

Research

Interrogation of women health researchers' 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. The objective of this study is to explore the societal, institutional, and cultural factors contributing to gender disparities in research productivity and leadership in academic settings in Nigeria.

Methods This research was part of a larger study aiming to understand the opportunities and identify strategies to enhance women's representation in scientific research in West Africa with a focus on Nigeria. This descriptive qualitative study was 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 medical and dental research institutions in Nigeria. The interview guide was developed based on the outcomes of the research. The interviews were conducted using WhatsApp video calls. The transcribed data was deductively analysed.

Results The analysis revealed four main themes namely: (1) patterns of male dominance in research and academic institutions, (2) gender disparities in women's entry into research, and academic institutions, (3) enabling environment and tools to enhance women's advancement into managerial positions, and (4) the factors contributing to the observed gender differences in research productivity. While participants acknowledged an increasing presence of women in the medical and dental research academia, there was no consensus regarding a higher number of first female authorships indicating a corresponding increase in junior authorships. Patriarchal social practices were identified as potential contributors to the lower participation of women in collaborative research within the dental research academia.

Conclusion Although respondents felt male dominance and lower research productivity among women persist in the medical and dental research academia in Nigeria, this is, however, the result of a complex interconnectedness between factors contributing to the disparity. Further research is needed to investigate previously unidentified factors influencing the observed gender skewness in research productivity among dental researchers in Nigeria.

1 Introduction

Multiple studies have indicated that the organizational systems and structures in Africa perpetuate male dominance, influenced by patriarchal societal norms [1, 2]. 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 [3–5]. These cultural ideologies,

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along with institutional discrimination and prejudiced beliefs, contribute to gender inequality within hypermasculine health research organizations, 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 recognized, with persistent lower research productivity among women and slower progress toward leadership positions in the sciences [7–12]. Women 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 success in academia 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 [18–20]. Gender disparities in research productivity are driven by inequalities in research funding and are not adequately addressed in collaborative research efforts [21–23]. 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 [26–28]. These factors prioritize 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 recognizing gender inequality in leadership positions and research opportunities, older men proposing changes based on commodifying women, and older women 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].

In a patriarchal society like Nigeria, where deeply ingrained cultural norms and institutional practices perpetuate male dominance in academia, women remain significantly underrepresented in leadership roles and high-impact research outputs despite the increasing number of women entering higher education and research fields. Institutional policies and organizational culture also limit women's leadership and research productivity [30]. Although research productivity and leadership disparities in the academia can be addressed through mentorship and training programs for early-career researchers [30], it is important to understand the specific challenges faced by women medical and dental researchers in the academia in Nigeria to develop targeted interventions and policies. Understanding these obstacles will inform the development of targeted interventions and policies that can promote gender equality, address gender disparities, promote a more inclusive academic environment, and enhance the representation and productivity of women in scientific research.

This study defines male dominance as systemic practices that favour men over women in professional and academic settings, particularly in leadership roles, resource access, and decision-making [31]. In medical and dental research institutions in Nigeria, this is reflected in men's disproportionate presence in leadership, collaboration opportunities, and research productivity. Research productivity, measured by publications, citations, and journal quality, is a key indicator of academic success and is partly driven by collaborative opportunities [32]. The study aims to examine gender disparities in research productivity and leadership in the academic setting, focusing on how societal norms, institutional practices, and cultural expectations disadvantage women researchers. In addition, the study sought to identify actionable strategies to support women researchers in overcoming these barriers and achieving their full potential within the scientific community.

2 Methods

Like our previous studies, we adopted an academic literacies perspective that considers the influence of context, culture, and genre [33, 34]. However, in contrast to our previous studies, we employed the social dominance theory to further investigate our previous findings based on the preference theory [35, 36]. The social dominance theory recognizes the hierarchical positioning of social groups and acknowledges that members of dominant groups within this hierarchy may have disproportionate access to positive social value [37, 38]. This theory acknowledges that group-based deprivation is perpetuated by systemic institutional and individual discrimination, leading to unequal distribution of resources [39]. Additionally, unified societal ideologies encompassing attitudes, beliefs, stereotypes, and values shape individual behaviors, establish new practices, dictate institutional norms, and reinforce existing hierarchies [39]. The theory also recognizes the embedded factors within social systems that sustain unequal group-based social relations [37, 39].

Given that Nigeria is a heavily patriarchal society characterized by deeply ingrained gender norms and inequalities that influence family structures, gender roles, social expectations, and power dynamics [40], we believe that the social dominance theory is particularly relevant for exploring the contextual factors contributing to gender inequality in health research organizations in Nigeria. Men hold primary power and authority as primary breadwinners and decision-makers, while women are relegated to subordinate roles with domestic and caregiving responsibilities [41]. 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 recognizes the struggles individuals may face in trying to maintain social order and yet push against the institutions of the social orders that are seemingly set up to protect them [42].

2.1 Study design

This was a phenomenological study that interrogated the findings of a mixed methods study that aimed to identify the opportunities and strategies to enhance women's representation in scientific research in West Africa with a focus on Nigeria. The interrogated study was conducted between June 2020 and May 2023. It started by exploring the obstacles impeding the career advancement of women researchers in five West African countries (Ghana, Senegal, Burkina Faso, Niger, and Mali) [5]. Next, the study delved into the perspectives of researchers regarding gender inequalities and disparities in the career progression and trajectory of medical and dental researchers in Nigeria [6]. The study also conducted a bibliometric analysis of the gender differences in the research productivity of dentistry and oral sciences researchers in Nigeria [43]. The emerging themes from these three studies were interrogated by the current study.

2.2 Study site

The study was conducted in Nigeria with a particular emphasis on institutions that host both medical and dental schools.

2.3 Study participants

The interrogation was conducted with senior medical and dental women faculty members from universities in Nigeria, who had held or were currently holding managerial positions (Heads of Departments or Units, Vice-Deans, Deans, Deputy Provost, Provosts, Deputy Vice Chancellors, and Vice Chancellors) in any university hosting dental or medical schools in Nigeria. These individuals have extensive experience and historical perspective on gender disparities in Nigerian academia, and their managerial positions provide insights into institutional practices and systemic barriers affecting gender equality in research productivity and leadership. This makes their perspectives valuable for identifying actionable strategies to promote gender equality.

Participants were required to have proficiency in reading and communicating in the English language and identify themselves as academics in the fields of health, medical, or dental education. They also had to be actively involved in promoting, designing, conducting, and disseminating biomedical, clinical, and socio-epidemiological research in Nigeria. All participants had to be residents of Nigeria. Invited participants who did not return a signed informed consent form were not recruited for the study.

2.4 Sample size

A list of 20 women academics who met the inclusion criteria was generated by the study's principal investigator (MOF), who had a good understanding of the fields and was well-informed about senior women in leadership positions within medical and dental institutions in Nigeria.

2.5 Sampling procedure

A purposive and convenience sampling approach was employed to identify potential participants for this study. The target population consisted of women academics working in medical and dental health academic institutions in Nigeria.

who were actively involved in conducting research and held 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.

Contact was established with the 20 potential participants through phone calls, emails, or messaging platforms such as WhatsApp. During these communications, the purpose and objectives of the study were explained, and the potential participants were invited to take part in an in-depth interview. Out of the 20 potential participants, eight individuals provided their consent 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 filled out and returned, the interviewee was officially enrolled as a study participant.

2.6 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. Fourteen open-ended questions were developed to explore six themes. The six themes were generated from the study findings of three publications from the larger study conducted by the study team [5, 6, 43]. The themes and the questions are highlighted in Table 1.

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

2.7 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 analyzed to identify emergent themes.

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

Social dominance theory was utilized to understand the ingrained patterns of male dominance in Nigerian research institutions and to explore gender disparities in medical and dental research. The theory guided the coding and analysis by providing a structured approach to identify how institutional practices reinforce gender hierarchies and the impact of these practices on women researchers' career progression.

Data were coded for instances of institutional practices that favour male dominance, suggestions on overcoming male dominance and fostering gender equality, women leadership and advocacy in promoting gender equality, instances of higher citation rates for female-authored publications, for examples of male researchers' engagement in mentorship and networking, and reasons for females listing as first authors.

To streamline the analysis, the focus was solely on the data pertinent to answering the research questions explored shown in Table 1 [44]. The analysis focused on identifying patterns that reflect the maintenance of male-dominated hierarchies and how these practices are normalized within institutions; the role of women in challenging the status quo and driving institutional changes towards equality; understanding the factors contributing to higher quality publications by women, considering possible biases and structural challenges; assessing how male dominance in senior academic roles has been sustained; and highlighting how cultural and institutional factors position women in junior roles in ways that affect their career advancement. Related themes 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.

Table 1 In-depth discussion guide

S.no	Themes	Probing questions
1	Ingrained patterns of institutionalized male dominance in research institutions	<p>A. Do you agree with male dominance in the health research field, and what are the reasons for your position?</p> <p>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?</p> <p>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?</p>
2	Hopes for a changing narrative on gender equality in research	<p>A. What are your perspectives on the impact of institutionalised male dominance in research institutions, and how can we change this?</p> <p>B. How has gender skewness in the medical and dental research institution affected access to grants?</p> <p>C. How has gender skewness in the medical and dental research institution affected rates of manuscript publication?</p>
3	Women driving the conscience for change	<p>A. How valid and applicable is this statement in the medical and dental research institute, and explain your perspectives, please?</p> <p>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?</p>
4	Female dental authors had a significantly higher number of citations than men, suggesting higher quality publication	<p>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?</p> <p>B. How can you explain this finding?</p>
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	<p>A. What are your perspectives about these findings, and how can you explain the findings?</p> <p>B. Do you perceive there may be any cultural nuances that may explain these findings?</p>
6	A significantly higher percentage of females listed as first authors suggests that female dental researchers in Nigeria play more junior roles	<p>A. What are your perspectives about this finding, and how can you explain the finding?</p> <p>B. Do you perceive there may be any cultural nuances that may explain these findings?</p>

3 Results

The study recruited eight participants. The sample size was judged to be adequate to generate rich information as the focus on key concepts and themes identified from previous research enabled we researchers to gather sufficient data to address the research questions without needing a larger number of participants. The complexity and depth of the interviews provided comprehensive insights into the themes studied. Saturation of information was reached while working with this homogeneous group of study participants as responses from participants began to repeat key themes and ideas.

The study participants were all older than 40 years, had been working in the medical and dental academia in Nigeria for over 20 years at the time the interviews and were all working in Southern Nigeria.

Four themes emerged from the deductive analysis conducted namely: (1) patterns of male dominance in research and academic institutions, (2) gender disparities in women's entry into research and academic institutions, (3) enabling environment and tools to enhance women advancement into managerial positions, and (4) gender differentials in citations, article listing, collaboration, mentorship, networking, and partnership among academics.

3.1 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 [45]. 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 men 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 men are the ones who have been in the profession for some time and the women are now trying to catch up. Now we are beginning to have womervice-chancellors, women Provosts, and more women Deans and Heads of Departments. We are starting to have women Provosts and Deputy Provosts in some medical institutions. We are gradually getting there (50 years old, Professor)

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 [46]. 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, then definitely they will be more in leadership positions. I think where we should start to make sure that more girls come to secondary school, and more girls come into the university (49 years old, Professor)

Will the men now vote for the women even if she is nominated? They may not. We have had instances where there were women candidates, but the majority voted for the men. (64 years old, Professor)

They feel that women that are in authority may not do well and that it's the men that can do it. I believe in the future things will change (60 years old, Dr.)

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, women researchers continue to be underrepresented in receiving awards. This may be attributed to fewer women 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 women, 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 men (50 years old, Professor)

The men tend to be more adventurous than women, engage with international research collaboration more readily, and are more positively disposed to negative comments than women. Women, being more emotional may fear rejection more than men (49 years old, Professor).

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 women because a lot of granting agencies try to encourage women participants. Most research grants require you to have a gender balance for the team. So, I think that the narrative is also changing (52 years old, Professor)

3.2 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 emphasized 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. In my class, we were 19 undergraduates and only 5 of us were girls. So now I don't expect that I get out of school and the pattern is going to be different. (49 years old, Professor)

Dentistry has fewer specialties with fewer work hours. You know women will like specialties that are more time flexible for homecare. (Professor)

Now and then, women take time off during which time their men counterparts continue to be productive. I also think that maybe most employers or maybe most research organizations are skewed toward the men. (52 years old, Professor)

3.3 Enabling environment and tools to enhance women advancement into managerial positions

Respondents emphasized 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 women academics to serve as mentors for younger women, despite the limited availability of senior women role models and concerns about work-life balance. They also noted the importance of both formal and informal mentoring support for young women pursuing surgical sub-specialization. The workplace should enable women to aspire to their desired roles while recognizing and valuing their societal contributions. Here are some representative quotes that reflect these perspectives:

I think the older women 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 a lot of women do not have that mentoring. (Professor)

I think women in managerial positions should be able to push for an enabling environment for the younger women who probably have a lot of distractions or other real-life situations based around the workplace. Women should also champion each other, which supports women to achieve despite their family life. (52 years old, Professor)

Women academics should be able to come to the workplace with their babies as this can encourage increased productivity for young women 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 men (52 years old, Professor)

3.4 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 [47, 48]. Moreover, it plays a crucial role in career advancement, garnering recognition, and securing speaking engagements at conferences [49]. Additionally, the number of citations received by an article reflects the quality and relevance of the research content and publications [50]. While previous studies have revealed disparities in citation rates between men and women dental authors and researchers [51], our research findings demonstrate that women dental researchers have a significantly higher number of citations compared to men [43]. Respondents attribute this trend to the recent changing narratives within academia, the increasing presence of women 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 a lot more of the women dentists are in the institution and do academics and researchers. So definitely, they are going to publish more and get more citations comparatively (Professor).

Women in dentistry and medicine are highly competitive and we aim very high. In terms of publication, for me, I'm not just publishing for numbers, I publish to get my article in a very high impact journal (50 years old, Dr).

Our research findings also indicated that men have a slightly higher percentage of articles listing, international and domestic collaboration and partnerships [43]. 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 time in the field of research than women and thereby, cultivated 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 women researchers to defer to their men spouse before initiating partnership and collaboration with men poses challenges that are usually not well acknowledged or recognized. 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 international collaborations and find new international partnerships because of the fear of being rejected (67 years old, Professor).

Men are more fluid, so engaging in collaborations and partnerships might be easier (52 years old, Professor)

You have a home, you have a husband, you have a child, you have things to do then you're partnering with me. Can you imagine a partnership with men for instance? Some Nigerian 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 to and take permission from for such engagements (Professor)

Our research noted that there were more women researchers listed as first authors and this may reflect a lot of more junior roles for women researchers in dental sciences in Nigeria, and more males playing the lead role as mentors [43]. A few of the respondents did not agree that having a higher percentage of women listed as first authors suggests that dental researchers in Nigeria play more junior roles as shown in these quotes:

First authorship is about the person who initiated the study. We need to look at whether there is also a definite trend or pattern in authorship. Sometimes, professors are not the last authors but the first because they conceptualized the study (52 years old, Professor).

The first authorship does not necessarily mean you're junior. I still write first authorship papers even as a professor (67 years old, Professor)

4 Discussion

The current study makes several significant contributions to the existing knowledge on gender disparities in research productivity and academic leadership within the medical and dental academia in Nigeria. We identified three new narratives that offer fresh insights into the experiences and challenges faced by dental science researchers in Nigeria. First, the study highlights that women researchers are less inclined to initiate international collaborations resulting from unique challenges such as poor spousal support for international collaborations. Second, is the evidence from the interviews where women questioned their achievements despite the evidence of their success, suggesting that these internalized beliefs may be a significant barrier to career advancement for women. Third is the reinforced notion of the prevailing male dominance in research academic productivity and leadership within the medical and dental academia in Nigeria, although there is a perceived change in the narrative for dentists for various reasons.

This is the first study exploring institutional gender dynamics among medical and dental researchers in Nigeria. One of the strengths of this study is the use of robust theoretical frameworks – literacies perspective and the Social Dominance Theory—for the study design and analysis. This allows for a comprehensive analysis of gender inequalities within the specific cultural and institutional context of Nigeria. The focus on Nigeria, a patriarchal society with deeply ingrained gender norms, may facilitate the translation of the strategies and policy recommendations aimed at creating a more equitable and supportive environment for women researchers, which can inform future interventions.

The current study, however, has a few limitations. With only eight participants, the sample size is relatively small. We, however, recognise that in-depth interview data are often complex, the research participants are extremely busy and so the research was designed to collect rich, detailed data that offer insights into participants' understandings, accounts, perceptions, and interpretations of the research findings. Thus, the study exploration was specific, targeted, and organized around key concepts. In addition, the study participants were all senior women researchers from Southern Nigeria. This homogeneity might not capture the experiences of women researchers from other regions of Nigeria or those at different career stages. Furthermore, the participants who agreed to take part in the study might have had a particular interest or experience related to gender inequality, which could bias the results. While the study focuses on gender inequalities in research productivity and career advancement, it might not fully explore other dimensions of gender inequality, such as work-life balance or informal institutional practices. Despite these limitations, the study provides programmatic information that can inform policies and interventions aimed at addressing gender inequalities in research institutions, particularly in Southern Nigeria.

First, the team's earlier research findings suggested that although there is a prevailing male dominance in research academic productivity and leadership within the medical and dental academia in Nigeria, this narrative is gradually changing [5] as evidence in the dental field seems to suggest—there were significantly more women than men first authors suggesting a higher number of female than male junior researchers [43]. On the other hand, the higher number of men involved in international collaborative research suggests there are a higher number of men than women senior researchers [43].

In the current study, there was no consensus among the interviewees about the higher number of women first authors and the higher number of men involved in international collaborative research reflects junior or senior gender roles in the academia in Nigeria. Rather, the interviewees seem to reinforce the notion of sustained male dominance in research productivity and the medical and dental academic leadership in the country despite the observations from the bibliometric analysis of research productivity of dentists. The interviews also suggest a broader and more nuanced shift in the complex discourse surrounding gender and research productivity [52] when reflecting on the findings of the bibliometric analysis of gender differences in the research productivity in the field of dental sciences.

First, interviewees suggested that the dental profession allows more research time for women during working hours compared to the medical profession. This reflection was not supported by prior evidence that indicated that women dentists are required to dedicate as much time to their work as men dentists [53]. What we may be observing in Nigeria is the predicted gender transition in the medical and dental workforce, with the transition occurring earlier in the dental workforce compared to the medical workforce [54]. Furthermore, dentistry is classified as a caring profession and tends to have a higher proportion of women professionals [55]. Future research interrogations may want to explore why higher researcher productivity of women than men in the field of dental sciences in Nigeria.

Second, respondents perceived that the better-paying opportunities outside of the research institution leads to fewer men within the academia, thereby explaining the higher research productivity of women than men in the academia. Previous studies have indicated that a significantly larger percentage of women dentists work for a salary at universities and government institutions, while a higher proportion of men engage in specialized private practice [56–58]. In addition, women, in general, are more comfortable with lower-paying job opportunities, and may be less driven by the pursuit of higher income [59, 60]. The cultural need for women academia to prioritize family responsibilities, and the societal expectation for men to serve as breadwinners in a patriarchal society like Nigeria [43] may explain the perception shared by the study respondents. It is important to conduct studies to explore the reasons for the gender difference in research productivity and international collaborations observed in the field of dental science in Nigeria.

Third, respondents noted that women 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 men research collaborators. While there is no specific research on gender differences in the fear of rejection during collaborative research, there is suggestive evidence that women may be more sensitive to rejection due to their heightened sensitivity to social stimuli compared to men [61].

Persistent self-doubt and a fear of being exposed as a fraud despite achievements, known as imposter syndrome [62], is higher among women than men [63]. There is, however, a report that imposter syndrome may be more common among men than women [64], and there is a report that there are no gender differences [65]. There is, however, the possibility of gender predilection for imposter syndrome because of its association with high neuroticism, low self-esteem, fear, inferiority, perfectionism, and self-deprecation [66–69], which are traits that are more prevalent in women than men [70–75]. Gender-specific differences might occur in cultures where women tend to have lower self-esteem and are less valued than men, as lower self-esteem correlates with imposter syndrome [69, 76]. When it affects women, imposter syndrome can hinder women from fully engaging in collaborative research settings.

There is very little known about how prevalent imposter syndrome is in the medical and dental profession, how it manifests in different cultures, and how to effectively tackle the syndrome among women. The outcome of this study is also a possible pointer to the imposter syndrome among women researchers in Nigeria. That the women interviewees questioned the achievements of women researchers despite the evidence of their objective evidence of success in dental science, suggests that these internalized beliefs of women being less capable of higher research productivity than men may be a significant barrier to career advancement for women in Nigeria. Further studies are needed to explore this phenomenon among women researchers in general, and how this phenomenon may explain women researchers' involvement in collaborative research in Nigeria.

In addition, the identified need for women academics to seek their men partners' permission to participate in collaborative research involving men is a novel perspective not previously reported in the literature. A previous study had highlighted that men in Kenya had noted the need for their women spouse to seek permission or support from them to participate in research [77]. The current insight into the low participation of women academics in collaborative research in Nigeria may reflect this household dynamics, which extends into the professional lives of women. There is little known about how prevalent this couple's relational dynamics are among women academics, how this dynamic impacts women's professional growth, and how it limits the opportunities for women academics' career advancement. This unexplored route of perpetuating gender inequality in academic and research settings needs to be explored in future research. In addition, further investigation into other cultural and societal contributing factors to the limited research productivity of women in patriarchal societies is needed.

Fourth, it is important to acknowledge that while women's efforts for gender equality in research institutions have shown some progress, more substantial actions are required, particularly at the lower education level where access to education for girls is compromised. In Nigeria, there is a significant gender disparity in terms of enrollment, retention, and completion of basic education for girls. Despite the existence of policies aimed at mitigating the risks associated with poor educational opportunities for girls, such as the Child Rights Act of 2003, the implementation of these policies remains inadequate [78]. Promoting girls' education can drive gender equality in research productivity, as it can enhance women's engagement in the research enterprise. Efforts should be directed towards addressing the social, economic, and cultural factors barriers that hinder girls' access to education.

Finally, the four themes that emerged from the study are interconnected and influence one another. Male dominance in research and academic institutions significantly shapes gender inequality by influencing barriers to entry, limiting supportive environments, and contributing to disparities in research productivity and collaboration [79]. Hierarchical structures and institutional practices that favour men often make it harder for women to balance work and family responsibilities, thereby reducing their participation in collaborative research [80]. The absence of enabling

environments, such as mentorship and flexible work policies, further hinders women's advancement [80]. Conversely, fostering supportive environments can help counteract these inequalities by improving women's access to research opportunities, enhancing career progression, and promoting leadership roles in academia [81].

This implies that addressing gender inequality in academia requires a multi-faceted approach that not only challenges male dominance but also actively promotes inclusive institutional practices, supportive policies, and mentorship frameworks. This can be achieved by institutionalizing gender equity metrics that systematically track gender ratios in academic leadership positions, gender-disaggregated data on publication outputs, authorship patterns, citation counts, grant award rates, funding allocations, and participation in international collaborations, as done in some academic institutions [82]. These numbers must be complemented by qualitative assessments of workplace climate, mentorship access, and perceived barriers to research partnerships as demonstrated by a prior study [83]. Exit interviews with women who leave academia will offer further insight into systemic push factors [84]. As a practical step, a national dashboard overseen by the National Universities Commission could publicly report these metrics, creating incentives for transparency and accountability.

Establishing accountability is equally essential. The Centre for Gender Studies or its equivalent in the various Universities should have the mandate to promote gender equality in the institutions. Women's academic support networks could serve as watchdogs, monitoring compliance and providing advocacy. Granting agencies can further promote gender accountability by requiring gender-balanced research teams and gender-sensitive tracking outcomes.

Culturally, the system must be reoriented through targeted mentorship programs, including national networks that pair senior women with early-career researchers. Men should also be incentivized to act as sponsors and allies. Mandatory training on unconscious bias, imposter syndrome, and inclusive leadership practices would help transform academic culture and reduce internalized barriers. In addition, expanding systemic support for women through targeted funding and family-inclusive policies and investing in the educational pipeline to empower girls in science, technology, engineering, and mathematics would help drive the gender equality agenda [85].

Furthermore, long-term success depends on rigorous monitoring and research. National audits conducted every five years by the Nigeria University Commission should assess progress across key indicators, including leadership representation, research output, and equitable access to funding. These efforts should be complemented by a robust research agenda funding longitudinal studies on subjects like imposter syndrome, spousal dynamics, and cultural barriers within the Nigeria academia.

5 Conclusion

The study identified that male dominance in research productivity and leadership within medical and dental research institutions in Nigeria persists. This informs gender disparities in women's entry into research and academic institutions and shapes the environment, thereby creating barriers to women's advancement into leadership roles and research productivity. Recognising the complexity of the interconnectedness of these factors facilitates the creation of multi-layered strategies addressing patriarchal norms, institutional biases, and promoting mentorship. This can enhance women's participation in research, improve their productivity, and increase their representation in leadership roles, ultimately fostering a more equitable academic landscape. Further research is needed to investigate previously unidentified factors influencing perceptions about gender inequality in the medical and dental academia in Nigeria, including the possible role of imposter syndrome in shaping these perspectives.

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Author 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.

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Data availability The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate Ethical approval of the current study was obtained from the Human Research Ethics Committee at the 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.

Competing interests The authors declare no competing interests.

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