Contraception 99 (2019) 205–211

Contents lists available at ScienceDirect

Contraception

journal homepage: www.elsevier.com/locate/con

Review article

Uptake of permanent contraception among women in sub-Saharan Africa: a literature review of barriers and facilitators

Babayemi O. Olakunde [a,*], Nadia A. Sam-Agudu [b,c], Tanviben Y. Patel [a], Aaron T. Hunt [a], Aurora M. Buffington [a,d], Tara D. Phebus [a], Ebube Onwasigwe [e], Echezona E. Ezeanolue [f,g]

[a] School of Community Health Sciences, University of Nevada, Las Vegas, NV, USA
[b] International Research Center of Excellence, Institute of Human Virology Nigeria, Abuja, Nigeria
[c] Division of Epidemiology and Prevention, Institute of Human Virology, University of Maryland School of Medicine, Baltimore, MD, USA
[d] University of Nevada Cooperative Extension, Las Vegas, NV, USA
[e] Eurofins Lancaster Laboratories Inc, Summit, NJ, USA
[f] Department of Pediatrics and Child Health, College of Medicine, University of Nigeria, Nsukka, Enugu, Nigeria
[g] HealthySunrise Foundation, Las Vegas, NV, USA

ARTICLE INFO

Article history:
Received 16 February 2018
Received in revised form 24 December 2018
Accepted 27 December 2018

Keywords:
Contraception
Contraception behavior
Tubal ligation
Female sterilization
Sub-Saharan Africa

ABSTRACT

Objective: Uptake of permanent contraception among women remains low in sub-Saharan Africa compared to other regions. We aimed to synthesize available evidence on barriers to, and facilitators of permanent contraception with regards to tubal ligation among women in sub-Saharan Africa.
Study Design: We reviewed literature on tubal ligation among African women published between January 1, 2000 and October 30, 2017. We searched PubMed, Global health, EMBASE, Web of science, and Google scholar for quantitative, qualitative, and mixed methods studies which reported on barriers and/or facilitators to uptake of tubal ligation in sub-Saharan Africa. Finally, we conducted a narrative synthesis and categorized our findings using a framework based on the social ecological model.
Results: We included 48 articles in the review. Identified barriers to tubal ligation among women included individual-level (myths and misconceptions, fear of surgery, irreversibility of procedure, religious beliefs), interpersonal-level (male partner disapproval), and organizational-level (lack of healthcare worker expertise and equipment) factors. Facilitating factors included achievement of desired family size and perceived effectiveness (individual-level), supportive male partners and knowing other women with permanent contraception experience (interpersonal-level), and finally, subsidized cost of the procedure and task-sharing with lower cadre healthcare workers (organizational-level).
Conclusions: Barriers to, and facilitators of permanent contraception among women in sub-Saharan Africa are multilevel in nature. Strategies countering these barriers should be prioritized, as effective contraception can promote women's health and economic development in sub-Saharan Africa. In addition to these strategies, more quantitative research is needed to further understand patient-level factors associated with uptake of permanent contraception among women.

1. Introduction

Family planning through contraceptive use is a critical component of reproductive healthcare; it allows women and their families to have the desired number of children and also to control the timing of pregnancies [1]. The ability to limit and space pregnancies has a significant impact on a woman's wellbeing, child survival, and economic growth and development [1–5]. Despite the benefits of contraceptive use, it is estimated that approximately 21% of women in sub-Saharan Africa have an unmet need for modern contraception [6]. This gap is largely responsible for the high proportion of unintended pregnancies in the region [6], estimated at 38% of the annual total of 51 million pregnancies in sub-Saharan Africa [7]. A substantial number of maternal deaths in this region could be averted if unintended pregnancies were prevented with the use of effective, less user-dependent modern contraception such as permanent contraception [8].

Permanent contraception includes vasectomy for men and tubal procedures for women, which are highly effective, with failure rates of less than one percent [9]. The approach to permanent contraception among women involves blocking or cutting the fallopian tubes through surgical or nonsurgical means (tubal ligation or occlusion) [10,11]. Permanent contraception offers a number of benefits compared to other contraception methods. It eliminates the recurrent direct and indirect

* Corresponding author.
E-mail address: olakunde@unlv.nevada.edu (B.O. Olakunde).

https://doi.org/10.1016/j.contraception.2018.12.007
0010-7824/

costs associated with reversible methods [12]. In addition, it eliminates problems associated with other methods such as compliance, side-effects, availability and inconvenience [13]. Also, for women, evidence suggests that tubal ligation has non-contraceptive benefits such as reducing the risk of ovarian cancer [14]. Lastly, studies have shown that tubal ligation in sub-Saharan Africa is safe, with a low rate of complications or failure when performed according to standard practice [15–17]. Reported complications include pain, infections, and bladder and bowel injuries [16–18].

In spite of the encouraging data and increasing desire among women to limit childbearing, the uptake of permanent contraception among women remains low in sub-Saharan Africa [19,20]. The prevalence of permanent contraception among married or in-union women of reproductive age in Africa is estimated at 1.6%, compared to Latin American and the Caribbean (25.7%), Asia (23.7%), Northern America (20.6%), and Europe (3.7%) [21]. Factors that likely contribute to this low uptake of permanent contraception include weak health systems and limited access to surgical procedures [22,23], lack of information, misconceptions, and religious beliefs [24–26].

To date, studies examining barriers and facilitators to the uptake of permanent contraception in sub-Saharan Africa have either grouped a range of contraceptive methods (not focused exclusively on permanent contraception) [27,28], or included both male and female permanent contraception [29]. The purpose of this study is to synthesize the literature on barriers and facilitators to uptake of permanent contraception-specifically, tubal ligation-among women in sub-Saharan Africa in order to inform female reproductive health policy and services in the region.

2. Material and Methods

This paper presents a literature review of available evidence on barriers to, and facilitators of permanent contraception among women in sub-Saharan Africa.

2.1. Study Inclusion Criteria (Box 1)

We reviewed studies on barriers and/or facilitators to uptake of permanent contraception, which included women who had undergone or were yet to undergo tubal ligation, male partners, and/or healthcare providers were reviewed. We considered qualitative, quantitative, and mixed methods studies published in major official languages, including English, French, or Portuguese. We included studies published between January 1, 2000 and October 30, 2017. We selected year 2000 as the start date for this review because of the global commitment in that year to the Millennium Development Goals (MDGs) which included improved maternal health (MDG 5) [30].

2.2. Search Methods and Information Sources

We searched the following electronic databases with no language restrictions: PubMed, Global health, EMBASE and Web of Science Search terms included free-text terms related to permanent contraception such as “female sterilization”, “tubal ligation”, “tubal occlusion”, and “voluntary surgical contraception”, together with terms such as “sub-Saharan Africa”, “developing country”, “resource-limited”, “East Africa”, “West Africa”, “South Africa”, “Central Africa” and the individual names of all sub-Saharan African countries. In addition to electronic database searches, we searched bibliographies of identified relevant reviews and studies for additional eligible publications. We identified unpublished papers in a grey literature search via Google Scholar. For the purpose of this review, we use the term “tubal ligation” to represent both tubal ligation and tubal occlusion.

Box 1
Study inclusion criteria

1	Conducted in sub-Saharan Africa on the topic of tubal ligation and/or occlusion
2	Conducted among women, male partners and/or healthcare workers
3	Quantitative, qualitative or mixed-methods design
4	Published in English, French or Portuguese
5	Published between January 1, 2000 and October 30, 2017

2.3. Study selection

Two authors (BO and EO) independently screened the titles and abstracts of studies identified to confirm if they met the inclusion criteria (Box 1). Author NASA conducted an additional independent literature search to identify any eligible articles which may not have been included in the initial selection. Articles deemed eligible for inclusion were obtained in full text and independently screened again by BO and EO before final inclusion. We excluded multiple publications based on the same cohorts or data. Where there was an overlap in time points reported by studies conducted at different periods, we selected the most recent study. Any conflict in study selection and/or exclusion was resolved by author EE.

2.4. Data extraction and synthesis

We extracted data from all the papers that met the inclusion criteria using pre-piloted and standardized data extraction forms designed for this review. Our framework for categorizing and organizing our findings was based on the social ecological model. The model helps in understanding how behavior is shaped by often complex interactions between factors existing at individual, interpersonal, organizational, community and public policy levels [31,32]. We coded identified barriers and facilitators into themes, which were grouped into the different social-ecological levels.

3. Results

3.1. Study characteristics

The electronic search yielded 672 records from the four databases, while an additional six studies were identified from bibliographic and grey literature searches (Fig. 1). Two hundred and thirty-one (231) duplicates were removed, and 394 articles were subsequently excluded. The 48 studies ultimately reviewed included 34 quantitative studies, five qualitative studies, and nine mixed-methods studies.

Twenty-two (23) of the included studies were conducted in East Africa: Ethiopia (n=13), Kenya (n=5), Rwanda (n=1), Tanzania (n=1) and Uganda (n=3); 20 in West and Central Africa: Cameroon (n=2), Democratic Republic of Congo (n=1), and Nigeria (n=17); and five in southern Africa: South Africa (n=3) and Zimbabwe (n=2). We did not identify any studies meeting inclusion criteria from Portuguese-speaking countries. Table 1 displays a summary profile of these studies by study design.

Barriers to, and facilitators of tubal ligation were organized using the socio-ecological model and are summarized in Table 2.

3.2. Individual-level factors

3.2.1. Barriers

Low-level knowledge about tubal ligation is a potential barrier to uptake among women [33–41]. For example, in an Ethiopian study, 76% of women participants were not aware that pregnancy was rare after tubal ligation [36]. In another Ethiopian study, only 44% of respondents had ever heard about tubal ligation [35]. For some women, the knowledge gap was largely regarding where to access the procedure and not necessarily lack of awareness about it [38].

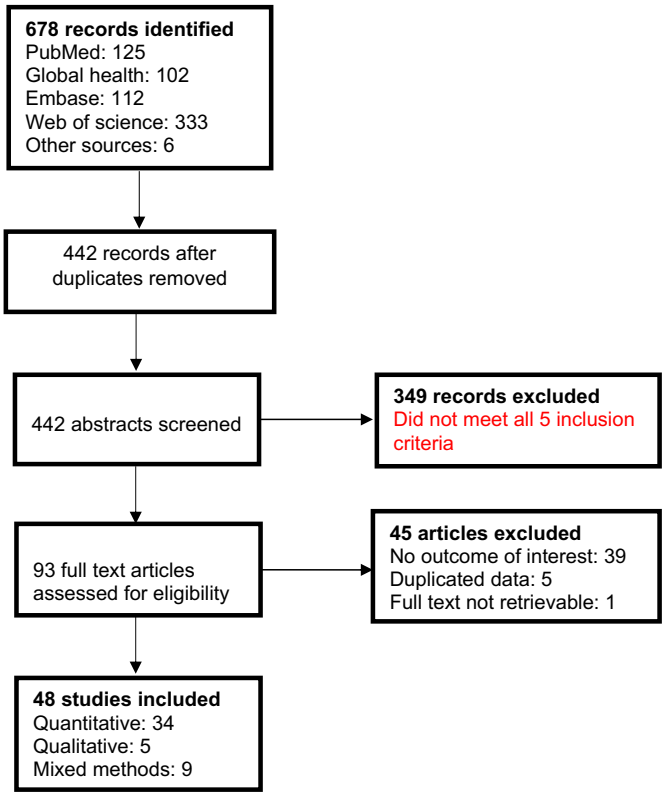

Fig. 1. Flowchart of article selection.

Prevailing myths and misconceptions about tubal ligation have been identified in some studies [24,25,34,39,42–44]. In Kenya, 47% of women believed that the procedure reduced sexual pleasure for both female and male partners [42]. Other misconceptions included beliefs that tubal ligation decreased sexual desire [34], required a good diet [43], was harmful and led to illness [24,25,39,43,44].

The permanent and irreversible nature of tubal ligation was mentioned as another barrier to its uptake in some studies [24,25,34,38,42,44]. In a South African study, 64% of respondents would not undergo the procedure because of its permanent nature [34]. Some women were concerned that after undergoing the procedure, there may be a future desire or need for having (more) children. Such needs may arise from child loss [24,42], improved financial status [44], or remarriage [25].

Table 1
Types of studies included

Study Design	Number of Studies
Quantitative	**34**
Cross-sectional survey	17
Retrospective medical records review	9
Prospective cohort	3
Randomized controlled study	1
Randomized non-inferiority trial	1
Retrospective cohort	1
Case series	1
Retrospective secondary data analysis and cross-sectional survey	1
Qualitative	**5**
In-depth interview	4
In-depth interview and key informants interview	1
Mixed-methods	**9**
Cross-sectional survey and focus group discussion	3
Cross-sectional survey and in-depth interview	3
Retrospective data analysis and in-depth interview	1
Cross-sectional survey, focus group discussion, and in-depth interview	1

Other women would not undergo tubal ligation because of its surgical nature [24,34,36,39,45], considering it a risky method of contraception that should be avoided [39,42]. Undergoing a surgical procedure for contraception was unacceptable to 39% of respondents in a study in Ethiopia [36]. Fear of perceived side effects of tubal ligation also appears to be a limiting factor for uptake [24,25,34–36,39,42–44,46,47]. In these studies, the respondents disapproved of tubal ligation because of the possible complications and side effects such as pain [39,42], stomach upset [25] and weight gain [43]. For some women, these perceived complications could be major and even lead to death [24,25].

Religious beliefs were an important barrier reported by some studies [24,26,37,44,46]. In Nigeria, one-third of each of the Christian and Muslim women cohorts in one study stated that tubal ligation was against their respective faiths [24]. Likewise, in an Ethiopian study among married women (predominantly Muslims, 98.8% vs. 1.2% Christians), 32% considered tubal ligation a religious taboo [37]. In the context of religious beliefs, indications for tubal ligation also appeared to determine its appropriateness: some women considered it contrary to religious tenets if women had permanent contraception without serious medical contraindications against childbearing [37].

3.2.2. Facilitators

Achieving the desired family size with no intention for more children was an indication for undergoing permanent contraception [48–57]. Already having many children – sometimes more than desired—was another facilitator among women who had had a tubal ligation [42,48,52,58,59]. In a Nigerian study among women who had more children than desired, 70% of them were grand multipara [48].

Health-related conditions were also identified as another reason for permanent contraception [48–53,55,56,58–61]. These conditions included previous caesarean section [50,52,53,55,58,59], ruptured uterus [55,59], sickle cell anemia, renal disease, psychiatric disorders [48], hypertension [48,58], congenital malformations [59], HIV infection [50,56,60,61], and pelvic infections [51].

The perceived effectiveness and benefits as a possible influencer of uptake of tubal ligation was found in a few studies [25,26,34]. For some women, it was highly effective [25,34] convenient [34], did not require recurrent hospital visits [26], eliminated recurrent use of pills [25], and had no side effects [26,34]. Side effects from other contraceptive methods or their failure to prevent pregnancy also appeared to influence uptake of tubal ligation [26,51,58].

Economic considerations were reported as one of the reasons for tubal ligation in two studies [49,52]. Thirty-nine percent of Ethiopian women who had undergone the procedure wanted to limit childbearing because of poor economic conditions [49].

3.3. Interpersonal-level factors

3.3.1. Barriers

Male partners' disapproval was reported as a barrier to uptake of tubal ligation in some studies [35,42,44,47]. In Kenya, 44% of women who did not have tubal ligation attributed it to lack of support from their spouses [42]. In addition to partners' opposition, some women expressed fear of negative reactions from male partners following tubal ligation, such as termination of their marriage/relationship [36,42] or their male partners marrying another wife [62].

Knowing other women with bad experiences with the procedure could also limit its uptake [25,46]. Women who had a failed procedure, suffered some complications, or had regrets from undergoing tubal ligation were not likely to recommend it to their peers [62,63].

3.3.2. Facilitators

Male partners were discussed as facilitators of tubal ligation in some studies [26,34,42,49,54,62]. For instance, 70% of the women who had tubal ligation in one study reported having supportive partners [42]. Joint decisions with male partners were additionally found to be critical

Table 2
Organization of findings according to the social-ecological model

Level	Barriers	Facilitators
Individual	• Low-level knowledge [33–41] • Not aware of where to access service [38] • Myths and misconception [24,25,34,39,42–44] • Fear of perceived side effect [24,25,34–36,39,42–44,46,47] • Irreversibility of procedure [24,25,34,38,42,44] • Surgical nature of procedure [24,34,36,39,45] • Against religious belief [24,26,37,44,46]	• Achievement of desired family size/completion of childbearing [48–57] • Too many children [42,48,52,58,59]. • Health-related conditions [48–53,55,56,58–61] • Perceived effectiveness/benefits [25,26,34] • Side effects from other contraceptive methods [26,51,58] • Low economic status [49,52]
Interpersonal	• Partners' disapproval [35,42,44,47] • Knowing other women with failed procedure/regrets [25,46]	• Supportive male partner [26,34,42,49,54,62] • Joint decision with male partner [49,54,64] • Influence of extended family [62,64] • Knowing other women who have undergone female sterilization [42,49]
Organizational	• Healthcare workers' personal reservations [25,68] • Long waiting time [25,60] • Lack of expertise [25,38,65,66] • Lack of equipment [65,66] • Healthcare provider limited knowledge [38] • Not offered/recommended/provided by healthcare provider [60,67,69] • High cost of procedure [25,48]	• Counseled/offered/recommended by healthcare provider [34,56,67,70–72] • Referral by healthcare providers [49] • Task-sharing with lower-cadre officer [17,63] • Outreach to facilities in rural areas [17,63,64] • Subsidized access to/cost of procedure [73–75]

to uptake [49,54,64]. Influential extended family members also played a role in decision making with regards to tubal ligation [62,64]. Knowing other women who had undergone tubal ligation was also a facilitator of its uptake [42,49]. In Kenya, nearly 80% of women who had tubal ligation knew other women who had had the procedure [42]. Some women also referred their peers to health facilities for the procedure [49].

3.4. Organizational-level factors

3.4.1. Barriers

Lack of expertise among healthcare providers was reported in some studies [25,38,65,66]. Healthcare providers at some facilities were not trained and could not perform tubal ligation [25]. Some facilities also lacked the required equipment [65,66]. Referral of women who desired or might benefit from tubal ligation by healthcare providers was also limited by lack of accurate information [38]. Even when referred to or attending a facility where tubal ligation could be performed, long waiting periods were an issue [25,60].

In some studies, women who desired permanent contraception and requested tubal ligation at healthcare facilities did not get the services [60,67], sometimes as a result of healthcare providers' negligence [67]. Not offering the procedure to women who may desire it also impeded uptake [67]. Some studies reported that healthcare workers' reservations about tubal ligation may influence their recommendation of the procedure [25,68]. Among family planning providers in Kenya, approximately 60% and 40% reported restricting tubal ligation recommendations based on clients' (perceived) low parity and single marital status respectively [69]. Among the providers that restricted tubal ligation based on parity, approximately 46% reported that a client must have a minimum of three children.

The high financial cost of undergoing tubal ligation was a potential barrier among women who desired it in two Nigerian studies [25,48]. In one of these studies, the average cost of tubal ligation was noted to be much higher than other modern contraceptive methods [48].

3.4.2. Facilitators

Some studies reported that facility- and community-based counseling and recommendations for tubal ligation by healthcare providers to potentially-eligible women facilitated uptake [34,56,67,70–72]. In Nigeria, preference for tubal ligation among women desiring contraception in a study significantly increased from 1.5% pre-counseling to 3.8% post-counseling [71]. In South Africa, 23% of female study participants had a tubal ligation because it was recommended by healthcare providers [34]. Likewise, in a Zimbabwean study, 80% of women who had a tubal ligation procedure did so because it was offered [67]. Referral to other tubal ligation-providing facilities by healthcare workers also contributed to uptake [49].

Task-sharing – trained lower-cadre healthcare workers performing tubal ligation – facilitated uptake in Ethiopia and Uganda [17,63]. In these studies, trained health and clinical officers were engaged to provide tubal ligation to women who desired permanent contraception in rural settings. Outreach services to rural areas also improved uptake of permanent contraception among women who did not have access to facilities where tubal ligation could be performed [17,63,64].

Subsidized cost of the procedure was as an important facilitator for utilization [73–75]. In Kenya and Uganda, a voucher scheme that subsidized access to reproductive health increased the uptake of tubal ligation [74,75].

4. Discussion

In this literature review, we identified and organized evidence on barriers to and facilitators of permanent contraception via tubal ligation among women in sub-Saharan Africa using a framework based on the social ecological model. We found uptake of tubal ligation to be influenced by individual-, interpersonal-, and organizational-level factors such as myths and misconceptions, fear of surgery, irreversibility of procedure, religious beliefs, lack of expertise and equipment factors, achievement of desired family size, perceived effectiveness and subsidized cost.

Poor knowledge and negative perceptions about tubal ligation may hinder women who desire permanent contraception to make informed decisions. The ideal family size is relatively higher in sub-Saharan Africa than in other regions, often due to socio-economic and cultural reasons [76–78]. It is estimated that 6 in 10 sub-Saharan African women with a demand for permanent contraception have either achieved or exceeded their desired family size [19]. Awareness creation, knowledge dissemination and strategies to influence individual-level decisions need to be implemented before women exceed their desired number of children. This may involve the use of media, which remains an important source of information and means for promotion for family planning in sub-Saharan Africa [79]. Studies have shown that women with access to media messages or campaigns are more likely to use contraceptives [80,81].

Religious beliefs, particularly among Muslim and Christian participants, were another important individual-level barrier identified. A number of studies have reported that religion influences the use of modern contraception in sub-Saharan Africa [82–86]. While evidence suggests that Christians may be more accepting of contraceptive use than Muslims [87], identifying a religion's stance on family planning or on a particular contraceptive method is complex. Religious tenets do not only vary between denominations within a faith; their

interpretations can also vary among individuals and religious leaders of the same denominations [88,89]. Nonetheless, religious leaders have been found to be influential on contraceptive use among their congregants [90]. Thus, where permanent contraception is permissible, religious leaders may have a role to play—with the help of healthcare workers—in improving uptake of tubal ligation among women who desire permanent contraception.

The permanent nature of tubal ligation is one of its advantages, however this characteristic also constitutes a major barrier to its uptake, particularly among African women still of childbearing age. The desire for more children may arise after the procedure, resulting in requests for reversal [91]. Studies report that women who underwent the procedure at a young age, who had few or no children (particularly no males), and little/no partner support for permanent contraception were more likely to have regrets [92–95]. These categories of women may not be suitable candidates for tubal ligation, and will benefit from other forms of reversible modern contraception. In reducing rates of post-procedure regret, it is important to provide all the relevant information, assess potential risk factors for change of mind, and obtain informed consent regardless of the indication.

Our findings also highlight the role men play in family planning decision-making in sub-Saharan Africa. Due to societal norms, men are able to achieve more economic power and assume provider roles, and women are expected to be deferential to men's authority [96,97]. These unbalanced gender-based power dynamics allow men to be primary decision makers with regards to the use of contraception in many settings [98,99]. However, some men show little interest and have limited engagement in spousal communication and discussion on family planning issues [100,101]. Concerning tubal ligation, poor knowledge among male partners may contribute to their lack of support and/or approval [102]. While some women make independent decisions regarding permanent contraception, joint decision-making with the male partner is critical [103] to prevent negative reactions, and should be encouraged through counseling.

In sub-Saharan Africa, tubal ligation is largely performed surgically. Nonsurgical approaches may be more acceptable to women who do not desire surgical procedures. However, nonsurgical permanent contraception requires sophisticated equipment and highly specialized skills, and is not yet readily available in our study setting [104]. Weak health systems, characterized by shortages of skilled healthcare providers, lack of equipment, and poor infrastructure limit the availability of surgical procedures such as tubal ligation [22,23]. Where these services are available, direct and indirect costs of accessing them could also be limiting factors [105]. Addressing this organizational-level factor with supportive policies can contribute to the increased uptake of female sterilization in sub-Saharan Africa. For example, the engagement of, and safety and acceptability regarding trained lower-cadre healthcare workers for female sterilization procedures and/or counseling has been encouraging in Uganda and Ethiopia [17,63]. A recent non-inferiority trial in Tanzania found no significant differences between the rates of adverse effects (major and minor) in tubal ligation performed by trained clinical officers and trained assistant medical officers [106].Cost as a barrier to tubal ligation will also need to be addressed through financing mechanisms that can reduce out-of-pocket expenditure [107]. Provision of cost-free tubal ligation services contributed to a recent increase in uptake in Malawi [108]. Of note, we found cost reported only in two studies from Nigeria, the most populous African country. This may reflect high costs of surgical procedures in Nigeria, or suggests that cost of tubal ligation is understudied in other countries.

In other settings, women who desire permanent contraception face barriers similar to those identified in our review. In the USA, evidence has shown that health system-level barriers prevent women from accessing permanent contraception. While those without health insurance are less likely to obtain permanent contraception [109–111], consent requirements hinder those with Medicaid (health coverage for those with limited income) in accessing it [112,113]. Limited counseling and lack of recommendations by healthcare providers are also barriers that have reported in the USA [114]. Findings from South Asia and Latin America also suggest low quality of counseling by healthcare providers to women who have had permanent contraception [115]. A German study identified religion and knowledge as significant influencers of permanent contraception acceptance [116]. Furthermore, similar to our findings, it reported desire for children, fear of surgery, the definitiveness of this method and cost as some of the reasons why younger women declined this mode of contraception [116].

A study reported sociodemographic characteristics of subgroups of women with very high (≥80%) unmet need for modern contraception in 77 low- and middle-income countries [117]. Women in these subgroups were mostly characterized as being poor, illiterate, young and living in rural areas. The highest unmet need (overall 67%) was found among women in West and Central Africa, where many countries have some of the lowest levels of women's empowerment on the continent [117]. This supports the inclusion of gender empowerment approaches to improving uptake of modern contraception (including tubal ligation) in resource-limited settings, especially in the lowest-uptake geographical areas and subgroups in sub-Saharan Africa.

The drive to engage particularly vulnerable women, male partners, other individuals and communities to increase awareness and education should involve healthcare workers at the forefront. Healthcare providers should be proactive in offering permanent contraception to women who desire or will benefit medically or economically from it, compared to other methods. However, careful selection of women to be offered tubal ligation, with attention to socio-cultural, economic, and health status/benefit differences may be important to the effectiveness of this approach. Finally, women should not be forced or coerced into undergoing permanent contraception. In sub-Saharan Africa, forced permanent contraception without informed consent has been reported largely among HIV-infected women [118–120]. Even though tubal ligation offers an effective option to permanently prevent childbearing and perinatal transmission of HIV among HIV-infected women, it is imperative that this decision be made voluntarily, regardless of HIV status.

Our literature review has some limitations. The results were limited by methodologies and quality of the studies reviewed, as most of the cross-sectional studies and chart reviews were descriptive and did not test for associations between identified barriers/facilitators and uptake of permanent contraception among women. More rigorous quantitative research is needed to better understand the significance of factors associated with uptake of permanent contraception. Additionally, the diverse nature of the study populations made it difficult to characterize facilitators and barriers with respect to patient characteristics. Studies on patient characteristics (including facility versus non-facility delivery) on the acceptability and uptake of permanent contraception among women are also needed. Lastly, non-identification of community- or policy-level factors in our review does not preclude their existence. Future studies could explore these factors both quantitatively and qualitatively.

5. Conclusions

Uptake of permanent contraception among women in sub-Saharan Africa is relatively low. Improving uptake will require multipronged social-behavioral and educational interventions to modulate negative individual- and interpersonal level perceptions, especially among women and their male partners. Health systems strengthening and policy changes are needed to narrow the gaps identified at organizational level. Women who desire it, and for whom tubal ligation is expected to provide better health and economic benefits over other contraceptive methods should be offered this procedure. Increasing uptake of effective and permanent contraceptive methods such as tubal ligation among women of reproductive age should be prioritized in sub-Saharan Africa. This is expected to improve women's health and wellbeing and

contribute to regional economic growth and development, in line with Sustainable Development Goals 3 (Good health and well-being) and 5 (Gender equality) [121].

Acknowledgements

The authors thank Xan Goodman for her assistance in conducting the electronic search for the review.

References

[1] World Health Organization. Family planning/Contraception: Fact sheet. Available from WHO 2017. http://www.who.int/mediacentre/factsheets/fs351/en, Accessed date: 12 December 2018.
[2] Gariepy A, Lundsberg LS, Vilardo N, Stanwood N, Yonkers K, Schwarz EB. Pregnancy context and women's health-related quality of life. Contraception 2017;95:491–9.
[3] Schwarz EB, Smith R, Steinauer J, Reeves MF, Caughey AB. Measuring the effects of unintended pregnancy on women's quality of life. Contraception 2008;78:204–10.
[4] Cleland J, Conde-Agudelo A, Peterson H, Ross J, Tsui A. Contraception and health. Lancet 2012;380(9837):149–56.
[5] Canning D, Schultz TP. The economic consequences of reproductive health and family planning. Lancet 2012;380(9837):165–71.
[6] Guttmacher Institute. Adding it up: investing in contraception and maternal and newborn Health. Available from: https://www.guttmacher.org/fact-sheet/adding-it-up-contraception-mnh-2017; 2017, Accessed date: 15 December 2018.
[7] Darroch JE, Elizabeth S, Biddlecom A. Adding it up: investing in contraception and maternal and newborn health, 2017-Supplementary tables. Available from: https://www.guttmacher.org/fact-sheet/adding-it-up-contraception-mnh-2017, Accessed date: 15 December 2018.
[8] Ahmed S, Li Q, Liu L, Tsui AO. Maternal deaths averted by contraceptive use: an analysis of 172 countries. Lancet 2012;380(9837):111–25.
[9] Trussell J. Contraceptive failure in the United States. Contraception 2011;83:397–404.
[10] Micks EA, Jensen JT. Permanent contraception for women. Womens Health 2015;11:769–77.
[11] Patil E, Jensen J. Permanent contraception for women. Semin Reprod Med 2016;34:139–44.
[12] Sonnenberg FA, Burkman RT, Hagerty CG, Speroff L, Speroff T. Costs and net health effects of contraceptive methods. Contraception 2004;69:447–59.
[13] World Health Organization. Female sterilization: what health workers need to Know. Geneva: World Health Organization; 1994.
[14] Cibula D, Widschwendter M, Majek O, Dusek L. Tubal ligation and the risk of ovarian cancer: review and meta-analysis. Hum Reprod Update 2011;17(1):55–67.
[15] Ruminjo JK, Lynam PF. A fifteen-year review of female sterilization by minilaparotomy under local anesthesia in Kenya. Contraception 1997;55(4):249–60.
[16] Aisien AO, Oronsaye AU. Two decades of minilaparotomy female sterilisation at the university of benin teaching hospital. Niger Postgrad Med J 2007;14:67–71.
[17] Gordon-Maclean C, Nantayi LK, Quinn H, Ngo TD. Safety and acceptability of tubal ligation procedures performed by trained clinical officers in rural Uganda. Int J Gynecol Obstet 2014;124(1):34–7.
[18] Cisse CT, Kerby K, Cisse ML, Diallo D, Faye EO, Moreira PM, et al. Complications of tubal sterilization by minilaparotomy under local anesthesia. Dakar Med 1997;42(2):96–8.
[19] Van Lith LM, Yahner M, Bakamjian L. Women's growing desire to limit births in sub-Saharan Africa: meeting the challenge. Glob Health Sci Pract 2013;1(1):97–107.
[20] Zenebe CB, Adefris M, Yenit MK, Gelaw YA. Factors associated with utilization of long-acting and permanent contraceptive methods among women who have decided not to have more children in Gondar city. BMC Womens Health 2017;17:75.
[21] United Nations, Department of Economic and Social Affairs, Population Division. Trends in contraceptive use worldwide. Available from: http://www.un.org/en/development/desa/population/publications/pdf/family/trendsContraceptiveUse2015Report.pdf; 2015, Accessed date: 15 December 2018.
[22] Lavy C, Sauven K, Mkandawire N, Charian M, Gosselin R, Ndihokubwayo JB, et al. State of surgery in tropical Africa: a review. World J Surg 2011;35:262–71.
[23] Hsia RY, Mbembati NA, Macfarlane S, Kruk ME. Access to emergency and surgical care in sub-Saharan Africa: the infrastructure gap. Health Policy Plan 2012;27(3):234–44.
[24] Akpor O, Fadare R, Ekanem E. Knowledge and perception of women regarding bilateral tubal ligation in Southwest Nigeria. IOSR J Nurs Health Sci 2016;5(5):31–6.
[25] Babalola S, John N. Factors underlying the use of long-acting and permanent family planning methods in Nigeria: a qualitative study. New York: EngenderHealth/The RESPOND Project; 2012.
[26] Keefe KS. "Women do what they want": Islam and permanent contraception in Northern Tanzania. Soc Sci Med 2006;63(2):418–29.
[27] Haider TL, Sharma M. Barriers to family planning and contraception uptake in sub-Saharan Africa: A systematic review. Int Q Community Health Educ 2013;33(4):403–13.
[28] Aviisah MA, Norman ID, Enuameh Y. Facilitators and barriers to modern contraception use among reproductive-aged women living in sub-Saharan Africa: a qualitative systematic review protocol. JBI Database System Rev Implement Rep 2017;15(9):2229–33.
[29] Gaym A. Current and future role of voluntary surgical contraception in increasing access to and utilization of family planning services in Africa. Ethiop Med J 2012;50(4):363–70.
[30] World Health Organization. Millennium Development Goals (MDGs). Available from: http://www.who.int/topics/millennium_development_goals/about/en/, Accessed date: 15 December 2018.
[31] McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. Health Educ Q 1988;15(4):351–77.
[32] Golden SD, Earp JAL. Social ecological approaches to individuals and their contexts. Health Educ Behav 2012;39(3):364–72.
[33] Abajobir AA. Intention to use long-acting and permanent family planning methods among married 15-49 years women in Debremarkos Town, Northwest Ethiopia. Fam Med Med Sci Res 2014;3:145.
[34] Credé S, Hoke T, Constant D, Green MS, Moodley J, Harries J. Factors impacting knowledge and use of long acting and permanent contraceptive methods by postpartum HIV positive and negative women in Cape Town, South Africa: a cross-sectional study. BMC Public Health 2012;12:197.
[35] Takele A, Degu G, Yitayal M. Demand for long acting and permanent methods of contraceptives and factors for non-use among married women of Goba Town, Bale Zone, South East Ethiopia. Reprod Health 2012;9:26.
[36] Alemayehu M, Belachew T, Tilahun T. Factors associated with utilization of long acting and permanent contraceptive methods among married women of reproductive age in Mekelle town, Tigray region, north Ethiopia. BMC Pregnancy Childbirth 2012;12:6.
[37] Dubiwak R, Seme A. Contraceptive method choice and use by married women of reproductive age in two Districts of East Harerge. Ethiop Med J 2014;52(1):27–35.
[38] Hoke T, Harries J, Crede S, Green M, Constant D, Petruney T, et al. Expanding contraceptive options for PMTCT clients: a mixed methods implementation study in Cape Town, South Africa. Reprod Health 2014;11:3.
[39] Meskele M, Mekonnen W. Factors affecting women's intention to use long acting and permanent contraceptive methods in Wolaita Zone, Southern Ethiopia: a cross-sectional study. BMC Womens Health 2014;14:109.
[40] Elul B, Delvaux T, Munyana E, Lahuerta M, Horowitz D, Ndagije F, et al. Pregnancy desires, and contraceptive knowledge and use among prevention of mother-to-child transmission clients in Rwanda. AIDS 2009;23(Suppl. 1):S19–26.
[41] Ngomba AV, Djouma Nembot F, Ekukule S, Akoh WE, Djeumeni VZ. Unwanted pregnancies and barriers to contraceptive use among women of childbearing age in the city of Bafoussam, Cameroon. Ann Med Biomed Sci 2017;3:11–6.
[42] Mbugua KK. Factors influencing uptake of bilateral tubal ligation among women who have completed family size in central and eastern provinces. Masters of Medicine in obstetrics and gynaecology [thesis]. Nairobi: University of Nairobi; 2013 Available from http://erepository.uonbi.ac.ke/handle/11295/59707, Accessed date: 18 December 2018.
[43] Gebremariam A, Addissie A. Intention to use long acting and permanent contraceptive methods and factors affecting it among married women in Adigrat town, Tigray, Northern Ethiopia. Reprod Health 2014;11:24.
[44] Mekonnen G, Enquselassie F, Tesfaye G, Semahegn A. Prevalence and factors affecting use of long acting and permanent contraceptive methods in Jinka town, Southern Ethiopia: a cross sectional study. Pan Afr Med J 2014;18:98.
[45] Chigbu B, Onwere S, Aluka C, Kamanu C, Okoro O, Feyi-Waboso P. Contraceptive choices of women in rural Southeastern Nigeria. Niger J Clin Pract 2010;13(2):195–9.
[46] Onifade OA, Adigun JO, Abikoye AI, Abiola OO, Aliyu S. Socio-cultural factors influencing choice of bilateral tubal ligation among women attending University of Ilorin Teaching Hospital. KIU J Soc Sci 2017;3:37–46.
[47] Mota K, Reddy S, Getachew B. Unmet need of long-acting and permanent family planning methods among women in the reproductive age group in shashemene town, Oromia region, Ethiopia: a cross sectional study. BMC Womens Health 2015;15:51.
[48] Abiodun OM, Esuga SA, Balogun OR, Fawole AA, Jimoh AG. Trends in the use of female sterilisation through minilaparotomy for contraception at a teaching hospital in north central Nigeria. West Afr J Med 2012;31(1):34–8.
[49] Kidan KG, Azeze B, Ismail S. Female sterilisation through mini-laparotomy at Gondar College of Medical Sciences. East Afr Med J 2001;78(8):414–7.
[50] Swende T, Hwande T. Female sterilization by tubal ligation at caesarean section in Makurdi, Nigeria. Ann Afr Med 2010;9(4):246–50.
[51] Nwogu-Ikojo EE, Ezegwui HU, Nweze SO. Sterilization by minilaparotomy in South-Eastern Nigeria. Afr J Reprod Health 2009;13(4):105–11.
[52] Omokanye LO, Salaudeen AG, Jimoh AAG, Panti AA, Saidu R, Balogun OR. Female surgical sterilization at University of Ilorin Teaching Hospital, Ilorin: 10-year review. Orient J Med 2012;24(1-2):23–9.
[53] Adesiyun AG. Female sterilization by tubal ligation: a re-appraisal of factors influencing decision making in a tropical setting. Arch Gynecol Obstet 2007;275(4):241–4.
[54] Adebimpe W. A survey of clients and ethical perspectives of voluntary tubal ligations in the South-Western Nigeria. J Basic Clin Reprod Sci 2016;5(1):21–6.
[55] Attah RA, Omole-Ohonsi A. Bilateral tubal ligation at Aminu Kano Teaching Hospital: a five year review. Borno Med J 2014;11(1):57–64.
[56] Mayhew SH, Colombini M, Kimani JK, Tomlin K, Warren CE, Mutemwa R. Fertility intentions and contraceptive practices among clinic-users living with HIV in Kenya: a mixed methods study. BMC Public Health 2017;17:626.
[57] Tsehaye WT, Mengistu D, Birhanu E, Berhe KK. Assessment of preference and its determinant factors to ward modern contraceptive methods among women of reproductive age group in Shire Indaselassie Town, Northern Ethiopia, 2011. Int J Fam Med 2013;2013:317609.

[58] Mitchel MJ, Thistle P. Acceptability of levonorgestrel subdermal implants versus tubal ligation for long-term contraception in a rural population of Zimbabwe. Contraception 2004;70(6):483–6.
[59] Igberase GO, Ebeigbe PN, Umeora OUJ, Abedi HO. Bilateral tubal ligation in a rural hospital in the Niger Delta, Nigeria Niger. J Clin Pract 2011;14(2):137–9.
[60] Marlow HM, Maman S, Groves AK, Moodley D. Fertility intent and contraceptive decision-making among HIV positive and negative antenatal clinic attendees in Durban, South Africa. Health Care Women Int 2012;33(4):342–58.
[61] Lutalo T, Gray R, Mathur S, Wawer M, Guwatudde D, Santelli J, et al. Desire for female sterilization among women wishing to limit births in rural Rakai, Uganda. Contraception 2015;92(5):482–7.
[62] Lutala PM, Hugo JF, Luhiriri LN. Psychosocial implications of tubal ligation in a rural health district: a phenomenological study. Reprod Health 2011;8:38.
[63] Nuccio O, Sendek B, Park MH, Mesele T, Okello FO, Gordon-Maclean C. Optimizing tubal ligation service delivery: a prospective cohort study to measure the task-sharing experience of Marie Stopes International Ethiopia. Health Policy Plan 2016;32(2):163–9.
[64] Keogh SC, Fry K, Mbugua E, Ayallo M, Quinn H, Otieno G, et al. Vocal local versus pharmacological treatments for pain management in tubal ligation procedures in rural Kenya: a non-inferiority trial. BMC Womens Health 2014;14:21.
[65] Fusi-Ngwa CK, Payne VK, Asakizi AN, Katte BF. Knowledge and practice of family planning in Dschang municipality, Cameroon. Afr J Reprod Health 2013;17(1):137–48.
[66] Haile A, Fantahun M. Demand for long acting and permanent contraceptive methods and associated factors among family planning service users, Batu town, Central Ethiopia. Ethiop Med J 2012;50(1):31–42.
[67] Verkuyl DAA. Sterilisation during unplanned caesarean sections for women likely to have a completed family – should they be offered? Experience in a country with limited health resources. BJOG 2002;109(8):900–4.
[68] Okunlola MA, Oyugbo IA, Owonikoko KM. Knowledge, attitude and concerns about voluntary surgical contraception [corrected] among healthcare workers in Ibadan, Nigeria. J Obstet Gynaecol 2007;27(6):608–11.
[69] Tumlinson K, Okigbo CC, Speizer IS. Provider barriers to family planning access in urban Kenya. Contraception 2015;92(2):143–51.
[70] Adanikin AI, Onwudiegwu U, Loto OM. Influence of multiple antenatal counselling sessions on modern contraceptive uptake in Nigeria. Eur J Contracept Reprod Health Care 2013;18(5):381–7.
[71] Balogun OR, Adewole A, Adeniran AS, Adegboye R. Effect of counseling on contraceptive uptake in Nigeria. J Med Biomed Sci 2017;6(3):1–6.
[72] Chigbu B, Onwere S, Feyi-Waboso P, Kamanu C, Aluka C, Ezirim O, et al. The impact of collaboration and family planning counseling in the community setting. J Med Investig Pract 2014;9(1):16–20.
[73] Mutihir JT, Nyango DD. Quarter of a century of female sterilization in Jos, Central Nigeria. Afr J Reprod Health 2011;15(1):103–8.
[74] Oyugi B, Kioko U, Kaboro SM, Gikonyo S, Okumu C, Ogola-Munene S, et al. Accessibility of long-term family planning methods: a comparison study between Output Based Approach (OBA) clients verses non-OBA clients in the voucher supported facilities in Kenya. BMC Health Serv Res 2017;17:236.
[75] Bellows B, Mackay A, Dingle A, Tuyiragize R, Nnyombi W, Dasgupta A. Increasing contraceptive access for hard-to-reach populations with vouchers and social franchising in Uganda. Glob Health Sci Pract 2017;5(3):446–55.
[76] Bongaarts J. Can family planning programs reduce high desired family size in Sub-Saharan Africa? Int Perspect Sex Reprod Health 2011;37(4):209–16.
[77] Muhoza DN, Broekhuis A, Hooimeijer P, Hooimeijer P. Variations in desired family size and excess fertility in East Africa. Int J Popul Res 2014;2014:1–11.
[78] Darroch JE. Trends in contraceptive use. Contraception 2013;87(3):259–63.
[79] Alege SG, Matovu JK, Ssensalire S, Nabiwemba E. Knowledge, sources and use of family planning methods among women aged 15-49 years in Uganda: a cross-sectional study. Pan Afr Med J 2016;24:39.
[80] Zamawe COF, Banda M, Dube AN. The impact of a community driven mass media campaign on the utilisation of maternal health care services in rural Malawi. BMC Pregnancy Childbirth 2016;16:21.
[81] Babalola S, Figueroa M-E, Krenn S. Association of mass media communication with contraceptive use in sub-Saharan Africa: a meta-analysis of demographic and health surveys. J Health Commun 2017;22(11):885–95.
[82] Obasohan PE. Religion, ethnicity and contraceptive use among reproductive age women in Nigeria. Int J MCH AIDS 2015;3(1):63–73.
[83] Walelign D, Mekonen A, Netsere M, Tarekegn M. Modern contraceptive use among orthodox Christian and Muslim women of reproductive age group in Bahir Dar City, North West Ethiopia: Comparative cross sectional study. Open J Epidemiol 2014;4:235–42.
[84] Gyimah SO, Adjei JK, Takyi BK. Religion, contraception, and method choice of married women in Ghana. J Relig Health 2012;51(4):1359–74.
[85] Agadjanian V. Religious denomination, religious involvement, and modern contraceptive use in Southern Mozambique. Stud Fam Plan 2013;44(3):259–74.
[86] Nketiah-Amponsah E, Arthur E, Aaron A. Correlates of contraceptive use among Ghanaian women of reproductive age (15-49 years). Afr J Reprod Health 2012;16(3):155–70.
[87] Blackstone SR, Nwaozuru U, Iwelunmor J. Factors influencing contraceptive use in sub-Saharan Africa: a systematic review. Int Q Community Health Educ 2017;37(2):79–91.
[88] Srikanthan A, Reid RL. Religious and cultural influences on contraception. J Obstet Gynaecol Can 2008;30(2):129–37.
[89] Pinter B, Hakim M, Seidman DS, Kubba A, Kishen M, Di Carlo C. Religion and family planning. Eur J Contracept Reprod Health Care 2016;21(6):486–95.
[90] Yeatman SE, Trinitapoli J. Beyond denomination: the relationship between religion and family planning in rural Malawi. Demogr Res 2008;19(55):1851–82.
[91] Ludermir AB, de M Machado KM, da Costa AM, Alves SV, de Araújo TVB. Tubal ligation regret and related risk factors: findings from a case-control study in Pernambuco State, Brazil. Cad Saude Publica 2009;25:1361–8.
[92] Curtis KM, Mohllajee AP, Peterson HB. Regret following female sterilization at a young age: a systematic review. Contraception 2006;73(2):205–10.
[93] Neena M, Charu C, Pradeep G. Post-sterilization regrets in Indian women. Indian J Med Sci 2007;61(4):186–91.
[94] Kariminia A, Saunders DM, Chamberlain M. Risk factors for strong regret and subsequent IVF request after having tubal ligation. Aust N Z J Obstet Gynaecol 2002;42(5):526–9.
[95] Singh A, Ogollah R, Ram F, Pallikadavath S. Sterilization regret among married women in India: implications for the Indian national family planning program. Int Perspect Sex Reprod Health 2012;38(4):187–95.
[96] Fleming PJ, Silverman J, Ghule M, Ritter J, Battala M, Velhal G, et al. Can a gender equity and family planning intervention for men change their gender ideology? Results from the CHARM intervention in rural India. Stud Fam Plan 2018;49(1):41–56.
[97] Blanc AK. The effect of power in sexual relationships on sexual and reproductive health: an examination of the evidence. Stud Fam Plan 2001;32(3):189–213.
[98] Mboane R, Bhatta MP. Influence of a husband's healthcare decision making role on a woman's intention to use contraceptives among Mozambican women. Reprod Health 2015;12:36.
[99] Akaba G, Ketare N, Tile W. A community-based, mixed-methods study of the attitudes and behaviors of men regarding modern family planning in Nigeria. Int J Gynecol Obstet 2016;135(1):86–90.
[100] Ijadunola MY, Abiona TC, Ijadunola KT, Afolabi OT, Esimai OA, OlaOlorun FM. Male involvement in family planning decision making in Ile-Ife, Osun State, Nigeria. Afr J Reprod Health 2010;14(4):45–52.
[101] Mosha I, Ruben R, Kakoko D. Family planning decisions, perceptions and gender dynamics among couples in Mwanza, Tanzania: a qualitative study. BMC Public Health 2013;13:523.
[102] Char A, Saavala M, Kulmala T. Male perceptions on female sterilization: a community-based study in rural Central India. Int Perspect Sex Reprod Health 2009;35(3):131–8.
[103] Mutombo N, Bakibinga P. The effect of joint contraceptive decisions on the use of Injectables, Long-Acting and Permanent Methods (ILAPMs) among married female (15-49) contraceptive users in Zambia: a cross-sectional study. Reprod Health 2014;11:51.
[104] Babigumira JB, Vlassoff M, Ahimbisibwe A, Stergachis A. Surgery for family planning, abortion, and postabortion care. In: Debas HT, Donkor P, Gawande A, Jamison DT, Kruk ME, Mock CN, editors. Essential surgery: disease control priorities. , 3rd ed.The International Bank for Reconstruction and Development / The World Bank; 2015.
[105] Forrester JD, Forrester JA, Kamara TB, Groen RS, Shrestha S, Gupta S, et al. Self-reported determinants of access to surgical care in 3 developing countries. JAMA Surg 2016;151:257.
[106] Barone MA, Mbuguni Z, Achola JO, Almeida A, Cordero C, Kanama J, et al. Safety of tubal occlusion by minilaparotomy provided by trained clinical officers versus assistant medical officers in Tanzania: a randomized, controlled, noninferiority trial. Glob Health Sci Pract 2018;6(3):484–99.
[107] Luboga, Macfarlane SB, von Schreeb J, Kruk ME, Cherian MN, Bergström S, et al. Increasing access to surgical services in sub-Saharan Africa: Priorities for national and international agencies recommended by the Bellagio Essential Surgery Group. PLoS Med 2009;6(12):e1000200.
[108] Jacobstein R. Lessons from the recent rise in use of female sterilization in Malawi. Stud Fam Plan 2013;44(1):85–95.
[109] Wolfe KK, Wilson MD, Hou MY, Creinin MD. An updated assessment of postpartum sterilization fulfillment after vaginal delivery. Contraception 2017;96(1):41–6.
[110] Baldwin MK, Rodriguez MI, Edelman AB. Lack of insurance and parity influence choice between long-acting reversible contraception and sterilization in women postpregnancy. Contraception 2012;86(1):42–7.
[111] White K, Potter JE. Reconsidering racial/ethnic differences in sterilization in the United States. Contraception 2014;89(6):550–6.
[112] Zite N, Borrero S. Female sterilisation in the United States. Eur J Contracept Reprod Health Care 2011;16(5):336–40.
[113] Borrero S, Zite N, Potter JE, Trussell J. Medicaid policy on sterilization–anachronistic or still relevant? N Engl J Med 2014;370(2):102–4.
[114] Kimport K, Dehlendorf C, Borrero S. Patient-provider conversations about sterilization: a qualitative analysis. Contraception 2017;95(3):227–33.
[115] Jadhav A, Vala-Haynes E. Informed Choice and female sterilization in South Asia and Latin America. J Biosoc Sci 2018:1–17 [Epub ahead of print].
[116] Erlenwein J, Kundu S, Schippert C, Soergel P, Hillemanns P, Staboulidou I. Attitude toward, acceptance of and knowledge about female sterilization as a method of contraception. Eur J Obstet Gynecol Reprod Biol 2015;185:83–7.
[117] Ewerling F, Victora CG, Raj A, Coll CVN, Hellwig F, Barros AJD. Demand for family planning satisfied with modern methods among sexually active women in low- and middle-income countries: who is lagging behind? Reprod Health 2018;15:42.
[118] Mclaughlin LC. The Price of Failure of Informed Consent Law: Coercive Sterilizations of HIV-Positive Women in South Africa. Law Inequal 2014;32(1):69–93.
[119] Mallet J, Kalambi V. Coerced and forced sterilization of HIV-positive women in Namibia. HIV/AIDS Policy. Law Rev 2008;13(2-3):77–8.
[120] Strode A, Mthembu S, Essack Z. "She made up a choice for me": 22 HIV-positive women's experiences of involuntary sterilization in two South African provinces. Reprod Health Matters 2012;20(Suppl. 39):61–9.
[121] United Nations. Sustainable development knowledge platform. Available from: https://sustainabledevelopment.un.org/sdgs, Accessed date: 18 December 2018.