

Acceptability and Determinants of using Male Hormonal Contraceptives: A Systematic Review from a Gender Perspective

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ABSTRACT

The development of male hormonal contraceptives (MHCs) is underway, and they may be available soon. Gender norms in family planning and predictors of use of MHCs need to be considered when addressing MHC promotion and adherence strategies. For this reason, an evaluation of the acceptability factors of MHC methods in the population is carried out from a gender perspective. A systematic review following the PRISMA 2009 checklist has been performed. Articles indexed in PubMed, EMBASE, Scopus, PsycINFO, Web of Science and CUIDEN databases were included. Twenty-nine original articles were evaluated. Most evidence comes from Europe and North America. There is a high acceptability of MHCs in both sexes (reaching more than 70%). There are differences between countries and cultures. The main factors influencing willingness to use MHCs are: side effects; route of administration (MHC pill preferred by most men and injections by most women); frequency of administration (influenced by the previous factors); level of education and health behaviours; religion; perception of shared responsibility; perception of masculinity; and impaired sexual function/desire. Efficacy has not been sufficiently explored. Gender-dependent attitudes towards contraceptive responsibility need to be further explored, so that policies that favour equal reproductive rights can be formulated once MHCs are marketed.

Key words: Acceptability, gender and health, MHC methods.

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BACKGROUND

Access to safe and effective contraception is a major concern for most women and men who participate in sexual behaviour that can result in unwanted pregnancy and who either do not wish a pregnancy or want to postpone it¹. Women of reproductive age (i.e., 15-49 years old, according to the WHO²) who do not wish a pregnancy and who do not want, or cannot, use hormonal contraception need to have access to contraception methods that can be used by their sex partners. The contraceptive options available for men have not changed for decades. The options on the market for men remain the same: (a) male condoms, which have a high rate of failure in typical use (13%)³ and low acceptability as a long-term contraceptive method and, (b) vasectomy, an invasive method not widely accepted because it is difficult to reverse⁴⁻⁶. Although research into male hormonal contraceptives (MHCs) began in the 1970s, the development of an effective MHC is yet to be finalized⁷. The obstacles encountered in their development have been bio-technical (e.g., bio-technical difficulties to develop a bio-chemical that can guarantee effectiveness without major side effects), financial (e.g., unavailability of money to fund the development of a MHC and the clinical trials), and social (e.g., difficulties to convince decision-makers and research institutions of the need to develop a MHC)⁸.

Despite the challenges mentioned above, ongoing research suggests that MHCs may be viable, effective and acceptable^{4,9-11}. For instance, clinical trials have shown that the combined administration of testosterone with a progestin is more efficient than testosterone alone; and, new regimens using testosterone in combination with other

molecules are being tested^{4,12}. Specifically, different studies are being conducted on different routes of administration of MHCs, such as pills, injections, implants and gels^{4,12-14}. In fact, for the development of the first MHC pill, parallel studies using different molecules are in advanced stages. In the first phase of the clinical trial, these studies have shown promising results¹⁵⁻¹⁶.

Thus, it seems that a MHC might be available for commercialization in the near future, giving men an effective and reversible option for contraception. Furthermore, a MHC could be a tool for establishing the equality of responsibilities and rights related to family planning among individuals who participate in sexual behaviour that can result in pregnancy. As the burden of contraception presently falls more on women, MHCs may help couples who wish to achieve shared contraceptive responsibility¹⁷⁻¹⁸.

However, the circumstances and characteristics under which MHCs will be acceptable to both men and women must be considered by health service providers in planning appropriate strategies to promote their quantitative and qualitative use as a contraceptive option. Historically, the responsibility for contraception has been assigned to women through the continued development of female contraceptive methods¹⁸⁻¹⁹. On this path, inequalities in factors related to gender and contraception play an important role in the ultimate inclusion of men in family planning. To our knowledge, no systematic review study has evaluated the gendered aspects of MHC acceptability.

This systematic review aims to understand the drivers of acceptability and use of MHC methods for women and men of reproductive age from a gender perspective. To achieve this aim, this review specifically explored: (a) the results reported on the acceptability of a MHC for men and women of reproductive age; (b) the sociodemographic variables that may influence the theoretical acceptability of MHC; and (c) women's and men's perceptions of the possible change of gender role in contraceptive

responsibility. In addition, the temporality of people's attitudes towards MHC use (the evolution over time) is one of the dimensions considered in the present review.

METHODS

Study design

This study is a systematic review that follows the checklist for Systematic Review and Meta-Analyses (PRISMA)²⁰.

Protocol registration

The protocol of this review is registered in the PROSPERO International prospective register of systematic reviews under registration number: CRD42020210015²¹.

Inclusion criteria

The inclusion criteria for this review were: scientific articles included in peer-reviewed journals reporting original findings on research into the acceptability or intent to use MHCs and predictors of potential MHC use by any route of administration involving female and male human subjects of reproductive age.

Participants (P)

Participants included all women and men of reproductive age (15-49 years old for women as defined by the WHO (2006)² and 15+ years old for men) who have sexual relationships with the opposite sex and who have been asked about the acceptability of a potential MHC. In addition, men participating in clinical trials to test a MHC and who were asked about the acceptability of the method at any stage of the study, as well as their female partners, are included.

Interventions (I)

MHCs exploit the classic cycle of endocrine feedback to suppress spermatogenesis. Any questionnaires or interviews on the acceptability of any route of administration of a MHC under any regimen using a steroid hormone given to a man (actual or theoretical) were considered for this review. The acceptability of a MHC is understood to mean the willingness to use it for male fertility control.

Outcomes (O)

The following are identified as the primary results: (a) results related to the acceptability of the method (including side effects, routes and frequency of administration, efficacy, cost); (b) results related to preferences according to personal characteristics (age, education, religion, relationship status, father/motherhood, ethnicity); (c) results related to perceptions of behaviour of women and towards contraceptive responsibility; (d) results related to women's and men's perceptions of masculinity in relation to MHC use.

Exclusion criteria

This review excluded meta-analyses, systematic reviews, unpublished papers and grey literature. No date limitations were set. Articles published in languages other than English, French, Portuguese or Spanish were excluded. Articles that have a "poor qualification" after the evaluation described in the *Quality Assessment* section were excluded.

Search strategy

A search for publications was conducted from June 2019 to March 2020. The PubMed, EMBASE, Scopus, PsycINFO, Web of Science and CUIDEN databases were screened for publications. Booleans AND and OR were used to generate the search strings. Search terms focused on male contraception, male hormonal contraception and male hormonal pill (see search strategy in *Table 1* [*near here*]).

Two members of the team, consulting a third party in case of disagreement, independently conducted the search and selection of the studies in the review. The results of each search were exported from the databases and imported into the reference manager Mendeley© (Elsevier Pub., Amsterdam, Netherlands). Firstly, the titles of all results were read and duplicates were excluded. Secondly, the titles and abstracts were read and irrelevant articles were discarded. Subsequently, the full texts of the articles from the second stage were read. Finally, a third stage involved searching for new articles among the bibliographic references of the articles included in the second stage.

Data extraction

A basic data extraction table, adapted from the Cochrane Collaboration Data Collection Form for Intervention Reviews (i.e. RCTs and non-RCTs)²² was created in MS Excel© (Microsoft, Washington, USA) and applied to all the selected articles. This spreadsheet included basic data about the publications such as: title, first and last authors, study aim, study site, sample size by sex, demographics of participants, and methodology. In addition to the information extracted from the articles, the authors searched the first and last authors on their institutions' websites to determine their gender (i.e., their gender, as assumed by us, based on their first names and pronouns) with the aim to map the contribution of women, men and non-binary scientists to MHC research.

Regarding the findings reported in each selected article, data were extracted on:

- (a) the percentage/range of acceptability or willingness to use a MHC (if the data were available);
- (b) opinions on factors that may affect the possible adoption of a MHC;
- (c) significant results in multivariate analysis between factors that could influence MHC acceptability (route of administration, side effects, effectiveness), as well as with possible confounding variables (age, education, socio-economic status, religion);
- (d) social determinants of health that may influence the acceptance of taking MHCs (reproductive

health policies, gender roles, health beliefs, perceived contraceptive responsibility). For studies that were described in more than one article, the data were extracted from all documents.

Quality assessment

Non-experimental study designs were independently assessed for risk of bias by the lead investigator and one of the other reviewers using design-specific risk-of-bias critical appraisal tools: a) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies from the National Heart, Lung, and Blood Institute (NHLBI, February)²³ (see *Table 2 [near here]*) and b) Critical Appraisal Skills Program (CASP) Qualitative Checklist for qualitative, case study and evaluation designs²⁴ (see *Table 3 [near here]*). Experimental study designs were independently assessed for risk of bias by the lead investigator and another reviewer including randomized controlled trials using the Cochrane Collaboration's tool²⁵ (see *Table 4 [near here]*) and quasi-experimental studies with the Critical Appraisal Tool for Quasi-experimental Studies²⁶ (see *Table 5 [near here]*) for assessing risk of bias. These tools were selected according to the type of articles selected for this review. Using the criteria of the checklists, the articles obtained a good result (more than 50% of the criteria are met), fair qualification (50% of criteria are met) or poor qualification (less than 50% of the criteria met).

Sex, gender and sexual orientation

As stated, the present review was conducted based on a gender perspective. For the purpose of this study, gender refers to socially perceived and constructed behaviours, roles, norms of women, men, girls, boys and gender-diverse people. Gender has an effect on how people perceive themselves and are perceived by society; it also influences the distribution and allocation of resources and power²⁷. Sex is defined as biological

attributes, such as physiological and physical characteristics, that are inherent to being born a female or a male²⁷.

Sexual orientation was not considered for the review so that all populations were included. Also, in the context of this study, the words “women” and “men” refer to individuals who, irrespective of their sexual orientation or gender identity, could use and benefit from contraception developed for persons born with female genitalia or for male genitalia, respectively, and who participate in sexual behaviour that can result in pregnancy.

RESULTS

Studies selection

The initial search produced a total of 10,798 articles. Among them, 8,083 duplicates were excluded, leaving 2,715 results. After reading the articles’ titles and summaries, 2,658 articles were excluded. The remaining 57 articles were read in full. A search among the references of the 57 articles selected in this phase found seven new articles. Finally, 29 articles were eligible and were included in the systematic review. The study flow is shown in [*Figure 1 near here*]. The included studies were narratively synthesized and presented.

Characteristics of MHC acceptability research

In the 29 articles selected, 19 articles presented data using a quantitative observational methodology, three papers were qualitative, another three papers used a mixed methodology, two articles were experimental studies and two other papers were quasi-experimental studies. No articles were removed due to methodological bias (poor qualification).

Regarding the main scope of the articles included in this review, nine articles presented data on the acceptability of MHC (unspecified form), 10 addressed the acceptability of a MHC pill, and six explored the acceptability of MHC injection. The acceptability of MHC gel alone, of a combination of MHC gel with MHC implant, of a combination of MHC gel with MHC injection, and of a combination of MHC pill with MHC injection were addressed by one article each.

As for the diversity of the population who participated in the 29 selected articles, they belong to a total of 23 countries. The acceptability of MHCs has mostly been explored in the United States of America, United Kingdom (12 articles each) and in China (five articles). Across the 29 papers, 59% of the samples were exclusively male, 38% of the samples were mixed, and 3% were exclusively female. Regarding the gender of the first author (as assumed by authors of this review), there was no disparity in gender representation amongst the articles' first authors: 14 and 14 articles were first authored by women and men, respectively, while the gender of the first author of one article could not be determined. Regarding last authorship, twenty (70%) articles had men as last authors..

Acceptability of MHC

Researchers asked about the willingness to use a hypothetical MHC; or the acceptability of a (real) MHC that has been tested in clinical trials for the development of a future marketable MHC. The responses of men and women on the acceptability of the use of a MHC along with their socio-demographic characteristics are shown in *Table 6 [near here]*.

Although the acceptability of the use of a MHC for women and men varies between the results of the articles, in the majority, the acceptability of MHC in its different

forms (pill, injection, implant or gel) has been moderate and high (reaching more than 70%).

A. Product characteristics as drivers of MHC acceptability

Side effects. Over time, tolerance to the possible side effects of a MHC has been the main predictor of intent to use for men and a major concern for women. *Table 7 [near here]* shows the evidence found in the articles included in this review in which side effects act as a condition of acceptability of a MHC. In clinical trials^{6,44,46,48}, the side effects of the real MHCs (irritability or emotional lability, increase appetite and energy, the appearance of acne or papules, increased sweating, painful injections, increased blood cholesterol) appear to be better tolerated than the side effects included in some of the hypothetical MHC described in the studies conducted in the past 40 years and across socio-culturally different countries (potentially serious long-term health risks and short-term effects on users' emotions and behaviour)^{18,35,40,52-53}.

Efficacy. Efficacy was the second most important factor influencing willingness to take a MHC. For instance, in 1981, a study conducted among 480 adolescents of both sexes living in the USA⁴⁰ concluded that the pills' efficacy was one of the two main factors impacting their willingness to use MHC. In 2006, in a randomized controlled trial (RCT), 17 Italian men (from a sample of 44 men) considered a delay of 12 weeks in achieving contraceptive efficacy of the injectable MHC method unacceptable³⁴. Other studies^{29,32,39} conducted from 1979 to 2019 suggest a medium-high level of correlation ($r = 30-83$) between the efficacy of the hypothetical MHCs and willingness to use it, and which has been stable over the past 40 years and across different regions of the world.

Routes of administration. The route of administration of a method is another determinant of use of a MHC. *Table 8 [near here]* shows the advantages and

disadvantages of each type of method and the preference for one in particular in the populations studied during the past 50 years.

Frequency of administration. The preference for a certain frequency of administration may be influenced by the side effects of the MHCs⁴⁸ or by the route of administration^{6,32}, among other factors. *Table 9 [near here]* shows the relevant findings.

Cost. For 43 British men (1998), the monthly price for a MHC pill was £5 to £10⁵³. For an injectable MHC, 31 men in Italy (2016) indicated that they would pay slightly more³⁴ than those surveyed in the UK regarding a MHC pill (between 10-20 €/month)⁶; 16 men would pay €10 a month; and three men would pay a maximum of €10; none would pay more than €20 per month³⁴. Willingness to take a pill will depend on cost and side effects for 45 Mozambican men (2019)³⁹. These findings also suggest that the cost of the hypothetical MHC is an important factor associated with the willingness to use it over time and across continents.

B. Preferences related to personal characteristics

Age. Age was not a factor associated with the acceptability of taking a MHC in several studies with diverse samples and different routes of administration such as a pill or injection^{17,34-35,39,44,48,53}. Regarding the male hormonal contraceptive pill, age was negatively correlated with the willingness to use it in a study conducted in 1979 in the USA²⁹. In the case of a MHC gel, a study carried out in the USA in 2007 showed that it was significantly associated with older men⁴⁹. The association was also significant between a MHC implant and older men in a series of studies conducted in different continents in the past 25 years³²⁻³⁸. In a recent study (2019) conducted in Mozambique (Africa), age was not associated with the level of willingness to use MHCs³⁹. Thus, with regard to the impact of age, over time, across different regions and across different routes of administration, the studies have shown conflicting results.

Socio-educational status. Balswick (1972)³⁵ showed that in the USA, level of education was positively associated with a favourable attitude towards the MHC pill. Men who were least willing to take the pill had less than 10 years of education. Heinemann et al. (2005)³² found that in France, USA, Mexico and Indonesia higher education and MHC uptake were significantly and positively correlated. In Mozambique, Vera Cruz et al. (2019)³⁹ found that 103 men with less than 12 years of schooling would never take the MHC pill, compared to only 12 men who had been in school for more than 12 years. However, in 2011 in the UK, level of education did not affect the acceptability of the MHC pill by either men or women³⁷. Overall, these results seem to indicate that people's level of education, both in men and women, has an impact on their attitudes towards the use of a MHC.

Social class was not correlated with the willingness to use a MHC pill in the USA according to Gough (1979)²⁹. However, according to Laird (1994)¹⁸, women who doubted the correct use of a MHC pill by their partner in the USA were from low-income families.

The notions and beliefs held by male college students in several countries during the 1990s predicted the likelihood of using a MHC pill while attitudes towards the female contraceptive pill, past sexual experiences and past experiences with contraception did not¹⁸. In 2009, an association between men's commitment to health behaviours and a positive attitude towards the MHC pill was shown in the UK⁴³. Thus, there is clear evidence that respondents' social status and social beliefs have an impact on their attitudes towards the use of MHC.

Religion. In a study carried out in nine countries over the past 30 years, religious objections were reflected in a significantly lower willingness to use a MHC in most countries³². Overall, 55% of Christian men and 60% of men who practise Judaism would use a new hormonal contraceptive method for men, while only 29% of Muslims and 40%

of Buddhists would (without statistical association)³⁰. In Mozambique, a recent study (2019) showed that 25% of Muslim men were unwilling to take a male pill, while only 5% of Christians would not take it³⁹.

Ethnicity. The discrepancy between three studies^{17,35,51} (one from the 1970s, and another two in the last decade) may be an indication that in multi-ethnic countries, such as the USA, there might have been an evolution concerning the effect of ethnicity on the acceptability or willingness to use MHC over the years. Studies published in 1972 and 2014 reported that African American men showed less interest than Caucasian or Asian men in using MHC^{35,51}. However, an article published in 2019 ruled out the effect of ethnicity in willingness to use MHCs¹⁷.

Relationship status, trust and parenthood. Stable relationships (e.g., living and/or married to an intimate partner, already having a child with an intimate partner) correlated positively with a high level of MHC pill acceptability in three articles^{43,52-53}. Four articles did not support this association^{17,33,38,52} (*Table 10 [near here]*). Since most of these studies were conducted from 2005 to 2019, the difference in findings likely cannot be explained by the periods in which these studies were carried out.

Two articles, both using qualitative methodology, mentioned the possible “*promiscuity*” of men if they took a MHC^{33,52}. In the USA, Marcell et al. (2005)³³ report that some women expressed concern thinking that their male partners would eliminate the possibility of impregnating other women and men might be more promiscuous. Despite concerns raised, 13 women said they would trust their partner to take a MHC³³. According to Dismore et al. (2014)⁵², UK participants also raised concerns that the use of MHC would possibly increase men’s promiscuity by facilitating patterns of irresponsible sexual behaviour (men’s statements about other men and not always about themselves).

As for parenthood, in the USA, men with fewer children were less opposed to the MHC pill (1972)³⁵. Also in the USA, according to Gough (1979)²⁹, men who wanted more children were significantly less willing to use the MHC pill. In the UK, Walker (2011)³⁷ found that men and women believed that men who were willing to take the MHC pill would have greater control over their own fatherhood. From the selected articles, there is not enough information to assess if the attitudes reported above have evolved or not in recent years.

Sexual function/sexual desire. Concerns that the new method could affect sexual desire was one of the revealed predictive factors of MHC pill use reported in several studies and over time^{32,38-39}. Participants would use a MHC if it was independent of intercourse²⁸⁻³⁰. In clinical trials, men made an overall evaluation of their sexual life as significantly higher during treatment than during recovery of spermatogenesis⁴⁵ or an increase in libido in the treatment groups⁴⁶. Only one woman did not report that their partner's erection was similar or "*harder*" than before treatment with a weekly MHC injection⁴⁵. However, this was not the case in all clinical trials, and some men even experienced a lower frequency of intercourse⁵⁰ or decreased sexual function after withdrawal of the method (not associated with method acceptability)⁴⁹ (*Table 11 [near here]*).

Overall, nine of the 28 women partaking in a study conducted in the UK reported that their own enjoyment of sex had increased by not using the female contraceptive pill and that they liked to be relieved of the responsibility for contraception⁶.

C. Perception of responsibility for contraception

According to Marsiglio (1985)³⁶, men may have attributed the responsibility for contraception to women because female contraceptives are more effective than available male contraceptive methods. Women's responsibility for contraception has been

highlighted in several articles^{38-39,41-42}. However, other authors found that the responsibility rested with both spouses^{28,53} (*Table 12 [near here]*).

In 1998 in the UK, among men who stated that the decision to use contraception was shared, there was a high willingness and preference to use the MHC pill⁵³. Also, in 2014 in the UK, 12 men interviewed acknowledged a change in gender role associated with a “*normalization of equality in contraceptive decision-making*” through the possibility of a MHC pill⁵². Overall, going from the oldest to the newest studies in terms of years of publication, there is an indication that male and female participants have significantly evolved from perceiving contraception as a women’s only issue to seeing it as an issue for both sexes.

D. Masculinities

Some time ago, Balswick (1972)³⁵ suggested that any re-education attempt on male contraception should take into account the fear among lower socio-economic status men of emasculation. More than 30 years later, Marcell et al. (2005)³³ found that seven men (N = 15) identified hormonal contraception as only for women. In addition, five of the 15 men reported that MHCs were a threat to their masculinity because they considered hormonal control of fertility to be female behaviour. In a qualitative study by Walker (2011)³⁷, three male participants (N = 54) associated contraceptive pill taking with femininity and it was suggested that the word pill immediately evoked a method used by women. In the same vein, Dismore et al. (2014)⁵² concluded that the feminine connotation of a male pill was still present in male discourse, although the men who expressed it did so with personal detachment (as an observation towards other men). According to Peterson et al. (2019)¹⁷, greater avoidance of femininity was associated with a lower behavioural willingness to take a MHC, such that taking a MHC was considered a threat to masculinity as had been seen many years earlier. Thus, the perception that masculinity

is somehow “incompatible” with the uptake of a MHC persists among a considerable number of men over the years.

Potential users of the MHC pill were described as more introspective, emotionally open, pro-social and were significantly described as more favourable to family planning and abortion than potential non-users of the MHC pill who were considered more assertive, conventional and selfish²⁹. In this regard, 101 women whose husbands expressed doubts about using the MHC pill rated their husbands as “*aggressive*”²⁹, while 65 women whose husbands said they would take the MHC pill rated them as “*concerned and sensitive*”²⁹. Men who volunteered to participate in a RCT for the development of MHC injection were in more equal and less patriarchal relationships than others⁴⁴. In China, it is uncommon for men to talk about contraception outside the home and, if necessary, women lie to maintain their husbands’ “manliness”⁴⁶. Some Chinese policymakers opposed the introduction and promotion of a male hormone method because they felt that it could cause social problems such as rape, paid sex and extramarital pregnancies, as well as a higher workload for family planning providers and greater costs to the system⁴⁶.

DISCUSSION

This systematic review reports the findings of peer-reviewed research on the attitudes of more than 18,000 people towards the acceptability of MHCs. Most of the research eligible for this review was conducted in Europe (40%) and in North America (21.7%), followed by Pacific (15%), South East Asia (10%), South America (6.7%), Africa (5%) and Central America (1.7%).

The stability of the participants’ attitudes towards MHCs can be considered high, with only two exceptions: who the perceived responsibility for contraception falls on (men vs women) and the ethnicity effect. In countries such as the USA, Canada and those

of Western Europe, the evolution on the ethnicity effect may be linked to the reduction in the educational and socio-economic differences between the different ethnic groups that make up the populations of these nations⁵⁴. The evolution on the responsibility perspective might be associated with the rising prevalence of feminist views and the values of gender equity and shared responsibility for family issues among women and men^{53,55}. While the greater burden of unplanned pregnancy still lies largely on women^{53,55}, over the past 30 years laws and different measures, applied more or less effectively depending on the country, have been adopted to encourage the male partner to contribute more to early age childcare.

In more than half of the articles where men's acceptability of MHC is reported, rates of acceptability are above 55%, reaching even 70% in some European countries such as Germany^{17,28-29,31-32,34,38,46-48}. For a MHC pill specifically, reported rates of acceptability range from a minimum of 28.9% in Indonesia to a maximum of 83.0% in South Africa^{32,38}. Overall, if the time (years) dimension is taken into account, the rates of acceptability have been growing over time, irrespective of the continent or region of the study. Regarding women, the articles report acceptability as high as 90% in South Africa and the UK⁴¹. In addition, this acceptability towards taking a MHC was significantly higher in several samples of women than men^{40,42-43}. There is evidence that the gap between female and male participants regarding this particular issue has shrunk over the years^{29,39-40,42-43}.

However, most of the studies selected for the present review indicated that women and men take different approaches to the acceptability of a contraceptive method. Indeed, there is evidence that men place greater weight on side effects in their willingness to use or not use a MHC^{30,39-40,52-53}. Women, on the other hand, appear to have a higher tolerance to possible side effects than men^{6,18,40}. It seems that the side effects of MHCs in most

clinical trials^{6,44,46,48} are less of a concern than in studies based on hypothetical MHCs^{18,35,40,52-53}. If these findings were to be confirmed when a real MHC is commercialized, this might facilitate its adoption^{44,48}. For women, there are also marked differences between countries in the acceptability of MHCs. Despite variability, the data reveal that many women would trust their partners to use a MHC^{40-41,43}.

Only one article found that the efficacy of MHC directly influences the acceptability of taking a MHC⁴⁰. Some studies³⁹⁻⁴⁰ have clearly shown that efficacy is a driver of acceptability. However, since the level of side effects is also a major factor impacting acceptability, these two factors may offset each other in the sense **that their interaction may increase or moderate the willingness to use the pill, as functions of circumstances and/or the individual characteristics of those involved.**

The acceptability of the route of administration varies between study countries and over time³², as is the case with male contraceptive methods already on the market⁷. This fact may be influenced by familiarity with a type of contraceptive method used in different regions. This suggests that there would not be a single universally acceptable MHC type. It would instead depend on the sociodemographic characteristics of each individual and/or couple⁵⁶ as there is evidence that is the case with the use of female contraceptive methods⁵⁷. It is therefore important that men be able to adapt the method of contraception to their needs and preferences. Overall, it seems that the daily MHC pill would be the most acceptable form for men^{31-33,38,53}. For MHC gels, there is no clear evidence as to what type of potential consumers would use this method as there is a very wide variability in their acceptability⁴⁹⁻⁵¹. In terms of women's preferences, it appears that they would prefer an injectable MHC^{33,42} due to concerns about their partners forgetting to take a daily MHC pill^{33,37}. Regarding the frequency of administration of an injectable MHC, the most acceptable frequency appears to be quarterly^{6,34,46}. The cost of

the MHC method seems to be a more relevant driver of acceptability in less developed countries such as Mozambique^{29,38-39}. This issue can be addressed by total or partial subsidy of costs, as is often the case with female hormonal contraception in developed as well as in developing countries.

In terms of preferences related to personal characteristics, the evidence found does not seem sufficient to assign a type of method to age^{29,32,35,38,53} and in other articles it is discarded^{18,31,35,41,52}.

With regard to the impact of education, the reviewed studies showed a clear pattern: the higher the level of education, the more likely it is to have favourable attitudes towards MHC use^{29,32,35,39}. Social and religious beliefs have been shown to predict the probability of MHC pill use¹⁹. Although some articles have related the acceptability of the MHC pill to being in a stable relationship^{43,52-53}, there are more articles in which this association was non-existent^{17,32,37,51}.

In all review articles (except one) reporting information on the participants' "fears" about using a MHC, men have expressed concern that a MHC could affect their sexual desire and satisfaction^{34,38,45,49-50}. As for advantages, men have stressed the fact that MHC is a method that is not directly linked to sexual intercourse like the condom; that is to say the fact that this method is less likely to negatively and externally affect the men's sexual functions is very much appreciated^{28,30}. Regarding the women's perspective, the reviewed literature suggests that many of them believed that moving the burden of a hormonal contraceptive responsibility from them to their male partner would increase their own sexual enjoyment and desire⁶.

The literature clearly indicates that contraceptive responsibility has fallen exclusively on women in different countries and over different time periods^{36,41-42}. One of the factors why men have so far passed the responsibility for contraception to women

may be the greater effectiveness of methods available only to women³⁶. In the few situations and cases where contraceptive responsibility has been shared by both partners, it is still difficult to assess to what extent this responsibility has been “really” shared in terms of decisions on method selection, purchase and use^{28,34,52-53}. Nevertheless, the reviewed studies suggest that the demand for sharing has not been the same for both sexes; in other words, it seems that women have shown greater interest in sharing responsibility for contraception than men^{33,39,44,46}.

Over the past 50 years, MHCs have been negatively and consistently associated with masculinity to the point of being considered a “threat” to manhood^{33,37,46,52}. This thinking is mostly based on the perception that using hormonal contraception is a female behaviour^{33,37,46,52}. Thus, it is possible that the feminine connotation of the MHC pill might make it more difficult for men to accept the male pill: “*if I use needles instead of pills, that’s more masculine*”⁵². However, it has recently been found that men might be more willing to use MHCs if the image of a man using hormonal contraception was viewed positively by other men¹⁷. The masculinity concern has also been associated with an existing and efficient method of contraception for men: vasectomy. Thus, a parallel can be drawn between the two male contraceptive methods. Indeed, studies conducted on men’s negative attitudes towards vasectomy indicated that the perception of vasectomy as strongly affecting men’s virility (e.g., the ability to get a woman pregnant whenever they want) is deemed by some participants as a reason for dissatisfaction^{30,58}.

Nevertheless, several studies have provided evidence of a moderate and high level of willingness to use a male contraceptive pill if available and a positive attitude towards vasectomy among men in different regions of the world^{29,31-32}. This fact may suggest that there is a large percentage of men who are willing to take a more active role in controlling their fertility and sharing contraceptive responsibility^{59,60}.

At present, the most widely used method of male contraception is the condom. At a global level, there are several studies demonstrating dissatisfaction with condoms. MHCs would probably have a much smaller impact on desire and pleasure than condoms³⁸ providing an alternative to condoms³⁴. Causes of dissatisfaction with condoms included method failure⁴¹ and the fact that it is linked to the sex act³⁰, and that it is not a well-accepted method for stable relationships^{6,61}. Women also perceive the use of condoms for contraception purposes as the most unsatisfactory method to prevent unwanted pregnancy⁴¹. While the main reason for men's dissatisfaction with the condom as contraceptive is the perceived diminution of pleasure, women often evoke the fact that they do not believe in its effectiveness.

Other gender comparisons

Men described a male pill as more “*unnatural*” than a female pill according to studies published in 1972 and 1994 in the USA^{18,35}. Balswick (1972)³⁵ suggested that these men felt that the effect on their own reproductive system or sexuality is more a violation of nature than it would be for women because sterility in a man is seen as a sign of a lack of masculinity or virility while for women “*it has nothing to do with their femininity*”. For the lower socio-economic status man, fatherhood is a sign of masculinity³⁵. The perception of sterility as a lack of masculinity or virility could have influenced the industrial development of the MHC pill⁵⁴. According to several studies, men who define themselves as highly masculine may be more reluctant to use a MHC because hormonal birth control is perceived as female behaviour^{17,33,54}. This suggests that social gender norms influence men's participation in contraception depending on the degree of rejection of “*effeminate*” behaviour and perceived threats to masculinity. Thus, to promote the use of MHCs, it may be necessary to implement educational programmes designed to

promote views on gender roles and masculinity in which the use of MHCs is not seen by men (and women) as emasculating^{18,35}.

Feminist movements from the late 1970s to the mid-1980s suggested that the medicalization of fertility exclusively for women is due to a patriarchal perspective in which the costs to women are undervalued in comparison to men's sexual enjoyment⁵³. Since the 1990s, men have joined the fight against traditional male stereotypes in family planning⁵³. This shift away from traditional family planning roles is producing a continuous cultural shift that is involving men in the responsibility for contraception⁵⁷. Some studies have shown that cases in which both partners are involved in decision-making regarding fertility control have been growing since the 1970s^{31-32,38}. Interestingly, although most women would trust their own partner to use a MHC, female participants still stereotyped men's behaviour as "*irresponsible*"³³. In recent years, in Mozambique, changing attitudes towards less traditional sex roles have also been observed³⁹. Identifying ways to change existing social constructions that promote more traditional male behaviours (like avoiding femininity)¹⁷ will be fundamental in the general acceptability of MHCs³³.

Whether a preventive behaviour, such as taking a MHC, is considered risky or safe depends on the extent to which it is perceived as effective in maintaining health⁶². Men may perceive their own healthcare as a weakness and therefore use preventive education and health services less than women^{33,43}. The development of male constructions of health and well-being along with transformative gender ideology would pave the way for greater male involvement in reproductive health programmes and family planning programmes.

Contraceptive use appears to have a significant social and interpersonal impact⁶⁰. There has been a shift towards increasing equality of gender roles, but in the absence of

MHCs and, in the framework of sexual and reproductive health rights, there cannot be said to be equality in terms of contraceptive responsibility between men and women⁶⁰. Therefore, male contraceptive counsellors and educators may have to go beyond the “*how to*” and consider the relationship aspects of male-female cooperation in contraceptive practice⁶³, as the development of more male contraceptive methods alone will not guarantee gender equality¹⁸.

Strengths and limitations

To our knowledge, this is the first systematic review of the relevant population’s willingness to use MHCs that includes an analysis of gender as a possible influencer and predictor of use.

The search strategy was broad enough to allow the collection of studies with diverse methods and grounded in different theoretical (social, human, health) perspectives. While this fact might represent a strength, it can also be seen as a limitation. Indeed, examining the selected articles without considering the theoretical points of view in which each study was conducted may bias the interpretation of the results, or lead to the overestimation/underestimation of the epistemological value given to the findings related to the review.

The findings of the articles included in the review show great variability in the variables investigated around the acceptability of MHCs. The predictors of MHC use were well defined, which facilitated the extraction of data from the articles despite the breadth of methodologies and the presence of different outcome measures. However, it is important to acknowledge that most of the articles reviewed are more than 10 years old. In addition, in the majority of the reviewed articles, the participants responded to questions regarding a hypothetical product. These are two major limitations of the present study. Since women’s and men’s attitudes towards MHCs may have significantly changed

during the past 10 years and there could be a dramatic difference if MHCs become commercially available. Furthermore, this systematic review mainly focused on the gender perspective, the cultural aspects that may greatly influence people's attitudes towards the use of contraception products were not specifically examined. That being said, the analysis of the results of the selected articles indicated that, with the few exceptions mentioned at the beginning of the discussion section, people's attitudes towards MHC use has not fundamentally changed since the 1970s.

Finally, there are limitations linked to the relationship between "intention" and "behaviour". In effect, the intention to use a contraceptive method does not always predict the behaviour in the actual use of the method^{30,38,41}.

Indications for future research

As we mentioned in the strengths and limitations sub-section, the present review did not specifically consider the theoretical framework on which the selected articles were based. Thus, future systematic review work must consider the theoretical perspective in the article selection criteria and the article analysis.

Most of the studies considered in this review were based on a hypothetical MHC. As soon as a "real" MHC is available and distributed, new studies must be conducted to assess the potential willingness to use it as functions of situations, socio-cultural context and the factors associated with the MHC itself (side-effects, efficacy, route of administration, etc.). Gender-dependent attitudes should also be examined at that time.

CONCLUSION

There is a high acceptability of MHCs in both sexes. The factors that influence the acceptability of MHCs have been analysed from a gender perspective. Side effects, route of administration (with the MHC pill being preferred by most men and injections by most

women), frequency of administration (influenced by the previous factors), level of education and health behaviours, religion, perception of shared responsibility, perception of masculinity, and impaired sexual function/desire have been highlighted. Efficacy has not been sufficiently explored as a predictor of use. Based on these findings, service providers should consider all the socio-educational aspects that influence the intention to use a MHC when it reaches the market. The development of a MHC alone will not ensure the redress of inequalities in reproductive rights between women and men, but it is a major step towards achieving shared responsibility for the prevention of unwanted pregnancies and increasing gender equality.

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Authors' contributions: PGT was responsible for the conception, organization and completion of this systematic review. PGT developed the research question and search strategy, conducted the search, screened the retrieved studies, extracted the data, performed the analysis and quality appraisal, and prepared the manuscript. GVC was responsible for the oversight and management of the review, assisted with data analysis and interpretation, and contributed to the manuscript preparation. PGT and TS were responsible for performing independent screening of identified studies and deciding upon

inclusion or exclusion from the review. TS also performed independent quality appraisal and data extraction of the included studies and contributed to the manuscript preparation. GMP contributed to the development of the inclusion and exclusion criteria; resolved screening, quality and data extraction discrepancies between reviewers; and was responsible for the oversight and helped develop the final research question. GMP and ALL were responsible for the oversight and management of the review; and preparing the manuscript. All authors read and approved the final manuscript.

Availability of data and materials

The materials used in this study are available from the corresponding author upon reasonable request.

ABBREVIATIONS

MHC = male hormonal contraceptive

RCT = randomized clinical trial

USA = United States of America

UK = United Kingdom

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