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BARRIERS TO UTILIZATION OF LONG ACTING REVERSIBLE AND PERMANENT CONTRACEPTIVE METHODS IN ETHIOPIA: SYSTEMATIC REVIEW

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ABSTRACT
BACKGROUND

Globally the use of Long-Acting Reversible and Permanent Methods (LARPMs) has been recommended as the first-line, highly effective options for pregnancy prevention. They have greater efficacy than short acting contraceptive methods and are associated with lower rates of unwanted pregnancy. Ethiopia has made significant progress in family planning (FP); however, one fourth of married women still have unmet need for FP and nearly three-fourth of family planning users depend on short acting injectable contraceptives. The aim of this study was to review existing researches to identify barriers to long acting reversible and permanent contraceptive use in emerging regions of Ethiopia.

METHOD:

Published and unpublished literatures were searched using major search engines and different search terms related to the topic. Literature search was carried out from March to May 2016. Six selection criteria were prepared to summarize the findings using PRISMA protocol. A checklist of eight-item quality assessment criteria was used to rate the quality of studies independently by two investigators, and the third investigator cross checked and decided on agreements. The studies were critically appraised, and thematic analysis was used to synthesize the data.

RESULTS:

Using the screening criteria, 69 eligible full-text articles and reports were reviewed; of which 34 articles and 8 policy/strategy documents were considered for data synthesis. The review has included policy related, individual, socio-cultural and health facility related barriers/factors affecting LARPMs use in emerging regions. Lack of strategies to reach the mobile population of emerging regions, facility readiness to provide LARPMs and quality of care were major policy and health care factors contributing for the low utilization of LARPMs. Low knowledge of LARPMs, health concerns, fear of side effects, and lower education were among individual level barriers identified through the review. Moreover, the review showed that men's (partner's) objection, desire for more children (especially by the male partner), absence of male involvement, lack of women's decision-making power and lack of discussion with partners were gender related barriers.

CONCLUSION:

The regional disparity in LARPM use, particularly in emerging regions, requires targeted policy and strategic direction to address the prevailing inequality in family planning use and method mix. To improve the utilization of LARPMs, efforts should be made to address the key demand and supply side barriers. More context specific research evidences should be generated to understand barriers that are specific to these regions.

INTRODUCTION

Globally the use of long-acting reversible and permanent contraceptive methods (LARPMs) have been recommended as highly effective options for pregnancy prevention[1]. But in developing countries-apart from preventing pregnancy, satisfying the demand for family planning and development are major issues[2-4]. Long-acting reversible and permanent contraception (LARPMs) have greater efficacy than short acting methods and are associated with lower rates of unwanted pregnancy. However, overall use of LARPMs among reproductive age population is low both in developed and developing nations[5].

In Africa, women's inconsistent fertility desires and contraceptive use behaviors reflect barriers to family planning (FP) use and high unmet need[6-8]. In some studies, more that 65% of postpartum women had unmet need for LARPMs of contraception[9]. The overwhelming problem of unmet need in low and middle-income countries (LMICs) requires effective policy intervention backed up by effective methods[2,10] based on rights-based, equity and quality principles[2]. Although much of the women use family planning to limit birth than to space[3,7], and overall improvements of contraceptive coverage[11,12], the regional trend in Africa showed unacceptably low use of long acting family planning methods[11,12].

Ethiopia has made significant progress in family planning coverage. It managed to nearly triple the contraceptive prevalence rate (CPR) over the past 10 years (from 15% in 2005 to 42% in 2014)[13]. Ethiopia has showed its commitment to achieve 55% contraceptive prevalence by the year 2020[14]. The national demand for family planning is 53.9% (25.3% unmet and 28.6 met need)[15]. However, the government clearly outlined that there are critical bottlenecks to address the inequities and inequalities of family planning use among emerging regions[13]. The relatively low uptake of long-acting reversible methods across the globe was attributed to clients' lack of knowledge, dependence on the provider for information, and provider's bias for permanent contraception[16-20].

In Ethiopia, the most preferred method in the past 15-years was injectable contraceptive method (Depo-Provera). The uptake of Depo-Provera has increased by more than ten-fold in the time period. But LARMPs has shown very limited increment. Therefore, identifying the barriers to LARPMs of contraception from available data and research is an urgent and crucial for appropriate implementation and to design effective family planning strategy in the years to come. Hence, the aim of this study was to review existing researches to identify the barriers for LARPMs of FP in Ethiopia with emphasis on emerging regions.

METHODS AND PROCEDURES

Data extraction from published and unpublished research works: Published and unpublished literatures (including policies, strategies/guidelines, reports and unpublished thesis works) were searched using search engines, including endnotes, Google scholar, HINARI and others from the common websites, such as: Pub Med and Ethiopian journals (Ethiopian journal of health development, Ethiopian Journal of Health Sciences and Ethiopian journal of reproductive health). Search terms such as "long acting methods AND Ethiopia", "long acting and permanent methods AND Ethiopia", "long acting methods AND Emerging regions of Ethiopia", "barriers of long acting methods AND Ethiopia", "short acting vs long acting methods AND Ethiopia", and "challenges of long acting methods" were utilized. Literature search was conducted from March to May 2016. Studies conducted in Ethiopia from 2000 to 2016 on married women/men population with objectives of assessing contraceptive use (short acting, long acting reversible and permanent contraceptives), family planning service access and facility readiness were included. Research articles with any kind of study designs (both qualitative and quantitative) and those published in English language were included.

A literature review matrix (as indicated in additional File 1) was prepared in Excel spreadsheet. Articles were reviewed; relevant information was extracted from identified literatures and summarized using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)protocol(Figure 1). The studies were critically appraised, and findings were synthesized systematically using the literature review matrix. A quality assessment criterion (with eight items) were used to rate the quality of studies/research

articles by two investigators independently, and a third investigator was used as tiebreaker (Table 1). The review team had cross-checked and decided on agreements.

Data extraction from policy documents: Policy /strategic documents such as the Ethiopian health policy, population policy, Health Sector Transformation Plan (HSTP), the revised RH strategy, FP service guideline, Adolescent and Youth Reproductive Health (AYRH) strategy, Maternal and Neonatal Health (MNH) road map were reviewed and content gaps related to long acting reversible and permanent contraceptive methods were summarized (Table 1) and factors related to quality, equity,

and region specific needs were identified from these policy/strategic documents.

In this review, initially a total of 531 source documents (19 policy/strategy documents and 512 articles (including unpublished thesis works)) were identified. At the screening step (reading the abstracts and scanning documents), a total of 210 documents were screened and considered relevant for the objective of this review. Using the screening criteria, 69 eligible full-text articles/reports and 8 policy/strategy documents were selected. Finally, after reading the full text of articles and policy/strategy documents thoroughly, 34 articles, 8 policy/ strategy documents were included (Figure 1).
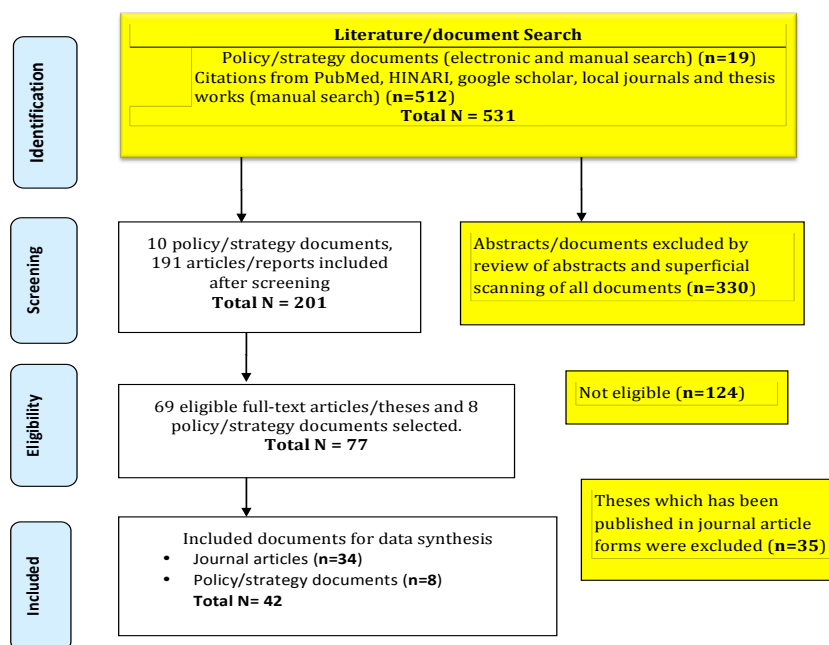
Figure 1: Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram of the systematic review

METHODOLOGICAL QUALITY ASSESSMENT

After identifying and including 34 research articles in this systematic review, a scientific research quality assessment criteria with eight items; 1) Explicit study objectives, 2) Adequate sample size, 3) Representative sample, 4) Clear inclusion and exclusion criteria, 5) Reliable and valid measurements, 6) Response rate reported and losses given, 7) Adequate description of data, 8) Appropriate statistical analyses and

interpretation of findings were used to rate the quality of the studies independently by two investigators, then the third investigator cross-checked and decided on agreements. Differences were also discussed and consensus was reached. Scores were given as: 1 for a "yes" answer and 0 for a "no" answer, for a possible maximum score of 8 points (Table 1).

RESULTS

BARRIERS OF LARPMS USE – REVIEW OF QUANTITATIVE AND QUALITATIVE STUDIES

The studies included in the systematic review showed diverging results on the prevalence of long acting and permanent family planning use in Ethiopia, ranging from 9.2%[3] to 37.8%[21]. A cross-sectional study conducted in Shashemene, southern Ethiopia, showed that long acting and permanent methods accounted for 28.4% of contraceptive use[22]. The prevalence of long acting and reversible family planning from different studies was also documented as; 19.9% in Wukro[21], 37.8% in Kilteawlaelo[21], 20% in western Ethiopia[23], 36.7% in Durame (with unmet need; 27.9%) [24], 26% in East Harerge[25], 19.5% in Debre Markos[26], 9.2% in Debre-Tabor[3] and 12.3% in Mekelle town[21,27,228]. In the other studies, documented in Wolayta Zone, 38% of women had the intention to use LARPMs[29]. Fifty two percent (51.9%) of women in Wolayta Zone[29] and 53.6% of women in Mekelle town had negative attitude towards the use of LARPMs[28].

Women do have different reasons and perceptions towards long acting family planning. A study conducted in Bahir Dar showed that 35.6% women perceived that LARPMs can cause health problems such as: cancer (24.7%)[30], infertility (16.7%)[30], implant cause irregular menstrual bleeding (49.2%) and believed IUD limit women from doing heavy work (20.6%) and 38.9% women believed that LARPMs should be used only for women who do not want more children[31]. A study conducted in Addis Ababa health facilities showed that 32%[31] of women were against the use of long acting contraception and 27.5% of women had reported partners opposition against the use of LARPMs[31]. Research evidences showed barriers affecting the use of LARPMs have been documented at individual, household, health care and community levels[9,32,33]. These barriers affecting long acting reversible and permanent contraceptive methods use were broadly categorized as demand side barriers (including individual level barriers, gender/relational barriers and socio-cultural barriers) and supply side barriers (including; provider related barriers, facility related barriers, policy related barriers (Figure 2) and summarized as follows. Different studies have documented that lower educational status of women[22],
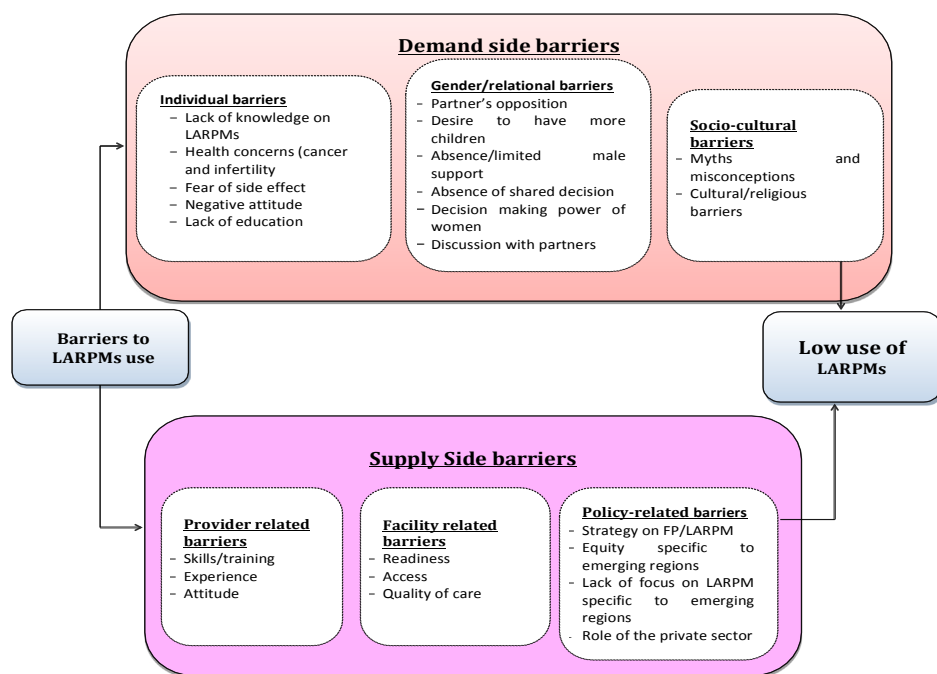

Figure 2. Summary of barriers affecting LARPMs use in emerging regions of EthiopiaIndividual level barriers

previous negative experience[24] and lack of knowledge[34-36] are important barriers to long acting reversible and permanent contraceptive use. Apart from the lack of knowledge, studies also indicated that women do have health concerns (perceiving that LAFP causes cancer and infertility)[30,37,328] and negative attitude towards the use of LARC[228,35,36,39], which could be described as a barrier to use LARC. Fear of immediate side effect associated with contraception use is also a barrier[8]. On the other hand, better educational status of women[21,23,24,29,36,40,41], shared fertility decision[22], higher number of live births[3,9,42,43], exposure to media and discussion with health care provider (counseling) have been documented as facilitator for long acting and reversible contraceptive (LARC) use.

Gender/relational barriers: Studies showed that gender and/or relational factors have detrimental effect on family planning use[44]. Lack of agreement between a woman and her husband on contraceptive use is also one of the barriers[45]. Similarly, this systematic review showed that, partners' objection against the use of LAC[31,43,46], absence/limited male support/ shared decision[3,22,47], limited women's decision making power[48] and lack of discussion with partners[22] were gender related barriers to LARC use. In our review, couples desire to have more children were reasons for early discontinuation of long acting family planning[22,31,37,49].

Socio-cultural barriers: Socio-cultural variables such as myths and misconceptions[50-52], culture of the society and religion[17,53,54] have been documented to affect family planning use in general. Similarly, the review showed that myths[29,37,43], religious/cultural misconceptions[8,25,29,55] were identified as barriers to modern contraceptive use. The demand and supply side barriers affecting the select representative sample and difficulty to generalize the findings. The lack of clear or wrong inclusion and exclusion criteria were the third major quality related problems of the selected articles (Table 1).

use of LARPMs in Ethiopia has been summarized as figure (Additional file 1 and Figure 2). The quality appraisal on included articles showed that the quality of the selected articles varied substantially. It ranges from aggregate quality score of 3 to the highest maximum quality score of 8. The most common limitation of the research articles was failure to report and indicate mechanisms to address bias due to non-response or information bias. Hence, most studies lack detail report or considerations about the response rate and losses. The second common problem was inability to

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Table 1. Quality assessment results of the selected and included articles, 2016

SN	Selected articles (Authors, years)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Total
1	Asnake M., E. G. Henry, et al. (2013)	Y	Y	N	Y	Y	N	Y	Y	6
2	Joti, K. K. (2014)	Y	Y	Y	Y	Y	N	N	Y	6
3	Demesse Y, et.al 2014	Y	Y	N	N	Y	N	Y	Y	5
4	Gelaw, B. et.al (2014)	Y	Y	N	N	Y	N	Y	Y	5
5	Gebrekidan, K. (2008)	Y	Y	Y	Y	Y	Y	Y	Y	8
6	Jemberie A. et al. (2014)	Y	Y	Y	Y	Y	N	Y	Y	7
7	Abdi, T. et.al. (2009)	Y	Y	Y	Y	Y	Y	Y	Y	8
8	Tesfaye, F. (2007)	Y	N	N	Y	Y	Y	Y	Y	6
9	Megabiaw, B. (2012)	Y	N	Y	Y	Y	N	Y	N	5
10	Dubiwak, R. et al. (2014)	Y	Y	Y	Y	Y	Y	N	Y	7

11	Haile, A. et al. (2012)	Y	N	N	N	N	Y	Y	Y	4
12	Bulto, G. A., T. A. Zewdie, et al. (2014)	Y	Y	Y	Y	Y	N	Y	Y	7
13	Walelegn M, et.al 2014	N	Y	Y	Y	Y	N	Y	Y	6
14	Takele, A., G. Degu., et al. (2012)	Y	Y	Y	Y	Y	Y	Y	Y	8
15	Gelagay A. A., D. N. Koye, et al. (2015)	Y	Y	N	Y	Y	N	Y	Y	6
16	Yalew, S. A., B. M. Zeleke, et al. (2015)	Y	Y	N	Y	Y	N	Y	Y	6
17	Earsido A, Gebeyehu A. et al. (2015)	Y	Y	Y	Y	N	Y	Y	Y	7
18	Melka A. S., T. Tekelab, et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y	8
19	Tamrie Y. E., E. G. Hanna, et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y	8
20	Birhane, K., S. Hagos, et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y	8
21	Mengistu M. and M. Wubegzier. (2014)	Y	Y	Y	Y	Y	Y	Y	Y	8
22	Alemayehu, M., T. Belachew., et al. (2012)	Y	Y	Y	N	Y	Y	Y	Y	7
23	Mengistu, A., W. Lakachew, et al. (2006)	Y	N	N	Y	Y	N	Y	Y	5
24	Gebremariam A. et al. (2014)	Y	Y	Y	Y	Y	N	Y	Y	7
25	Alemu WG. Et al. (2014)	Y	Y	Y	Y	Y	Y	Y	Y	8
26	Gebremariam, A. et al. (2014)	Y	Y	N	N	N	N	N	Y	3
27	Mulatu K. et.al (2014)	Y	Y	Y	Y	Y	N	Y	Y	7
28	Mekonnen, G., F. Enquselassie, et al. (2014)	Y	Y	Y	Y	Y	N	Y	Y	7
29	Alemayehu M., A. Kalayu, et al. (2015)	Y	Y	Y	Y	Y	N	Y	Y	7
30	Tsedeke, T., D. Wakgari., et al. (2006)	Y	Y	Y	Y	N	Y	N	Y	6
31	Mota, K., S. Reddy, et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y	8
32	Desalegn, M. (2014)	Y	Y	Y	Y	Y	Y	Y	Y	8
33	Asegidew, W. et al (2014)	Y	Y	Y	Y	Y	Y	Y	Y	8
34	Negatu, B. et al (2014)	Y	Y	Y	Y	Y	Y	Y	Y	8

NOTE

1. Q1=Explicit study objectives
2. Q2=Adequate sample size
3. Q3=Representative sample
4. Q4=Clear inclusion and exclusion criteria
5. Q5=Reliable and valid measurements
6. Q6=Response rate reported and losses given
7. Q7=Adequate description of data
8. Q8=Appropriate statistical analyses and interpretation of findings
9. Y = Yes, fulfilled
10. N = No, not fulfilled

THE LARPMS POLICY GAP: FINDINGS FORM POLICY AND STRATEGY DOCUMENT REVIEW

The Ethiopian Government is a signatory of several international conventions/ charters and declarations, including those arising from the 1987 Safe Motherhood Initiative[56]; the 1994 ICPD[57] and the 1995 Fourth World Conference for Women[58]. The Ethiopian constitution in its Article 35:9 clearly stipulates that women do have the right to be protected from harm arising from pregnancy and childbirth. Similarly, the constitution has guaranteed every woman to have access to family planning education, information and capacity so that to safeguard their health[59]. Ensuring the provision of equitable, comprehensive and integrated primary health care through decentralized health promotion and disease prevention interventions have been the major emphases specified under the Ethiopian health policy. The national health policy has also given due consideration to maternal and child health deserve; particularly family health and population planning to be addressed through intersectoral collaboration[60].

To ensure optimal family health and planned population dynamics, decentralizing services, enriching the concept and intensifying the practice of family planning are the critical recommendation made by the national health policy[60].

Similarly, the Ethiopian population policy (1993) pointed out that there has been limited family planning service delivery both in scope and diversity. Hence, this policy designed steps to be taken to expand coverage and provide greater choice of methods to users by: expanding the diversity and coverage of family planning service delivery through clinic and community based outreach services; encouraging and supporting the participation of non-governmental organizations in the delivery of population and family planning related services; and creating conditions that will permit users the widest possible choice of contraceptives by diversifying the method mix available in the country[61].

Moreover, to enhance FP utilization, other strategic documents have emphasized on the integration and linkage of FP services with other RH services. As a part of women empowerment commitment, the government of Ethiopia also has developed Women's Policy, revised the Family Law, the Criminal Law and the family planning guidelines. Accordingly, the issue of family planning is emphasized in the recent several strategic documents of FMOH including the previous Health Sector Development Plans (HSDPs) and the current Health Sector Transformation Plan (HSTP), and the revised RH strategy for the 2016-2020[14,61,62].

Fertility and family planning is one of the six priority areas identified under the reproductive health umbrella of the National Reproductive Health Strategy of Ethiopia[63]. The strategy includes the need to create acceptance and demand for FP, with special emphasis to different populations segments vulnerable by geographic dispersion, age, marital status, gender, and wealth. The revised National Reproductive Health Strategy of the FMOH gives due emphasis to family planning. It has clearly put that the goal of family planning is to reduce unwanted pregnancies and enable individuals to achieve their desired family size[64].

In the previous national reproductive health strategy (2006-2015)[63] and other policy and strategic documents mentioned above, no clear reference is given on Long Acting Reversible and Permanent Contraceptive Methods (LARPMs). In addition, a clear priority and target is not set in the document related to emerging regions where access to quality FP services and utilization is the lowest compared to the other regions of the country. Cognizant of this, the revised RH strategy (2016-2020), gives due emphasis to focuses on the LACs by setting clear targets, to increase the proportion of long acting reversible and permanent contraceptive methods to 50% (Implants 33%, IUCD 7%, female sterilization 7% and male sterilization 3%) from the total method mix. In addition, an annual 2% CPR increment rate for the developing regional states is indicated[64]. The policy/strategy documents have included clear statements about the importance of expanding family planning program considering its contribution for population dynamics, health and women empowerment. However, the documents did not indicate implementation strategies to address the most disadvantaged regions (emerging regions) specially to expand LARPMs. Similarly, the core equity indicators of the health sector transformation plan (HSTP) (2015-2020), did not include FP indicators (Table 2).

Table 2. Summary of main findings from policy/strategic documents

Policy document	Main finding	Comment
ICPD, Cairo program of Action	The Ethiopian Government signed ICPD declarations and Cairo program of action	Gives the basic ground and initiation for FP program
Ethiopian Constitution Article 35:9	Women have the rights to be protected from harm arising from pregnancy and childbirth and in order to safeguard their health; women have the right of access to family planning education, information and capacity	Supports FP (sufficient ground to support LARPMs practice (Family law developed). Not specific to LARPMs

National Health Policy	Comprehensive and integrated primary health care in a decentralized and equitable fashion. It emphasizes the concept and intensifying the practice of family planning for optimal family health and planned population dynamics	Has supportive ground for FP program and equity. No details about type methods (FP guidelines developed)
HSTP (2015-2020)	Has planned to reduce TFR to 3.0 by 2020. Increase CPR to 55% by 2020. Reduce unmet need to 10%. It emphasizes equity.	The core equity indicators of this document did not include FP indicators. No details about LARPMs. No specific plan for emerging regions
Ethiopian population policy	Emphasized steps to be taken to expand coverage and afford greater choice of methods to users (reduce TFR 6.4 to 4.4). Permit users the widest possible choice of contraceptives by diversifying the method mix available in the country	Strong support of method choice. Regional specific interventions were not included.
National Reproductive Health Strategy (2016-2020)	Has a clear target, to increase the proportion of long acting reversible and permanent contraceptive methods to 50% (Implants 33%, IUCD 7%, female sterilization 7% and male sterilization 3%) from the total method mix. In addition, annual 2% CPR increment rate for the developing regional states is indicated.	Strong support for FP and LAMs and considers geographic variation. No specific implementation strategies (modalities) were indicated

DISCUSSION

Over the past 25 years, Ethiopia has been adopting and following up on its international commitments. Based on the international promises, it has been implementing a series of policies and national strategies aimed at creating the required circumstances for all Ethiopians to have access to basic social services, as well as ensuring women's human, economic, and political rights and their full participation in the development process[61]. The federal constitution, health-related policies, and strategies in Ethiopia cover all major grounds to offer all necessary provisions, creating an enabling environment to maintain the population dynamics in the interest of sustainable development goals[14,59,61,62,64]. Therefore, to achieve family health and population related national and international goals, family planning program has been given due attention[14,62]. However, with all these efforts this review identified both policy/strategy gaps and implementation challenges (especially in the emerging regions of Ethiopia; which is the focus area of this systematic review) to expand family planning utilization in Ethiopia.

In this systematic review, although there are very few studies in emerging regions, the barriers for LARPMs use have been summarized as; the demand side factors (including individual factors/barriers, gender/relational factors and socio-cultural factors) and supply side factors (including the policy/strategy gap, health facility and provider related factors. Although, there has been interest to expand family planning services in general and utilization of LARPMs in particular, the reviewed policy/strategy documents had limitations in stating clear strategies on how to address emerging regions and how the LARPMs can be accessible in all parts of the country. It is clearly evidenced that the policy/strategic documents have gaps to clearly indicate specific focuses on how to increase LARPMs use in the emerging regions and unable to define applicable implementation modalities. This might have contributed for the significant difference in the performance of emerging regions to increase LARPMs utilization. Non-contextual and non-

focused policies/strategies for the emerging regions might in-turn have contributed to facility readiness, access and quality of care, provider's skill or attitudinal factors for low LARPMs use in emerging regions.

Although there are no studies conducted on LARPMs in emerging regions, the life style (nomadic and pastoralist way of life) and geographic barriers, access to health facilities are still major concern and determinants for LARPMs use; unlike the other non-emerging regions in Ethiopia. Apart from the general truth that method availability, absence of trained/experienced health professionals and capacity of the health facilities affects LARPMs use, it is clear that physical barriers/ geography, population characteristics, cultural/normative, religious and behavioral factors could contribute for low utilization of LARPMs use in these regions. These might have been due to the fact that policies/strategic documents did not include context specific strategies to address low LARPMs utilization in the emerging regions. In addition, providers' choice, inadequate counseling, method stocking out and poor service integration due to shortage/lack of skilled service providers and female health extension workers could be factors for low utilization of LARPMs which would have been addressed by region specific strategies.

Regarding the demand side factors, the reviewed evidences revealed that individual level factors including lack of knowledge (awareness) on LARPMs, health concerns like cancer and infertility, fear of side effects, negative attitude towards LARPMs, and lack of education to understand written documents or use of technology about LARPMs were identified as very important barriers. Gender/ relational barriers are mainly arising from the male gender dominance observed in the country. The reviewed documents indicated that partner's opposition, desire to have more children (especially the male partner), absence/limited male support, absence of shared decision, lack of women's decision-making power/low women status and lack of discussion with partners were barriers related to gender. The problem is even worse in the emerging regions of Ethiopia.

The other demand side barriers identified were the socio-cultural factors. Some of the myths and misconceptions are learned in the community. Studies revealed that the society in many places of Ethiopia believe that LARPMs can cause infertility and other health problems. Additionally, the tradition of pronatalist thinking and religious believes are contributing for the non-use of contraceptives, especially LARPMs. These believes contribute for non-use because of the fact that users can be stigmatized or they may develop guilt feeling if they have used. Therefore, they may not have psychological readiness to use or may interrupt early if they are using LAMs. This problem is common across different parts of Ethiopia and even higher in the emerging regions. Based on findings in this review, summary of the barriers is presented in Figure 2.

LIMITATIONS

Most of the findings were extracted from studies conducted in other parts of the country (not context specific). The available evidences are based on cross-sectional studies including gray literature with methodological shortcomings. Since the purpose of this systematic review was to understand the major barriers of LARPMs use in emerging regions of Ethiopia, it did not focus only on high quality articles which optimally used available evidence. The effects size/strength of association of identified barriers was not included. Therefore, development of strategic documents using the identified barriers should be used carefully. Hence, it is highly recommended to conduct a study using mixed methodology (both quantitative and qualitative involving facility and community based designs).

CONCLUSIONS

This systematic review indicated that there is high paucity of evidences on use of LARPMs of contraception in emerging regions. However, the review has identified both supply and demand side barriers responsible for the low utilization of LARPMS in Ethiopia which would logically be true for the emerging regions too. The reviewed policy/strategy documents did not have details about LARPMs in general and for emerging regions in particular. And there is no strategic document that indicates specific intervention modality to expand LARPMs in emerging regions. The demand side factors include variety of barriers related with individual level barriers, gender/ relational barriers and socio-cultural barriers.

Majority of the supply side factors affecting LARPMs utilization including policy/strategy related gaps, facility and provider related factors including; facility readiness, access and quality of care, provider skill and caring attitude, which could have been solved by regional/context specific strategies designed for emerging regions.

RECOMMENDATIONS

In increasing access and utilization of LARPMs, the inclusion of clear and direct strategies in all the policy and strategic documents will help program implementers in giving due emphasis and priority in addressing the very high unmet need for the specific family planning methods and services in general and for LARPMs in particular. Explicit reflection of the disparity in emerging regions and providing targeted policy and strategic direction for the emerging regions is crucial. Such policy and strategic directions will help the country in achieving its ambitious development goals and addressing the prevailing inequity and inequality in family planning use and method mix.

No intervention could be effective without considering both supply side and demand side barriers. Therefore, specific intervention strategies are required to address each of the identified barriers. Then, the interventions should be integrated and mix of intervention modalities should be designed to address the barriers.   Interventions should also involve establishing mobile clinics, provision of supplies, training of providers, demand generation activities, including awareness creation through mass media/other appropriate methods and by health extension workers and enhancing male involvement at the community level are recommended.

Finally,   Evidence   generation   followed by knowledge translation specifically to emerging regions is critical and should be given emphasis. Therefore, a close look at the barriers in emerging regions through collection of primary data is highly recommended to generate context specific evidences. Designing facility and community linked study using quantitative and qualitative approaches as well as intervention studies are worthwhile.

DECLARATIONS

Ethical approval and consent

CONSENT FOR PUBLICATION

All authors have consented for publication.
Availability of data and material
All the data related to this article and its conclusion has been available as tables and figures.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

AG MA, YD, TS, MY, AMT, and GT developed the original research and selected the eligible studies. AG, MA, TS, YD and AMT designed the research design and conducted data extraction and document consolidation. AG, MA, YD, TS, AMT and GT conducted the analysis. AG, YD, TS and GT conducted the methodological quality assessment of articles. TS drafted the manuscript. All author critically reviewed the manuscript. All authors read and approved the final manuscript.

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Additional file

Additional file_1. Characteristics and major findings of the reviewed articles, 2016

Reference (Authors, years)	Title	Objectives	Study type/ Design or Program document	Sample size and study population or Population covered	Main findings related to FP	Findings related to barriers of LARPM	Study area (Place)
Asnake M., E. G. Henry, et al. (2013)[36]	Addressing unmet need for long-acting family planning in Ethiopia: uptake of single-rod progestogen contraceptive implants (Implanon) and characteristics of users.	To describe women who accept single-rod progestogen contraceptive implants	Comparative study based on Demographic and Health Survey (DHS) data	5973 Women who accepted Implanon during training events in 4 regions	Implanon acceptors were younger and had more years of education and fewer children. Almost one-quarter (22.9%) of all participants had never used contraception before	Implanon acceptors were less likely than non-acceptors to be using contraception (70.8% vs 77.3%; P < 0.05). Women who accepted Implanon were younger but more educated than women with unmet need for contraception in the 2005 DHS.	4 regions in Ethiopia
Joti, K. K. (2014) [51]	Assessment of factors influencing utilization of long acting and permanent contraceptive methods among married women (18-49 ears) of reproductive age in Ambo town, Oromia region, Ethiopia	To assess factors influencing utilization of long acting and permanent contraceptive methods and associated factors	A descriptive cross-sectional community-based study	384 married women	Overall prevalence of LARPMs wa 65.6% (i.e. 57% implants users, 6.2% female sterilization and 0.3% male sterilization users) Thirty four (34%) of respondents never practiced LAMPs and had negative attitude towards practicing of LARPMs	Income (high) (AOR = 3.6, 95% CI of (1.494, 8.74)) and religion (Orthodox) (AOR = 4.715, 95% CI of (1.026, 21.67) are predictors of the LARPM	Ambo town, Oromia region
Demesse Y, and et.al 2014[52]	Assessment of long acting and permanent contraceptive methods utilization and associated factors among female antiretroviral therapy attendees in Gondar town, North west Ethiopia, 2014	To determine long acting and permanent contraceptive methods utilization and associated factors	Institution based cross-sectional study	468 non-pregnant HIV positive women (15-49years)	85.0% women were using some modern form of contraception. Current utilization rate of LARPMs (alone or with condom) was 24.1%	Knowledge of women [AOR=2.59, 95% CI [1.04, 6.45], being ever pregnant since the commencement of ART [AOR= 2.68, 95%CI [1.21, 5.93] and discussion about family planning with health care provider [AOR=2.69, 95% CI [1.18, 6.15] were factors of using LARPMs.	Gondar town, Amhara region
Gelaw, B. et.al (2014) [37]	Assessment of magnitude and factors affecting intention of women living with HIV to use long acting and permanent family planning methods in Addis Ababa city government public hospitals, Addis Ababa, Ethiopia.	To assess the magnitude and factors affecting intention to shift to LARPMs by women who are on Anti-Retroviral Therapy	Facility based cross sectional survey	633 HIV positive women	Thirty eight (38.5%) of women had intention to shift to LARPMs. Knowledge of respondents on LARPMs was 95%.	Women's level of education AOR= 1.59, 95 % CI: 1.07, 2.36], their level of knowledge about LARPMs [1.68, 95% CI: 1.09,2.60] and attitude of women towards LARPMs [1.66, 95% CI: 1.18-2.34] were factors associated (positively) with intention of HIV positive women to shift to LARPMs. Parity of women: one to two children [0.25, 95%:0.12, 0.39] and three to five children [0.12, 95% CI: 0.06, 0.24] were found to be significant associated (negatively) with intention of women to shift to LARPMs.	Addis Ababa public health hospitals

Author	Title	Objective	Study design	Sample	Findings	Key finding	Location
Gebrekidan, K. (2008)[53]	Assessment of status of long acting and Permanent family planning services In town, Tigray Regional State	To assess the status of long acting and permanent family planning services provision	Cross-sectional descriptive study	422 Family Planning clients and 10 health care providers were interviewed 481 client-health care provider interactions were observed	The method mix showed; injectable (92.9%) and pills (7.1%). Among total users, 73.9% were for spacing and 23.5% were using contraception limiting. 20.4%, 6.1%, 4%) and 2% of new clients were informed about implants, IUCD, and female and male sterilization respectively. Of the 10 health care providers, six had received training in counseling and providing implants within the last five years. Four of the providers did not feel that they had knowledge and skills necessary to do LARPM services	Four facilities were stock out of pills while five facilities were stocked out of implants in last six months.	Six health service delivery points in Tigray region
Jemberie A. and et al. (2014)[31]	Assessment of the level of Knowledge and attitude towards vasectomy among married men in Dangila town, Ethiopia,	To determine the level of knowledge and attitude towards vasectomy; To identify factors associated with knowledge and attitude towards vasectomy as a family planning method	Community based cross sectional study	872	52.5% know vasectomy for FP 94.6% reported that their religion is against vasectomy as FP where 80.2% reported that they will not be volunteer to use it 68.6% have negative attitude for vasectomy	Educational status is directly associated with higher knowledge and positive attitude on vasectomy	Dangila town, Amhara Region Ethiopia,
Abdi, T. et.al. (2009)[54]	Assessment of the prevalence and factors influencing the utilization of long acting and permanent contraceptive method in Butajira town, Gurage zone, SNNPR, Ethiopia	To assess the prevalence and factors influencing the utilization of long acting (Implant, and IUCD) and permanent (male sterilization and female sterilization) contraceptive methods	Cross sectional community based study	600 women of reproductive age groups and 24 FGD discussants	Among the LARPMs, implant is known by most of the participant 20.5% and the least known is male sterilization 8.1%. Greater than half, (65.8%) of the participants have intention/plan to use LARPM. It is showed that, there was low knowledge and a relatively high (fair) level of LARPMs in Butajira town.	Low knowledge /awareness on LARPMs (25%) in Butajira town	Butajira town, SNNPR
Tesfaye, F. (2007) [38]	Assessment of the Training-Based Long-Term Family Planning Service Delivery Program in Four Regions of Ethiopia; Formative Evaluation	To assess the acceptability and utilization of long-term FP methods in the focus regions, and to identify challenges encountered and lessons learned through the program.	Client interview Key informant interview Current (includes both quantitative and qualitative methods of data collection)	640 current Norplant users 12 Health facilities with targeted intervention	Nearly all of the clients were using Norplant implants. About 65% of the clients intend to continue using the method for the recommended five years, while the rest expressed intention to terminate the method before the five years. 640	About 40% of the clients reported experiencing method related body changes or side effects such as menstrual irregularities, pain and numbness in the arm, headache, dizziness, or loss of weight	Pathfinder supported areas in Amhara, Oromia, SNNP and Tigray regions
Megabiaw, B. (2012) [55]	Awareness and utilization of modern contraceptives among street women in North-West Ethiopia.	To assess awareness, practice and associated factors of modern contraceptives among street women	A cross-sectional study	204 street women	Majority (90.7%) had ever heard about modern contraceptives. Nearly half (47.1%) had ever used and a third (34.3%) were current users. Three quarter of the current users (74.3%) were using injectable while 10% were on long acting or permanent methods	[The study did not report factors associated with LARCMs]	Gondar and Bahir Dar cities

Citation	Title	Objective	Study design	Sample	Findings	Additional findings	Study area
Dubiwak, R., A. Sene (2014)[8]	Contraceptive method choice and use by married women of reproductive age in two Districts of East Harerge.	To assess factors influencing contraceptive method choice and use among married women of reproductive age in rural Districts of East Harerge Zone of Oromia Region.	community-based cross-sectional	473 married women of reproductive age	Three-fourth (74%) of women were short-term contraceptive method users while only 26% were long-term contraceptive method users.	Duration of family planning use, reasons for contraceptive use and provider's choice of the method were positively associated with long-term contraceptive use in the study area. Qualitative finding also showed that religious and cultural perceptions about contraceptives and societal values have negatively influenced contraceptive use.	Two rural districts of East Harerge Zone
Haile, A., M. Fantahun. (2012) [56]	Demand for long acting and permanent contraceptive methods and associated factors among family planning service users, Batu town, Central Ethiopia	To assess demand for long acting and permanent contraceptive methods and associated factors among women aged 18-49 years	A facility based cross-sectional study	398 women aged 18-49 years old	Thirteen (3%) were using long acting and permanent contraceptive methods and 89 (22.4%) wanted no more child in the future making the total demand of long acting and permanent contraceptive methods 24.4%.	Factors significantly associated with demand for LAMPs include: Age, number of children (parity), the provider ask about reproductive intention, and the provider explained side effects of selected method Significant number of clients, 33.2% encountered myths and misconceptions about LARPMs, particularly about IUDs and implants	Batu town, Central Ethiopia
Bulto, G. A., T. A. Zewdie, et al. (2014)[21]	Demand for long acting and permanent contraceptive methods and associated factors among married women of reproductive age group in Debre Markos Town, North West Ethiopia.	To assess demand for long acting and permanent contraceptive methods and associated factors among married women of reproductive age group in Debre Markos town	Community based cross sectional study	519 married women of reproductive age group	323 (62.2%) of participants were using modern contraceptive methods in which 101 (19.5%) were using long acting and permanent contraceptive methods (LARPMs). Of the total respondents, 171 (32.9%) had unmet need for LARPMs. The total demand for LARPMs was 272 (52.4%) of which 37.1% were satisfied and 62.9% unsatisfied demand.	Being in the older age group (40-44 years) [AOR = 2.8; 95% CI:1.12, 9.55], desire to have a child after 2 years [AOR=0.4; 95%CI:3.04,13.47], not ever heard of modern FP [AOR = 5.73; 95% CI:1.26, 25.9]], not ever using of modern FP [AOR = 1.89; 95% CI:1.01, 3.55] and having no spousal discussion in the last six months [AOR = 1.642, 95% CI: 1.049, 2.57) were some of the factors significantly associated with demand for LARPMs.	Debre Markos town, Amhara Regional State, North West Ethiopia

Author	Title	Objective	Study design	Sample	Results	Factors	Setting
Walelegn M, et.al (2014)[57]	Demand for long acting and permanent contraceptive methods and associated factors among female antiretroviral treatment attendees in Addis Ababa, Ethiopia	To assess the demand for long acting and permanent contraceptive method and factors associate with it	Facility based cross sectional	421 women	The total demand for LARPMs among HIV positive women on ART was 60.2% (95% CI 55-65) which was 14% for met need and 46.2% unmet need.	Factors associated with demand for LARPMS include: Number of live children (AOR 0.188 95% CI 0.074-0.476);Disclosure of HIV status to family members (AOR 0.400 95% CI 0.227-0.750) Predictors of unmet need include: Number of live children (AOR 0.100 95% CI 0.032-0.311);Marital status (AOR 0.405 95% CI 0.169-0.968;Disclosure of HIV status to family members (AOR 0.339 95% CI.182-0.631);Satisfaction with cost of method (AOR 0.438 95% CI 0.221-0.867)	Addis Ababa in three of the public hospitals.
Takele, A., G. Degu, et al. (2012)[58]	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	To determine the utilization of long acting and permanent contraception and its associated factors among married women	Cross sectional community based study	734 married women of reproductive age	The demand for Long Acting and Permanent Methods (LARPMs) of contraception was 18.1%. Utilization of LARPMs in the town was 64 (8.7%) and the unmet need for LARPMs was 69 (9.4%). 636 (86.6%) women do have information on LARPMs through different media	The use of LARPMs was significantly associated with ever use of modern contraceptive AOR [17.43, 95% CI: 9.19, 33.03], number of times discussions made on methods AOR [4.6, 95% CI: 1.72, 12.17] and main decider of using methods AOR [2.2, 95% CI: 1.03, 4.65].	Goba Town, Bale Zone, South East Ethiopia.
Gelagay A. A., D. N. Koye, et al. (2015)[35]	Demand for long acting contraceptive methods among married HIV positive women attending care at public health facilities at Bahir Dar City, Northwest Ethiopia.	To assess demand for long acting contraceptive methods and associated factors among married reproductive age women attending care at Antiretroviral treatment (ART) clinics	Institution-based cross-sectional study	654 ART clients	The demand for long acting contraceptive methods was 36.7 % (95 % CI: 33.2 %, 40.6 %).	Being urban resident [AOR = 3.05, 95 % CI: 1.34, 6.89], attending elementary level education [AOR = 2.31, 95 % CI: 1.34, 3.99], number of live births [AOR = 3.86, 95 % CI: 1.62, 9.20], desire to have more children with in two years [AOR = 5.68, 95 % CI: 3.05, 11.58] and women's experience of contraceptive use[AOR = 6.35, 95 % CI: 4.09, 9.87] were factors associated with demand for LARPMs Myths about LARPMs were common in the community and are major barriers for the promotion and utilization of LARPMs	Bahir Dar city

Authors	Title	Objective	Study design	Sample size	Results	Setting
Yalew SA, B. M. Zeleke, et al. (2015)[3]	Demand for long acting contraceptive methods and associated factors among family planning service users, Northwest Ethiopia: a health facility based cross sectional study	To assess demand for long acting contraceptives and associated factors among family planning users in Debre-Tabor Town, Northwest Ethiopia	Facility based cross-sectional study	487 current family planning users	Demand for long acting contraceptives was 17%. Only 9.2% of the women were using long acting contraceptive methods (met need). About 7.8% of women were using short acting methods while they actually want to use long acting methods (unmet need). Demand for LACMs was positively associated with being a daily laborer (AOR = 3.87, 95% CI = [1.06, 14.20]), being a student (AOR = 2.64, 95% CI = [1.27, 5.47]), no future birth intensions (AOR = 2.17, 95% CI = [1.12, 4.23]), having five or more children (AOR = 1.67, 95% CI = [1.58, 4.83]), deciding together with husbands for using the methods (AOR = 2.73, 95% CI = [1.40, 5.32]) and often having discussion with husband (AOR = 3.89, 95% CI = [1.98, 7.65]). Poor client handling during the service uptake was negatively associated with demand for LACMs (AOR = 0.42, 95% CI = [0.24, 0.74]).	Debre-Tabor Town, Northwest Ethiopia
Earsido A, Gebeyehu A, Kisi T (2015)[59]	Determinants of Long Acting and Permanent Contraceptive Methods Utilization among Married Women in Hossana Town, Southern Ethiopia: A Case - Control Study	To assess the determinants of Long Acting and Permanent Contraceptive Methods Utilization among Married Women in Hossana Town	Community based unmatched case control study	420 (140 cases and 280 controls)	Twenty eight percent (28.3%) of cases and 26.1% of controls mentioned mass media (TV/radio) as their source of information. For 37% of cases and 34.4% of controls, health extension worker were source of information for modern contraceptives. The method mix among cases; Implants (79 %), IUD (12.3%), female sterilization (8.7%) Method mix among controls; injectable (87.3%), pills (12%). Out of the total controls 59% had intention to use LARPM. Nearly, 80% of cases and 72% of controls decided to use contraceptives with their husbands involvement Women with moderate [AOR=13.9, 95% CI: 6.16, 31.56]and good level [AOR=8.74, 95% CI: 3.78, 20.2] of knowledge, discussion about modern contraceptives with their partners [AOR=3, 95%CI: 1.37, 7.11], intention to give birth in the future [AOR=0.5, 95% CI: 0.25,0.98], source of modern contraceptives from non-governmental health facilities [AOR=7.4 95% CI: 2.62, 20.8] and women who had 3-4 children [AOR = 0.42 95% CI: 0.20, 0.90] were determinant factors of LARPM utilization.	Hossana Town, Southern Ethiopia

Author	Title	Objective	Study design	Participants	Findings	Factors (AOR)	Study area
Melka A. S., T. Tekelab, et al. (2015)[18]	Determinants of long acting and permanent contraceptive methods utilization among married women of reproductive age groups in western Ethiopia	To understand the determinant factors of long acting and permanent contraceptive methods use among married women of reproductive age in Western Ethiopia	Community based cross-sectional study	1003 married women of reproductive age	Use of long acting and permanent contraceptive methods in this study was found to be 20%.	Women's education(AOR=1.72, 95%CI=1.02-3.05), women's occupation (AOR=2.01, 95% CI=1.11-3.58), number of live children (AOR=2.42, 95% CI: 1.46-4.02), joint fertility related decision (AOR=6.11, 95% CI: 2.29-16.30), having radio/TV (AOR=2.31, 95% CI: 1.40-3.80), and discussion with health care provider about long acting and permanent contraceptive methods (AOR=13.72, 95% CI: 8.37-22.47) were factor associated with long acting and permanent contraceptive methods use	Western Ethiopia
Tamrie Y. E., E. G. Hanna, et al. (2015)[60]	Determinants of long acting reversible contraception method use among mothers in extended postpartum period, Durame Town, Southern Ethiopia	To assess the determinants of long acting reversible contraception method use among mothers in extended postpartum period	Community based cross sectional study	460 women in extended postpartum period	Prevalence of LARCM use among mothers during their extended postpartum period was 36.7% (95%CI: 32.2, 41.0). Unmet family planning need of mothers in the extended postpartum period was 27.9%.	Attending formal education (AOR 4.09 95%CI: 1.68, 9.58), pervious experiences of using LARC (AOR 7.84 95% CI: 3.78, 16.23), receiving counseling on LARC during delivery (AOR 3.29 95% CI: 1.53, 7.03) and receiving counseling service on LARC during immediate postpartum period (AOR 4.55 95% CI: 1.94, 10.66) were factors affecting LARC use.	Durame Town, Southern Ethiopia
Birhane, K., S. Hagos, et al. (2015)[44]	Early Discontinuation Rate of Implanon and its Associated Factors among Women who ever used Implanon in 2012/2013 in Ofla woreda, Tigray, Northern Ethiopia, 2014	To determine early discontinuation rate of Implanon and to identify its associated factors	Community based cross sectional study	224 women who ever used Implanon	Mean duration of Implanon use was 6.6±2.8 months. The overall early Implanon discontinuation was 16%	Health concerns, fear of side effects and desire to have more children were the main reasons for early discontinuation of Implanon	Ofla Woreda of Tigray region
Mengistu M, M. Wubegzier (2014)[24]	Factors affecting women's intention to use long acting and permanent contraceptive methods in Wolaita zone, Southern Ethiopia	To explores the association between women's awareness, attitude and barriers with their intention to use LARMs among users of short term methods	Mixed method cross sectional study	416 Women who were using short acting contraceptive methods 12 in-depth interviews family planning providers and women	Thirty eight percent (38%) of women had the intention to use LARPMs while nearly half of them had a negative attitude to use such methods. Two-third of study participants had myths and misconceptions about short acting contraceptive methods	Women's positive attitude (AOR=2.47; 95% CI: 1.48-4.11) having myths/misconception. Women who had no myths and misconceptions on LARPMs (AOR=1.71; 95% CI: 1.08-2.72) and educational status (secondary (AOR=2.10; 95% CI: 1.11-3.98)and higher level of education(AOR=2. 80; 95% CI: 1.15-6.77) were factors associated with intention to use LARPMs	Wolaita zone, Southern Ethiopia

Author	Title	Objective	Study design	Sample	Findings	Results	Setting
Alemayehu, M., T. Belachew, et al. (2012)[34]	Factors associated with utilization of long acting and permanent contraceptive methods among married women of reproductive age in Mekelle town	To assess factors associated with utilization of long acting and permanent contraceptive methods (LARPM) among married women of reproductive age group in Mekelle town	Cross sectional survey	390 married (15-49 Years) women Two FGDs (one with women and 1 with men)	The overall prevalence of LARPMs use was 12.3% (with 0.0% method mix for permanent methods) Sixty four percent of married women heard about LARPMs. More than half (53.6%) of the married women had negative attitude towards LARPMs use. Use of another contraceptive method is frequently mentioned (93.3%) reason for not using LARPMs Ninety percent (90%) users know modern family planning where (73.9%) users got information on family planning from the community-based reproductive health (CBRH) workers	Women's knowledge on LAROMs (AOR = 7.9, 95% CI of (3.1, 18.3), number of previous pregnancies (>2) (AOR = 2.7, 95% CI of (1.4, 5.1) were factors associated with use of LARPMs.	Mekelle town, Tigray region, north Ethiopia.
Mengistu, A., W. Lakachew, et al. (2006)[61]	Improving the range of contraceptive choices in rural Ethiopia	To examine the pattern of family planning method mix overtime, impact of combining strategies, such as community and facility based approaches, in improving access to family planning services and choices.	Cross sectional, study	218 family planning clients	Fifty two percent (52%) have undergone voluntary surgical contraception (5% vasectomy), Norplant (39.0%) and IUD (8.7%). Almost 81% of the clients using long-term and permanent methods were in the age group of 25-44 years. Limiting family size (45.9%), spacing (27.5%), and side effects of the previous method (12.4%) were the major reasons mentioned for the use of current methods	The study was descriptive and could not report factors related to LARPMs use	Tehuledere Woreda, South Wollo Zone, Amhara Regional State
Gebremariam A. A. Addissie. (2014)[42]	Intention to use long acting and permanent contraceptive methods and factors affecting it among married women in Adigrat town	To assess intention to use long acting and permanent contraceptive methods (LARPMs) and identifying associated factors among currently married women in Adigrat town	community based cross sectional study	594 married women	The prevalence of intention to use LAPMs was 48.4% (95% CI = 44.1, 52.7) here, 152(58.9%) had intention to use LAPMs within the next one year. The most preferred LARPMs was implants 184(71.3%), followed by IUCD 62(24.0%). Fear of side effect (34.5%) and fear of infertility after use (21.1%) and religious or cultural reasons(1.5%) were the main reasons low intention to use LAPMs Similarly, participants in the focus group discussion have expressed their concern on the return of fertility after using implants or IUCD as well as insertion and removal procedures	Intention to use LARPMs was higher among women who knew at least one of LARPMs (AOR =4.7, 95% CI = 1.58, 14.01) and women who do not want to have birth within the next 2 years (AOR = 1.9, 95% CI = 1.22, 3.13). Perceived poor support from their husbands (AOR = 0.2, 95% CI = 0.09, 0.45) and perceived harmful effect of LARPMs for the womb (AOR = 0.24, 95% CI =0.14, 0.41) were identified as protective factors for intention to use LARPMs.	Adigrat town, Tigray, Northern Ethiopia

Author	Title	Objective	Study design	Sample	Findings	Factors / Remarks	Setting
Alenu WG, and et.al (2014)[25]	Intention, Experience and Associated Factors of Contraceptive Method Shift to Long Acting Family Planning among Family Planning User Women in Bahir Dar, Amhara Region, Northwest Ethiopia.	To determine experience of contraceptive users, method shift and associated factors among women who had method shift to long acting family planning methods in the last three years	Facility based cross sectional study	810	Ninety two percent (92.4%) have knowledge on LAFPM. Thirty five percent (35.6%) women perceived that LAFPMs can cause health problems such as: cancer (24.7%), infertility (16.7%). Current method mix; implant (14.5%), Jadelle (4.1%) and IUCD (1.7%). Intention to method shift to implanon (58.4%), to jadelle (28.3%) and to IUCD (23%). Spacing is the mostly frequently reported reason for method shift (41.1%)	Service related factor are detrimental for LAFP use. Information about LAFP has better outcome on LAFPMs use (COR = 5.7, 95% CI: 2.0, 16.0).	Bahir Dar, Amhara Region, Ethiopia
Gebremariam, A. and A. Addissie (2014)[33]	Knowledge and perception on long acting and permanent contraceptive methods in Adigrat town, Tigray, northern Ethiopia	To assess the knowledge and perception on long acting and permanent contraceptives of married women and men in Northern Ethiopia	Qualitative method	Four focus group discussions with married women and men. Six in-depth interviews with family planning providers	Participants' knowledge on long acting and permanent contraceptives is limited to recognizing the name of the methods. Most of the participants are not able to identify permanent methods as a method of contraception. They lack basic information on how these methods work and how they can use it	Women had fears and rumors about each of these methods. Women prefer methods which do not require any procedure. Family planning providers stated as they have weakness on counseling of all contraceptive choices	Adigrat town, Tigray, northern Ethiopia
Mulatu K. et.al 2014 [17]	Men's Involvement in Long Acting and Permanent Contraceptive Use in Mizan-Aman District Southwestern Ethiopia: A Community Based Cross-Sectional Study	To assess the role of men in long acting and permanent contraceptive use among currently married men aged 20-64 years in Mizan-Aman District, South Western Ethiopia.	Community Based Cross-Sectional Study	521 men	Method mix for current use showed that; implant 51(85%), IUCD 9(15%) and female or male sterilization 0(0%). More than half 281 (54%) of men approved the use of LARMs. Reasons for disapproval for use of LARPMs; religious prohibition 118(49.2%); need for more child 66 (27.5%), 55 (22.9%), fear of side effect 25 (10.4%), and health problems and culture 22 (9.2%).	Discussions between couples about long acting and permanent contraceptive in the last 12 months (AOR=4. 95% CI1.9.8.2) and desired number of children (AOR=3.1: 95% CI1.9.2), accompanying wives to health facilities to discuss about family planning with health providers (AOR=2.7: 95% CI. 1.3-5.6), and supporting the use of long acting and permanent contraceptive (AOR=4.5: 95% CI. 1.6-12.5) were significantly associated long acting and permanent contraceptive use.	Mizan-Aman District, South Western Ethiopia.
Mekonnen, G., F. Enquselassie, et al. (2014)[62]	Prevalence and factors affecting use of long acting and permanent contraceptive methods in Jinka town, Southern Ethiopia: a cross sectional study	To assess prevalence and associated factors of long acting and permanent contraceptive methods in Jinka town, southern Ethiopia	Community based cross sectional	800 child bearing age women. 32 purposively selected focus group discussants	The prevalence of long acting and permanent contraceptive method was 7.3%. Three fourth (76.1%) of the women ever heard about implants with 50% method-mix. Almost two third of women had intention to use long acting and permanent methods.	Knowledge of contraceptive and age of women have significant association with the use of long acting and permanent contraceptive methods	Jinka town, southern Ethiopia.

Author	Title	Objective	Study design	Sample size	Findings	Factors	Location
Alemayehu M., A. Kalayu, et al. (2015)[16]	Rural women are more likely to use long acting contraceptive use in Tigray region, Northern Ethiopia: a comparative community-based cross sectional study.	Comparing and identifying factors related to the utilization of long acting contraceptive in urban versus rural settings of Ethiopia	Comparative community-based cross sectional	1035 married women	The proportion of long acting contraceptive use among urban setting was 19.9% Vs 37.8% in rural district. Implanon was the most commonly used contraceptive in districts, urban (75%) and rural (94 %).	No or limited support from male partners was an obstacle to using long acting contraceptive method [AOR = 0.24, 95 of CI: 0.13, 0.44]. Educational status and the partner's permission to use contraception could influence the utilization of long acting contraceptives.	Tigray region, Northern Ethiopia
Tsedeke, T., D. Wakgari, et al. (2006)[41]	The role of men in contraceptive use and fertility preference in Hossana Town, southern Ethiopia.	To assess the role of men in contraceptive use and fertility preference among currently married men	Community-based cross-sectional survey	773 currently married men (20-64 years)	Sixty percent of (60.3%) participants want more children. About 91% of the respondents were familiar with at least one of the family planning methods. The most commonly known methods includes; pill (79.4%), injection (78.5%), male condom (65.6%), Norplant (42%), and IUD (30.5%). Forty eight percent (48%) of respondents reported that their wife is currently using contraceptives Injection was the most commonly used method (58%), followed by the pill (27.5%).	The main reasons for not using contraceptives include; a desire to have more children (32%), husband opposition (23.2%), and fear of side effects (15%).	Hossana town, southern Ethiopia
Mota, K., S. Reddy, et al. (2015)[63]	Unmet need of long-acting and permanent family planning methods among women in the reproductive age group in Shashemene town, Oromia region,	To assess factors associated with unmet need of Long Acting and Permanent Methods of contraception among women in the reproductive age group (15-49)	Facility based cross sectional study	382 women (15-49 years)	Utilization of Long Acting and Permanent Methods (LARPMs) was found to be 28.4%. Seventy one percent (71.6%) used short acting methods and from these current short acting users, 127(41.5%) desired to use LARPMs The prevalence of unmet need of LARPMs was 122(33.3%).	Educational status of women (< secondary level) AOR [3.8, 95 % CI: 2.9, 7.6; P <0.001]; lack of discussion between partners AOR [2.9, 95 % CI: 1.8, 9.6; P = .01]; lack of proper counseling for women AOR [5.3, 95 % CI: 1.7, 11.2; P = 0.04]; and women's occupation as a housewife AOR [4.7, 95 % CI: 3.1, 11.3; P = 0.02] were factors associated with unmet need of LARPMs	Shashemene town of West Arsi zone, Oromia Region
Desalegn, M. (2014)[30]	Utilization of long acting and permanent contraceptive method and associated factors among married women in Adama town, Oromia region, central Ethiopia: community based cross sectional study	To assess Level of utilization of long acting and permanent contraceptive methods and associated factors	Community based cross sectional survey	530 married women	Eight seven percent (87%) of the respondents knew long acting and permanent contraceptive methods Fifty five percent (55%) had positive attitude LAFPM The prevalence of long acting and permanent contraceptive use was 20.9%; fear of side effect (63.5%) was the reason for non-use	Knowledge of women (AOR=5.26, 95% CI=1.90-14.69) and positive attitude about the method (AOR=3.25, 95% CI=1.60-6.58) were factors associated with current use long acting and permanent contraceptive method.	Adama town, Oromia region

Author	Title	Objective	Study design	Sample	Findings	Setting
Asegidew, W. et.al (2014)[32]	Utilization of long acting and permanent family planning methods among women of reproductive age group in Debre-Birhan Town, North Shewa Ethiopia 2014	To assess the utilization of long acting and permanent family planning methods and associated factors among women of age group 18-49 years in Debre-Birhan town, North Shewa Zone, Amhara region, Ethiopia	Community-based cross sectional study	507 women (18-49 years)	More than half of women had negative attitude towards LARPMs use.	Acceptance of the women to use, attitudes of women towards LARPMs, satisfaction of women with any family planning service provided and women age were major independent predictors for the utilization of LARPMs. Common myth and misconception about LARPMs including; IUCD and implants affect the daily activities by preventing free movement interfere with sexual intercourse and desire and particularly IUCD causes cancer and infertility were barriers to the utilization of LARPMs in the community.	Debre Birhan Town, Amhara region
Negatu, B. et.al (2014)[26]	Utilization of Long Acting Contraceptive among Reproductive age women in Addis Ababa Public health Centers	To assess the utilization of long acting contraceptive	Facility based cross sectional study	447 women (15-49 years)	Ninety nine percent (98.9%) of women were aware of LAFPMs Twenty four percent (23.9%) were using LACM. In this study, 32% of women do not support use of LAC due to husbands/partners opposition (27.5%), beliefs that implant cause irregular menstrual bleeding (49.2%), believe that IUD limit women from doing heavy work (20.6%) and believes that LAC should be used only by women who do not want more children (38.9%).	Attitude of clients, previous use of long acting contraceptive, desire to have no children in the future and discussion with partners about long acting contraceptives were factors associated with long acting contraceptives use	Addis Ababa public health clinics

FACTORS INFLUENCING ANTENATAL CARE UTILIZATION IN ETHIOPIA: A SYSTEMATIC REVIEW

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ABSTRACT

BACKGROUND

Maternal death is a major public health problem in Ethiopia. Antenatal care (ANC) utilization is believed to promote the uptake of obstetric care services and hence improve maternal health. But ANC coverage is low and reviews on determinants of utilization are lacking in Ethiopia.

OBJECTIVE

Synthesize evidence on factors influencing ANC utilization in Ethiopia.

METHODOLOGY

Relevant articles were searched electronically, filtered and quality assessed. Factors were categorized using a conceptual framework adapted from Anderson's model and bio-behavioural modelling in health care utilization.

RESULTS

Twenty-five studies were reviewed. Maternal education, place of residence, family income, husband's approval, media exposure, pregnancy intention and previous bad obstetric history were the major individual factors affecting ANC utilization. The only health service factor was distance of a health facility. Most of the studies lack standardized outcome measures which could differentiate between non-use verses inadequate use of ANC. Only a single study used conceptual framework. Other important individual factors such as women's autonomy, cultural beliefs, social networks and health facility factors such as quality, waiting time, and service fee were not examined. No study identified consumer satisfaction as a factor affecting ANC use.

CONCLUSIONS AND RECOMMENDATIONS

Comprehensive data on factors influencing ANC utilization is lacking in Ethiopia. The measurement of ANC utilization should be standardized and factors should be segregated into those influencing initiation verses adequate use of ANC. Programs intended to improve ANC utilization should focus on women's education; promote planned pregnancy; target the underprivileged and expand their scope to involve partners in ANC provision.

KEY WORDS: antenatal care, prenatal care, utilization, maternal health, factors, systematic review, Ethiopia

INTRODUCTION

Maternal death is major public health problem in Ethiopia. The maternal mortality ratio- 412/100,000 live births- is among the highest in the world1. Antenatal care (ANC) is one of the strategies to promote the uptake of obstetric care services and improve maternal health. ANC with its inherent principles of health promotion & disease prevention is even more crucial in developing countries where management of obstetric complications is challenging because of late presentation of patients and health facility constraints.

There are few systematic reviews done on factors affecting ANC utilization in developing countries. The available studies indicate that the predominant factors vary in different contexts2. Hence context specific reviews are important for appropriate policy and program recommendations.

Generally, there is significant unmet need for maternal health care in Ethiopia and numerous studies reported low ANC utilization. The most recent EDHS (2016) reported ANC coverage of 62%2. Although there are numerous studies addressing determinants of ANC utilization; to the best of our knowledge there are no systematic reviews in Ethiopia.

Research evidences of utilization tailored to a geographic context are central to guide efforts focused on improving the uptake and quality of prenatal care. Understanding which factors are most important to ANC utilization will help in devising evidence based effective policies and interventions. It will also guide health organizations to target specific/underprivileged groups and improve quality of services. This will ultimately lead to the achievement of the goals of ANC and ensure customer satisfaction.

In light of the above facts, a review of the literature on factors influencing the utilization of ANC in Ethiopia was done with the objectives of identifying context specific factors which will help to devise effective policies/interventions and point out the existing knowledge gap.

MATERIALS AND METHODS

Search strategy and Information sources (Figure 1): Search was done between May to July 2014 (updated in Jan 2016). The following categories of terms (i.e. terms related to utilization/access with those related to maternal/antenatal services) in different combinations were used: antenatal/prenatal care; maternal health care; utilization; accessibility factors/determinants; inequalities; service quality; Ethiopia.

MEDLINE (PubMed interface), EMBASE (OVID interface) and GOOGLE scholar databases were browsed by developing search strategies specific to their medical subject headings and text words. Grey literature, the national DHS and the websites of organizations working on maternal health in Ethiopia were also searched. Additionally, contact was made with study authors to identify additional articles. Retrieved information was collected in a pre-prepared format. Hand searching for library catalogs was not done because of time & facility constraints.

Eligibility criteria/filters for bibliographic search: Publication date: from 1990 to 2014; Publication language: English; Setting: Ethiopia. Research design: both qualitative and quantitative studies. Recent methodological debate has highlighted the advantages of integrating both in systematic reviews [2]. Use of qualitative or quantitative research alone might exclude relevant factors or might result in inappropriate judgments about their relative importance2. Contributions from both research designs are required to underpin the formation of evidence-based healthcare policy2. Quality assessment: There was no single quality assessment tool used. But the following important elements from Center for Reviews and Dissemination (CRD's) Guidance for study quality assessment by Khan et al3 were used to assess methodological quality of the papers:

(a) Relevance to the review - Excluded those with main focus on another topic; focus on emergency health care seeking than preventive

(b) Validity and appropriateness of methodology - Studies with Defined outcome measures, comparison groups, and appropriate sample selection were included

(c) Quality of evidence – generalizability - Data from specific groups (e.g. teenage pregnancy); limitations of the study and the issue of confounding and how it was adjusted

Outcome measures: Four outcome measures were used by the studies in different combinations (Table 2). ANC use/visit as the single outcome measure was used in 19 studies and it was defined variably as any number of ANC attendances. A single study used rigorously defined outcome measure in which ANC use was considered only if the recommended four visits were attended [9].

Only a single study used a combination of two outcome measures (any ANC attendance and adequate use). Receiving four or more visits was considered as adequate[10.] Four studies, focused exclusively on early initiation of ANC, used timing of the 1st ANC visit as the single outcome measure[11,12,13,14]. Early ANC attendance was defined as first visit before 12 weeks of gestation.
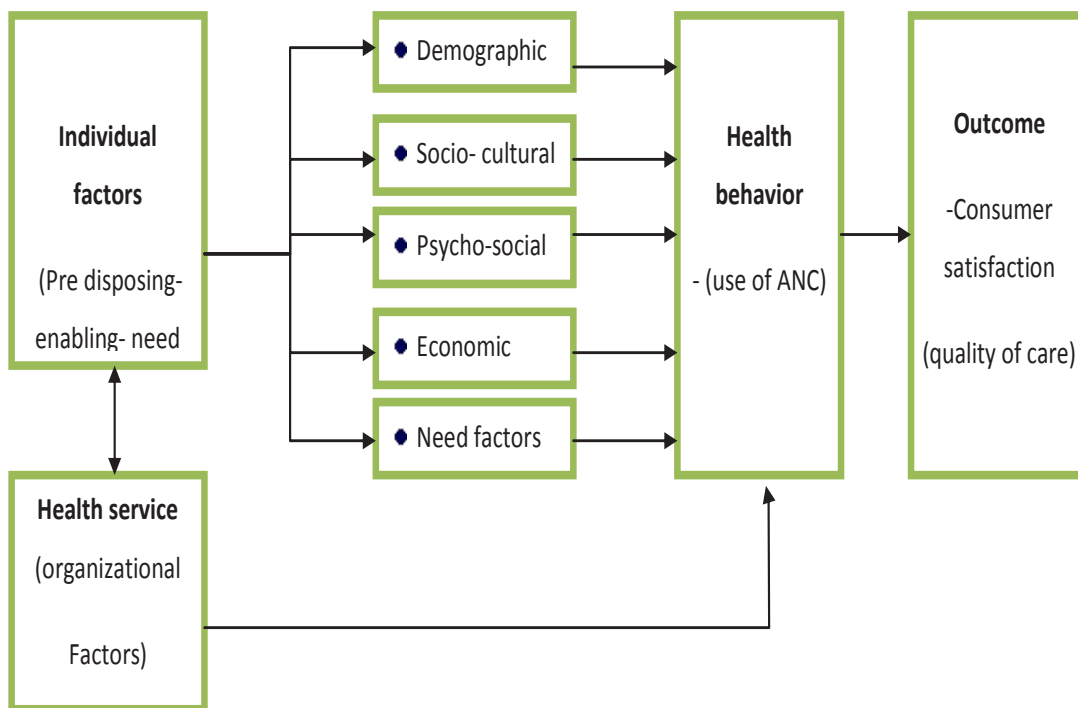

Figure 2: Conceptual frame work used for data synthesis in the review

Individual (population, demographic) factors affecting ANC services utilization: The major demographic factor associated consistently with ANC utilization was place of residence in 6 studies[7,8,9,13,15,16] in which rural residence was significantly associated with non-use of ANC. According to DHS 2000[7] and the study of inequalities in ANC utilization comparing all the three Ethiopian DHS surveys[8]; women in urban areas were more likely to use ANC from a healthcare provider than rural women.

But conflicting findings were reported for age and marital status. While young were less likely to utilize ANC in 4 studies[17,18,19,20] non-use of ANC was more likely in older women (>30yrs) in the other three studies[16,21,24]. Four studies reported married women were more likely to utilize ANC compared to single/ divorced women[7,21,22,23] while in the other 3 studies married women were less likely to use ANC[19,24,25].
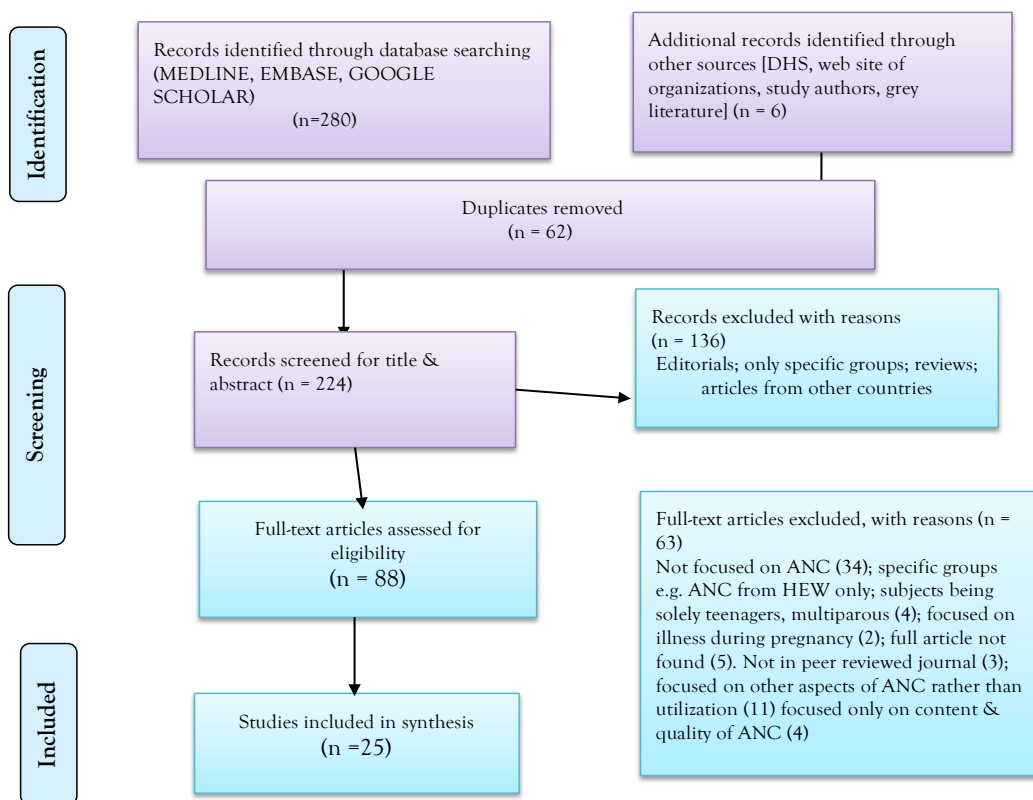
Figure 1: the PRISMA flow diagram for identification of articles

Search outcome: As shown in the 4 phase PRISMA flow diagram for reporting systematic reviews (Figure1); a total of 280 articles were retrieved and of those only 25 were eventually found to be relevant for this synthesis based on inclusion criteria and study quality assessment.

Conceptual frame work for data synthesis: The purpose of this framework is to identify and categorize factors affecting ANC utilization into explanatory themes which will also help in making meaningful recommendations for policy and program interventions.

The most widely used Anderson's model is deemed unsuitable for reviews and is mainly suggested for longitudinal and experimental studies[4]. In a recent review, the Anderson's model, has been found to have important limitations such as overlapping of factors in the predisposing /enabling/need categories; poor generalization and production of results; difficulty in practical interpretation of findings and recommendations for policy & intervention[5,6]. Hence, a modified conceptual

framework is developed for this synthesis (Figure2). It has incorporated both factors at

different levels of HC utilization as well as categories derived from the 5 major approaches used for behavioral modeling of health service utilization without changing the basic concepts in the original Anderson's model.

A narrative synthesis was undertaken, since a quantitative synthesis was not possible due to heterogeneity of research designs and different outcome measures used by the studies.

RESULTS

Characteristics (description) of the studies: Table-1 (supplementary file) shows an overview of the articles included. Of the 25 studies, 19 were quantitative and 6 used mixed quantitative and qualitative methods. Two studies were based on secondary data analysis from Ethiopian demographic health survey. All the rest were primary studies. The studies were conducted in various regions of Ethiopia.

Table 2: variations in the main outcome measures utilized by the studies

Outcome Measure	List of referenced Studies
ANC Use (use or non-use) Any attendance of ANC	7, 8,10, 15, 16, 17, 18,19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,31
Timing of 1st visit Early (1st visit ≤12wks)	11, 12, 13, 14
Number of visits recommended # of visits (≥4 defined FANC use)	9
Adequacy of care -adequate (≥4) and non-adequate care (1-3 visits)	10

Socio-cultural/ (Social structure) Factors such as literacy, occupation, ethnicity, husband's approval of ANC, religion, husband's occupation were factors to be associated significantly with ANC utilization. Most (18) studies identified women's education as powerful predictor of ANC attendance (Table 3). Moreover, Women with better education (primary/secondary) were more likely to initiate ANC visits earlier[13] and receive adequate care[10] compared to less educated women.

Table 3: factors significantly affecting ANC utilization in Ethiopia stratified according to the conceptual framework

Category	Number of studies	References
DEMOGRAPHIC		
Residency	6	[7, 8, 9, 13, 15, 16,]
Age	7	[16 - 19, 20, 21, 24,]
Marital status	7	[7, 9, 21-25]
SOCIAL STRUCTURE (SOCIO-CULTURAL)		
Education	18	[7, 8, 10, 13, 15 – 18, 21 – 29, 31]
Occupation	6	[20, 21, 24 – 27]
Husband's approval	4	[17, 18, 19, 28,]
Family size	2	[18, 27]
Woman's autonomy	2	[20, 29]
Husbands education	2	[15, 25]
Husband's occupation	2	[22, 25]
Ethnicity	2	[24, 28]
Culture	1	[7]
Religion	2	[7, 24]
PSYCHO-SOCIAL (HEALTH BELIEF)		
Knowledge of ANC	4	[14, 15, 21, 26]
Attitude towards pregnancy	2	[17, 21].............
INDIVIDUAL		
Perception towards ANC	1	[26]
FACTORS		
Lack of time	1	[21]
Perceived benefit	1	[26]

Knowledge of Danger signs	1	[17]

ECONOMIC

Family income	9	[7, 12, 15, 17, 19, 21, 23, 24, 29]
Wealth index	2	[8, 10]

NEED FACTORS

Parity	8	[7, 10, 11, 14, 20, 21, 24, 27]
Previous use	3	[11, 20, 28]
Timing of pregnancy recognition	2	[10, 13]
Pregnancy intention	9	[10 – 14, 20, 21, 28, 29]
Advice on recommended visit	2	[11, 12,]
Media exposure	5	[9, 15, 17, 25, 27]
Perceived morbidity	1	[9]
Perceived need	6	[9, 13, 16 20, 21, 29]
(Previous abortion, preterm)	1	[31]

AVAILABILITY

ACCESSIBILITY	5	
HEALTH * Travel time	3	[9, 10, 31]
SERVICE * Distance	2	[22, 30]
FACTORS:		
EXPERTISE (PERCEIVED QUALITY)	3	[16, 21, 25]
WAITING TIME	2	[21, 25]

Women's occupation of being students and farmers was associated with better utilization of prenatal care compared to house wives in 2 studies[24,25]. But students and house maids were less likely to utilize ANC in the other 2 studies[21,26]. Employed women were also more likely to use ANC compared to unemployed women[20,27].Paternal characteristics influencing ANC utilization were addressed in limited studies. Two studies indicated that maternal use of ANC was higher in those mothers with husband's occupation of being government employee and non-farmer[22,25]. Four studies found husband's positive attitude and/or approval of ANC favorably affects ANC attendance[17,18,19,28]. Husbands' formal education (of being secondary and above) as a factor increasing the likely of ANC utilization was reported in 2 studies[15,25].

The role of Ethnicity on ANC utilization is not clear as the only two studies reported conflicting results. While being Amhara was found to be predictor of better utilization in a study by Belay T. Biratu et.al[28]; no association was found in the other study done in Jimma town[24].

Two studies reported religion as a factor affecting ANC utilization[7,24]. According EDHS 2000; Muslims in rural areas were nearly one and a half times more likely to use antenatal services compared to Orthodox/Catholic women[7]. But the underlying reasons behind this difference were not explained. Two studies reported the effect of family size on ANC attendance where large family size (>3) was significantly associated with non-use of ANC compared to smaller size[27,18.]Decision making power (autonomy) of women was favorably associated with utilization of ANC services in 2 recent studies[20,29]. A single study reported women with traditional belief were less likely to use prenatal services compared to any other religious group[7]. Economic factors: Monthly family income in 9 studies[7, 12, 15, 17, 19, 21, 23, 24, 29] and household wealth indices in 2 national surveys[8, 10] were significantly associated with both ANC Utilization and timely initiation. In

all studies, families with low monthly income (<500-1000birr /month) and/or low household wealth index were less likely to attend ANC. Psycho-social/ (Health belief) factors: Limited studies identified psycho-social factors affecting ANC utilization. Lack of knowledge about ANC in 4 studies[14, 15, 21, 26], negative attitude towards importance of ANC in one study[26]; negative attitudes pregnancy in 2 studies[17, 21] and lack of time in one[21] were associated with non-use of ANC. Poor knowledge on early ANC was also a predictor of late Initiation of prenatal care[14].

Need Factors: Need characteristics are conditions that patients or health providers recognize as requiring medical treatment [5]. Pregnancy intention was consistently identified as factor affecting ANC utilization in which planned/intended pregnancy is positively associated with ANC attendance in 9 studies[10 - 14, 20, 21, 28, 29]. Planned pregnancy was also powerful predictor of early attendance in all the 4 studies that focused on timely initiation of ANC[11 - 14] as well as receiving adequate care[11]. Eight studies reported association between parity and ANC utilization with conflicting results [7, 10, 11, 14, 20, 21, 24, 27]. Higher parity was barrier to the use of ANC in most (5) studies[10, 11, 21, 24, 27] while a single study showed parity > 3 in rural mothers is associated with ANC use[20]. Importantly, Digsu and Alemayehu found that nullipara women were more likely to initiate ANC use earlier compared to multiparous women[11, 14]. The secondary data analysis from EDHS (2000) by Mekonnen & Mekonnen found dual association in which multiparous women tended to use ANC service more often (1.2x) than primiparous women in urban areas while the reverse was true in rural areas[7]. Five studies showed media exposure significantly favored ANC utilization[9, 15, 17, 18, 25]. Women with any and/or frequent exposure to media were more likely to receive ANC compared to those who reported no exposure at all.

There were conflicting findings on the effect of previous ANC use on the current use. It was positively associated with ANC attendance in two studies[20, 28], but not in the other one[11].

Perceived need is how people view and experience their own general health, functional state and illness symptoms[5]. Previous bad obstetric history (abortion, still birth, preterm)

was one of the important factors favouring ANC utilization in 6 studies[9, 13, 16, 20, 21, 29]. A study in Jimma town by Wegene found previous history of preterm birth was significant predictor of early ANC use. [13] Individuals who thought that they might develop dangerous health problems during pregnancy were more likely to use focused ANC[9].

Delayed pregnancy recognition was associated with both late initiation of ANC [13] and receiving inadequate care (Less than 4 visits)[11]. Failure to get advice on timing of 1st visit significantly increased the likely of late ANC attendance in two studies[11, 12].

Health service (organizational) factors affecting ANC utilization: Accessibility -Five studies identified accessibility as one of the major factors affecting ANC utilization. Distance of HC from patients' home of 10km in 2 studies[22, 30] and more than 1hr travel to a health facility in three studies[9, 10, 31] were associated with low utilization of ANC.

Availability - In a single study by Muluwas et al. the availability of traditional birth attendants was reported as factor favoring ANC utilization[31].

Health providers' characteristics: Perceived quality of care affecting ANC utilization was identified in 3 studies where reported good skill of health provider[25] and good perception of women to the quality services[16, 21] were associated with better use of ANC.

Waiting/working time: In 2 studies done by Tesfaye and Gebi in East Wollega, and Mengisti in Arsi zone, longer waiting time at health institutions was associated non-use of prenatal care[21, 25]. But the influence of working time was not assessed in any of the studies.

DISCUSSION

Maternal education, income, place of residence, husband's attitude/approval knowledge of the importance ANC, media exposure, pregnancy intention; perceived need and accessibility of health facilities were the major independent predictors of ANC utilization in Ethiopia. But other important individual factors including women's autonomy, social networks, and cultural beliefs; health service factors such as

working hours, provider characteristics, client-provider interaction, user fee charges, perceived quality of care were not well studied as well as consumer satisfaction.

The findings are in agreement with the systematic review of ANC use in developing countries by Simkahada et al[2] except that some of the need factors (perceived need, and pregnancy intention) were unique determinants in our review while marital status, women's employment and cost were identified as independent predictors in that review.

The major demographic factor influencing ANC use was rural residence. Women in rural area will need to travel long distance to access health facilities and usually there are no adequate trained ANC providers. The poor condition and seasonal nature of rural roads and lack of transportation could also be contributing factors.

The most consistent predictor of ANC use in this review was maternal education (18 studies). It is widely believed that educated women have better autonomy and decision-making power relating to house hold and social matters which will give them the freedom to make independent decision on their own and attend health care facilities when necessary. Literacy also increases women's' exposure to media and other sources of maternal healthcare services which increase their health seeking behavior.

The most prominent paternal characteristic affecting ANC use by pregnant mothers was husbands' attitude/approval. It was found out that husband's approval had a greater effect on prenatal care utilization than whether a wife wanted the pregnancy or a wife's level of education[28]. This is especially relevant in the Ethiopian context where male partners hold predominant decision-making power in household/community matters. Hence involving partners in ANC provision might increase the uptake of ANC services by pregnant mothers.There are limited evidences on the influence of Women's autonomy on ANC use in this review. Generally, women's autonomy was found to be associated with better maternal health seeking behavior in a secondary data analysis from the 2005 Ethiopian DHS[33] and 2 other cross sectional studies[20, 29]. Women with better autonomy are more likely to have better position in house

hold decision making and more financial freedom for health care expenditure.Income affects ANC attendance in many (8) of the studies. Better off families have the financial freedom of spending for health care and they will also have a better access to sources of information on maternal care. The decision of low income families will be influenced by anticipated expenses for transportation, ANC services and medications.

Family size influencing ANC use was identified by 2 studies. It was evident that in most developing countries, women with big family size spend most of their time on house hold activities which will jeopardize awareness to own health[2]. Culture (values, practices, meanings, and beliefs which are transmitted from one person to another) is addressed only in a single study[7]. In developing countries, the use of maternal health services is significantly affected by cultural beliefs and values that shape the way individuals perceive their health and available healthcare services[2]. This is even more crucial in Ethiopia where there are diverse ethnic groups with wide cultural differences.

The role of social networks, which are important determinants of heath care utilization, was not explored in any of the studies. Individuals may consult social networks for health care advice. Social networks can provide an impetus for health care utilization but may also press an individual to abstain from accessing health services[32].

The role of parity and the direction of association were not clear. Generally high parity was barrier to the use of ANC. Low utilization of ANC among parous women could be ascribed to lack of time, limited resources in the family, and bad experience from previous utilization.Pregnancy intension was the most powerful need characteristic affecting ANC use, particularly early attendance. This was also evidenced in a meta-analysis in which increased odds of delayed/inadequate use was seen in unintended pregnancies[34]. It is believed that those women with wanted/planned pregnancy are more likely to be ready psychological/ economically for the necessity of attending maternal health facilities. Wanted pregnancies are also more likely to get support from families and social networks.

Women experiencing bad obstetric outcome in previous pregnancies (perceived need) are more likely to realize the importance of attending ANC services in the current pregnancy with a belief that they will have favorable pregnancy outcome.Media exposure provides women with the opportunity to obtain information and advice on the importance and necessity of ANC during pregnancy. This has been confirmed also in previous reviews both in developing and developed countries[2].

The major Health organization factor affecting ANC utilization was accessibility. Transportation to distant facilities may discourage women because of both the time taken and costs involved. Unlike reviews in developed and some developing countries, health insurance coverage was not identified in any of the articles. But user fee charges were found to affect maternal health care utilization in Ethiopia[35]. Other health facility factors including provider characteristics, socio-cultural sensitivity of service provision and communication barriers were not addressed. None of the studies addressed consumer satisfaction affecting ANC utilization. But a study of quality of ANC services in public facilities in Bahir Dar showed almost half were not satisfied with the care given[36].

The updated Anderson's model of health care utilization includes recognition that consumer satisfaction reflects health care use. De-satisfaction with care provision could be a significant barrier to ANC utilization[2]. Limitations of the studies: Most of the studies lack clearly defined (standardized) outcome measures. Hence it is impossible to delineate the factors that predominantly affect nonuse verses inadequate use. Most studies used at least a single maternal facility visit during pregnancy to be sufficient to define ANC utilization. But a single study defined ANC use only when all the recommended 4 visits were attended[9]. The use of at least one visit to define ANC utilization might exaggerate estimates of ANC utilization which might be misleading to efforts targeting improvement in access to ANC. Only a single study used conceptual framework. Hence, the pathways through which the identified factors influenced ANC utilization are not explained which would have made the recommendations scientific and would have given clear guidance for designing interventions that will improve

ANC use.

It was not also clear if the studies differentiated ANC utilization for preventive/(routine) verses for health problems during pregnancy. This is important as factors affecting attendance for preventive services might be different from those affecting attendance for curative services.

Factors affecting initiation of ANC visit verses continued visits(recommended)visits were not segregated in the studies. According to the revised Anderson's model, whether or not a specific health service is utilized and the frequency it is utilized will have different determinants based on characteristics of the population and the health services[32].

Very few studies segregated factors in to those affecting ANC use in rural compared to urban residents. Considering the various contextual factors including cultural beliefs, values, attitudes towards health care, social networks which could be different in the two, future studies addressing the issue are recommended. Indices for Adequacy of utilization were never used by any of the studies. Since adequacy of care considers both initiation of care and service received, it has implications for interventions targeting factors influencing ANC utilization both at individual and health facility level.

The mere recommendation of women receiving a defined number of ANC visits does not necessarily ensure the uptake of adequate care. Hence future Qualitative studies addressing the uptake of all ANC services including the content /quality of ANC and associated factors are recommended.

CONCLUSIONS

Comprehensive data on factors affecting ANC utilization in Ethiopia are lacking. Most of the studies lack clearly defined/standardized outcome measures and the pathways through which the identified factors influenced ANC utilization were not explained which would have given clear guidance for designing targeted interventions. Determinants of ANC use(initiation) verses adequate use were not segregated which have policy and program implications as the mere recommendation of attending a defined number of ANC visits does not ensure uptake of adequate care.

It is recommended that women's education and planned pregnancy should be given high priority in interventions intended to improve ANC utilization. The scope of ANC should expand to involve husbands so as to promote uptake of prenatal services. Policies/programs should focus on the reported inequalities and devise strategies to ensure accessibility of services to the underprivileged. Identification of all individual and health organization factors affecting ANC utilization including consumer satisfaction is imperative as well as the segregation of determinants of ANC initiation verses continued use/adequate care.

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A 3 YEARS REVIEW OF MATERNAL DEATH AND ASSOCIATED FACTORS AT AYDER COMPREHENSIVE SPCIALIZED HOSPITAL, NORTHERN ETHIOPIA

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ABSTRACT

BACKGROUND:

Maternal mortality ratio in Ethiopia is one of the highest in the world. Despite measures to alleviate it and showing a promising declining trend, it still remains one of the highest at 412 maternal deaths per 100,000 live births. To our knowledge there is no accessible published study on maternal mortality at Ayder Comprehensive Specialized Hospital (ACSH).

OBJECTIVE

The aim of this study is to systematically analyze causes of maternal deaths and contributing factors at (ACSH).

METHODS

This was a descriptive, retrospective chart review of institutional maternal deaths using a 3-years record from July 1, 2014 – June 30, 2017 at ACSH.

RESULTS

There were 52 maternal deaths from July 1, 2014 – June 30, 2017 at ACSH. The main causes of these deaths were related to obstetric hemorrhage (n=11, 21.2 %), hypertensive disorders of pregnancy (n=10, 19.2%) and sepsis (n=7, 13.5%). About 86.5% (n=45) of the mothers were referral cases of whom 24 (53.33%) of them travelled more than 100 kilometers to reach ACSH. The furthest referral site was 498 kilometers from ACSH. Most common reasons for referral include for admission to intensive care unit, for further workup and management, for blood transfusion and for high risk admission. Most of the maternal deaths occurred in the postpartum period.

CONCLUSION

There is an urgent need for expansion of intensive care unit (ICU) and availing blood transfusion services in all the general and regional hospitals with close monitoring of mothers in the postpartum period. The referral system needs coordinnation from the lower level to the teritirary care centers.

KEY WORDS: Maternal death, cause of maternal death, factors for maternal death, Ayder Comprehensive Specialized Hospital, Mekelle, Tigray, Ethiopia

INTRODUCTION

Nearly 303, 000 maternal deaths occurred globally in 2015. Developing countries accounted for 99% of these deaths; Sub-Saharan Africa alone contributed for 66% of the maternal deaths. Ethiopia is one of the top ten countries which contributed for 59% of global maternal deaths in 2015. It is the forth following Nigeria, India, and Democratic Republic of the Congo [1-4]. Ethiopia is praised for training the health development army in strategies for addressing social and structural barriers to sexual, reproductive, maternal and newborn health [1].

This, in fact, has contributed greatly for the promising trend in decreasing maternal mortality ratio in the country. The maternal mortality ratio has dropped from 871 in 2000 to 412 in 2016 [4]. It is among the 39 countries categorized as "making progress" in the 1990-2015 maternal mortality estimates with 71.8% change in maternal mortality ratio (MMR)[1]. Despite these measures, however, maternal mortality still remains unacceptably high Analyzing maternal deaths is important to identify where the gap exists. Previous studies show that the top four causes of maternal deaths were obstructed labor/uterine rupture (36%), hemorrhage (22%), hypertensive disorders of pregnancy (19%) and sepsis/infection (13%) [5]. Lack of trasportation, broken referral linkages, low institutional delivery were also the main contributing reasons associated with these causes[6]. Teaching hospitals have high MDR than the national average because most of the very ill patients are usually referred to these tertiary centers for management 7. Maternal demographic factors, availability of reliable transport system, logistic support to pregnant women in the event of emergencies, health service availability and quality are among the multitude of factors that determine the occurrence of maternal death[8]. Systematic analysis of each death is important to know which factors are major and which ones are modifiable[9]. The objective of this study is, therefore, to systematically analyze causes of maternal deaths to identify modifiable factors and recommend the way forward.

SUBJECTS AND METHODS

We conducted a retrospective descriptive chart review of maternal deaths that occurred at Ayder Comprehensive Specialized Hospital in the northern Ethiopia from July 1, 2014 to June 30, 2017. The Hospital is a referral center in the region serving for a catchment area of Eight million people in Tigray, Afar and north Amhara. It is tertiary hospital giving all types of care.The definition of maternal death and classifications was based on the International Classification of Diseases 10th revision (ICD-10).Ethical approval for the study was obtained from the ethics and research committee of Mekelle University, College of Health Sciences. No identifier of the diseased (name etc.) was collected.

RESULT

There were 52 maternal deaths from July 1, 2014 – June 30, 2017. During the study period there were 9128 live births making the maternal mortality ratio of the institution 569.7 per 100,000 live births.
Sixty nine percent of the maternal deaths (n=36) were rural dwellers. Their age at death ranged from 19 – 46 years and their parities from 0 – 8. Most of them (n=33, 63.5%) were para 0-4 and the remaining (n=19, 36.5%) were para 5 or more. Most of them (n=32, 61.5%) were in the age group of 20 – 34 years. Threety two (61.5%) of the cases had at least one antenatal care visit while the remaining 20 (38.5%) had no antenatal care visit in the index pregnancy (Table 1).

Table 1: Characteristics of 52 maternal deaths at Ayder Comprehensive Specialized Hospital July 1, 2014 – June 30, 2017

Characteristics	Frequency	Percent
Age (in years)		
<20	1	1.9%
20-34	32	61.5%
>34	19	36.5%
Region		
Tigray	41	78.8%
Afar	8	15.4%
Amhara	3	5.8%
Distance in Kilometers of referrals from ACSH*		
<10 k.m.	9	20.0%
10-49 k.m.	4	8.9%
50-99 k.m.	8	17.8%
100-149 k.m.	12	26.7%
150-200 k.m.	9	20%
199-400 k.m.	1	2.2%
>400 k.m.	2	4.4%
ANC Booking Status		
Yes	32	61.5%
No	20	38.5%

*Total of 45 because the remaining 7 cases came directly to ACSH from Mekelle City, where ACSH is based.

Thirty of the deceased (57.7%) suffered direct maternal deaths. The leading causes of direct maternal deaths were obstetric hemorrhage (n=11, 21.2%), hypertensive disorders of pregnancy (n=10, 19.2%) and sepsis accounting (n=7, 13.5%). There was no death due to obstructed labor. Nine of the 11 mothers (81.8%) who died of obstetric hemorrhage were due to postpartum hemorrhage. The remaining two had antepartum bleeding because of ruptured uterus on a background of previously scared uterus.

The leading causes of indirect maternal deaths were congestive heart failure (n=5, 9.6%), viral hepatitis (n=4, 7.7%) anesthesia comcaplications (n=3, 5.8%). Of the 3 anesthesia related deaths, 1 was because of faulty intubation during general anesthesia and two were because of high spinal anesthesia. Intestinal obstruction, AIDS and cancer related deaths accounted for 3.8% (n=3) each (Table 2). Five mothers died of congestive heart failure with background heart disease.

Two of the mothers refused for termination in early pregnancy and discontinued antenatal care. The other three had severe pulmonary hypertension and died immediately after birth. Two mothers died of intestinal obstruction, one of them refused operative intervention and the other died because of overwhelming sepsis after operative intervention.

Forty mothers (76.9%) died postpartum (Table 2) of whom 24 (60%) died in the first 48 hours postpartum. More than 60% of patients spent less than 24 hours in the hospital before they die. Nearly 90% died within the first 48 hours of referral.

Six of the 52 maternal deaths died without getting ICU care. It was noted in their charts that they could not be admitted to the ICU because the beds were occupied with other critical patients. There are 8 ICU beds for the entire hospital and referrals which are mostly occupied by critical medical and surgical cases.

Table 2 Causes of 52 maternal deaths at Ayder Comprehensive Specialized Hospital July 1, 2014 – June 30, 2017

Direct Causes (n=30)	Number	% of total causes
Obstetric hemorrhage	11	21.2%
Hypertensive disorders in pregnancy	10	19.2%
Sepsis	7	13.5%
Abortion complicated with sepsis	1	1.9%
Embolism	1	1.9%
Subtotal (Direct Causes)	30	57.7%
Indirect Causes (n=22)		
Heart failure	5	9.6%
Viral hepatitis and its complications	4	7.7%
Anesthesia related deaths	3	5.8%
Intestinal obstruction	2	3.8%
AIDS related	2	3.8%
Cancer related deaths	2	3.8%
Diabetic ketoacidosis with preeclampsia	1	1.9%
Disseminated Tuberculosis	1	1.9%
Chronic kidney disease with uremic encephalopathy	1	1.9%
Misoprostol toxicity	1	1.9%
Subtotal (Indirect causes)	22	42.3%
Total	52	100%
Timing of death		
Antepartum	11	21.2%
Postpartum	40	76.9%
Postabortal	1	1.9%

Forty-five mothers (86.5%) were referred of which 53.33% (n=24) travelled more than 100 kilometers to reach the hospital. Two mothers (4.4%) travelled 498 kilometers. The commonest reasons for referral were for intensive care admission and for further work-up and management each accounting 26.67% (n = 12 patients each). The second commonest reason (n=7, 15.6%) was for blood transfusion including the two mothers who travelled 498 kilometers from the referral site. Six patients (13.33%) were referred for high risk admission and 5 (11.11%) other for senior (surgical and medical) evaluation. Two patients (4.44%) were referred for lack of general anesthesia in the referral site. One patient (2.22%) came self referred.

Delay in receiving adequate healthcare contributed for 44.2% (n=23) of maternal deaths and delay in decision to seek care and delay in reaching care contributed for 32.7% (n=17) and 23.1% (n=12) maternal deaths each, respectively.

DISCUSSION

The leading causes of direct maternal deaths of the present study are similar to studies in other developing countries [10,11]. However, it differs from other local finding which has reported 36% of obstructed labor/uterine rupture [11]. In our study no mother died of obstructed labor which might indicate decline in obstructed labor.

Indirect causes accounted for 42.3% (n=22) of the total audited deaths. This is higher

than global and regional studies. For example, a systematic analysis which has reviewed 23 studies showed that indirect causes as a cause of 27.5% of deaths which is much lower than our study [11] and in another study in developing country indirect causes caused for the death of 19.6% of 998 maternal deaths[12].

AIDS related indirect maternal death contributed higher than global (1.6%) and Sub-Saharan (2.0%) estimates [1]. Anesthesia related death was found to be similar to another study in a similar set up in Nigeria[13]. In the present study, poor pre-anesthetic evaluation, poor clinical judgment, inadequate anesthetic monitoring and poor readiness to anesthesia complication management were found to be causes of anesthesia related mortality.

In the present study the MMR of the Ayder Comprehensive Specialized Hospital is 569.7 per 100,000 live births higher than the national MMR of 412 per 100,000 live births [4] and higher than a study in a university hospital in Ghana (493/100,000 live births) [7]. This ratio, however, is lower than MMR at Jima University Specialized Hospital (857/10,000) in Ethiopia [14]. The MMR is higher than the national figure for several reasons. Patients referred to teaching hospitals are very ill and critical because they are thought to be centers with both human and technical resources that can manage these complicated cases. This, however, is not always true. The Hospital is inadequately resourced with personnel, and essential requirements required in the management of these cases.

Several patients reach the tertiary hospital after developing serious complications. More than 60% of patients spent less than 48 hours in the hospital before they die, indicating how gravely ill the patients arrive to the hospital giving little time for work-up and management. This can be due to several reasons.

Twenty-four mothers (53.33%) out of the 45 referred mothers travelled more than 100 kilometers to reach Ayder Comprehensive Specialized Hospital without any support making them vulnerable for irreversible complications. Seventeen were reluctant to sick care till their condition worsen and become critical. Three other patients refused treatment in our referral center as per the documentation on their chart by the treating physician. In 14

of the maternal deaths there was ineffective and inappropriate referral and were poorly managed prior to referral. Nine of the 40 postpartum maternal deaths delivered at home and came with serious morbidity making it difficult to understand what happened in the per partum period.

Seven mothers (15.6%) were referred for blood transfusion and two of these had to take a risky journey of 498 kilometers to reach Ayder Comprehensive Specialized Hospital.

The present study revealed multiple examples of substandard obstetric care in Ayder Comprehensive Specialized Hospital. Poor interdepartmental teamwork, poor record keeping, and lack of ICU bed is among the most frequently encountered. None of the reviewed maternal deaths record charts contains educational status, marital status and socio-economic status making analysis of the deaths against these important variables difficult.

CONCLUSION

Despite the expected higher MMR in teaching and referral centers than the national average, the ratio in Ayder Comprehensive Specialized Hospital is still unacceptably high. Poor referral system (including delay in referral, inappropriate management before referral and lack of support during the referral and travel (e.g., oxygen), poor record keeping, lack of ICU in general hospitals, and relatively few mechanical ventilators and ICU beds in our center, poor inter-departmental teamwork and unreasonable referrals from nearly 500 kilometers for blood transfusion when availing the services is much easier than referring a dying patient were the identified gaps.

This study gives emphasis to urgent need to proper and complete record keeping including important socio-demographic variables, expansion of intensive care unit (ICU) and availing blood transfusion services in all the general and regional hospitals. Similarly, delays in referral, poor management prior to referral, risky long referral line without support require a health system approach and solutions and actions are needed at all levels. We also emphasize that mothers with obstetric

complications be followed strictly specially for the first 48 hours postpartum.

Previous studies show that interventions like availability of ambulance referral system, improved referral services, instituting of variety standardized quality improvement techniques, integrating the MDSR into routine clinical care is crucial to ascertain the cause of deaths and near misses and thereby reduce morbidity and mortality, filling gaps in facilities so that they functional fully avert maternal mortality [15-18].

The relatively high home delivery, refusal for treatment and contraceptive services in mothers with medical conditions which contraindicate pregnancy and delay in seeking care can be averted by winning the confidence of mothers through compassionate and respectful care, proper communication and discussion with the mothers and community mobilization and education on obstetric complication.

COMPETING INTERESTS

The authors of this paper have no conflicts of interest to report

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DETERMINANTS OF HIGH FERTILITY AMONG MARRIED WOMEN IN ANGACHA DISTRICT, KAMBETA TEMBERO ZONE, SOUTHERN ETHIOPIA

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ABSTRACT

BACKGROUND:

Fertility is the major component of population dynamics, which is used to show a major role in the size, and structure of a particular population. In Ethiopia, total fertility rate is 4.6 children per woman. This high fertility brings a significant problem on the health of mothers and children.

OBJECTIVE: To identify the determinants of high fertility in Angacha District, Southern Ethiopia.

METHOD:

A community-based case-control study design was conducted from September 20 to October 10, 2017 in Angacha district, Southern Ethiopia. A total of 388 married women in Angacha district were selected using simple random sampling technique. Bi-variable and multi-variable logistic regression analyses were performed.

RESULT:

A total of 388 eligible women (129 cases and 259 controls) requested to interview, of which 126 cases and 255 controls participated. Educational status of women (AOR[95% CI] = 0.36 [0.16-0.83]), desire to have more children before marriage (AOR[95% CI] = 0.51[0.28, 0.93]), age at first marriage (AOR[95% CI] = 4.77[2.59, 8.78]), history of under-five mortality (AOR[95% CI] = 4.22[2.43, 7.31]) and not ever use of contraceptive methods (AOR[95% CI] = 4.55[2.21, 9.39]) were identified as determinants of high fertility.

CONCLUSION:

In this study educational status of women, age at first marriage, desire to have children before marriage, not ever use of contraceptive methods and experiencing under-five mortality were identified as determinants of high fertility. Therefore, all concerned bodies should intervene in improving the education level of women, increase age at first marriage, reduce child mortality and improve the access to contraceptive methods.

KEYWORDS: High Fertility, Married Women, Angacha, Southern Ethiopia

INTRODUCTION

Fertility is one of the elements in population shifting aspects that has significantly contributed to changing the population size and structure over time[1,2]. Evidence showed that, throughout the world, the total fertility rate is declining from an average of 4.7 children per woman in 1970-1975 to 2.6 children per woman in 2005-2010. But, this reduction mostly occurred in developed countries. The decline was less marked among unindustrialized countries where fertility seated high, in such countries, fertility dropped from 6.3 children per woman in 1970-1975 to 4.4 in 2005-2010[3].

The high fertility has resulted in rapid population growth of 2.5 percent per year in the world. It is projected that 7.2 billion world populations in 2015 will be reached 8.9 billion in 2050. In sub-Saharan countries the population will grow from 0.86 billion in 2010 to 1.96 billion in 2050[4,5,6]. Ethiopia is the second most populous country in Africa with a total population of 98.1 million by mid-2015 and projected population of 130.5 million and 165.1 million by mid-2030 and mid-2050 respectively[3,6].

According to Ethiopian demographic and health survey (EDHS), Ethiopia is one of the sub-Saharan African countries where biggest and determined fertility rate has been seen for a long dated of time. Although a slight decreasing trend was shown from year to year, it is still high and the fertility is higher in rural 4.6 compare to urban 1.9[1]. There is a steady decline in total fertility rate (TFR) in Ethiopia from 5.5 children per woman in 2000 to 5.4 children per woman in 2005 to 4.8 children per woman in 2011 and 4.6 children per women in 2016[7]. The demographic implication of Ethiopian population growth on the African region is substantial[2,8]. Its population has increased nearly 1.3 times from 80 million at the beginning of 2005 to about 101 million in 2016. The estimated annual rate of growth was 2.48%[7].

Based on the 2007 census conducted by the Central Statistical Agency (CSA) of Ethiopia, the Southern Nations, Nationalities, and Peoples' Region (SNNPR) of Ethiopia has an estimated total population of 14,929,548 (7,425,918 men and 7,503,630 women)[9]. This region has a total fertility rate of 4.4 children per woman, which is significantly higher than Addis Ababa (1.8) and Dire Dawa (3.1)[7].

To reduce the fertility to the expected level, Ethiopia has been providing family planning services by considering a significant contribution of family planning in reduction of fertility. The Ethiopian population policy also enforced that the minimum age at marriage should be 18 years and emphasized this change as one of the key factors in lowering fertility[4,10,11]. Despite these efforts, uninhibited fertility has been persisting in Ethiopia and adversely influencing the socio-economic, demographic and environmental development of the country [12]. High fertility also increased obstetric and medical risks of mothers[12,13]. Other evidences also showed that high maternal, child and infant mortality and also fetal deaths and low birth weight are also associated with high fertility[2,3]. In developing countries like Ethiopia, pregnancy and child birth is 18 times more likely in the woman's death than in developed countries[1,4,7]. High fertility could be due to a variety of factors. These factors differ from place to place, depending on the particular conditions of the given area[15]. Fore-instance, poverty, low levels of education, early marriage, early child bearing, history of under-five mortality, number of children attach with honor, less utilization of family planning, a feeble infrastructure, and low agricultural and industrial production have aggravated the problem of high fertility[12].

A proper understanding of these factors is of dominant importance in attacking the problem of uncontrolled fertility, which overlays the way for the improvement of the prevailing socio-

economic problems of the country. Particularly, it would have a considerable contribution in the improvement of the wellbeing status of women and children[16]. Experience of fertility transition countries also emphasizes the role of determining factors in fertility change[17].

Identifying factors responsible for fertility levels in the Angacha district would imply identifying factors in other similar settings of the country and important in detecting relevant variables of interest for intervention. Therefore, this study is intended to identify the determinants of high fertility in Angacha District of Southern Ethiopia.

SUBJECTS AND METHODS

µ≤Community based case-control study design was conducted among 388 married women (129 cases and 259 controls) from September 20 to October 10, 2017. The study was conducted in the Angecha district, Kambata Tembero zone, SNNPR, Ethiopia. The study includes those women aged 20 through 49 who has been married for at least 5 years and gave birth to at least one alive child and also live at least in selected kebeles for six months. Among these women the cases were women with number of alive children ever born (CEB) greater or equal to 5 (high fertility). Controls were women with number of alive children ever born (CEB) less than 5 children.

The sample size was calculated using double population proportion by using STATCALC program of the EPI INFO statistical software considering the most determinants of high fertility (age at first marriage, history of under-five mortality and age at first childbirth) from the study conducted in Gilgel Gibe field research center of Jimma University. Age at first marriage of women gave a maximum sample size, so by taking age at first marriage as a main determinant of high fertility [2], at the level of significance (∏) = 0.05, the power of the test (1-∏) = 80%, the case to control ratio(r) = 1:2, the

proportion of exposure among controls (P1) = 57%, the proportion of exposure among cases (P2) = 41%. The final sample size calculated was a total of 369 (123 cases and 246 controls) women. Then, by taking 5% non-response rate it became n = 369X5/100 =388 (case=129 and control=259) women.

To identify these sampled women from the district, first, from 22 kebeles of the district, 8 kebeles were selected by lottery method. Then, the sampling frame of cases and controls of married women in the selected 8 kebeles were obtained from family folder registration books and the number was assigned accordingly. Proportional allocation to size method was employed for determining the number of married women to be included in the study from each of the kebele. Then, the study subjects were selected using simple random sampling technique using table of random method from a list of cases and controls. Finally, records were reviewed for the women address and then by tracing their address (by the help of health extension workers, from each kebele) the women were interviewed.

The dependent variable of this stud was status of fertility. Fertility status is measured by a number of children ever born (CEB) alive. It was categorized as low fertility when CEB alive is< 5 and high fertility when CEB alive is ≥5. The cutoff point of 5 is taken because the medical and obstetric risk for mothers with a number of CEB greater or equal to 5 children is significantly higher compared with those with less than 5 children [2]. It is also based on the population policy of Ethiopia which aims to have less than five children per women as low fertility, and greater or equal to five children per women as high fertility [18].

The independent variables were socio-demographic variables: educational level, place of residence, religion, ethnicity and occupation. Reproductive health related variables: age at first marriage, age at first birth, age at last birth,

age at first sexual intercourse, contraceptive use, knowledge about the fertile period between menstrual cycles, duration of breast-feeding, duration of post-partum amenorrhea, history of still birth, abortion experience and experience of under-five mortality.

The data was collected using a structured interviewer administered questionnaire, which was developed and adapted from EDHS and other published literatures. It was initially prepared in English and was translated to local language (Kembatic), and back to English by language experts to ensure consistency. The data was collected by eight health professionals with diploma and supervised by two professionals with Bachelor of Science (BSc) degree.

Data collectors and supervisors were trained for two days and pretest was conducted in a rural village adjacent to the study area. Based on pretest result modification was done on the questionnaire, repetitive ideas and ambiguous questions were corrected. Each questionnaire was reviewed and checked for completeness by the supervisors and the research team on daily basis and the necessary feedback given to the data collectors.

The completeness and consistency of the data was checked, coded and double entered into EPI-INFO version 3.5.1 and exported to Statistical Package for Social Sciences (SPSS) version 21 for analysis. Exploratory data analysis was carried out to check the levels of missing values and presence of influential outliers. Descriptive statistics were computed and presented using frequencies, proportions, summary statistics and tables. The bi-variable and multivariable logistic regression conducted to identify determinants of high fertility. Variables at p-value of 0.25 in the bivariate logistic regression and biologically plausible variables were included in multivariable logistic regression analysis. Adjusted odds ratios with 95% CI were used for those variables which were found to be determinants of high fertility. Hosmer and Lemeshow test as well as Omnibus test were used to test the model fitness. Variables which were significant at p-value of 0.05 in 95% CI were considered as the determinants of high fertility.

The study was conducted after getting approval from Arba Minch University institutional review board (IRB) to conduct the study. Following the approval, official letter of co-operation was written to concerned bodies by the department of Public Health of Arba Minch University. Permission was granted from the Angacha district administration, where the study conducted, as per the recommendation letter from the department. Informed written consent was obtained from the study participants (mothers) after explaining the purpose of the study. Participants were assured that their name will not be stated, data will be kept confidential and anonymous and it will be used only for research purpose.

RESULT

Of the total of 388 eligible women (129 cases and 259 controls) requested for interview, 126 cases and 255 controls participated making a response rate of 98.2%. The mean number of alive CEB for the women in the case group were 8 ($\pm$2.0SD) and 4 ($\pm$1.0SD) for the control group.

The mean ($\pm$SD) age of the study participants was 34.8 ($\pm$6.12) years. Majority of cases (77%) and controls (81.2%) were protestant. Concerning educational status of women, (79.4%) among cases and (42.7%) controls did not attended formal education. High proportion of women, (84.1%) among cases and (79.6%) among controls resides in rural area. Regarding educational status of their husbands, (47.6%) of cases and (49.4%) controls had husbands that did not attend formal education whereas (52.4%) of cases and (50.6%) of controls had husbands who attended formal education. Regarding occupational status of women, high proportion of women (68.2) among cases and (40.4%) among controls were house wives (Table 1).

Table 1. Socio demographic characteristics of study respondents in Angacha district, Kambata Tembero zone, Southern Ethiopia, 2017

Variables	Category	Cases N=126(%)	Controls N=255(%)
Maternal age(Years)	20-24	7(5.6)	8(3.1)
	25-29	28(22.2)	59(23.1)
	30-34	33(26.2)	75(29.4)
	35-39	25(19.8)	55(21.6)
	40-44	18(14.3)	36(14.1)
	45-49	15(11.9)	22(8.6)
Religion	Orthodox	26(20.6)	38(14.9)
	Protestant	97(77)	207(81.2)
	Others**	3(2.4)	10(3.9)
Ethnicity	Kambata	114(90.5)	220(86.3)
	Hadiya	9(7.1)	19(7.4)
	Others***	3(2.4)	16(6.3)
Place of residency	Urban	20(15.9)	52(20.4)
	Rural	106 (84.1)	203(79.6)
Educational status of women	No formal education	100(79.4)	109(42.7)
	Primary	16(12.7)	137(53.7)
	Secondary	8(6.3)	7(2.7)
	≥Secondary	2(1.6)	2(0.8)
Education status husbands	No formal education	60(47.6)	126(49.4)
	Primary	45(35.7)	108(42.4)
	Secondary	12(9.5)	14(5.5)
	≥ Secondary	9(7.1)	7(2.7)
Occupation of women	Housewife	86(68.2)	103(40.4)
	Farmer	20(15.9)	69 (27.1)
	Merchant	20(15.9)	83(32.5)

**Muslim and Catholic   ***Gurage and Siltie

Majority of the respondents, (63.5%) of cases and (42%) of controls were married before 18 years of age. Whereas, women who gave birth of first child before 19 years of age were higher among cases (62.6%) compared to controls (47.8%). The majority of the cases (63.5%) and controls (44.7%) desired more than five children before marriage. About 61.1% of women in the case group and 24.3% of women in control group have had under-five mortality. Regarding history of contraceptives, (48.4%) of cases and (52.9%) of controls were ever heard about contraception and (10.3%) of cases and (49.1%) of controls were ever used contraceptive methods (Table 2).

Table 2. Reproductive health characteristics of cases and

controls among married women living in Angacha district, Kambata
Tembero zone, Southern Ethiopia, 2017

Variables	Category	Cases n=126(%)	Control n=255(%)
Age at first sexual intercourse	<18 years	65(51.6)	127(49.8)
	≥18 years	61(48.4)	128(51.2)
Age at first marriage	<18 years	80(63.5)	107(42)
	≥18 years	46(36.5)	148(58)
Age at first birth	<19 years	79(62.6)	122(47.8)
	≥19 years	47(37.4)	133(52.2)
Age at last birth	20-34 years	49(38.9)	135(52.9)
	35-49 years	77(61.1)	120(47.1)
Desire of more children (before marriage)	<5	46(36.5)	141(55.3)
	≥5	80(63.5)	114(44.7)
Desire of additional children (currently)	Yes	64(50.8)	125(49)
	No	62(49.2)	130(51)
Husband's need additional children(currently)	Yes	67(53.2)	127(49.8)
	No	59(46.8)	128(50.2)
History of abortion	Yes	68(54)	122(47.8)
	No	58(46)	133(52.2)
History of stillbirth	Yes	75(59.5)	101(39.6)
	No	51(40.5)	154(60.4)
History of under-five mortality	Yes	77(61.1)	62(24.3)
	No	49(38.9)	193(75.7)
Ever heard of contraceptive	Yes	61(48.4)	135(52.9)
	No	65(51.6)	120(47.1)
Ever use of contraceptive methods	No	113(89.7)	130(50.9)
	Yes	13(10.3)	125(49.1)
Knowledge about the fertile period between menstrual cycles	Yes	62(49.2)	133(52.2)
	No	64(50.8)	122(47.8)
Duration of postpartum amenorrhea after the last birth	<6 months	42(33.3)	85(33.3)
	≥6 months	41(32.5)	87(34.2)
Ever breast-feed exclusively	Yes	67(53.2)	124(48.6)
	No	59(46.8)	131(51.4)
Duration of breastfeeding during the last birth	0-4months	37(29.4)	85(33.3)
	5-6 months	30(23.9)	39(15.3)

In binary logistic regression analysis, variables like educational status of women (COR[95%CI] = 1.9[0.09-0.23]), occupation of women (COR[95%CI] = 0.29[0.16-0.51]), age at first marriage (COR[95%CI] = 2.41[1.55-3.73]), age at first birth (COR[95%CI] = 1.83[1.18-2.84]), age at last birth (COR[95%CI] = 1.77[1.14-2.73]), desire of more children (before marriage) (COR[95%CI] = 0.46[0.30-0.72]), history of under-five mortality (COR[95%CI] = 4.89[3.09-7.74]), history of still birth (COR[95%CI] = 2.24[1.45-3.46]) and ever use of contraceptive methods (COR[95%CI] = 8.36[4.48-15.6]) were significantly associated with high fertility.
In multivariable logistic regression,

educational status of women was significantly associated with high fertility. In that, women who attended formal education were 64% less likely to have high fertility compared to those who did not attended formal education (AOR [95%CI] = 0.36 [0.16-0.83]). Similarly, desire to have more children before marriage is significantly associated with the high fertility, women who desire to have less than five children before marriage were 49% less likely to have five or more children ever born compared to their counter parts (AOR [95%CI] = 0.51 [0.28-0.93]). Age at marriage is significantly associated with high fertility, women who get married at early age (less than 18 years) were 4.77 times more likely to have 5 or more children as compared to women who get married at 18 years and above (AOR [95% CI] = 4.77[2.59-8.78]). Ever use of contraceptive method is significantly associated with high fertility, women who had never used contraceptive were 4.55 times more likely to have 5 or more children ever born compared to women who had used contraceptive (AOR [95%CI] = 4.55[2.21- 9.39]). History of under-five mortality is significantly associated with high fertility, women who had history of under-five mortality were 4.22 times more likely to have 5 or more children ever born compared to women who had no history of under-five mortality (AOR [95% CI] = 4.22[2.59- 8.78]). However, factors like occupational status, husband education, age at first birth, age at last birth, history of still birth, and duration of breast feeding for the last birth failed to show significant association with high fertility in multiple logistic regressions analysis (Table 3).

Table 3. Determinants of high fertility among married women in Angacha District, Kambata Tembero zone, Southern Ethiopia, 2017

Variables	High Fertility (%)		COR (95%CI)	AOR (95%CI)	P-value
	Cases n=126	Control n=255			
Educational status of women					
No formal education	100(79.4)	109(42.7)	1	1	0.001
Formal education	26(20.6)	146(57.3)	1.9(0.09-0.23)	0.36(0.16-0.83) **	0.001
Age at first marriage					
<18 years	80(63.5)	107(42)	2.41(1.55-3.73)	4.77(2.59-8.78) **	0.001
≥ 18 years	46(36.5)	148(58)	1	1	
Desire more children					
<5	46(36.5)	141(55.3)	0.46(0.30-0.72)	0.51(0.28-0.93) **	0.027
≥5	80(63.5)	114(44.7)	1	1	
History of <5 child mortality					
Yes	77(61.1)	62(24.3)	4.89(3.093-7.74)	4.22(2.43-7.31) **	0.001
No	49(38.9)	193(75.7)	1	1	
Ever use of contraceptive methods					
No	113(89.7)	130(50.9)	8.36(4.48-15.6)	4.55(2.21-9.39) **	0.001
Yes	13(10.3)	125(49.1)	1	1	

**=statistically significant at p≤0.05

DISCUSSION

In this study, educational status of women, age at marriage, a desire to have children before marriage, ever use of contraceptive and under-five mortality were identified as factors determining the likelihood of having five or more children ever born.Educational status of women has shown to be independently associated with high fertility in this study. Women who attended formal education were 64% less likely to have five or more children compared to those who did not attend formal education. This result is in line with the results of the studies done in Tigray, Northern Ethiopia[8] and Butajira, Southern Ethiopia[19]. This might be due to the fact that women who are able to read and write were probably spend their time in school and consequently have an awareness about their fertile period and less likely to have unwanted pregnancy and birth.

Age at first marriage also was shown to be significantly associated with high fertility, where being 18 years of age or less at marriage 4.7 times increased likelihood of having five or more children. This finding is supported by the studies done in Jimma, Ethiopia[2], Nepal[20], Butajira, Ethiopia[19]. In addition, Ethiopia demographic and health survey shows that women who married at age of 18 years or less were three times more likely to have five or more children[21]. This may be as a result of the fact that marriage indicates women's exposure to the risk of pregnancy and those who married early have on average an extended period of exposure to pregnancy and a greater number of life time births.In this study, the number of children a woman desired to have before marriage is significantly associated with high fertility, where those women who desire less than five children before marriage were 49% less likely to have five or more children compared to those women who desire to have five or more children before marriage. This concurs with the findings of a study in

Hawassa, Ethiopia[22].   Pro-natalist culture prevailing in Ethiopia especially in rural areas were children thought as wealth, source of help in old age and maintain posterity could explain the finding of the study where the highest proportions of women were rural resident.Moreover, having had under-five mortality was shown to increase the likelihood of having five or more children 4.22 times. This finding corroborates the finding of the studies conducted in Hawassa, Southern Ethiopia[22] and Tigray, Northern Ethiopia[8]. It is generally believed that high infant and under-five mortality causes high fertility through the insurance and replacement effect. The insurance effect considers that the couples adjust their fertility because they expect some of their children to die. Child replacement effect involves a deliberate decision of couples to make up for the lost children and is based on the fact their previous childbearing[23]. Women's characteristics regarding ever use of contraceptive have shown to be significantly associated with high fertility, where women who have not used contraceptive methods were 4.55 times more likely to have 5 or more children compared to those women who ever used contraceptive methods. This finding concurred with that of the study conducted in Southern Ethiopia[24]. The possible reason for this consistency might be contraceptive methods could decrease risk of pregnancy and then fertility.

The strength of this study is being a community-based study and use of control study participants.

The limitation of the study is that the study relied on participants' self-reported data, which was prone to social desirability bias due to the retrospective tracking of information beyond the advantages of case control study. But, close monitoring by supervisor and principal investigator was made to minimize such biases, clarification of potential ambiguities and misunderstandings, maintaining privacy of participants and proving for answers were

carried out by interviewers.

CONCLUSION AND RECOMMENDATION

In general, this study identified important factors that determine high fertility among married women in Angacha district, Southern Ethiopia. Those women who are able to read and write desired less than five children before marriage were less likely to have five or more children. Comparatively, the likelihood of having five or more children has shown to increases with being 18 years of age or less at marriage and ever use of contraceptive as well as having under-five mortality.

In conclusion, educational status of women, age at first marriage, desire to have children before marriage, ever use of contraceptive and experience of under-five mortality were identified as factors determining the likelihood of having five or more children. Therefore, to decrease women's fertility, all concerned bodies should intervene by improving the education level of women, increase age at first marriage of women, reduce child mortality and improving access to contraceptive methods.

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KNOWLEDGE, ATTITUDE AND PRACTICE ON BIRTH PREPAREDNESS AND COMPLICATION READINESS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE AT CHIRO ZONAL HOSPITAL EASTERN ETHIOPIA

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ABSTRACT

BACKGROUND:

Birth preparedness and complication readiness is a comprehensive strategy to improve the use of skilled providers at birth, and the key intervention to decrease maternal mortality. It is also a key component of globally accepted safe motherhood programs.

OBJECTIVE:

To assess the knowledge, attitude and practices about birth preparedness and complication readiness among pregnant women attending antenatal care at Chiro Zonal Hospital, East Ethiopia.

METHODS:

Hospital based cross sectional study was conducted on a sample of 418 pregnant women. Exit interview using a pretested structured questionnaire was used to collect data from pregnant women attending antenatal care at Chiro Zonal Hospital. The collected data was cleaned, coded and analyzed using SPSS version 20 statistical package.

RESULT:

Twenty percent had knowledge of one key danger signs during pregnancy, child birth and postpartum and 61.2% had favorable attitudes towards birth preparedness and complication readiness. Knowledge of at least one key danger signs during pregnancy, child birth and post partum, attitudes towards birth preparedness and practice of birth preparedness were associated with birth preparedness and complication readiness.

CONCLUSION AND RECOMMENDATION:

Both knowledge of obstetric danger signs and birth preparedness and complication readiness were low. Enhancing women's awareness and improving the quality of labour wards would improve delivery service utilization.

KEYWORDS: Birth preparedness, complication readiness, antenatal care, pregnant women

INTRODUCTION

In developing countries, 300 million women are estimated to suffer from short or long-term illnesses as a result of pregnancy and childbirth[1]. Though the absolute number of women dying due to complications during pregnancy and childbirth has decreased by 45%; from an estimated 523 000 in 1990 to 289 000 in 2013; the decrease was below the MGD target of 75% reduction by 2015[2]. Most of the causes of maternal morbidity and mortality are preventable and attributed to the three delays; delay to decide to seek care if complication occurs, delay to reach the place of care, and delay to receive appropriate care[3]. JHPIEGO, an international non-profit health organization affiliated with John Hopkins University, developed the birth preparedness and complication readiness matrix to address these three delays at various levels. The concept of birth preparedness and complication readiness includes recognition of danger signs, a plan for a birth attendant and place of delivery, arranging transportation, identifying a blood donor, decision-maker (in case of emergency) and saving money in case of an obstetric complication[1,3]. Nearly 80% of the women in sub-Saharan Africa are attending antenatal care services at least once. Despite the growing number of antenatal care visits, the number of births attended by skilled birth attendants still are still low[4]. In Tanzania for example, despite the antenatal care coverage rate of around 94% (one-time visit), the rate of skilled birth attendance can be as low as 30%, especially in rural areas[5]. As a result, The World Health Organization (WHO) proposes that all pregnant women attending Antenatal Care (ANC) should be aware of the need for skilled birth attendance as well as increasing their knowledge of how and when to access skilled birth attendants. Birth planning and emergency preparedness has been introduced as part of focused antenatal care in many African countries[6].There are evidences that having a skilled birth attendant at every delivery have been found to markedly reduce maternal morbidity and mortality worldwide. Many studies conducted in sub-Saharan African countries such as Tanzania[5], Ethiopia[8], Uganda[7] and Burkina Faso[3] showed that women had low levels of awareness on obstetric danger signs during pregnancy, delivery and postpartum[3,5].

Similarly, studies have also indicated low rates of birth preparedness among pregnant women in Kenya[9], Ethiopia[8,1], and Burkina Faso[3]. The low awareness of danger signs together with lack of preparedness contributes to the delay in seeking skilled care and ultimately the aggregated effects of all leads to high levels of maternal mortality and morbidity[7]. In Ethiopia, the levels of maternal mortality and morbidity are among the highest in the world. The estimated maternal mortality ratio is 412 per 100, 000 live births. Although access to health care services is improving, the country has faced challenges in increasing health care utilization. For example, the proportion of births attended by skilled health personnel (skilled birth attendant) in Ethiopia is only 28%[10]. Birth preparedness and complication readiness is essential to increase institutional delivery and further improve maternal health, but little is known about the current magnitude and influencing factors in Ethiopia.

SUBJECTS AND METHOD

A hospital based cross sectional study was done in Chiro Zone, Oromia Regional State, Eastern Ethiopia on pregnant women attending ANC. Using systematic sampling method, pregnant women were selected from those who came for ANC services in the zonal hospital.

Data were collected using a pre-tested structured questionnaire as an exit interview. The questions were adopted from the safe mother-hood questionnaire developed by maternal and neonatal health program of JHPIEGO, the affiliate of Johns Hopkins University,[11] by modifying the questions according to local context and the objectives of the study.

Sample size was determined by using single population proportion formula with 5% margin of error, 95% level of confidence, and prevalence of 44.7% (which was found to be the proportion of knowledge on safe delivery service utilization from South-East Ethiopia[12]. The overall sample size calculated with nonresponse of 10% was 418. A sampling interval of 20 was used based on the anticipation of an average of 20 clients per day. Data was collected from January to February

2014.

Knowledge assessment: Women who mentioned at least one key danger signs in each of the three periods (during pregnancy, delivery and postnatal period) were considered as knowledgeable[7]. Attitude assessment: women were considered as having favorable attitude towards utilization of safe delivery services, if they scored above the mean on 10 attitude questions. The mean of each question was calculated and finally the weighted mean (of all questions based on the frequency) was used for the classification of favorable verses unfavorable attitudes. For positive statements, those who chose agree were given 1 point and those who chose neutral and disagree were given zero. On the other hand, for negative statement those who chose disagree were given 1 point and those who chose, agree and neutral given zero. The overall attitude was calculated by summing up the scores as done elsewhere[12]. Practice assessment: practice was assessed using 11 practice related questions. Each of these questions were analyzed separately and then all together to determine the level of the practice of pregnant women. At the end, the result of the analysis was considered as good practice, if the total score was ≥50% poor practice, if it was <50% (12).Birth-preparedness and complication readiness (BP/CR): BP/CR, the dependent variable for this study, was measured using series of questions about knowledge of danger signs; plans for a birth provider; plans for transport in case of emergency; and plans for saving money in case of emergency[3]. The first

(knowledge of danger signs) was independently assessed by raising questions and a woman who can mentioned at least one danger sign at each of the three stages (during pregnancy, delivery and postnatal period) was considered as knowledgeable. At the end, to measure the outcome variable (BP/CR), a woman who fulfills all the four (have knowledge about danger signs, have plan for birth provider, transportation, saving money) was categorized as having good preparation (well prepared) for BP/CR. If not it was considered as not having good preparation (not prepared) for BP/CR.

The collected data were cleaned, coded and analyzed by SPSS version 20 statistical package. Factors statistically related to the outcome variable (BP/CR) were identified by running a multivariable logistic regression model.

Ethical clearance was obtained from Haramaya University College of Health and Medical Sciences Ethical Review Board. Written consent was taken from each participating pregnant woman.

RESULT

Socio-demographic characteristics: There were 418 participants. 54.5% were from urban areas. The mean age of respondents was 25±4 years with minimum and maximum age of 15 and 45 years respectively. The majority of them were married (n=412, 98.6%, illiterate (n=71, 27.5%) housewives (n=311, 74.4%) and had a family size of two (n=164, 39.2%) (Table 1).

Table 1: Socio-demographic characteristics of ANC attendant in Chiro Hospital, eastern Ethiopia 2014

Characteristics	Classifications	Frequency	Percent
Address	Urban	228	54.5
	Rural	190	45.5
Educational level of the women	Illiterate	71	27.5
	Grade 1-4	85	14.8
	Grade 5-8	74	23.7
	Grade 9-10	75	23.2
	Grade 11-12	13	1.9
	12+	94	6.2
Occupation	Housewife	311	74.4
	Govt. employee	52	12.4
	Private employee	6	1.4
	Self-Business	49	11.7
Age of respondents	15 20	123	30.9
	21 - 25	144	36.2
	26 - 30	101	25.4
	>30	30	7.5
Family size	2	164	39.2
	2-4	140	33.5
	≥5	114	27.3
Marital status	Married	412	98.6
	Divorced	2	0.5
	Widowed	3	1

Past obstetric history: Most of the participants were primigravida (n=167, 40%), and primiporous (n=167, 40%). Twenty-nine (6.9%) participants gave history of one child loss whereas 3 (0.7%)0 reported two and more child loss. Seventy-seven participants (18.4%) had experienced danger signs during pregnancy, child birth and post partum in their previous pregnancies (Table 2).

Table 2: Past obstetric history of ANC attendant in Chiro Hospital eastern Ethiopia, 2014

Variables		Frequency	Percent
Gravidity	1	167	40
	2-3	147	35.2
	>4	104	24.9
	0	167	40
Parity	1-2	146	34.9
	>3	105	25.1
Born alive	0	171	49.9
	1-2	75	17.9
	>2	172	41
Born dead	0	386	92.3
	1	29	6.9
	≥2	3	.7
Danger sign in the past (during pregnancy, child birth and post-partum)	Yes	77	18.4
	No	341	81.6

Knowledge of danger signs: 153 (36.6%), 164 (39.2%) and 127 (30.4%) had the knowledge of at least one danger signs during pregnancy, childbirth and postpartum, respectively. The most commonly known danger signs were severe vaginal bleeding during pregnancy (n= 132, 31.6%), childbirth (n=144, (34.4%) and postpartum (n=97, 23.2%). Two hundred and one (48%) of the participants relatively had good awareness of birth preparedness but only 84 (20%) respondents had knowledge of at least one key danger signs in each of the three periods (pregnancy, child birth and postpartum) combined (Table 3).

Table 3: Pregnant women who reported knowledge of the key danger signs in pregnancy, childbirth and postpartum during ANC attendant in Chiro Hospital eastern Ethiopia, 2014

Variables		Knowledge of danger sign during pregnancy		Knowledge of danger sign during labor & child birth.		knowledge of danger sign during post-partum	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
Vaginal bleeding	Yes	132	31.6	144	34.4	97	23.2
	No	286	68.4	274	65.6	321	76.8
Severe headache	Yes	24	5.7	16	3.8	16	3.8
	No	398	94.3	402	96.2	402	96.2
Blurred vision	Yes	16	3.8	DNC		10	2.8
	No	402	96.2			408	97.6
Convulsion	Yes	10	2.4	8	1.9	13	3
	No	408	97.6	410	98	405	96.9
Swollen hands/face	Yes	11	2.6	DNC		18	4.3
	No	407	97.4			400	95.7
High fever	Yes	9	2.2	10	2.4	16	3.8
	No	409	97.8	408	97.6	402	96.2
Loss of consciousness	Yes	6	1.4	8	1.9	4	1
	No	412	98.6	410	98	414	99
Difficulty breathing	Yes	3	0.7	DNC		8	1.9
	No	415	99.3			410	98
Severe weakness	Yes	37	8.9	DNC		22	5.3
	No	381	91			396	94.7

Severe abdominal pain	Yes	48	11.5	DNC		DNC	
	No	370	88.5				
Accelerated/reduced fetal movement	Yes	15	3.6	DNC		DNC	
	No	403	96.4				
Water breaks without labor	Yes	24	5.7	DNC		DNC	
	No	394	94.3				
Labor lasting >12hours	Yes	DNC		DNC		DNC	
	No						
Placenta not delivered 30 minutes after delivery	Yes	DNC		DNC		DNC	
	No						
Mal-odorous vaginal discharge	Yes	DNC		DNC		35	8.4
	No					383	91.6

DNC = Do Not Collect data

Attitudes of pregnant women: The mean score for attitude questions was 9.8, and those scored above the mean were considered as having favorable attitudes. 162 participants (38.8%) had below the weighted mean, while 256 (61.2%) had above the weighted mean. 406 (97.2%) had good attitudes towards hospital delivery than home delivery. 300 (71.8%) respondents reported that cost of transportation was higher than delivery service in hospital set up. 396 (94.7%) respondents considered that 'bad approach' of health personnel had an impact on service utilization. One hundred eight two (43.5%) respondents replied lack of privacy in labor wards had effect on service utilization, whereas, while 236 (56.5%) respondents did not care about privacy (Table 4).

Table 4: Practices of birth preparedness and complication readiness of ANC attendant in Chiro Hospital eastern Ethiopia, 2014

Characteristics	Category	Frequency	Percent
Do you identify place of delivery?	Yes	417	99.8
	No	1	0.2
Reason for home delivery	Distance of health facility	2	25
	No transportation	1	12.5
	Economic constrain	1	12.5
	Faith in TTBAs	4	50
Saving money	Yes	249	59.6
	No	169	40.4
Prepare essential items for clean delivery and post partum	Yes	244	58.4
	No	174	41.6
Identify skilled provider	Yes	243	58
	No	175	41.9
Detect of early emergency	Yes	161	38.5
	No	257	61.5
Designate decision maker	Yes	151	36
	No	267	63.9
Arrange for emergency funds	Yes	95	22.7
	No	323	77.3
Identify mode of transportation	Yes	388	92.8
	No	30	7.2
Arrange blood donors	Yes	36	8.6
	No	382	91.4
Identify institutions with 24hrs EMOC services	Yes	374	89.2
	No	45	10.8

Birth preparedness practice was assessed using four practices items. Identifying skilled provider, saving money, identifying means of transportation, and preparing essential items for clean delivery and postpartum materials for their current pregnancy were done by 243 (58%), 249 (59.6%), 388 (92.8%), and 244 (58.4%) of the participants, respectively (Table 5). Generally, 56.7% (n=237/418) of the respondents practiced birth preparedness and complication readiness during the interviews.

Table 5: Factors associated with birth preparedness and complication readiness of ANC attendant in Chiro Hospital, eastern Ethiopia 2014.

Variables	BP and CR		AOR (95%CI)	P-value
	prepared	Not prepared		
Age				
15-20	6	117	1.335(.136-13.151)	.804
21-25	9	135	482(.034-6.858)	.590
26-30	13	88	565(.025-12.714)	.719
Above 30	9	41	1	
Residence				
Rural	10	180	1	
Urban	27	201	.302(.020-4.461)	.383
Gravidity				
1	18	129	2.650(.195-3.6)	.464
2-3	9	95	.672(.264-.1.714)	.406
4 and above	10	157	1	
Experienced obstetric complication before				
No	26	315	1	
Yes	11	66	.384(.060-2.472)	.314
Knowledge of at least one key danger signs during pregnancy				
No	5	276	1	
Yes	32	105	.112(.003-3.802)	.224
Knowledge of at least one key danger signs during pregnancy, child birth and post-partum				
Not knowledgeable	4	330	1	
Knowledgeable	33	51	2.66(.0224-9.86)	**.019**
Prior knowledge of birth preparedness				
No	4	213	1	
Yes	33	168	.820(.108-6.213)	.848
Attitudes towards birth preparedness				
Un favorable attitudes	1	161	1	
Favorable attitudes	36	220	2.83(1.332-4.17)	**.001**
Practice of birth preparedness				
Not practiced	2	179	1	
Practiced	35	202	1.23(8.95-16.9)	**.001**

Predictors of birth preparedness and complication readiness: There were three factors associated with (on bivariate analysis having p-value <0.3) and remain independent predictors of birth preparedness and complication readiness (BP/ CR). These factors/ predictors were 'knowledge of at least one danger signs during pregnancy, child birth and postpartum', 'favorable attitudes towards birth preparedness' and 'practice of birth preparedness'. For example, those women who had knowledge of at least one key danger signs in any of the three periods were 2.5 times more likely to be prepared for BP/CR than those who had no knowledge on any key danger signs (AOR: 2.66, 95% CI: 0.22-9.86, P = 0.02). At the same time, those pregnant women with favorable attitude had almost 3 time more likely to prepared for BP and CR than those who have unfavorable attitude (AOR: 2.83, 95% CI:1.33 – 4.17, P = 0.001) (Table 6).

Table 6: Factors associated with birth preparedness and complication readiness among ANC attendant at Chiro Hospital, eastern Ethiopia 2014.

Variables		BP and CR		AOR (95%CI)	P-value
		prepared	Not prepared		
Age	15-20	6	117	1.335(.136-13.151)	0.804
	21-25	9	135	0.482(0.034-6.858)	0.590
	26-30	13	88	0.565(0.025-12.714)	0.719
	Above 30	9	41	1	
Residence	Rural	10	180	1	
	Urban	27	201	0.302(0.020-4.461)	0.383
Gravidity	1	18	129	2.650(0.195-3.6)	0.464
	2-3	9	95	0.672(0.264-.1.714)	0.406
	4 and above	10	157	1	
Experienced obstetric complication before	No	26	315	1	
	Yes	11	66	0.384(.060-2.472)	0.314
Knowledge of at least one key danger signs during pregnancy	No	5	276	1	
	Yes	32	105	0.112(0.003-3.802)	0.224
Knowledge of at least one key danger signs during pregnancy, child birth and post partum					
	Not knowledgeable	4	330	1	
	Knowledgeable	33	51	2.66(.0224-9.86)	**0.019**
Prior knowledge of birth preparedness					
	No	4	213	1	
	Yes	33	168	0.820(0.108-6.213)	0.848
Attitudes towards birth preparedness					
	Unfavorable attitudes	1	161	1	
	Favorable attitudes	36	220	2.83(1.332-4.17)	**0.001**
Practice of birth preparedness					
	Not practiced	2	179	1	
	Practiced	35	202	1.23(8.95-16.9)	**0.001**

DISCUSSION

About 57% of respondents practiced birth preparedness and complication readiness while 43.3% of respondents did not practiced birth preparedness and complication readiness. This is higher than a study done in rural Uganda and South-Western Uganda where about 35% of the respondents were classified as "well birth prepared"[7,14]. This discrepancy might be due to the recent main focus by the government on improving service delivery in maternal health especially on enhancing institutional deliveries among pregnant women. This study has shown that knowledge of pregnant women who knew at least one key danger sign during pregnancy, child birth and postpartum, attitude and practice about BP and CR have shown a statistical significance association with the outcome variable. But there was no statistically significant association between 'knowledge of at least one key danger signs at specific periods (pregnancy, child birth or postpartum)' and birth preparedness and complication readiness. This is similar to the study done in rural Uganda[7].Thirty three percent of women knew at least one key danger sign during pregnancy, 38% during delivery and 28.5% during post-partum. This is much lower than study done in rural Uganda where 52% of women knew at least one key danger sign during pregnancy, 72% during delivery and 72% during postpartum[7], but higher than the study done in northern Ethiopia[8] and rural Tanzania[5]. The difference could be due to the difference in effort of educational programs provided at different places.The most commonly identified danger signs during pregnancy, delivery and post-partum periods were sever vaginal bleeding, which accounts 31.6%, 34.4% and 23.2%. Similar findings were found in northern Ethiopia[8], rural Uganda[7], Ghana[6] and southwest Nigeria[13]. This similarity might be due to the similarity of health information emphasis at different health facilities.

Pregnant women who showed favorable attitude attitudes towards birth preparedness and complication readiness were 61.2%. This is similar to the study done in Arsi Zone, South-East Ethiopia[12]. This similarity might be due to the improvement of delivery service in the country and the recent moment of making the delivery service free of charge at a national level. In this study, attitude is one of the factors affecting birth preparedness and complication readiness (AOR 2.8, 95% CI: 1.33-4.17). This finding is similar to a study done in Arsi Zone[12] which depicted similar favorable attitudes on some issues. For example, 97.2% of ANC attendants showed favorable attitudes towards hospital delivery than home delivery. On the other hand, a study done in southern Ethiopia found that the majority of the respondents (87.9 intension was to deliver at home[1].About 44% of pregnant women responded that the lack of privacy in labor ward affected their delivery service utilization which is similar to the response of women in Arsi Zone where 40.0% of them agreed to the statement "Giving birth on the delivery bed of labor ward was very shameful"[12]. Because of the fact that lack of privacy affect delivery service utilization might be due to cultural influence in which, most of the time laboring women has been given birth in home or isolated place and they do not want to expose themselves.

Of the four birth preparedness practices; 58%of the respondents had identified skilled provider, 59.6% saved money, 92.8% identified means of transport, and 99.8% decided the place of delivery. Even though these findings are similar to the in rural Uganda[7], they are higher than the finding in Adigrat Town, Northern Ethiopia[8]. The difference might be due to differences in local health delivery system, availability of roads and program effort by Ministry of Health and collaborating stakeholders.

CONCLUSION AND RECOMMENDATION

Knowledge is an important factor that affects attitude, intension and behaviour. Knowledge relates to behaviour, and behaviour produces change towards service utilization. The more knowledge they have about dangerous signs of pregnancy and delivery the more they go for antenatal and delivery services. Knowledge is strong predictor of maternity service utilization; those having good knowledge about danger signs of pregnancy and delivery are more likely using skilled delivery services. It is expected that a better-informed individual is better

placed to make reasonable decisions. A strong positive association that has been also shown to exist between qualities of care obtained during pregnancy and the use of skilled delivery care [5]. Knowledge of obstetric danger signs and birth preparedness and complication readiness in the study area were found to be low. Our study showed low awareness of knowledge of obstetric danger signs and birth preparedness and complication readiness among ANC follow up of pregnant women in the hospital. Study also demonstrated strong association between knowledge of dangers signs during the three periods, attitude towards birth preparedness and complication readiness and practice of birth preparedness. So, effort to increase knowledge of obstetric danger signs and birth preparedness and complication readiness should focus on antenatal care services and giving regular health education in health facilities and outreach to the communities.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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A CASE OF THANATOPHORIC DYSPLASIA TYPE I: THE FIRST CLINICOPATHOLOGIC REPORT FROM ETHIOPIA

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ABSTRACT

Thanatophoric dysplasia (TD) is a short-limb neonatal dwarfism syndrome that is usually lethal in the perinatal period1. It is characterized by markedly underdeveloped skeleton and short-limb dwarfism. TD is caused by a mutation of the fibroblast growth factor receptor 3 gene (FGFR3), which is located on the short arm of chromosome 42,3.This study reports a neonate born at Tikur Anbessa Teaching Hospital with features of thanatophoric dysplasia which was proven radiologically and pathomorphologically. The mother presented to the hospital at 39 +1 weeks of gestational age with ultrasound diagnosis of achondroplasia. She developed cephalopelvic disproportion and underwent caesarian section. Outcome was an alive anomalous female neonate with a weight of 2900 gms of 4, 2, 2 & 0 in the 1st, 5th, 10th & 20th minute APGAR scores, respectively. The neonate expired due to severe respiratory distress despite resuscitation. The parturient died following pulmonary thromboembolism diagnosed on her second postoperative day.

CONCLUSION:

Thanatophoric dysplasia is a lethal skeletal anomaly which should be diagnosed and managed in the second trimester of pregnancy. Missing this case in the mid-trimester costed note only the physical, psychological and the economic burden but also the life of the mother.

KEY WORDS:

Thanatophoric dysplasia, fibroblast growth factor receptor 3 gene (FGFR3)

INTRODUCTION

Thanatophoric dysplasia (TD) is the most common form of skeletal dysplasia known to be lethal in neonatal period.[3] The prevalence rate, per live births for thanatophoric dysplasia in Northern Ireland has been calculated to be 0.8/10,000[4]. It is characterized by markedly underdeveloped skeleton and short-limb dwarfism. The name TD is derived from the Greek word which means "death-bearing." TD presents with macrocephaly, narrow bell-shaped thorax with shortened ribs, normal trunk length, and severe shortening of the limbs[4].

TD is divided into two clinically defined subtypes: TD type I(TD-1) and TD type II (TD-2). The clinical subtypes are defined mainly by the appearance of the long bones; whether they are curved or straight. TD-1 is the most common subtype, is characterized by a normal shaped skull and curved long bones (shaped like old-fashion telephone receivers). TD-II is associated with a cloverleaf-shaped skull and straight femurs[4].The incidence of type 1 TD (TD1) is variously quoted as 1 in 20 000 - 40 000 stillborn and live born infants 1 in 33 000 - 47 000 live births[3]. TD is caused by a mutation of the fibroblast growth factor receptor 3-gene (FGFR3), which is located on the short arm of chromosome[4]. The penetrance of this mutation is 100%. It was reported that hypochondroplasia, achondroplasia and thanatophoric dysplasia are the different types of mutations in FGFR3 with hypochondroplasia being the mildest and TD, the most severe form [2,3]. The diagnosis is usually made by ultrasonography in the second trimester[2]. The radiological features of TD1 are characteristic when the infant is delivered at termmacrocephaly, symmetrical micromelic shortening of long bones, metaphyseal cupping of the proximal femora, telephone-receiver shaped femora, hypoplastic or small scapulae, platyspondyly with H-shaped vertebrae in the anterior-posterior view, a narrow thorax with short ribs, and characteristic triradiate acetabulum with short

sacrosciatic notches. Interpediculate narrowing of the spinal canal evident on lateral views results in damage to the spinal cord in rare survivors. In TD2, the skull has a marked anterior depression forming the trilobal cloverleaf skull[3].

The possible differential diagnosis are Achondrogenesis, Achondroplasia (homozygous type), Asphyxiating Thoracic dystrophy, Hypophosphatasia, Osteogenesis imperfect type II.

The teartment of TD mainly depends on early prenatal diagnosis and termination of pregnancy via vaginal route. In case of postpartum diagnosis, intubation is performed to treat respiratory distress: the neonate need to be admitted to neonatal intensive care unit (NICU)[4].

Since this anomaly is a lethal congenital anomaly, it should be diagnosed and managed early in the second trimester. We will discuss the anatomical features, pathologic findings and possible option of management of TD in the present report, which would help in the further earlier intervention before significant physical, economical and psychological burden both for the family and the health service as a whole.

CASE REPORT

A 33 years old gravida III, para I mother with one previous history of spontaneous abortion from Addis Ababa presented with rupture of the membranes and pushing down pain of 8 hours at a gestational age of 39 weeks and 1 day. She had two antenatal care visits at a health center. She presented to Tikur Anbessa Teaching Hospital (Addis Ababa, Ethiopia) on December 7, 2011 with an ultrasound report of achondroplasia, and with estimated fetal weight of 4200 gms. She was admitted to the labor ward with the diagnosis of Term pregnancy, latent first stage of labor, pregnancy induced hypertaion, fetal Achondroplasia and Obesity. Sonographic study was not repeated and cesarean delivery was decided for cephalopelvic disproportion (CPD) after the progress of labor was followed in the labor ward. Outcome was an alive anomalous

female neonate with a weight of 2900gms with APGAR score of 4, 2, 2 & 0 in the 1st, 5th, 10th& 20th minute respectively.

The neonate had macrocephally with head circumference (HC) of 41 cm, and frontal bossing, depressed nasal bridge, bell shaped thorax, both upper extremities measured 11 cms, right lower extremities equaled 11cms, left lower extremity was 13cms, abdominal circumference of 34 cms, and crown-heel length of 38 cms. The umbilical cord was 20 centimeters long and fragile with focally adherent placenta. The neonate expired on arrival to NICU after resuscitation was tried in the operation theater. The body was subjected

for autopsy and radiographic study after taking consent from the parents (Fig 1). There was no maternal history of drug, alcohol, or tobacco use. The baby's parents were healthy, and there was no family history of congenital abnormalities. Paternal age was 34 years.

The mother had a smooth immediate postoperative period until the second day which she developed sudden onset of respiratory distress with drop in saturation. She was transferred to intensive care unit with possible cause of massive pulmonary thromboembolism for respiratory support, but she couldn't be salvaged.
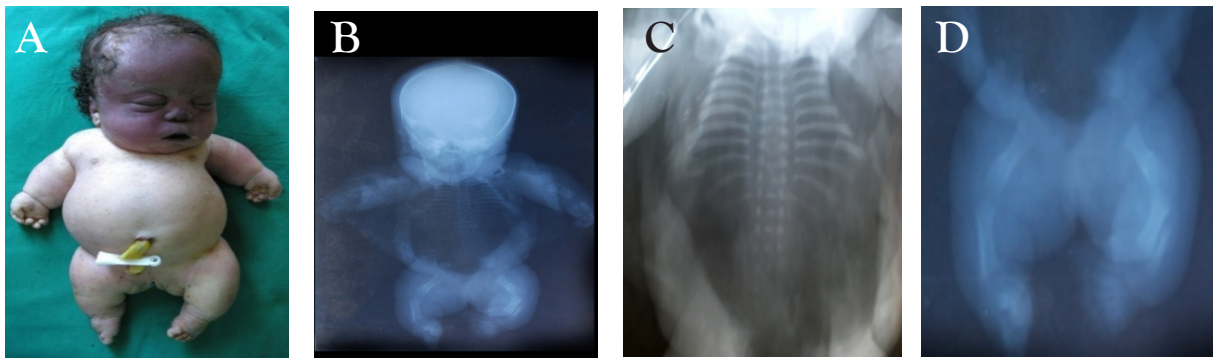
Fig.1 A. Photograph of the neonate taken the day of delivery showing large head, markedly short limbs, and narrow thorax

Fig 1B, 1C &1D. Radiography of the neonate demonstrating thanatophoric dysplasia type I (TD1) findings, including platyspondyly, a severely hypoplastic pelvis, shortness of long bone, hypoplasia of the lungs and thorax, and femoral bowing ("telephone receiver" femur).

RADIOLOGIC FINDINGS:

Radiography of the neonate demonstrating thanatophoric dysplasia type I (TD1) findings including: macrocephaly, platyspondyly, a severely hypoplastic pelvis, shortness of long bone, hypoplasia of the lungs and thorax, and femoral bowing ("telephone receiver" femur).

AUTOPSY FINDINGS:
Autopsy results also confirmed Thanatophoric dysplasia type I. Hypoplastic lungs with malformed veins and persistent fetal circulation. The pertinent autopsy features reported were:

BONES:
VERTEBRAL COLUMN- flat vertebral bodies with small center of mineralized cartilage and minimal bone formation. Cartilaginous part was vascularized.

LONG BONES: both femurs were curved which is the so called "telephone receiver" and showed marked resting bone zone with indistinct or absent proliferation zone (Fig. 2).
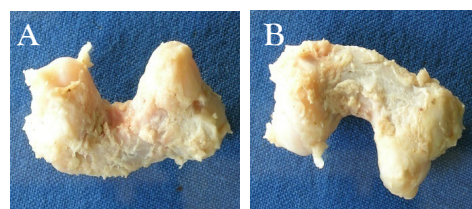

Fig.2: Right and left femur: Short and deformed ("telephone-receiver") but normal thickness (normal periosteal growth).

Zone of hypertrophy was focal and very small. This chaotic zone of cartilage which is seen at the epiphyseal plate (Fig 3a). Mineralization of cartilage, deposition of osteoid, and periosteal bone formation was normal (Fig 3b).
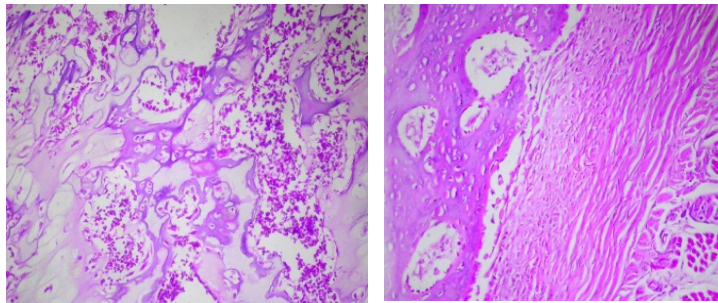

Fig. 3a: The chaotic growth plate of the   humerus   resulting in disturbed   longitudinal   growth.
Fig. 3b: Normal periosteal   growth resulting in normal thickness of the   tubular bones.

RIB: The bony part is side-by-side with the cartilage part. Bony part showed marked periosteal bone formation and cartilage part showed chaotic zones with indistinct columns and central vascular core.

CENTRAL NERVOUS SYSTEM: Choroid plexus showed angiomatoid change with focal hydropic swelling and ectopia. Subependymal ruminants of germinal cells.

RESPIRATORY: Hypoplastic lungs and the left lobe larger than the right. It was poorly inflated. Have features of capillary dysplasia with misalignment of vein (Fig. 4) Persistent fetal circulation.

Autopsy Conclusions: Thanatophoric dysplasia type I: Hypoplastic lungs with malformed veins and persistent fetal circulation, features of right ventricular failure.
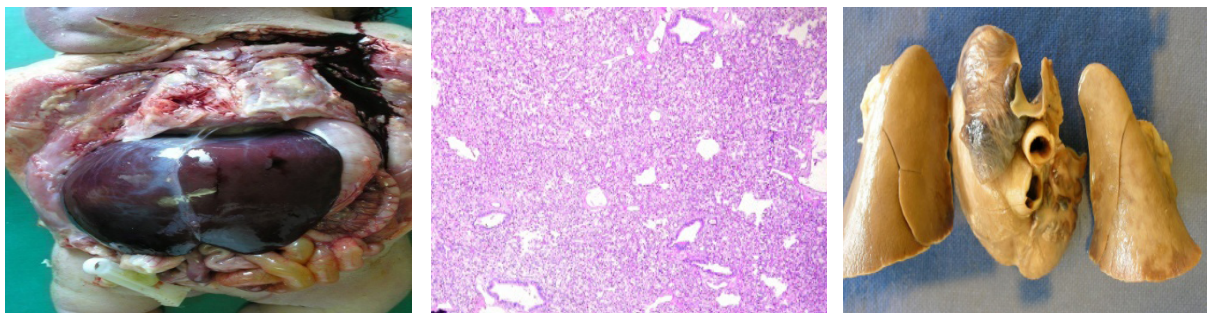

Fig.4a: Situs: Narrow   bell-shaped   thorax and   hepatomegaly.
Fig.4b: Heart   and lung: The proportion between heart and lung   reveals the severe hypoplasia of the lung.
Fig.4c: Histology of the lung: The arrangement of the veins is abnormal. Instead of being   within the   interlobular septae some   accompany the   arteries (misalignment of pulmonary veins)

DISCUSSION

The term thanatophoric dysplasia (TD) originates from a Greek word 'Thanatophores' which means constantly bearing death. It was first described by Maroteaux et al in 1967[6]. It is characterized by a large head with a prominent forehead; macrocephaly occasionally with a cloverleaf–shaped skull known as kleeblattschädel, depressed nasal bridge, shortening of the limbs. A hypoplastic thorax is common, which is disproportionately small in relation to the abdomen. Classically, a bell-shaped thorax has the shape of a champagne bottle cork and results in pulmonary hypoplasia. Characteristic radiologic findings include excessive shortening of the long bones, telephone receiver shape of femur, disproportionate thorax with short hypoplastic ribs and malformed pelvis, with flat speculated acetabulum. Vertebrae are flattened with diminution of the intervertebral space[1,7]. Hydramnios is a common finding. It is commonly mistaken clinically for

achondroplasia, particularly the heterozygous type in which both parents are of normal stature. This confusion is unlikely when one or both parents are achondroplastic dwarfs, since a TD offspring from this combination has not been reported[6]. This scenario occurred in our case the patient came with sonographic report of a diagnosis of Achondroplasia.This dysplasia has two types, differentiated by the skull shape and the femur morphology.

Type I (80%) is characterized particularly by the femur shape which is in a telephone receiver like configuration, severe platyspondylia and no cloverleaf shaped skullType II (20%) differs from type I especially by the cloverleaf-shaped skull, the femur that is straighter and the vertebral bodies that are a little taller than in type I. in our case the diagnosis is confirmed to be TD-1 from both radiologic and pathologic report.

Affected neonates generally die within minutes or days after birth, usually from respiratory failure[1,8]. In our patient the lung was not only hypoplastic, but also showed reduced capillarization of the alveolar septae with some of the veins in abnormal position, features suggestive of   capillary dysplasia with misalignment of veins.TD is caused due to mutation of the fibroblast growth factor receptor 3 gene (FGFR3), which is located on the short arm of chromosome 4. This receptor is particularly abundant in the cartilage growth plates. The mutation results in the activation of FGFR3 tyrosine kinase independently of ligands such as fibroblast growth factor 8. This activation of FGFR3 results in decreased apoptosis and increased proliferation[1,2].

Histologically, resting cartilage has normal cellular density with abundant homogeneous matrix. Enchondral ossification is severely disturbed. Hypertrophic chondrocytes are recognizable but in disordered arrangement. The most characteristic abnormality is hypertrophy of the periphysis with penetration of the growth plate so that fibrous disorganization with formation of plump, haphazardly arranged, bony trabeculae is apparent. This fibrous disorganization of the growth plate is not uniform[9]. In our case the chaotic zones of cartilage that are seen at the epiphyseal plate disturbs the longitudinal growth of the long bones for which reason this anomaly present with shorted long bones. Mineralization of cartilage, deposition of osteoid, and periosteal bone formation was not affected, which resulted a normal bone thickness. Abnormalities in the central nervous system have been described and mainly affect the temporal lobe[9]. In the present case we found angiomatoid changes of the choroid plexus and an ectopic rudimentary ventricle in the   subarachnoid space.A definite diagnosis should be established by molecular genetic analysis to find out the abnormal mutations in the FGFR3 gene[1]. But in developing countries like Ethiopia were genetic analysis is not widely available clinical, radiological and pathological knowledge should applied to reach up in a diagnosis.Prenatal diagnosis in the second trimester can allow for elective abortion to be carried out, thereby avoiding possible complications such as later caesarean section, difficult vaginal delivery due to hydrocephalus, and malpresentation later in the pregnancy[10]. In our case late diagnosis brought not only physical, psychological and economic burden but also a grave complication which caused maternal death.

The overall prognosis is poor. Most patients die of respiratory insufficiency due to reduced chest circumference and hypoplastic lung within 48 hours, although four to nine-year survivals have been reported.[1]

SummaryThanatophoric dysplasia is a lethal skeletal disease. This can be diagnosed with mid-trimester ultrasonographic scan; at which time it can be managed without significant complication.

In the presented case it was diagnosed late in the postpartum period. If it was diagnosed early all the complications could have been prevented. Even if ultrasound is not accessible in all Antenatal care service delivery centers, mid-trimester scan should be route in those centers with ultrasonography.

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Original Research

A Comparison of Methods for the Diagnosis of Fetal Growth Restriction Between the Royal College of Obstetricians and Gynaecologists and the American College of Obstetricians and Gynecologists

Nathan R. Blue, MD, Meghan E. Beddow, MD, Mariam Savabi, MD, MPH, Vivek R. Katukuri, MD, Ellen L. Mozurkewich, MD, MS, and Conrad R. Chao, MD

OBJECTIVE: The Royal College of Obstetricians and Gynaecologists (RCOG) defines fetal growth restriction as ultrasound-estimated fetal weight less than the 10th percentile or abdominal circumference less than the 10th percentile; the American College of Obstetricians and Gynecologists (ACOG) defines fetal growth restriction as estimated fetal weight less than the 10th percentile alone. We compared each method's ability to predict small for gestational age (SGA) at birth.

METHODS: For this retrospective study of diagnostic accuracy, we reviewed deliveries at the University of New Mexico Hospital from January 1, 2013, to March 31, 2017. We included mothers with singleton, well-dated pregnancies and nonanomalous fetuses undergoing indicated fetal growth restriction surveillance with an ultrasound-estimated fetal weight within 30 days of delivery. Estimated fetal weights and percentiles were calculated using the Hadlock intrauterine growth curve. Small for gestational age was defined as birth weight less than the 10th percentile based on a recent, sex-specific curve. We calculated the area under the curve, sensitivity, specificity, and positive and negative likelihood ratios for various approaches using abdominal circumference and estimated fetal weight to diagnose fetal growth restriction, including the definitions endorsed by ACOG and RCOG.

RESULTS: We included 1,704 pregnancies with a mean ultrasonography-to-delivery interval of 14.0 days (±8.6). There were 235 SGA neonates (13.8%). The rate of fetal growth restriction was 13.6% when using ACOG's criteria and 16.9% according to RCOG's criteria (P=.007). The area under the curve of RCOG's diagnostic approach was 0.78 (95% CI 0.76–0.80), which was higher than ACOG's (0.76, 95% CI 0.74–0.78, P=.01). Sensitivities and specificities of the various methods were similar. Adopting estimated fetal weight or abdominal circumference less than the 10th percentile instead of estimated fetal weight alone to predict SGA at birth would correctly identify one additional case of SGA for each 14 patients assessed.

CONCLUSION: The diagnostic approach endorsed by RCOG is a marginally better predictor of SGA at birth compared with the method endorsed by ACOG. Future research should consider the potential benefits and harms of the different methods in different populations.
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DOI: 10.1097/AOG.0000000000002564

Small for gestational age (SGA), usually defined as birth weight less than the 10th percentile, is associated with adverse neonatal outcomes and cardiovascular and metabolic diseases in adulthood.[1,2] The intrauterine diagnosis of fetal growth restriction is

used to predict SGA at birth and is associated with intrauterine fetal death. The goal of screening for fetal growth restriction is to identify the fetus at increased risk for intrauterine demise to institute antenatal surveillance with the goal of decreasing perinatal death.[3] The standard estimated fetal weight is calculated using Hadlock formula, which incorporates the fetal biparietal diameter, head circumference, abdominal circumference, and femur length.[4,5]

The American College of Obstetricians and Gynecologists' (ACOG) Practice Bulletin on fetal growth restriction supports the use of estimated fetal weight less than the 10th percentile to diagnose fetal growth restriction, considering fetuses with an abdominal circumference less than the 10th percentile but an estimated fetal weight greater than the 10th percentile as normal.[4] In contrast, the Royal College of Obstetricians and Gynaecologists' (RCOG) criteria include either estimated fetal weight less than the 10th percentile or abdominal circumference less than the 10th percentile, considering a fetus with a small abdominal circumference but a normal estimated fetal weight to have fetal growth restriction.[6] The diagnostic accuracy of a small abdominal circumference in the setting of a normal estimated fetal weight has been tested only in limited populations, and the significance of this finding remains unclear.[7–9] Therefore, we set out to compare the diagnostic accuracies of the approaches recommended by ACOG and RCOG to predict SGA at birth with a secondary aim of testing the intermediate approach of estimated fetal weight less than the 10th percentile or abdominal circumference less than the fifth percentile. We hypothesized that RCOG's diagnostic approach (estimated fetal weight or abdominal circumference less than the 10th percentile) would be comparable with or better than ACOG's (estimated fetal weight less than the 10th percentile alone) to predict SGA at birth.

MATERIALS AND METHODS

For this study of diagnostic accuracy, we obtained approval by our institutional review board to retrospectively review all consecutive deliveries at our institution occurring between January 1, 2013, and March 31, 2017. We included neonates who both had an ultrasonographic estimated fetal weight performed within 30 days before delivery and were delivered at our institution. Exclusion criteria were multiple gestations, fetal hydrops, intrauterine fetal demise, inconsistent gestational age documentation, missing ultrasound or birth weight data, and congenital anomalies not allowing for accurate assessment of the biparietal diameter, head circumference, abdom-

inal circumference, or femur length (eg, hydrocephalus or severe ventriculomegaly, holoprosencephaly, bony cranial abnormality, abdominal wall defect, limb–body wall anomaly, skeletal dysplasia, and caudal regression syndrome). Because neither ACOG nor RCOG specifies a gestational age range at which their criteria are valid, ultrasound assessments were not limited to specific gestational age ranges as long as they occurred within 30 days of delivery.

At our institution, third-trimester ultrasonography is performed only when indicated and fetal growth restriction is diagnosed using ACOG's criteria. Fetuses with a small abdominal circumference but normal estimated fetal weight do not undergo additional surveillance unless otherwise indicated. Starting in 2015, gestational age was determined using criteria recommended by ACOG.[10] Before 2015, gestational age was determined by last menstrual period as long as the earliest and best ultrasonographic gestational age estimate was within 8% of the gestational age at the time of the examination. When the ultrasonography–last menstrual period discrepancy was greater than 8% of the gestational age, the due date was determined by the ultrasonogram. Estimated fetal weights were calculated and estimated fetal weight or abdominal circumference percentiles assigned using the Hadlock estimated fetal weight and z score formulas, which are not sex-specific.[11,12] All values were calculated using the raw measurements to avoid error from varying use of different formulas or growth curves. Calculation of estimated fetal weights, estimated fetal weight and birth weight percentiles, and application of each diagnostic method occurred retrospectively and so were not available to clinicians.

Birth weight percentiles were assigned using recent, sex-specific curves based on a nationwide cohort of births in the United States that are not specific to race or ethnicity.[13] We chose this birth weight reference standard because it is comprised of a large, updated sample of nationally representative births. These birth weight percentile tables included data for completed weeks of gestation only, so to determine the percentiles using gestational weeks+days, cubic splines were used to interpolate the whole-week LMS (lambda, the power transformation; mu, the median; sigma, the coefficient of variation) curves to derive LMS data points for each gestational day. Cubic splines are preferred over linear interpolation because they generate a smooth curve that passes through all provided data points. We then used the LMS z score formula ($z = [(X/M)^L - 1]/LS$, where X is birth weight in kilograms) to calculate percentiles specific to the gestational day.[14] Small for gestational age was defined as birth weight less than the 10th percentile.

To characterize the overall test performance of the diagnostic approaches endorsed by ACOG (estimated fetal weight less than the 10th percentile) and RCOG (estimated fetal weight or abdominal circumference less than the 10th percentile) to predict SGA at birth, we plotted the receiver operator characteristics (true-positive rates plotted as a function of false-positive rates) and calculated the area under the curve (AUC) and positive and negative likelihood ratios with 95% CIs for each approach. Although receiver operator curves are normally generated by plotting the characteristics of multiple thresholds of a single continuous parameter, the methods being compared in our analysis are comprised of multiple parameters and so could only be plotted as a single point. Therefore, the "curves" for each method were generated by drawing straight lines from (0,0) to each method's plotted point to (1,1) with the AUC being the area under the lines. We also calculated the sensitivity and specificity with 95% CIs. As part of the secondary objective, the following diagnostic approaches were analyzed and compared against both ACOG's and RCOG's approaches: estimated fetal weight less than the 10th percentile or abdominal circumference less than the fifth percentile, estimated fetal weight and abdominal circumference less than the 10th percentile, abdominal circumference less than the 10th percentile interpreted independently of estimated fetal weight, and abdominal circumference less than the fifth percentile independent of estimated fetal weight.

Lastly, we compared the rates of the following neonatal outcomes among neonates prenatally predicted to be SGA by ACOG and RCOG: preterm birth at less than 37 weeks of gestation, neonatal intensive care unit admission, neonatal intensive care unit stay greater than 48 hours, mechanical ventilation for greater than 24 hours, necrotizing enterocolitis, death before discharge, and need for supplemental oxygen, bag–mask ventilation, endotracheal intubation, or chest compressions in the delivery room. Statistical significance was inferred by χ^2 for dichotomous variables and paired t test or analysis of variance with appropriate post hoc tests for continuous variables. Areas under the curve were compared using the DeLong method and NCSS 11.[15] We were unable to find an expected difference between methods in the literature to inform a power analysis and so did not calculate a prespecified sample size.

RESULTS

We identified 1,704 neonates that underwent an ultrasonographic estimated fetal weight within 30 days of delivery. In our sample, the mean interval from ultrasonography to delivery was 14.0 days (± 8.6), and the rate of SGA at birth was 13.8% (n=235). Demographic characteristics are summarized in Table 1. The racial makeup of our study population was different from that of the cohort in the birth weight norms. Our sample had a higher proportion of Hispanic women (49.5% vs 24.4%) and lower proportions of non-Hispanic white women (23.8% vs 50.6%) and black women (1.9% vs 15.7%, $P<.01$ for all comparisons). The most common indications for an ultrasound examination were "size not equal to dates" (n=596 [35.0%]) and "maternal condition" (n=589 [34.6%]; Table 2).

To predict SGA at birth, the approach recommended by RCOG (estimated fetal weight greater

Table 1. Study Population Demographic Characteristics (N=1,704)

Characteristic	Value
Maternal age (y)	28.8±6.5
Ethnicity	
White	406 (23.8)
Hispanic	844 (49.5)
Native American	184 (10.8)
Black	32 (1.9)
Asian	41 (2.4)
Other or missing	195 (11.4)
Parity	
Nulliparous	461 (27.1)
Parous	1,243 (72.9)
Grand multiparous	56 (3.3)
Diabetes	360 (21.1)
Pregestational DM	81 (4.8)
Gestational DM	279 (16.4)
Hypertensive disorder	293 (17.2)
Chronic HTN	62 (3.6)
Preeclampsia	223 (13.1)
HELLP	6 (0.4)
Eclampsia	2 (0.1)
Tobacco use	239 (14.0)
Illicit drug use	275 (16.1)
Heroin	69 (4.0)
Amphetamine	60 (3.5)
Marijuana	63 (3.7)
Cocaine	13 (0.8)
Opioid replacement	149 (8.7)
Gestational age at delivery (wk)	37.7±2.8
US–delivery interval (d)	14.0±8.6
Mean birth weight (g)	2,960±865
Female fetal sex	824 (48.4)
Preterm birth	386 (22.7)
SGA	235 (13.8)

DM, diabetes mellitus; HTN, hypertension; HELLP, hemolysis, elevated liver enzymes, and low platelet count; US, ultrasonography; SGA, small for gestational age.
Data are mean±SD or n (%).

Table 2. Indications for Ultrasound Examination
(N=1,704)

Indication	n (%)
Size not equal to dates	596 (35.0)
Maternal condition*	589 (34.6)
Fetal evaluation	249 (14.6)
Obstetric complication	177 (10.4)
Unclear	93 (5.5)

* Maternal conditions include advanced maternal age, chronic disease, smoking, diabetes, drug use, uterine abnormality, maternal infection, poor prenatal care, poor weight gain, poor obstetric history, prior cesarean delivery, or teen pregnancy.

than the 10th percentile or abdominal circumference less than the 10th percentile) yielded an AUC of 0.78 (95% CI 0.76–0.80), demonstrating better overall performance than the ACOG approach (AUC 0.76, 95% CI 0.74–0.78). This difference was statistically significant (P=.01). There was no difference between the two methods for any of the remaining parameters (as demonstrated by overlapping confidence intervals; Table 3). The receiver operator characteristics of each method are plotted in Figure 1, demonstrating the performance of estimated fetal weight less than the 10th percentile, estimated fetal weight or abdominal circumference less than the 10th percentile, and estimated fetal weight less than the 10th percentile or abdominal circumference less than the fifth percentiles.

Of the 235 SGA neonates, 80 (35%) were not identified by either method before delivery. The diagnostic criteria endorsed by RCOG led to 16.9% (95% CI 15.2–18.8%, n=289) of the cohort being diagnosed with fetal growth restriction compared with 13.6% (95% CI 12.0–15.3%, n=232) when using ACOG's criteria. This difference was statistically significant (P=.007). Although fetuses prenatally diagnosed with fetal growth restriction by ACOG's or RCOG's criteria had higher rates of neonatal morbidities than normally grown fetuses (Table 4), the fetuses identified as having fetal growth restriction by RCOG's but not ACOG's criteria (those with abdominal circumference less than the 10th percentile and estimated fetal weight greater than the 10th percentile) did not have different outcomes than fetuses with normal growth, although our study was not powered for this comparison. When analyzed separately, the additional cases of SGA identified by RCOG's criteria also did not have higher rates of adverse neonatal outcomes than those already identified by ACOG's criteria. When the analysis was performed excluding all anomalous fetuses rather than just those described in the exclusion criteria previously, the results were unchanged.

The alternate method of estimated fetal weight less than the 10th percentile or abdominal circumference less than the fifth percentile had better performance than ACOG's but was not different from

Table 3. Test Characteristics of Diagnostic Approaches for Fetal Growth Restriction

Diagnostic Approach	AUC (95% CI)	Sensitivity (%) (95% CI)	Specificity (%) (95% CI)	+LR (95% CI)	−LR (95% CI)
ACOG (EFW less than 10th percentile)	0.76 (0.74–0.78)	58.7 (52.1–65.1)	93.6 (92.2–94.8)	9.2 (7.3–11.5)	0.44 (0.38–0.51)
RCOG (EFW less than 10th percentile or AC less than 10th percentile)	0.78* (0.76–0.80)	66.0 (59.5–72.0)	90.9 (89.3–92.3)	7.2 (6.0–8.7)	0.37 (0.31–0.45)
EFW less than 10th percentile or AC less than 5th percentile	0.77[†] (0.75–0.79)	62.1 (55.6–68.4)	92.7 (91.3–94.0)	8.5 (6.9–10.5)	0.41 (0.35–0.48)
EFW less than 10th percentile and AC less than 10th percentile	0.73[‡] (0.71–0.75)	51.5 (44.9–58.0)	94.8 (93.6–95.9)	10.0 (7.7–12.8)	0.51 (0.45–0.58)
AC less than 10th percentile	0.75[§] (0.73–0.77)	58.7 (52.1–65.1)	92.1 (90.6–93.4)	7.44 (6.1–9.1)	0.45 (0.38–0.52)
AC less than 5th percentile	0.71[‡] (0.69–0.73)	46.8 (40.3–53.4)	95.4 (94.4–96.5)	10.3 (7.8–13.5)	0.56 (0.49–0.63)
AC less than 10th percentile, normal EFW	0.52[‡] (0.50–0.54)	7.2 (4.3–11.3)	97.3 (96.3–98.1)	2.7 (1.5–4.6)	0.60 (0.55–0.65)
AC less than 5th percentile, normal EFW	0.51[‡] (0.49–0.53)	3.4 (1.5–6.6)	99.1 (98.5–99.5)	3.8 (1.6–9.2)	0.97 (0.95–1.0)

AUC, area under the curve; +LR, positive likelihood ratio; −LR, negative likelihood ratio; ACOG, American College of Obstetricians and Gynecologists; EFW, estimated fetal weight; AC, abdominal circumference; RCOG, Royal College of Obstetricians and Gynaecologists.
* P=.01 when compared against ACOG approach using the DeLong method.
† P=.04 when compared against ACOG approach, P=.13 when compared against RCOG approach using the DeLong method.
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Table 5. Distribution of Small-for-Gestational-Age and Non–Small-for-Gestational-Age Fetuses by Diagnostic Method

Diagnostic Approach	TP	FP	TN	FN
ACOG (EFW less than 10th percentile)	138	94	1,375	97
EFW less than 10 or AC less than 5th percentile	146	107	1,362	89
RCOG (EFW or AC less than 10th percentile)	155	134	1,335	80
EFW less than 10th percentile and AC less than 10th percentile	121	76	1,393	114
AC less than 10th percentile	138	116	1,353	97
AC less than 5th percentile	110	67	1,402	125
AC less than 10th percentile, normal EFW	17	40	1,429	218
AC less than 5th percentile, normal EFW	8	13	1,456	227

TP, true-positive; FP, false-positive; TN, true-negative; FN, false-negative; ACOG, American College of Obstetricians and Gynecologists; EFW, estimated fetal weight; AC, abdominal circumference; RCOG, Royal College of Obstetricians and Gynaecologists.
Data are n.

restriction performs better than the method endorsed by ACOG in the prediction of SGA at birth. As expected, application of more inclusive diagnostic criteria led to a higher rate of fetal growth restriction and the identification of additional cases of SGA that would have been missed by more restrictive diagnostic schemes. This is an important finding given that the antenatal surveillance of SGA fetuses who are correctly identified may reduce the risk of stillbirth and, when coupled with referral to appropriately resourced secondary or tertiary centers, confers an absolute risk reduction in perinatal death of 5 per 1,000.[3] The observation that our analysis did not show any difference in neonatal outcomes between normally grown fetuses and those with fetal growth restriction by RCOG's criteria but not ACOG's criteria should be interpreted with caution because the small number of those fetuses did not allow for sufficient power to detect a difference. Additionally, our analysis applied multiple diagnostic criteria retrospectively and so clinical care was guided only by the diagnostic method in use at that time, precluding any potential for outcomes to be altered by application of an alternate method. A large, prospective trial would be required to demonstrate a difference in neonatal outcomes among fetuses identified with fetal growth restriction according to the differing definitions. In addition, more research is necessary to ascertain whether the additional fetuses classified with fetal growth restriction identified by the more liberal RCOG criteria are more likely to be pathologically or constitutionally small. This distinction is important to establish because constitutionally small fetuses are not at increased risk for adverse outcomes of pregnancy and thus might not benefit from increased identification.[16]

Of interest is whether fetal growth-restricted cases identified by the more inclusive schemes are more likely to be true- or false-positives. Because additional true-positives identified by more inclusive diagnostic methods are inevitably accompanied by false-positives, more inclusive methods or thresholds may not always represent improved performance, leading some to choose the more restrictive approach as a result of concerns regarding the potential risks of additional false-positives. As a metric of test performance, the AUC accounts for this by incorporating both the true-positive rate and the false-positive rate, thereby providing an assessment of overall performance that takes both measures into account. In our comparison of AUCs, the RCOG method had statistically better overall performance than the ACOG method. Although overlapping CIs is one way to assess for statistically significant differences between proportions, the DeLong analysis was designed to compare AUCs derived from two tests applied to one study population (as was the case in our study) and has demonstrated a statistical difference.

Our study had multiple strengths. It was comprised of a large cohort of well-dated pregnancies from a single center, and the recalculation of estimated fetal weights and percentiles standardized the process and minimized bias. The use of cubic splines to interpolate birth weight whole-gestational week norms added granularity and clinical applicability. Study limitations included our inability to quantify the rate of fetal death among at-risk fetuses as a result of the nature of our database-driven chart review. Our population had a racial and geographic makeup that may not be nationally representative, although data previously reported from our institution demonstrated comparable mean birth weights to other geographic regions within the United States.[17]

Perhaps the most important limitation is that the retrospective nature of our study did not allow us to ascertain whether the application of different fetal growth restriction diagnostic methods affected neonatal outcomes. We would not expect this to alter the principal comparison of diagnostic criteria for fetal growth restriction, however, because both sets of criteria were applied to the same study population and would therefore be equally affected by any potential bias.

In summary, our study provided an important first step in addressing the difference in the fetal growth restriction diagnostic criteria recommended by ACOG and RCOG, demonstrating marginally superior performance of RCOG's criteria of estimated fetal weight or abdominal circumference less than the 10th percentile to predict SGA at birth. The adoption of the RCOG method may represent an opportunity to improve outcomes for a group of at-risk neonates, especially because it only requires an adjustment in interpretation of ultrasound parameters that are already part of standard intrauterine growth assessments. This approach falls short of what is ultimately required, however, because adjusting the thresholds of an inherently limited modality can only offer limited gains in SGA prediction. These limitations are exemplified by the high rate of SGA cases not identified by either method in our study. This underscores the need for research into and development of better diagnostic methods than those that rely on the use of traditional estimated fetal weight parameters and intrauterine growth curves alone. The diagnostic approach endorsed by RCOG is a marginally better predictor of SGA at birth compared with the method endorsed by ACOG. Future research should consider the potential benefits and harms of the different methods in different populations.

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References: References have to be numbered consecutively in the order in which they are first mentioned in the text. References must also follow the Vancouver system.

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