cultures catering to male expectations. This study has shed light on the fact that male-dominated networks within research institutions can present additional hurdles for women pursuing research careers. Institutional cultures that assume an unwavering commitment to an academic career throughout one's working life, often aligning with male expectations, can establish formidable barriers for women (National Academy of Sciences et al., 2007).

In summary, the study noted that academic institutions have taken steps to encourage gender equity, primarily concentrating on the individual or interpersonal aspects. While this represents a positive development, Fagenson's theory emphasises the importance of addressing systemic and structural obstacles. These structural barriers, such as male-dominated networks, bullying, and harassment, are integral components of the institutional context that shapes academic literacy practices. Women must navigate these barriers as they engage with the academic literacies within the research community.

These findings underscore the critical need to tackle systemic obstacles and foster gender equity within research institutions to support women's career progression in West Africa, echoing the

insights of Rathgeber (2013). Moreover, they emphasise the importance of recognising and addressing the pervasive influence of gendered norms within family structures and research institutions on women's experiences in research and academia in West Africa. It highlights the necessity of challenging these gender norms and advocating for institutional reforms that address underlying power dynamics and gender-related constraints hindering women's participation and advancement.

The study also identifies avenues to enhance women's involvement in research and academia through implementing policies and initiatives. These strategies should aim to increase women's access to essential resources, including time, support networks, and opportunities for career development. Furthermore, efforts should be made to alleviate the burden of unpaid domestic work and ensure equitable access to the resources required for research. Efforts should also include interventions that improve women's capabilities to manage their dual roles and promote their decision-making autonomy within the family context. Empowerment programs can equip women with the skills and resources to navigate these challenges effectively.

Additionally, research institutions must actively promote gender equity and empower women to pursue their academic and research careers without encountering constraints. There is also a need for institutional changes and programs that address gender bias and promote women's leadership and participation. Encouraging women to take leadership roles within research institutions is crucial for creating an inclusive and equitable academic environment. It is essential to recognise that achieving gender equality requires a long-term perspective, encompassing institutional changes that foster gender equity within research and academia. These changes should consider both short-term empowerment initiatives and long-term systemic reforms within research institutions and academia, with due consideration of culturally appropriate strategies.

6.2 Researchers' perceptions of gender equality enacted in the medical and dental research field in Nigeria

We further the conclusions drawn from the West Africa study by highlighting the prevalence of male dominance in medical and dental professionals' research outputs within the Nigerian study's research institutions. This gender disparity also extends to unequal leadership positions within these institutions. These patterns of gendered influence within medical and dental research institutions can be attributed to the absorption and perpetuation of societal patriarchal values.

The individuals who participated in this study expressed a growing awareness of the need for change at the individual and collective levels among women in academia. They are collectively advocating for a shift in the current paradigm. Several opportunities were identified to facilitate this transformation. These include the implementation of institutional policies explicitly promoting

gender equality, the establishment of specialised gender-focused units within research institutions dedicated to implementing these policies, ongoing advocacy and awareness campaigns, mentorship programs involving women mentoring both women and men and capacity-building initiatives aimed at enabling women to participate in various aspects of the research enterprise actively.

Participants in this study perceive gender inequality because of institutionalising societal patriarchal and androcentric values. This has significant implications, particularly in how domestic responsibilities and career interruptions for family-related reasons can disproportionately affect women's research outputs and career advancement compared to their male counterparts. The study suggests that the limited environmental support for research within Nigerian institutions may have a more pronounced impact on women. This is because women often find it challenging to access sponsored opportunities for capacity development due to their obligations to stay home, even when such opportunities arise (The Conversation, 2021).

For instance, women may be less able to take up research grant opportunities, even when these grants are designed to favor the selection of female researchers due to the caregiving responsibilities they bear. These interruptions to capacity building and empowerment opportunities during the early stages of a woman's career can be difficult to overcome in later years, leading to a widening gender competency gap. The failure to recognise years spent managing households as valuable managerial skills, and the insufficient acknowledgment of home caregiving as valuable work skills contribute to women lagging in assessments of their suitability for leadership roles.

The study underscores the urgent need for institutional and societal changes to address these deeply entrenched gender disparities within research institutions, both in Nigeria and more broadly. This involves recognising and valuing the skills and contributions of women in academia, as well as implementing policies and initiatives that promote gender equality and create a more supportive environment for women's career development in research.

The findings of this study align with the 2008 USAID Gender Equality Framework by shedding light on the pervasive gender disparities within research institutions that are primarily rooted in deeply ingrained patriarchal values present in both societal and institutional contexts. In addition, study participants' growing awareness of the need for change at both individual and collective levels, the need for establishing gender-focused units and promoting gender equality policies underscores the importance of policy implementation and structural changes within research institutions, and the revelation that domestic responsibilities and career interruptions disproportionately affect women's research outputs and career advancement reinforces the principles in the 2008 USAID Gender Equality Framework. Furthermore, the call for capacity-building initiatives to enable women to participate in research actively aligns with the framework's

principle of enhancing institutional capacity to support gender equality in research institutions. The failure to recognise women's skills in managing households and caregiving as valuable managerial and work skills, respectively, reflects a broader societal issue that institutionalises harmful discriminatory gender norms, beliefs, and stereotypes, which hinder women's advancement.

The findings also align with Fagenson's theory that recognises the prevalence of male dominance in research outputs and leadership positions within medical and dental research institutions. The current study findings align with the focus on organisational cultures that can either facilitate or hinder women's career advancement (O'Neil and Hopkins, 2015). Also, the perpetuation of patriarchal values within research institutions in Nigeria identified in this study contributes to the observed gender disparities; and this will require proactive collective advocacy and action by women for their rights and opportunities and for organisations to recognise and accommodate women's work-life balance needs. Collective advocacy reflects academic practices' social and collaborative aspects (Kelly, 2015). Such policies should address the widening gender competency gap from young researchers' career interruptions. Access of female researchers to mentorship programmes and capacity-building initiatives are formal and informal support networks within organisations that can enable women to navigate their careers. Mentorship can enhance individuals' academic literacies by providing guidance and support (Johnson, 2007).

This study aligns with the 2008 USAID Gender Equality Framework, Fagenson's theory, and the academic literacies theory by emphasizing the need for institutional and societal changes to combat gender disparities in Nigerian research institutions. It addresses imbalanced caregiving responsibilities and limited support for women accessing research opportunities. Advocacy, policy implementation, and challenging gender norms are essential for fostering supportive gender equality environments and addressing structural and social constraints. Furthermore, the study supports Fagenson's theory, highlighting the impact of organisational factors and gender practices on women's career development. It reinforces the importance of addressing these factors to promote gender equality in careers and organisations.

6.3 Navigating gender inequity within research institutions and the role of a supportive environment for female medical and dental researchers can be established

While institutional policies and advocacy can contribute to closing gender gaps in research, the complete elimination of these disparities remains unlikely. Implementing effective gender equality policies is a challenging but valuable endeavor, as demonstrated by the concept of gender mainstreaming (Murray, Swaine, and Doody, 2010). In medical and dental research institutions,

gender-sensitive policies enacted by dedicated gender-focal units could drive progress toward gender equality in research outputs and the representation of women in senior positions. These policies should promote a gender-sensitive review of criteria for appointments and promotions, recognizing the value of home-management skills as administrative abilities. Such efforts could help bridge the gender gap in managerial positions and encourage men to take on caregiving roles without adverse consequences.

The perspectives of study participants highlight the ongoing need for advocacy and awareness-raising. Medical Women's Associations, known for their success in advocating for policies benefiting women in clinical practice (Medical Women Association of Nigeria, 2022), may need to focus more on addressing gender equality challenges in research. Establishing advocacy groups involving women and supportive male allies within academia could be instrumental in championing gender equality and reshaping traditional notions of masculinity. Advocacy involves a combination of individual and collective actions aimed at gaining political commitment, societal acceptance, and systemic support for specific goals (Cullerton et al., 2018). While effective, advocacy can be complex, especially for those with limited resources and influence. Further research must assess how gender equality within research institutions contributes to broader sustainability objectives.

Advocacy, while impactful, often brings about change gradually. In contrast, mentorship, especially when led by women mentoring other women and with the support of male allies, has the potential to drive more rapid transformation in the research context (Meschitti and Smith, 2017). Female mentors are pivotal in inspiring other women fostering a sense of belonging and confidence. However, the study participants' descriptions of mentorship lacked clarity and specificity. Senior medical and dental research professionals could take proactive steps to mentor and support other women, potentially institutionalising this practice within research organisations or professional associations. Mentorship can also empower women to engage actively in research alongside their peers. However, it's essential to ensure that mentorship strategies are gender-sensitive and do not inadvertently reinforce existing gender inequalities or hierarchies (Bivens, Moriarty, and Taylor, 2009). Providing mentors with training in gender-sensitive mentorship practices can mitigate these risks.

The feminist institutionalisation analysis of these study findings reveals several key insights regarding the efforts to address gender disparities in research institutions. First, it emphasises the need to embed gender considerations in institutional structures and practices by creating specific units and policies that can institutionalise gender equality as a core value, making it less vulnerable to shifts in leadership or external pressures. Second, it recognises that achieving gender equality requires persistent efforts to challenge and transform entrenched gender norms, including challenging traditional notions of masculinity within research contexts. However, advocacy to change traditional notions can be complex, particularly for those with limited resources and

influence. Institutional change is often met with resistance and requires sustained efforts. Third, the analysis also suggests that further research is needed to understand the broader impact of gender equality within research institutions on sustainability goals, given the need for a comprehensive approach to addressing the gender gaps identified. Supportive networks and alliances are also needed to drive gender equality initiatives, as the study findings underscore the need for clear and gender-sensitive mentorship practices to avoid perpetuating existing gender hierarchies.

The study findings on the need for gender-sensitive policies, dedicated units, advocacy, mentorship, and the acknowledgment of the complexities involved in achieving gender equality align well with the principles and approaches outlined in the 2008 USAID Gender Equality Framework. Collectively, these strategies contribute to efforts to reduce gender disparities in research institutions.

6.4 Ways to improve on the inequitable gender representation in scientific research

The current study's findings in the field of dentistry and oral sciences in Nigeria reveal a notable gender disparity, with more male authors publishing articles in the WoS category than female authors. Despite this, females exhibited higher productivity and received more citations on average than their male counterparts. However, no statistically significant differences existed in journal quartile or citation impact. Additionally, while not statistically significant, a slightly higher percentage of papers authored by males had international and domestic collaborators. Moreover, significantly more females were credited as the first authors, whereas significantly more males were noted as the last authors.

In contrast to prior research on gender differences, this study found no significant differences in productivity, impact, collaboration patterns, or open-access publishing. Furthermore, unlike what has been reported in other high- and upper-middle-income countries (Jones, 1998; Simon et al., 2019; Kiziltan Eliacik and Karahan, 2021), females in Nigeria outperformed males in terms of productivity, impact, and open-access publishing. This shift in gender-related patterns may be attributed to gender roles in Nigeria, where men often bear primary financial responsibilities within households (Akanle and Nwaobiala, 2020). The challenging economic conditions and limited research funding in Nigeria over the past decade or more may have influenced men's reduced focus on research, as reflected in their higher involvement in research collaborations, both domestic and international, compared to females. Nigeria currently allocates less than 0.22% of its gross domestic product to research, positioning it among the countries with the lowest research funding globally (Olufadewa et al., 2020). These findings represent a departure from the typical gender disparities observed in dental research in wealthier countries and can be linked to Nigeria's unique economic dynamics and gender roles.

The proposition that economic viability affects male research productivity can be interpreted in several ways. It may suggest obstacles that hinder women from realising their full research potential and imply that, in the context of dentistry and oral health research in Nigeria, male competence may surpass that of females. When the research environment favors men, it can reinforce male dominance in oral health research. Conversely, research may take a back seat when family responsibilities, community dynamics, and the national economy affect men's financial stability. This proposition underscores the need for caution in interpreting the findings and emphasises the importance of considering the context for a meaningful interpretation. Additionally, previous evidence suggests that a nation's political and economic stability can influence oral health research output (Allareddy et al., 2015), adding significance to this proposition and calling for further exploration.

Alternatively, the results indicating more female WoS publications per author, higher first authorship positions, and more citations per paper could signify progress toward gender equality in dentistry and oral research in Nigeria. However, it's essential to recognise that this may not necessarily reflect the broader gender equality status in the country, which remains low: Nigeria scored 0.33% on the gender equality ranking conducted by the World Bank in 2020 (Trading Economics, 2022). Notably, there has been an increase in women's participation in dentistry in regions like the global North, attributed to equal educational and practice opportunities (Adams, 2005; McKay and Quiñonez, 2012; Gallagher and Scambler, 2021). Nevertheless, the reasons behind the observed dominance of women in research productivity require further investigation.

Additionally, despite productivity and impact indicators suggesting potential female predominance in oral health research, there was a significantly higher proportion of females as first authors and males as last authors. This observation indirectly hints at the possibility of a higher number of senior male researchers, although further investigation is needed to confirm this assumption. Traditionally, the last author is seen as the primary driving force behind financial and intellectual research (Tscharntke et al., 2007), which may correlate with the substantial male dominance in research collaborations in Nigeria.

However, new interrogations of senior female health research academics in Nigeria on the research findings corroborated the findings on the prevailing male dominance in research productivity and leadership roles within Nigeria's medical and dental academia. However, there was no consensus among interviewees regarding the higher number of females serving as first authors in research publications, suggesting that this phenomenon may have multiple underlying factors beyond mentorship dynamics.

These interviews also shed light and revealed new narratives specific to dental science researchers in Nigeria on evolving dynamics and perspectives within this complex landscape. Firstly, it was suggested that the dental profession offers more flexible work hours, accommodating female academics' social lives, thereby potentially contributing to a more balanced gender distribution in dental academia. Secondly, the interviews hinted that males may be underrepresented in research

academia because they have better-paying opportunities outside research institutions. Lastly, females may be less inclined to initiate international collaborations due to a fear of rejection and a lower likelihood of receiving support from their spouses for engaging with male research collaborators. This perspective opens new avenues for exploration regarding rejection sensitivity in research collaboration and the influence of male partner involvement. These observations underscore the importance of examining the various factors influencing career choices within the profession.

Ways to improve the inequitable representation of women in scientific research would include recognizing the impact of economic factors on research productivity and considering measures to alleviate financial constraints that may disproportionately affect male researchers. This will include improving the opportunities for increased access to research funding and financial support for all researchers, irrespective of gender, and challenging societal stereotypes and expectations that may discourage men from pursuing research careers and women from engaging in international collaborations. Instead, encourage individuals to pursue opportunities based on their interests and capabilities rather than gender roles. Female researchers should also have access to continuous training to enhance their confidence and skills in initiating and participating in international collaborations. Such training should address concerns related to rejection sensitivity and support mechanisms for research collaborations. Finally, encouraging the younger generation of researchers to embrace gender equality and diversity in research can foster a culture of inclusivity and equal opportunity from an early career stage.

The call to encourage the younger generation of researchers to embrace gender equality and diversity in research is strongly substantiated by the comprehensive analysis undertaken to investigate age and gender-related variations in opinions across different generations concerning the perpetuation of gender inequality within medical and dental research institutions in Nigeria. The study unveiled notable disparities in generational perspectives on gender inequalities within these institutions. Younger male and female participants readily acknowledged the existence of gender inequality and stressed the significance of promoting equal opportunities for women. Conversely, older male participants acknowledged gender inequality but proposed addressing it through traditional gender stereotypes, while older female participants appeared unaware of such inequalities, deeming them as normal and not in need of change.

Furthermore, it was observed that older female academics, who could potentially drive change, held firmly to outdated views on gender inequality, perceiving it as an unalterable norm. This resistance to change was rooted in cultural, religious, and societal values, leading to the belief that substantial transformation was improbable. The persistence of traditional gender norms among older women presents challenges for mentorship and the development of professional networks that could support younger female academics. This situation may impede the professional growth of early-career female researchers.

Hence, while promoting the capacity of female academics to serve as mentors are encouraged to bridge the gender inequality gap, these efforts must be complemented by initiatives aimed at enhancing gender awareness and sensitivity through education and training within research institutions. It is equally crucial to foster open dialogues and intergenerational conversations to challenge and transform stereotypical beliefs regarding gender inequality. Male mentors can also significantly support female mentees by providing mentoring sensitive to gender-related issues and advocating for workplace cultures prioritizing gender equality.

Furthermore, institutions should maintain vigilant oversight over changes and consistently evaluate evidence-based interventions to address gender bias within medical and dental research institutions. This approach ensures that progress is measured and sustained improvements are achieved. Additionally, it is essential to anticipate that younger generations, as they assume leadership roles, will actively champion gender equality practices. Thus, investing efforts in promoting gender-transformative institutional norms among early-career researchers should be viewed as an ongoing institutional process, contributing to medium- to long-term advancements.

In summary, the gender profile of research productivity in dentistry in Nigeria indicates progress toward achieving gender equality. The current landscape appears supportive of women entering the dental research domain and gaining acceptance from male colleagues. The higher number of papers and citation rates among females suggests their potential for academic success. However, addressing challenges such as lacking female mentors for early-career female researchers could expedite progress toward gender equality in Nigerian dentistry. This perspective is supported by prior research suggesting that male mentors may be less effective in encouraging female mentees to explore opportunities they might otherwise miss or actively avoid. In contrast, female mentors excel in helping female mentees set career goals and take calculated risks (Ensher and Murphy, 2011). Addressing this challenge has the potential to hasten progress towards gender equality in the dental profession in Nigeria.

In addition, efforts should promote collaborations between male and female researchers and invest in further research to understand the underlying reasons for gender disparities and the factors contributing to women's higher productivity in the field. This research can inform targeted interventions to address any barriers or biases limiting the full potential of male and female researchers. Furthermore, encouraging gender-neutral authorship norms where authorship positions are determined based on contribution rather than gender may help challenge traditional hierarchies and create a more equitable publishing environment (Miles, Renedo, and Marston, 2022).

However, it's crucial to recognise that the gender disparity in research productivity is multifaceted and requires a detailed examination. It's more pronounced at the junior level, and certain health professions may facilitate higher research productivity among females. Addressing educational disparities for girls in Nigeria is crucial to fostering gender equality in research productivity. Achieving gender equality in research institutions and promoting increased research productivity

among women necessitates addressing social, economic, and cultural barriers. Further research is needed to delve deeper into the factors influencing gender disparities in research productivity among dental researchers in Nigeria.

6.5 Study limitations

The data collected primarily relied on self-reported information related to research, academic advancement, and gender-related experiences, and the coding and analysis were conducted within this context. The richness of participants' narratives may contain additional themes and perspectives warrant further exploration. Furthermore, the empowerment experiences of women researchers within their homes could benefit from in-depth examination in future studies. Additionally, the data covered only six out of the 15 countries in West Africa.

In the section of the study on Nigeria, the focus was primarily on perceptions of gender inequality within medical and dental research institutions, and the coding and analysis were conducted within this specific context. There may be additional themes and perspectives within the participants' narratives that deserve further exploration, especially regarding gender and cultural differences impacting gender equality in these institutions. Examining differences in the perspectives of dental and medical researchers separately is also a potential avenue for future research, as the experiences of these two groups may differ.

Moreover, in the bibliography analysis, we counted each article that listed authors meeting the inclusion criteria individually. This means that if two authors collaborated on one paper, the count of articles increased by two. We faced limitations due to data unavailability, including the inability to control for certain confounding variables. These variables included career length, as we lacked data on employment status, although we assumed it would affect both genders equally. Additionally, data on leave of absence related to parental care, which tends to affect women more than men, was inaccessible. Furthermore, we lacked data on the gender distribution of the research workforce, preventing us from weighting research productivity by gender. The results also couldn't reflect Nigeria's vast cultural, geographical, political, and religious diversity, factors that influence gender roles and values and may manifest as significant gender differences in research productivity.

7. RECOMMENDATIONS

The career-limiting gender inequality experience of female researchers in West African universities and research institutions results from various factors. This intricate web of challenges is mirrored in the decisions made by female researchers as they strive to overcome these constraints and succeed in their careers. Gender-insensitive organisational cultures and institutional policies within these academic and research settings add an additional layer of complexity, making it difficult to break free from these constraints. Therefore, many women often find themselves conforming to societal gender norms, which, unfortunately, poses a significant threat to their career advancement.

Moreover, when the medical and dental research institutions in Nigeria were examined, the research showed that gender inequality was deeply rooted, primarily stemming from societal, cultural, and religious patriarchal values. These profoundly ingrained values contribute to the underrepresentation of female medical and dental trainees, a noticeable gap in research productivity between female and male researchers, and a noticeable scarcity of women in high-ranking managerial positions within these institutions. There's a compelling need to cultivate a more nurturing environment for female medical and dental researchers in Nigeria. To achieve this, it's crucial to develop, monitor, and enforce new norms that actively champion gender equality. This entails nurturing a critical mass of gender experts within medical and dental research institutions who can craft and advocate for effective strategies to promote gender equality practices in Nigeria.

One such strategy is to invest in the training and mentoring of early career researchers as gender-sensitive advocates and proponents. The current study findings underscore generational differences in opinions regarding gender inequality within medical and dental research institutions in Nigeria. While both younger men and women acknowledge the presence of gender inequality, older women appear unaware of it, and older men tend to promote gender equality through the commodification of femininity. Effectively addressing gender equality in medical and dental research institutions in Nigeria necessitates strategic actions, anticipating that younger generations will actively champion change as they assume leadership positions.

Additionally, there appears to be a consensus that male dominance is prevalent in research productivity and leadership roles within medical and dental research institutions in Nigeria. However, there's a growing perception that female research productivity and representation in leadership roles are steadily improving, primarily driven by the determined efforts of women in the profession. Nevertheless, it's imperative to acknowledge that enhancing gender equality in research productivity necessitates the implementation of policies and programs that enhance educational opportunities for girls even before they reach tertiary education. Acknowledging the intricate web of interconnected factors contributing to the observed gender disparity in research productivity among medical and dental researchers in Nigeria is crucial. Further research is needed

to delve into the previously unidentified factors influencing the observed gender imbalance in research productivity among dental researchers in Nigeria.

Finally, a shift towards a more gender-sensitive transformation in organisational culture and institutional policies and procedures can significantly enhance the career progression of female researchers in West Africa. The authors of this research hope that their work will contribute to developing a theory that comprehensively outlines the obstacles and catalysts influencing researchers' academic and professional advancement. Additionally, they aspire for this study to serve as a valuable resource in creating evidence-based interventions to bridge the gender-related disparities in academic and research institutions across West Africa.

7.1. Transform the culture within medical and dental academia

Advocate for a more gender-sensitive transformation in organisational culture and institutional policies and procedures. This transformation can significantly improve the career progression of female researchers in West Africa by creating inclusive and equitable research environments where all researchers, regardless of gender, can thrive. This will require that medical and dental research institutions are encouraged to actively involve women in decision-making processes, leadership roles, and research initiatives. It also requires identifying and dismantling these barriers that create gender barriers in hiring, promotions, and resource allocation and instituting policies and procedures to provide equal opportunities for career advancement and research funding to both male and female researchers.

Gender-sensitive transformations emphasise zero tolerance for gender-based harassment, abuse, or discrimination. Creating safe and respectful research environments is essential for female researchers' well-being and career progression. Such policies should promote flexible work arrangements, parental leave, and childcare support. These policies enable researchers to balance their professional and personal lives effectively. Gender-sensitive transformation culture should align with global efforts to achieve gender equality, including the United Nations' Sustainable Development Goals.

7.2. Conduct further research to generate evidence for policy and program design

It is crucial to acknowledge the necessity for ongoing research to investigate the intricate factors that contribute to gender disparities in research productivity, with a specific focus on dental researchers in Nigeria. This continuous research endeavour holds the potential to unearth previously unidentified elements and offer valuable insights essential for devising impactful interventions.

One of the noteworthy findings from this research that has thus far remained unexplored pertains to the influence of female researchers' subordinate roles within patriarchal households on their decision-making processes related to the pace of their careers. This aspect represents a unique and critical angle that demands further investigation. Understanding how societal expectations and

gender norms, particularly within family structures, affect female researchers' career trajectories is essential for crafting interventions that effectively support their professional growth.

Furthermore, a compelling need exists to explore culturally appropriate strategies that female researchers may wish to employ in challenging and reshaping traditional norms that currently act as barriers to their research productivity. This exploration should consider the specific cultural context in Nigeria, recognising that interventions must align with the local environment to yield meaningful results. By addressing these context-specific aspects, future research endeavours can contribute to developing well-informed policies and designing and implementing programs tailored to the unique drivers of gender inequalities within the research landscape. These context-specific research findings can serve as the cornerstone for creating targeted and effective initiatives to promote gender equality in research productivity.

Systems should also be in place to utilise the findings of this research to create evidence-based interventions aimed at bridging gender-related disparities in academic and research institutions across West Africa. These interventions should be tailored to address women's specific challenges in these settings.

7.3. Invest in the training and mentoring of early career researchers

Investing in the training and mentoring of early career researchers as gender-sensitive advocates is a critical strategy for fostering gender equality within academic and research institutions and transforming the culture within the medical and dental academia. This approach involves providing the next generation of researchers with the necessary knowledge and skills to become champions of gender equality in their respective fields. Early career researchers are great targets because they are often at a stage where they are still developing their professional identities and values. By offering them training and mentorship focused on gender sensitivity and equality, institutions can equip these researchers with a deep understanding of the issues surrounding gender disparities. This includes knowledge about the historical context, current challenges, and potential solutions related to gender inequality within the medical and dental academia and research.

In addition, as these early career researchers progress, they can serve as advocates for gender equality within their institutions. They can raise awareness about gender disparities, both overt and subtle, and work towards eliminating them. This includes advocating for policies and practices that promote gender balance in research teams, leadership positions, and funding opportunities.

Furthermore, building a community of early career researchers passionate about gender equality creates a strong support network. These individuals can collaborate, share experiences, and provide mutual support. Such networks can be instrumental in fostering a culture of inclusivity and gender sensitivity within academic and research settings. Investing in them as gender-sensitive advocates has the potential to bring about lasting change. As they progress in their careers and assume leadership roles, they can continue to champion gender equality, influencing policies and practices at higher levels within institutions.

7.4. Address generational differences in perspectives on gender inequality

It is essential to recognise and address the generational differences in perspectives on gender inequality within medical and dental research institutions. While younger generations tend to acknowledge gender inequality, older generations may have different viewpoints. Initiatives should be designed to bridge these generational gaps and promote a shared understanding of the importance of gender equality. Generational differences often result from varying life experiences, societal norms, and historical contexts. Younger generations, having grown up in a different era, may be more attuned to issues of gender inequality and may have different expectations regarding gender roles. On the other hand, older generations may have witnessed or experienced different societal norms and view gender dynamics differently.

Bridging the gap between these generational perspectives is essential to create a more inclusive environment. Younger generations can benefit from the wisdom and experience of their older counterparts, while older generations can gain insights into the evolving challenges and opportunities related to gender equality. Initiatives facilitating knowledge exchange and mutual understanding can help both groups learn from each other. Initiatives addressing generational differences should emphasise the importance of gender equality as a shared goal. While perspectives may differ, the ultimate objective is to create a research environment where individuals of all genders have equal opportunities and are free from discrimination. Emphasising this common purpose can help build bridges between generations.

Mentorship programs that pair older and younger researchers may be instrumental in bridging generational gaps. Younger researchers can benefit from the guidance and mentorship of older colleagues, while older researchers can gain fresh insights and perspectives from their mentees. Collaborative research projects that involve researchers from different generations can also foster a sense of shared purpose and understanding.

We, however, acknowledge that not all young researchers espouse feminist ideals. Some individuals from backgrounds that adhere to conventional gender norms may be less inclined to embrace feminist concepts or may hesitate to openly identify as feminists due to concerns about potential repercussions or societal backlash. Despite an increasing awareness of feminist principles among young people, generational disparities in perspectives persist. Nevertheless, our research findings imply that targeted investments in the younger generation could enhance the development of a gender-sensitive culture within medical and dental academic research institutions in Nigeria. We perceive that mentorship programs can help improve perspectives that align with gender-sensitive organisational programming (Harris, 2022).

7.5. Monitor institutional progress

Recognising and addressing gender inequality is not a short-term endeavour. It requires ongoing efforts to create an inclusive and supportive research culture. Transforming the culture and practices within research institutions to be more inclusive and supportive of gender equality is a

journey that unfolds over years and even decades. It involves changing deep-seated beliefs, norms, and behaviours, which requires sustained dedication. Thus, institutional commitment to addressing generational differences should remain steadfast. It's not enough to initiate change; institutions must continuously evaluate progress, adapt to evolving challenges, and remain responsive to researchers' evolving needs and expectations. Medical and dental research institutions committed to gender-sensitive transformations should establish mechanisms for monitoring progress. Regular assessments can gauge the effectiveness of policies and identify areas that require further improvement.

7.6. Promote gender equality through education

It is also important to implement policies and programmes that promote gender equality from an early age. Gender disparities in education often start at a young age. In many regions, girls face barriers to accessing quality education, including cultural norms, economic constraints, and lack of infrastructure. To promote gender equality in research and academia, it's essential to address these disparities early. This involves enhancing educational opportunities for girls even before they reach tertiary education and ensuring that girls have equal access to education, including primary and secondary education, by removing financial, cultural, and structural barriers that may prevent girls from attending school.

By addressing gender disparities in education, institutions can create a more level playing field for women pursuing careers in research and academia. Promoting gender equality initiatives within medical and dental research institutions should include educational components that raise awareness about generational differences in perspectives. Workshops, seminars, and discussions can provide a platform for open and respectful dialogue between generations, allowing individuals to share their viewpoints and learn from one another.

7.7. Promote gender equality through collaborative approaches

Gender equality is not a challenge confined to a single discipline or field; it is a complex and multifaceted issue that transcends disciplinary boundaries. It is a challenge that affects one specific field or profession and permeates various aspects of society, including academia and research. To effectively address and promote gender equality, it is essential to recognise that early career researchers from diverse backgrounds can play a pivotal role in collaborating on initiatives that tackle gender disparities from multiple angles, leading to more comprehensive and effective solutions.

An interdisciplinary approach that involves researchers who explore the interconnectedness between social, cultural, economic, and institutional factors will help to tackle these multifaceted challenges. This diversity of thought helps in gaining a more comprehensive understanding of the gender disparities that exist in research and academia. They can identify aspects of the problem that might be overlooked from a single disciplinary lens. In addition, collaboration among early career researchers from diverse backgrounds enables the development of comprehensive strategies

and solutions where ideas from one field can inspire innovation in another. Such collective voice becomes stronger, making it more likely for their recommendations and advocacy efforts to be heard and acted upon.

7.8. Develop comprehensive theories of relevance to the West Africa Context

Support the development of comprehensive theories that outline the obstacles and catalysts influencing researchers' academic and professional advancement, particularly in the local context of gender equality, and, in this case, address the contextual drivers and solutions for gender inequality perpetuated within medical and dental research institutions in West Africa. These theories can serve as valuable frameworks for understanding and addressing gender-related disparities. They also provide a structured framework for dissecting and comprehending the multifaceted factors contributing to gender disparities in research institutions. They allow researchers and policymakers to identify the root causes and interconnections between elements that sustain gender inequality.

Theories tailored to the local context of West Africa are essential because they acknowledge the unique societal, cultural, and institutional dynamics at play in the region. They help pinpoint context-specific drivers of gender inequality, and design targeted solutions that resonate with the local culture and values. They also serve as blueprints for crafting policies that address gender disparities effectively. These theories are grounded in rigorous research and empirical data. Therefore, they can provide evidence to inform decision-makers, enabling them to make informed choices about policies, interventions, and strategies to promote gender equality within medical and dental research institutions, ultimately leading to more impactful and tailored interventions.

Theories include metrics and indicators that help measure progress over time. They enable institutions to track advancements in gender equality and identify areas where improvements are needed; they foster consensus and collaboration among stakeholders by providing a common language and framework for discussions, thereby facilitating coordinated efforts to address gender-related disparities. These theories can provide the tools and insights needed to drive meaningful change, break down barriers, and create a more inclusive and equitable research environment that benefits society.

8. CONCLUSIONS

1. **The career-limiting gender inequality experience of female researchers in West African universities and research institutions results from various factors**. This intricate web of challenges is mirrored in the decisions made by female researchers as they strive to overcome these constraints and succeed in their careers. Gender-blind organisational cultures and institutional policies within these academic and research settings add an additional layer of complexity, making it difficult to break free from these constraints. Therefore, many women often find themselves conforming to societal gender norms, which, unfortunately, pose a significant threat to their career advancement.

2. **Male dominance is prevalent in research productivity and leadership roles within medical and dental research institutions in Nigeria**. While there is a growing perception that female research productivity and leadership representation are on an upward trajectory, driven by the determined efforts of women in the field, our findings underscore the persistence of male dominance in research productivity and leadership positions within medical and dental research institutions in Nigeria. The significant gender gap in research output and the underrepresentation of women in high-ranking managerial roles highlight the ongoing need for strategic interventions aimed at dismantling this male dominance and fostering a more equitable and inclusive professional landscape.

3. **Deeply rooted gender inequality, primarily stemming from a complex web of societal, cultural, and religious patriarchal values,** is the main obstacle hindering the progression of medical and dental female researchers in Nigeria's academic landscape and the representation of female medical and dental academics in the research space. This inequality derives from an intricate interplay of societal, cultural, and religious patriarchal values, highlighting the critical need for multifaceted efforts to dismantle these barriers and promote gender equity in the academic and research domains.

4. **Women in medical and dental research in Nigeria have a constrained agency that impedes them from using their expertise and competency to shape critical decisions regarding the trajectories of their research careers**. How women's agency is jeopardized by societal, cultural, religious, and State-related patriarchal rules and norms can be further explored using an intersectional feminist perspective. Although women navigate academic and research environments with an endangered agency, they can take the lead in designing and implementing evidence-based interventions to bridge the gender-related disparities evident in academic and research institutions across West Africa, including medical and dental research and academic institutions in Nigeria.

5. **Women have had to organise themselves as advocates and voices to navigate decision-making processes that promote gender inequities within medical and dental research**

institutions in Nigeria. However, these collective efforts have often lacked evidence-based support, with a scarcity of context-specific research to inform strategies for addressing gender disparities. The initial crucial step is recognising the complex web of interconnected factors contributing to the observed gender imbalance in research productivity among medical and dental researchers in Nigeria. Moving forward, it is imperative to conduct further research to uncover previously unexamined factors influencing this gender disparity, including the influence of gender values and norms on the research outputs of both male and female researchers. This research is essential for developing evidence-based strategies to promote gender equity within these medical and dental research institutions.

6. **Establishing a conducive cultural and institutional environment for female medical and dental researchers can help improve their productivity**. Fostering a supportive atmosphere that prioritises work-life balance for female medical and dental researchers is paramount. Achieving this goal involves developing, continuously monitoring, and enforcing new norms that ardently advocate for gender equality. A pivotal step in this direction is the cultivation of a critical mass of gender experts within medical and dental research institutions in Nigeria. These experts are essential in crafting and championing effective strategies that promote gender equality practices and ultimately contribute to a more equitable and thriving research landscape.

7. **Multiple strategies can be deployed to enhance the underrepresented presence of female medical and dental researchers in scientific research**. These include enhancing gender equality in research productivity through implementing policies and programs that enhance educational opportunities for girls even before they reach tertiary education. In addition, investing in the training and mentoring of early career researchers as gender-sensitive advocates and proponents can potentially improve restrictive gender norms in the medium to long term. Furthermore, a shift towards a more gender-sensitive transformation in organisational culture and institutional policies and procedures can significantly enhance the career progression of female researchers in West Africa, particularly for female medical and dental researchers in Nigeria.

9. CONCLUSIONES (CASTELLANO)

1. **La experiencia de las desigualdades de género en las universidades e instituciones de investigación de África del Oeste, que limita las carreras profesionales de las investigadoras, es el resultado de la interacción compleja de varios factores.** Esta intrincada red de desafíos se ve reflejada en las decisiones que las investigadoras toman mientras se esfuerzan por superar las desigualdades y tener éxito en sus carreras. La existencia, en los entornos académicos y de investigación, de culturas organizacionales y políticas institucionales que son ciegas al género, añade para las investigadoras una capa adicional de complejidad que les dificulta aún más el liberarse de las limitaciones a las que se enfrentan. En consecuencia, muchas mujeres a menudo se ajustan a las normas sociales de género, aunque, desafortunadamente, estas normas les supongan una amenaza importante para su carrera profesional.

2. **Existe, en las instituciones de investigación médica y odontológica de Nigeria, un dominio por parte de los investigadores masculinos, en la producción científica y en los roles de liderazgo.** Existe una percepción creciente sobre el aumento de la productividad científica y la representación en roles de liderazgo por parte de las mujeres investigadoras. Esta percepción está motivada por los esfuerzos de las mujeres en investigación. No obstante, los hallazgos de esta tesis subrayan la persistencia del dominio masculino en la producción científica y en las posiciones de liderazgo en las instituciones de investigación médica y odontológica en Nigeria. La significativa brecha de género en la producción científica y en la representación de las mujeres en posiciones de gestión de alto nivel ponen el foco en la necesidad de intervenciones estratégicas que estén dirigidas a desmantelar este predominio de los investigadores masculinos, y a dar lugar a entornos profesionales más equitativos e inclusivos.

3. **La profundamente arraigada desigualdad de género, que surge principalmente de una compleja red de valores patriarcales sociales, culturales y religiosos**, es el principal obstáculo para el progreso de las investigadoras médicas y odontológicas en entornos académicos de Nigeria, y para la representación de las académicas médicas y odontológicas en espacios destinados a la investigación. Esta desigualdad de género deriva de una intrincada interacción de valores patriarcales sociales, culturales y religiosos, lo que destaca la necesidad crítica de esfuerzos multifacéticos para desmantelar estas barreras y promover la equidad de género en entornos académicos y de investigación.

4. **Las mujeres en la investigación médica y odontológica en Nigeria tienen una capacidad de acción limitada que les impide utilizar su experiencia y competencia para tomar decisiones críticas con respecto a la trayectoria de sus carreras en investigación**. Desde una perspectiva feminista interseccional, se puede ahondar sobre cómo la capacidad de acción de las mujeres se ve amenazada por reglas y normas

patriarcales de la sociedad, la cultura, la religión o el estado. A pesar de que las mujeres navegan en entornos académicos y de investigación con una capacidad de acción amenazada, las mujeres tienen la capacidad de tomar la iniciativa en el diseño e implementación de intervenciones basadas en evidencia destinadas a reducir las disparidades de género evidenciadas en las instituciones académicas y de investigación en toda África Occidental – incluidas las instituciones académicas y de investigación médica y odontológica en Nigeria.

5. **Las mujeres han tenido que organizarse como sus propias defensoras y portavoces, para poder navegar en los procesos de toma de decisiones que promueven las desigualdades de género dentro de las instituciones de investigación médica y odontológica en Nigeria**. Sin embargo, estos esfuerzos colectivos a menudo han adolecido de falta de respaldo basado en la evidencia, debido a una escasez de investigaciones específicas del contexto que puedan informar estrategias para abordar las disparidades de género. El primer paso crucial es reconocer la compleja red de factores interconectados que contribuyen al desequilibrio de género observado en la productividad científica de los profesionales de la investigación médica y odontológica en Nigeria. En el futuro, es imperativo realizar más investigación para descubrir qué factores no analizados previamente influyen en esta disparidad de género, y cómo influyen los valores y normas de género en los resultados científicos de profesionales de la investigación masculinos y femeninos. Esta investigación será esencial para desarrollar estrategias basadas en la evidencia que promuevan la equidad de género en las instituciones de investigación médica y odontológica en Nigeria.

6. **El establecimiento de un entorno cultural e institucional propicio para las investigadoras médicas y odontológicas puede ayudar a mejorar su productividad.** El fomentar un entorno de apoyo que priorice el equilibrio entre la vida laboral y personal de las investigadoras médicas y odontológicas es de suma importancia. El alcance de este propósito implica el desarrollo, monitoreo continuo y aplicación de nuevas normas que aboguen firmemente por la igualdad de género. Un paso fundamental en esta dirección es el fomento de una masa crítica de expertas y expertos en género dentro de las instituciones de investigación médica y odontológica en Nigeria. Estas expertas y expertos son esenciales para diseñar y liderar estrategias efectivas que promuevan prácticas de igualdad de género y que, en última instancia, contribuyan a un panorama de investigación más equitativo y próspero.

7. **Hay múltiples estrategias que podrían implementarse para mejorar la presencia de investigadoras médicas y odontológicas en el campo de la investigación científica**. Estas estrategias para mejorar la igualdad de género en la productividad científica incluyen la implementación de políticas y programas que mejoren las oportunidades educativas de las niñas incluso antes de que tengan acceso a la educación terciaria. Además, el invertir

en la capacitación y mentoría –con sensibilidad de género– de las investigadoras, al inicio de su carrera, como defensoras de sus derechos tiene el potencial de transformar, a medio y largo plazo, las normas de género restrictivas. Un cambio transformador sensible al género en la cultura organizacional y en las políticas y procedimientos institucionales tiene el potencial de mejorar significativamente la carrera profesional de las investigadoras en África Occidental, y, en particular, de las investigadoras médicas y odontológicas en Nigeria.

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ANNEX 1. Information Sheet and Consent Form for Focus Group Discussion

INSTITUTE OF PUBLIC HEALTH, OBAFEMI AWOLOWO UNIVERSITY, ILE IFE

INFORMED CONSENT DOCUMENT

Insert an identifier in the footer such as version number and/or date on the first page

If there are more than one consent form, identify each document by the population who will sign it, for example, "Adult Controls", "Parents", "Teachers", etc.

INFORMED CONSENT FORM FOR THE FOCUS GROUP DISCUSSION

Study Title: Gender Equality and Medical and Dental Academic Researchers in West Africa

Principal Investigator: PROF MORENIKE OLUWATOYIN FOLAYAN

HREC No.:

PI Version Date:

What you should know about this study

- You are being asked to join a research study.
- This consent form explains the research study and your part in the study.
- Please read it carefully and take as much time as you need.
- Participation in this study is optional. You may decide to leave at any time without being penalises.
- During the study, we will tell you if we learn any new information that might affect whether you wish to continue to be in the study.

Information about each of the following sections may be found in the **instructional template.**

Purpose of research project

The purpose of this research is to assess the knowledge and perception of female and male medical and dental academic researchers on the factors that limits women from accessing tertiary education, professional research opportunities and advancing as health scientists at the same rate as

men. We will also want to learn from participants strategies and actions that of female and male medical and dental academic researchers can take to address the limitations.

Why you are being asked to participate

This focus group discussion is design to enable the principal investigator learn from you the best themes to explore to enable us learn about the challenges academic researchers face in promoting gender equality in research engagement in West Africa. You are invited to participate in the research enquiry process because you are recognised as a medical and dental researcher in West Africa with some years working in the enterprise.

Procedures

The principal investigator will be conducting the focus group discussion with you along with five other peers. This will be an online group discussion. The focus group discussion shall take place for one hour. The principal investigator shall lead the discussion using a guide. The discussion will be audiotaped for the purpose of transcription. The audio recording shall be destroyed as soon as the analysis is completed.

Risks/discomforts

I do not anticipate any risk with the study participation. Participants will not be referred to by name. The one hour spent for this research may have otherwise being used for alternative purpose.

Benefits

The study finding will be disseminated to university authorities in West Africa and beyond. The lessons and recommendations shared there should inform the development of institutional practices that can help promote gender equality in the grooming, coaching and mentoring of more female academic researchers in West Africa.

Payment

None

Protecting data confidentiality

Data collection forms will be de-identified and stored in a passworded computer by the principal investigator.

Add the following sections, if applicable (see instructional template).

If none are applicable, skip to section titled, "Who do I call if I have questions or problems?"

Protecting subject privacy during data collection

Data will be collected in the privacy. Individual participants in the focus group discussion shall be encouraged to stay in spaces where privacy can be ensured and interruptions during the discussion is limited.

Alternatives to procedures or treatments: Not applicable

Biological specimens: Not applicable

Insert applicable specimen(s) names and use text as written:

The < **insert specimen name** > and data collected from you during this study are important to science. You will not own the < **insert specimen name** > or data after you give it to the study. You will not receive any financial benefit from any product or idea created by the investigators using the data or materials collected from you.

Cost of participation in the study: Your participation may involve internet cost. Participants who request for compensation of their airtime shall be offered $25 for the one hour expended participating in the focus group discussion

What happens if you leave the study early? Not applicable

Sharing your health information with others: the data collection is a delinked process. The research team are therefore not able to relate the data collected to any specific person since no personal identifier will be collected.

Conflict of Interest: None

Payment of treatment costs for injury or illness from study participation: Not applicable

Clinical Trial Registration: Not applicable

Include in all consent forms

Who do I call if I have questions or problems?

Research conducted in an **international setting** must provide a local contact name and telephone number, address, and email, if available. If a local HREC is overseeing the study, replace the information below with contact information for the local HREC.

- Call the principal investigator, MORENIKE OLUWATOYIN UKPONG, at 07062920394 if you have questions, complaints, or get sick or injured as a result of being in this study.

- Call or contact the Institute of Public Health, Obafemi Awolowo University HREC Office if you have questions about your rights as a study participant. Contact the HREC if you feel you have not been treated fairly or if you have other concerns. The HREC contact information is:

Address: Health Research and Ethics Committee, Institute of Public Health, Obafemi Awolowo University, PMB 045, OAU Post Office, Postal Code 220005, Ile Ife. Telephone:+234 808 842 8726. E-mail: iph@oauife.edu.ng; iphoauife@gmail.com

Keep the questions below on the same page as the signature lines.

What does your signature (or thumbprint/mark) on this consent form mean?

Your signature (or thumbprint/mark) on this form means:

- You have been informed about this study's purpose, procedures, possible benefits and risks.
- You have been given the chance to ask questions before you sign.
- You have voluntarily agreed to be in this study.

_____	_____	_____
Print name of Adult Participant	Signature of Adult Participant	Date

ANNEX 2. Information Sheet and Consent Form for In-depth interview

INSTITUTE OF PUBLIC HEALTH, OBAFEMI AWOLOWO UNIVERSITY, ILE IFE

INFORMED CONSENT DOCUMENT

Insert an identifier in the footer such as version number and/or date on the first page If there are more than one consent form, identify each document by the population who will sign it, for example, "Adult Controls", "Parents", "Teachers", etc.

INFORMED CONSENT FORM FOR THE IN-DEPTH INTERVIEW

Study Title: Gender Equality and Medical and Dental Academic Researchers in West Africa

Principal Investigator: MORENIKE OLUWATOYIN FOLAYAN

HREC No.:

PI Version Date:

What you should know about this study

- You are being asked to join a research study.
- This consent form explains the research study and your part in the study.
- Please read it carefully and take as much time as you need.
- Participation in this study is optional. You may decide to leave at any time without being penalises.
- During the study, we will tell you if we learn any new information that might affect whether you wish to continue to be in the study.

Information about each of the following sections may be found in the **instructional template.**

Purpose of research project

The purpose of this research is to assess the knowledge and perception of female and male medical and dental academic researchers on the factors that limits women from accessing tertiary education, professional research opportunities and advancing as health scientists at the same rate as men. We will also want to learn from participants strategies and actions that of female and male medical and dental academic researchers can take to address the limitations.

Why you are being asked to participate

This in-depth interview is designed to enable the principal investigator learn from you your thoughts on opportunities and limitations female and male medical and dental academic researchers have in creating opportunities for junior female faculty members to make significant progress with their career as a researcher. I also hope to learn from you as a female medical or dental academic researcher, your understanding of the gaps in knowledge, skills and resources that limits female and male medical and dental health academic researchers' ability to integrate sex and gender-oriented theoretical and methodological approaches into their research, and the strategies and actions female and male medical and dental health academics to can take to promote gender equality and ensure gender balance and representation in West African academic research institutions.

Procedures

The principal investigator will host one-hour in-depth interview with you. The principal investigator shall lead the interview using a guide. The discussion will be audiotaped for the purpose of transcription. The audio recording shall be destroyed as soon as the analysis is completed. Please note you are free to withdraw from study participation at anytime. There is no consequence for withdrawing in the study participation.

Risks/discomforts

I do not anticipate any risk with the study participation. Participants will not be referred to by name. The one hour spent for this research may have otherwise being used for alternative purpose.

Benefits

The study finding will be disseminated to university authorities in West Africa and beyond. The lessons and recommendations shared there should inform the development of institutional practices that can help promote gender equality in the grooming, coaching and mentoring of more female academic researchers in West Africa.

Payment

None

Protecting data confidentiality

Data collection forms will be de-identified and stored in a passworded computer by the principal investigator.

Add the following sections, if applicable (see instructional template).

If none are applicable, skip to section titled, "Who do I call if I have questions or problems?"

Protecting subject privacy during data collection

Data will be collected in the privacy. Individual participants in the focus group discussion shall be encouraged to stay in spaces where privacy can be ensured and interruptions during the discussion is limited.

Alternatives to procedures or treatments: Not applicable

Biological specimens: Not applicable

Insert applicable specimen(s) names and use text as written:

The < **insert specimen name** > and data collected from you during this study are important to science. You will not own the < **insert specimen name** > or data after you give it to the study. You will not receive any financial benefit from any product or idea created by the investigators using the data or materials collected from you.

Cost of participation in the study: Your participation may involve internet cost. Participants who request for compensation of their airtime shall be offered $25 for the one hour expended participating in the focus group discussion

What happens if you leave the study early? Not applicable

Sharing your health information with others: the data collection is a delinked process. The research team are therefore not able to relate the data collected to any specific person since no personal identifier will be collected.

Conflict of Interest: None

Payment of treatment costs for injury or illness from study participation: Not applicable

Clinical Trial Registration: Not applicable

Include in all consent forms

Who do I call if I have questions or problems?

Research conducted in an **international setting** must provide a local contact name and telephone number, address, and email, if available. If a local HREC is overseeing the study, replace the information below with contact information for the local HREC.

- Call the principal investigator, MORENIKE OLUWATOYIN UKPONG, at 07062920394 if you have questions, complaints, or get sick or injured as a result of being in this study.

- Call or contact the Institute of Public Health, Obafemi Awolowo University HREC Office if you have questions about your rights as a study participant. Contact the HREC if you feel you have not been treated fairly or if you have other concerns. The HREC contact information is:

Address: Health Research and Ethics Committee, Institute of Public Health, Obafemi Awolowo University, PMB 045, OAU Post Office, Postal Code 220005, Ile Ife. Telephone:+234 808 842 8726. E-mail: iph@oauife.edu.ng; iphoauife@gmail.com

Keep the questions below on the same page as the signature lines.

What does your signature (or thumbprint/mark) on this consent form mean?

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- You have been informed about this study's purpose, procedures, possible benefits and risks.
- You have been given the chance to ask questions before you sign.
- You have voluntarily agreed to be in this study.

_____	_____	_____
Print name of Adult Participant	Signature of Adult Participant	Date

ANNEX 3. Recruitment Form

Unique identification number (UIN): _____	**Sociodemographic data**
Age	*Number*
Birthplace	*Text*
Educational level:	□ *Highschool* □ *University (Bachelor)* □ *University (Master)* □ *University (PhD)*
Religion:	□ Islam □ Animism □ Christianity □ Other :_ *Text*__ Do you consider yourself a practicing believer? □ *Yes* □ *No*
Family status (Married? Number of children?)	*Text* *Number*
Education (& Year of completion)	*Text* *Number*
Current profession (& Years of work experience):	*Text* *Number*
Institution (& number of years):	*Text* *Number*
IMPORTANT: Only collect this data if the participant consents to participating in the research	

Annex 4. Interview Guide for West Africa

Please, we would like to listen to your opinions and experiences on:		
1	Professional career of researchers	*Can you tell me about your professional career as a researcher*?
2	Opinion on gender equality in the field of research	*What do you think about gender equality in the field of research*?
		How do you judge the policies of African academies in terms of gender equality?
		What are the organizations in African academies and research institutes doing in terms of gender equality?
3	Opportunities related to the gender and/or sex of the researcher	*What opportunities for development have you had during your career as a researcher*.
		(Probe discussions on opportunities received related to the researcher's gender)
		What is the comparison you can make between the trajectory of a female researcher and that of a male researcher (in terms of opportunities)?
4	Barriers related to the gender and/or sex of the researcher	*What barriers have you encountered during your career as a researcher*? -
		(Explore any theme on discrimination due to the researcher's gender in the academic environment)
		What are the environmental barriers that may impede the careers of women researchers? *(Explore about the role of family and the social environment)*
5	Difficulties of women researchers in their professional careers	*What are the difficulties encountered by women researchers in attaining positions of responsibility*?
		Can you share any personal experiences? *(Ask question if discussant identified difficulties with career development)*
		How would you compare the trajectory of a female researcher with that of a male researcher (in terms of difficulties)?
6		*Can you give us recommendations for improving gender equality in universities and research institutes*?

	Recommendations for achieving gender equality in universities and research institutes	*What are the coping strategies employed by women researchers in the face of the difficulties and obstacles they encounter in advancing their careers*?
		Are there other coping strategies that women researchers can adopt to build their careers in research?

ANNEX 5. Interview Guide for Nigeria

Introduction		
Hello, my name is Morenike Oluwatoyin Folayan and, during this interview, I would like to help you tell me about the most important events in your engagement with health research and social research in health. I will try not to interfere with your freedom of expression. It is my duty to let you talk as much as you wish. This is an opportunity to make your voice heard. Therefore, I will only guide you by asking you one question at a time that relates to all aspects of the study that we want to explore. You can answer my question by giving a full and detailed narrative of your experiences and feelings in this particular area.		
THEMES		
1	Professional careers of female medical and dental researchers	Can you tell me about your professional career as a researcher?
2	Opinion on gender equality	What do you think about gender equality in the research area? What do you think about gender equality in medical or dental health research area?
3.	Opportunities related to the sex/gender of the researcher	What are the opportunities you've encountered during your medical or dental health research career? – Prompt about gender/sex-related opportunities ...do you think medical or dental researchers of the opposite sex encounter the same type of opportunities?
4	Sex and gender related research obstacles	What are the obstacles you've encountered during your medical or dental health research career? – Prompt about sex and gender related obstacles ...do you think medical or dental researchers of the opposite sex encounter the same type of obstacles?
5	Difficulties female researchers face in their professional career	What are the difficulties and challenges female researchers face to... ...receive an education as researchers? ...lead their own research projects? ...access funding, grants, scholarships...? ...publish? ...conciliate academic and research positions? ... reach top management positions?

		... In comparison with men: How are all these things similar or different?
6	Integration of 'gender perspective' or 'gender lens', 'gender approaches' in medical/dental research	Perception... a) In their own research agenda b) In the medical/dental research agenda o colleagues in the same field
8	Professional experience with sex and gender mainstreaming in health research conduct	How have you practiced sex and gender mainstreaming in medical or dental health research? *Probe, what made it (not) possible; what where the challenges faced; what are the barriers created by knowledge, skills and access to resources; how were these barriers and challenges addressed; if they were not addressed what make it challenging; has the patriarchal society had any significant influence; what spurred you to take such initiative.*
6	Recommendations for gender equality in research and academia	Can you give us recommendations on how to promote and institutionalise gender equality in research practices and in the academia?
7	Opinion of researcher regarding sex and gender mainstreaming in medical or dental health research conduct	We are going to talk about integrating gender and sex in medical or dental health research: What in your opinion are the opportunities there are regarding the integration of sex and gender into health research? *Probe for opportunities that can be derived from the institution and from peers* What changes can result from integrating gender and sex into medical or dental health research practices? (Advantages disadvantages)
9	Female medical and dental health academic researchers' sorority and solidarity efforts in support of the elimination of gender inequality practices	How well have female colleagues been supported to succeed with their career as medical or dental health researcher? *Probe on the career progression pathway in the institution; how junior female colleagues have fared; what senior colleagues has done/can do to improve career progression of early career females; perception on how gender/sex dynamics have impacted on institutional and individual support; and what can be*

		done to improve the current institutional and individual systems and practice to support early career medical and dental academia. *How do you feel male join women's efforts and initiatives to improve gender equality in medical dental research...*
10	Recommendations for better sex and gender mainstreaming in medical or dental health research conduct	Can you give us recommendations for better integration of gender and sex in medical and dental health research in West Africa? How feasible would it be to implement the recommendations you're making... What would be necessary to convince women and men in medical dental research to pool time resources efforts to make reality all the transformations you suggest...