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Factors associated with modern contraceptive demands satisfied among currently married/in-union women of reproductive age in Ethiopia: a multilevel analysis of the 2016 Demographic and Health Survey

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ABSTRACT

Objectives Regardless of the local and international initiatives, excluding exempting services, demand satisfied for contraceptives remains low in Ethiopia. This circumstance is supposed to be attributed to different level factors; however, most were not well addressed in the previous studies. Therefore, this study aimed at assessing the magnitude and individual, household and community-level factors associated with demand satisfied for modern contraceptive (DSFMC) methods among married/in-union women of reproductive age.

Design Cross-sectional study.

Setting A community-based study across the country.

Participants Randomly selected 9126 married/in-union women had participated using a structured questionnaire.

Outcome DSFMC methods among married/in-union women of reproductive age.

Results DSFMC methods in Ethiopia was 39.5% (95% CI 38.5% to 40.5%). Women aged 35–49 years (adjusted OR (AOR): 0.43, 95% CI 0.32 to 0.58), Muslim religion (AOR: 0.58, 95% CI 0.43 to 0.78), husband lived elsewhere (AOR: 0.42, 95% CI 0.29 to 0.60), joint decision making to use (AOR: 1.30, 95% CI 1.04 to 1.62), good knowledge (AOR: 1.57, 95% CI 1.32 to 1.86) and wealth status of poorer (AOR: 1.56, 95% CI 1.17 to 2.06), middle (AOR: 1.77, 95% CI 1.33 to 2.35), richer (AOR: 1.96, 95% CI 1.49 to 2.59), and richest (AOR: 1.49, 95% CI 1.05 to 2.08), pastoralist regions (AOR: 0.28, 95% CI 0.18 to 0.42), and agrarian regions (AOR: 1.72, 95% CI 1.21 to 2.44) and rural residency (AOR: 0.56, 95% CI 0.37 to 0.82) were factors significantly associated.

Conclusions Women's age, religion, the current living place of husbands and women's knowledge were individual-level factors. Household wealth status and mutual decision making to use were household-level factors. Region and residency were households and community-level factors associated with DSFMCs. Increasing the accessibility of modern contraceptive methods to women in rural areas and pastoralist regions, those living separately, engaging religious leaders and men in the programme, would increase their satisfying demand.

Strengths and limitations of this study

► The study used a large sample size at the national level to enhance its representativeness.
► The DHS has a similar design, with similar variables in a different setting; the result may, therefore, be applied to other similar locations.
► The possible limitations might be recall bias, particularly for age and other retrospective data relying on past events.

BACKGROUND

The modern family planning (FP) programme is a crucial strategy for universal access to reproductive health and economic development.[1] FP could help prevent 70% of maternal and more than 57% of under-five deaths by prolonging birth intervals.[2] It also promotes child growth and development.[3] Besides, it encourages women to engage in the workforce, promotes equal access to education, reduces poverty, and enhances their involvement in political and economic decision making.[4–6] However, in low-income countries, more than 200 million women are still seeking modern contraceptives,[7] which resulted in about 40% of unintended pregnancies of which 90%.[8] could have been prevented.

To realise the accessibility, ongoing international initiatives, such as the 2030 Agenda for Sustainable Development, the Every Woman Every Child Global initiative launched in 2010 to end avoidable deaths of women, children and adolescents, and the FP 2020 aimed at engaging 120 million additional modern contraceptive users from 69 poorest countries by 2020.[8–10] With these policy measures and broadly adapted initiatives, demand satisfied

for modern contraceptives (DSFMCs) continues to be lacking in developing counties.[11]

The higher unmet need and the lower DSFMCs imply that women are suffering from unwanted or mistimed pregnancies. Unwanted pregnancy is associated with multidimensional health and economic development effects: raises maternal mortality, promotes prenatal depression, decreases mental and physical development of children resulting from malnutrition secondary to the short birth interval, jeopardises the maternal and offspring's bond, reduces participation of women in the labour force and politics.[1 12–14]

The current estimates show that the need for modern contraception has not been met for about 214 million women globally.[15] The world FP report 2017 showed that the international share of modern contraceptives' satisfaction was 78% and it's corresponding figure in Africa was 56%.[16] Further, a survey in 17 low-income and middle-income countries, including Ethiopia, has highlighted that about 52.9% of women were satisfied.[3]

For many years, modern contraceptive has been a priority public health intervention in Ethiopia with high participation of local and international partners through offering free FP services. It is also one of the target areas of domestically innovated health extension programmes addressed through both outreach and facility-based approaches.[17 18] Despite these strategies, DSFMC methods in 2011 was 50.2%, of which 42.6%, 6.8% and 0.9% were contributed by short-acting, long-acting and permanent methods, respectively.[3] The magnitude of DSFMCs varies across different segments of the country's population: according to the 2014 mini Ethiopian Demographic and Health Survey (EDHS) report, modern contraceptive usage was 49.2%, with unequal distribution between regions ranging from 57% in Addis Ababa to a tiny proportion (1%) in the Somali region.[19 20] Although there is no well-known explanation for the disparity among regions which are governed by the same FP policy, the available literature in the different parts of Ethiopia and across the globe have shown that DSFMCs is affected by sociodemographic, economic, health service and information accessibility, knowledge, side effect, and reproductive-related factors.[4 11 21–23]

In addition, some crucial factors such as sex of household heads, women's age at first marriage, husband's current residency, the presence of other wives, women's involvement in decision making on their healthcare need as well as on major household purchase, level of informed choice of methods, and their exposure status of FP messages are supposed to have a direct relationship with FP usage in resource-limited and less educated countries particularly in Ethiopia. However, they were overlooked by previous studies. These contributing factors can be stratified as individual, household and community level. Sorting out the different factors responsible for affecting demand satisfied and categorising them at different levels is crucial to target and tackle the problem efficiently and wisely.

A national-level data with an advanced and rigorous scientific data summary approach is needed for evidence-based decision making in the field. Besides, assessing and reporting the actual DSFMC use and contributing factors at the country level generates powerful evidence which triggers the policy makers in the field. It is also important to design evidence-based strategies to maintain the population growth beyond improving the health of the women. Therefore, the objectives of this study were: (1) To determine the demand satisfaction of married/in-union women in modern FP methods, and (2) To identify the individual, household and community-level factors in Ethiopia using data from the 2016 EDHS. It is believed that the evidence generated from this study will give a strong suggestion to programme managers and policy makers to understand certain contributing factors at different levels that can be an indicator for stakeholders' involvement and promote services for eligible individuals as well as the community as a whole.

METHODS
Study area and period
The study was conducted in Ethiopia using data from the 2016 EDHS. Ethiopia is found in the horn of Africa. Administratively, the country is subdivided into nine geographical regions: Tigray, Afar, Amhara, Oromia, Benishangul-Gumuz, Gambela, Harari, Somali and Southern Nations, Nationalities, and Peoples Region (SNNPR), and two administrative cities (Addis Ababa, the capital city of the country and Dire Dawa).

Ethiopia is the second-most populous country in Africa with a population of 114 763 301, equivalent to 1.47% of the total world population ranked the second and twelfth populated country in Africa and the world, respectively. More than 40% of the population is below 15 and a fertility rate of over five children per woman.[24]

The EDHS is a nationally representative household data source gathered every 5 years with the ownership of the Central Statistical Agency.[25] The survey was conducted from 18 January 2016 to 27 June 2016, by health professionals across all regions and administrative cities of the country.

Sampling technique and procedure
In EDHS 2016, a two-stage stratified cluster sampling was employed using the 2007 population and housing census as a frame. The census used a complete list of 84 915 enumeration areas (EAs) created for primary healthcare as a frame. In the first stage, 645 EAs were selected with probability proportional to the EA size. The regions were stratified into urban and rural areas.

In the second stage, 28 households from each cluster were selected by systematic sampling. The data collectors interviewed only preselected households, and no replacements or changes of the preselected homes were allowed in the implementing stages to prevent bias.[26] The 2016 EDHS maternal data sets across all regions
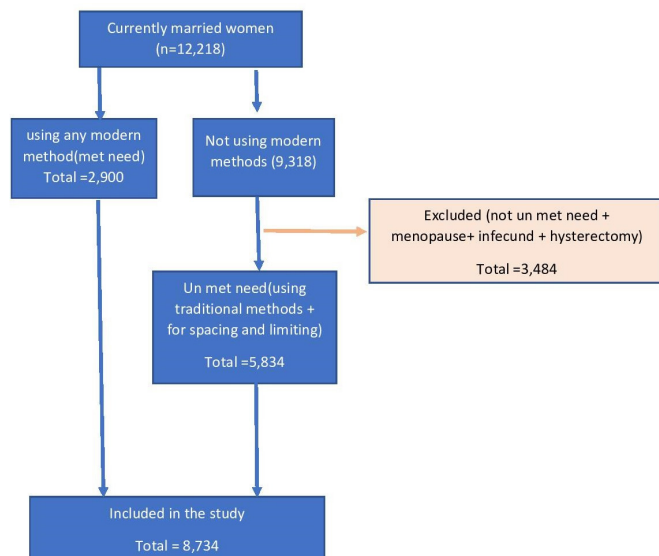
Figure 1 Schematic presentation of demand satisfied for modern contraceptives among currently married/in-union women of reproductive age (before sampling weight) (adapted from Bradley et al[27]) in Ethiopia, 2016.

and two administrative cities were used for analysis. All women aged 15–49 years who were the usual members of the selected households were eligible. The demand satisfied for this study was computed based on the demographic and health survey's (DHS) revised definition of demand satisfied. Those who use any of the modern FP methods were considered as met needs and used in the calculation as nominator. Those who require modern methods for spacing or limiting but are unable to get and those who use traditional methods were considered as an unmet need. The met and the unmet needs were used as the denominator for the calculation (total demanded). Thus, demand satisfied=met need *100/ met need +unmet need.[27] Accordingly, 8734 women aged 15–49 years who are currently married/ in-union were identified as total demanded modern contraceptive methods (2900 met the need and 5834 unmet need) from 12 218 currently married reproductive-age women. To increase its representativeness, sample weighting was done. Thus, the met need was changed from 2900 to 3603, unmet need changed from 5834 to 5523. Consequently, total demand was changed from 8734 to 9126. The sampling procedure before sampling weight was done (figure 1).

Individual, household and community-level independent variables were extracted, and further analyses of the selected variables were done.

Measurements of variables

The study's dependent variable was demand satisfaction for modern contraceptive methods among married or in-union women who were aged 15–49 years. It was measured using women who reported any of the following modern contraceptive methods: female sterilisation, male sterilisation, pill, intrauterine device (IUD), injectables,

implants, male condom, female condom, emergency contraception or lactation amenorrhea method among the total demanded mothers. The independent variables were categorised into three levels: individual level, household level and community level. Participant's age, religion, educational status, occupation, the presence of other wives, husband's current residency, and knowledge of participants to modern methods and ovulatory cycles were the individual-level variables.

The knowledge status of women for modern contraceptive methods: in the EDHS, the knowledge of women for contraceptives was recorded as 'yes' and 'no'. After merging the results of all the selected modern contraceptive methods, the minimum and maximum values were determined, given that the minimum score is 0, maximum 10 and average 5.5. Then, taking the average as the cut point, the results were dichotomised. Thus, those who scored above 5 were levelled as having good knowledge, whereas those below 5 were levelled with poor knowledge.

The sex household heads, family size, wealth status, number of living children and decision maker on FP use were household-level variables, whereas the community-level variables were residency, region, distance to a health facility, heard about FP on radio/at community event/ conversation.

In the EDHS, the wealth quantile was calculated as an index based on consumer goods and fixed assets, such as television, bicycle or car. Household characteristics were also considered in computing the wealth status. These scores were derived using principal component analysis, expressed in terms of quintiles of individuals in the population, and combined to produce a single asset index for all households. Finally, the wealth status was ranked into five (poorest, poorer, middle, richer and richest). Distance to the health facility in the EDHS was assessed using the respondent's response and categorised as 'big problem' or 'not a problem'.[28]

All independent variables were extracted from the data set considering their relevance to the identified research questions. An expert-based discussion was conducted along with the author, and other literature to determine relevant variables was reviewed. An extraction format specific to the study that comprised important variables was prepared, and face validity was done. Further, variables included in the previous studies were added, and critical appraisal for its relevance was employed.

Data processing and statistical analysis

The extracted data were cleaned, recoded, and analysed using STATA V.14 (Stata Corp, College Station, Texas, USA). Finally, descriptive statistics were presented using tables and text.

A multilevel analysis was conducted after checking the statistical assumptions. First, the model assumption was examined by calculating the intraclass correlation coefficient (ICC), and an ICC of more than 5% is deemed as eligible for multilevel analysis. The ICC was 38.97%. Since the EDHS data are hierarchical (individuals are

nested within the household and household levels are also nested within the community), a three-level mixed-effects logistic regression model was fitted to estimate the individual-level, household-level and community-level variables (fixed and random-effects) on-demand satisfied for modern contraceptive methods.

Bivariable and multivariable analyses were computed. First, in the bivariable logistic regression analysis, a value of p<0.2 was used to fit the four models (models for the individual level, household level, community level, and all individual, household and community levels together). In the final model (fixed-effect), for the individual, household and community levels, a value of p<0.05 was used to declare the presence of an association between individual-level, household-level and community-level factors with DSFMC methods. Next, the adjusted OR (AOR) with a 95% CI was used to estimate the strength and direction of the association.

The measures of variation (random effects) were reported using ICC and proportional change in variance to measure the variation between clusters. The log-likelihood test was used to estimate the goodness of fit of the adjusted model compared with the preceding models. A model with the smallest log-likelihood value is better; accordingly, model 4 (a model for all the individual, household and community-level variables) was preferred.

Patient and public involvement
No patient or the public was directly involved in developing the research questions, the design, results and dissemination plan of the study.

Ethical considerations
During EDHS data collection, the data collectors were trained in the data collection process and the handling of the participants without introducing biases. Participants were informed about the objective of EDHS data collection and their rights in the data collection process. Personal identifiers were omitted. Moreover, permission to access the data were obtained from the measure DHS on 07 September 2020, after submitting a brief study concept. However, since this study used secondary data from DHS, consent directly from the participants was not applicable. Further, this study adhered to the Declaration of Helsinki.

RESULTS
Sociodemographic and economic characteristics
The majority (42%) of women fall in the age group between 25 years and 34 years. More than three-fourths (83.5%) were from the rural part of the country, and 62.1% had not attended formal education. About 41.5% were orthodox Christian. More than half (51.4%) had less than five family members, and male household heads led 87.0%. Moreover, more than half (51.1%) were unemployed, and 38.7% were living in poor household wealth status (table 1).

Reproductive health factors
Just below two-thirds (63.4%) were early married, and 74.5% gave first birth when they were 20 years old and younger. Around 40% of them had no desire to have more children. Nearly two-thirds (63.4%) of women had optimal birth intervals (table 2).

Husband/partner-related factors
Under half (46.1%) of the husbands had not attended formal education and 61.5% worked in agriculture. More than 90% of them lived with their wives, 39% had a consistent desire to have more children with their wives and the majority (88.7%) had no wife other than the one living with them. Regarding decision making, the majority (63.1%) had shared the decision on women's healthcare needs, including FP, and household purchases (table 3).

Women's knowledge of modern contraceptive methods and ovulatory cycles
A little below two-thirds (64%) and 88.6% had poor knowledge about female and male sterilisation (permanent) methods, respectively. Besides short-acting methods, the majority (88.8%) had good knowledge. About long-acting methods, slightly more than three-fourths (76.3%) had good knowledge about Norplant, and 53.9% also had good knowledge about IUD. On average, 62.5% of the women had poor knowledge of modern contraceptive methods. Moreover, 82.4% of them knew at least any of the ovulatory cycles (table 4).

Health service and information accessibility and other factors
The majority (83.7%) of users had received the contraceptive methods from governmental health facilities, and 59.4% were informed about the respective side effects. Of them, more than three-fourths (78.2%) were told how to cope with the side effects. The distance to access the services was a big problem for more than half (54.5%). The exposure level for contraceptive messages was also considered as one of the determinants for demand satisfaction. Accordingly, 22.2% heard them through the radio and 41.3% through community conversation (table 5).

DSFMC methods
DSFMC methods were measured using the number of women using any modern contraceptive method among total modern contraceptive demands. The demand satisfied with modern contraceptive methods was 39.5% (95% CI 38.5% to 40.5%). The most commonly used method was injectable (64.6%), whereas the least frequently used methods were condom, emergency contraceptive and standard day methods, which accounted for 0.4% of the total (table 6).

The distribution of DSFMC methods was distinct across the nine regions and the two administrative cities: about 5.5% of the users were pastoralist regions (Somali, Harari, Gambela, Afar and Benishangul Gumzile), the majority (59.6%) were from the semipastoralist areas (Oromia and South nations) and nationalities people's region. A

Table 1 Sociodemographic characteristics of participants in Ethiopia, 2016 (weighted n=9126)

Variables	Category	Frequency	Percentage (%)
Age of participants, years	15–24	1925	21.1
	25–34	3903	42.8
	35–49	3298	36.1
Residency	Urban	1505	16.5
	Rural	7621	83.5
Region	Pastoralist	500	5.5
	Semi-pastoralist	5439	59.6
	City administration	376	4.1
	Agrarian	2811	30.8
Religion	Orthodox	3793	41.5
	Muslim	3065	33.6
	Protestant	2050	22.5
	Others*	218	2.4
Family size	Below 5	4690	51.4
	Above 5	4436	48.6
Educational status of respondents	No education	5666	62.1
	Primary education	2517	27.6
	Secondary education	562	6.1
	Higher education	381	4.2
Occupation	Not working	4664	51.1
	Professionals	280	3.1
	Sales and services	1467	16.1
	Agriculture workers	2131	23.3
	Others †	584	6.4
Wealth status	Poorest	1708	18.7
	Poorer	1814	19.9
	Middle	1853	20.3
	Richer	1806	19.8
	Richest	1945	21.3

Pastoralist: Afar region, Somali region, Gambella region, Benshangul Gumze region and Harari region. Semi-pastoralist: Oromia, Southern Nations, Nationalities, and Peoples' Region (SNNPR). Agrarian: Tigray and Amhara.
*Others: Catholic, traditional.
†Others: skilled manual and unskilled manual workers and others.

tiny percentage (4.1%) were from city administrations and 30.8% were from agrarian regions.

The measure of variation (random effect)

There was a significant discrepancy in DSFMC methods among married or in-union reproductive-age women across the community (clusters). The intracluster correlation coefficient (ICC) in the null model for demand satisfied was 0.3894, implying 38.9% of the variation of DSFMC methods is due to the difference between regions/clusters (table 7).

Model 0: without independent variables (null model), Model 1: only individual-level variables, Model 2: only household-level variables, Model 3: only community-level variables, Model 4: individual, household and community-level variables (full model).

Factors associated with DSFMC methods

In multivariable analysis (Model 1), women's age, religion, educational status, occupation, knowledge about modern contraceptive methods and husband's residency were the individual-level variables associated with demand satisfaction.

In Model 2, the sex of the household head, household wealth status, number of living children, and decision makers for health services and household purchase were significantly associated at the household level. Moreover, region, residency, distance to a health facility and exposure to FP messages on radio/at community events or conversations were factors identified at the community level (Model 3).

After adjusting individual, household and community-level variables, women's age, religion, husband's current

Table 2 Reproductive health-related factors for demand satisfied of modern contraceptive methods among married reproductive-age women, in Ethiopia, 2016 (weighted n=9126)

Variables	Category	Frequency (n)	Percentage (%)
Age at first marriage, years	<18	5784	63.4
	≥18	3342	36.6
Age at first birth (n=8459)	≤20	6300	74.5
	>20	2159	25.5
Number of living children	Have no child	708	7.8
	1–3	4031	44.2
	4–6	3108	34.0
	>6	1279	14.0
The desire for more children (n=9126)	Wanted within 2 years	1689	18.5
	Wanted after 2 years	3131	34.3
	Undecided	724	7.9
	No more want	3582	39.3
Birth space (n=7164)	<2 years	1322	18.45
	2–5 years	4546	63.45
	>5 years	1296	18.09

living place, household wealth status, decision maker for women's healthcare need and household purchase, region, and residency were factors significantly associated with demand satisfied for modern FP methods among reproductive-age married/in-union women in Ethiopia (Model 4).

Accordingly, the odds of having DSFMC methods was reduced by 57% among women aged 35–49 years compared

Table 3 Husband/partner-related factors that may affect women's demand satisfaction towards modern contraceptive methods in Ethiopia, 2016 (n=9126)

Variables	Category	Frequency	Percentage (%)
Educational status of husbands/partners	No education	4203	46.1
	Primary	3434	37.5
	Secondary	846	9.3
	Higher	643	7.1
Husband's/partner's occupation	Not working	729	8.0
	Professional	520	5.7
	Sales and services	941	10.3
	Agriculture	5611	61.5
	Skilled and unskilled Manual	912	10.0
	Others	413	4.5
Husbands' desire for more children	Both want same	3579	39.4
	Husband wants more	2341	25.8
	Husband wants fewer	661	7.3
	Don't know	2502	27.5
Currently residing in husband/partner	Living with her	8296	90.9
	Living elsewhere	830	9.1
Number of other wives	No	8095	88.7
	Yes	1031	11.3
Decision maker for health services and household purchases	Respondent alone	1392	15.3
	Joint decision	5763	63.1
	Mainly husband	1971	21.6

Table 4 Knowledge-related factors of women towards demand satisfied for modern contraceptive methods in Ethiopia, 2016 (n=9126)

Variables	Category	Frequency	Percentage (%)
Knowledge of modern family planning methods			
Female sterilisation	No	5840	64.0
	Yes	3286	36.0
Male sterilisation	No	8085	88.6
	Yes	1041	11.4
Oral contraceptives	No	1021	11.2
	Yes	8105	88.8
IUD	No	4915	53.9
	Yes	4211	46.1
Depo-Provera	No	227	2.5
	Yes	8899	97.5
Norplant	No	2159	23.7
	Yes	6967	76.3
Male condom	No	3401	37.3
	Yes	5725	62.7
Female condom	No	7449	81.6
	Yes	1677	18.4
Emergency contraceptive	No	7662	84.0
	Yes	1464	16.0
Knowledge modern of FP methods	Poor	5701	62.5
	Good	3425	37.5
Know at least any of the ovulatory cycles	Yes	7517	82.4
	No	1609	17.6

FP, family planning; IUD, intrauterine device.

Table 5 Health service and information accessibility factors on demand satisfied for modern contraceptive methods in Ethiopia, 2016 (n=9126)

Variables	Category	Frequency	Percentage (%)
The last source of contraceptive (n=3588)	Governmental health facility	3003	83.7
	Private health facility	503	14.0
	Others	82	2.3
Informed choice			
Told about side effects (n=3267)	No	1941	59.4
	Yes	1326	40.6
Told how to deal with side effects (n=1489)	No	325	21.8
	Yes	1164	78.2
Told about other family planning methods (n=3273)	No	1666	50.9
	Yes	1607	49.1
Exposure to family planning messages on radio/community conversation (n=9126)	No	4509	49.4
	Yes	4617	50.6
Distance to a health facility (n=9126)	Big problem	4970	54.5
	Not a big problem	4156	45.5

demand satisfied was significantly decreased among pastoralist regions (AOR: 0.28, 95% CI 0.18 to 0.42) but it was increased to among agrarian areas (AOR: 1.72, 95% CI 1.21 to 2.44) compared with city administrations. (table 8).

DISCUSSION

This study was carried out to determine the level of DSFMC methods and to identify factors associated with DSFMC methods in Ethiopia among married/in-union women

Table 6 Number of women whose demand was satisfied with modern contraceptive by method type in Ethiopia 2016 (n=3603)

Type of method	Frequency (n)	Percentage (%)	95% CI
Pills	188	5.2	0.85 to 0.86
IUD	208	5.8	0.46 to 0.48
Injection	2327	64.6	0.93 to 0.94
Female sterilisation	43	1.2	0.32 to 0.34
Implant	807	22.4	0.70 to 0.72
Lactational amenorrhea	15	0.4	0.34 to 0.36
Others*	15	0.4	0.19 to 0.21

*Others: condom, emergency contraceptive and standard day methods
IUD, intrauterine device.

with women aged 15–24 years (AOR: 0.43, 95% CI 0.32 to 0.58). The likelihood of having demand satisfied among Muslim women declined by 54% compared with orthodox women (AOR: 0.58, 95% CI 0.43 to 0.78). The likelihood of having demand met was reduced among women who were not living with their husbands (AOR: 0.42, 95% CI 0.29 to 0.60) by 58% compared with those living with their husbands. The likelihood of DSFMC was increased by 43% among women having good knowledge about modern contraceptive methods (AOR: 1.57, 95% CI 1.32 to 1.86) than women having poor knowledge.

The odds of having DSFMC was increased by 70% among women where decisions were jointly made (AOR: 1.3, 95% CI 1.04 to 1.62) than decisions made by women alone.

The odds of having DSFMC methods was higher among women with the household of poorer (AOR: 1.56, 95% CI 1.17 to 2.06), middle (AOR: 1.77, 95% CI 1.33 to 2.35), richer (AOR: 1.96, 95% CI 1.49 to 2.59) and richest (AOR: 1.48, 95% CI 1.05 to 2.08) wealth status than women with poorest wealth status. On the other hand, the likelihood of demand satisfaction was reduced by 44% among rural residents (AOR: 0.56, 95% CI 0.37 to 0.83) compared with their counterparts. Regarding regions, the odds of having

Table 7 Result from a random intercept model (a measure of variation) for demand satisfied for modern contraceptive methods among married/in-union reproductive-age women at cluster level using multilevel logistic regression analysis, EDHS 2016

Measure of variation	Model 0	Model 1	Model 2	Model 3	Model 4
Variance	2.1	0.9	1.0	1.2	0.7
Explained variation (PCV)%	Ref.	22.2%	30%	50%	66.6%
ICC (%)	38.9	21.9	23.2	26.6	16.6
Model fitness					
Deviance (−2*log likeihood)	9809.2	9143.8	9408.6	9476.0	8796.4
AIC	11 367.7	10,817.8	11 130.9	11 175.3	10 644.2

AIC, Akaike's Information Criterion; EDHS, Ethiopian Demographic and Health Survey; ICC, intraclass correlation coefficient; PCV, proportional change in variance.

using data from EDHS 2016 by applying multilevel logistic regression analysis. The study highlighted that nearly two-thirds (60.5%) of the women were either suffering from unwanted pregnancy or using conventional methods in Ethiopia.

Of the modern contraceptive users (39.5%), a bit more than a quarter (27.65%) and 11.12% were short-acting and long-acting FP users, respectively, and all permanent users were women. The low utilisation of long-acting methods might depict the poor accessibility of services, especially in rural parts of the country that requires special training for health professionals. Besides, the low performance of permanent methods has shown minimal men's involvement in the programme, which could be related to knowledge gaps; in the current study, it has been witnessed that 88.58% had poor knowledge about men's permanent methods. Recognising the severity of the problem, the ministry of health, therefore, needs to give special attention to men's involvement and service promotion to increase the performance of DSFMCs.

The proportion of women satisfied with modern contraceptives was consistent with a time trend analysis among 73 counties (<40%).[4] However, it is higher than a study's finding in pastoralist women in the Bale zone of Ethiopia (20.8%).[29] Regions that recorded high performance were included in this study and could contribute to the noticeable difference.

The result is lower than a study revealed in rural Jordan (54.7%),[11] in the low-income and middle-income countries (52.9%),[3] Ethiopian FP 2020's commitment (63.6%),[8] rural Nunu Kumba district, Ethiopia (55.7%),[30] Family Planning 2020 initiative (67.9%),[9] and among 185 countries (75.8%).[10] The strength of country-level healthcare systems and the focus of healthcare policies, source of funds, and the degree of stakeholders' involvement could bring the observed discrepancy. The 2020 FP initiative is a global movement that involves different stakeholders without limitation of financial aid and evaluated by timely progress reports and international workshops, unlike the Ethiopian practice where the FP programme is going on together with other primary healthcare services. The repeated monitoring and supervision of a specific programme

is presumed to be a robust strategy to check its effectiveness, and the government of Ethiopia shall learn from the 2020 FP initiative programme to realise its goal. Moreover, DSFMCs in this study was measured by the use of at least one of the following methods: pills, injectables, implants, IUD, condom (male and female), female and male sterilisation, lactation amenorrhea, emergency contraceptives, and standard day methods, and on the contrary, a study involved 185 countries included cervical cap, spermicidal foam, jelly cream and sponge in addition to the above methods, which may have resulted in variation.[10]

Various factors contributed to DSFMCs. DSFMC among women aged 35–49 was reduced by 57% compared with women aged 15–24 years. This find is supported by studies in Denbia north-west Ethiopia,[31] SNNPR, Ethiopia,[32] Arba Minh,[33] Uganda,[34] Zambia[35] and Bangladesh.[36] Most of the women in the age group of 15–24 years are students, family dependent unemployed groups. Still, they are sexually active groups, and they may have different sexual partners either for love or for income generation purposes. Thereby, they may be scared of getting pregnant and this could lead them to use modern contraceptive methods. However, increased demand satisfaction or decreased performance of demand satisfied for modern methods may not reflect health system performance. In practice, such groups of users are not obtaining services by themselves, but through third bodies because of fear of breaking confidentiality. The condition leads to appropriate use of methods, high dropout secondary to side effects may be happed due to absence of counselling. Thus, the concerned bodies in the area need to consider different tracing mechanisms to increase the effective coverage of services.

The DSFMCs among Muslims was reduced by 42% compared with Orthodox Christians. This is supported by studies in Zambia,[35] Ghana,[37 38] Tanzania,[39] Nigeria[40] and rural Nepal.[41 42] The findings show that the governments of the countries need to consider addressing different social determinants such as engagement of religious leaders; pieces of evidence have shown that those women who get FP-related massages from religious leaders have a high uptake of FP services.[40] This study demonstrated

Table 8 Multilevel logistic regression analysis of individual, household and community-level factors associated with demand satisfied for modern contraceptive methods among reproductive-age women who were married /in-union in Ethiopia, 2016 (n=9126)

Variables	Demand satisfied Yes	Demand satisfied No	Crude odds ratio (95% CI)	Model 0 (ICC: 38.9%)	Model 1 AOR (95% CI)	Model 2 AOR (95% CI)	Model 3 AOR (95% CI)	Model 4 AOR (95% CI)
Individual-level variables								
Respondent's age								
15–24	844	1081	1		1			1
25–34	1720	2183	0.89 (0.74 to 1.08)		0.97 (0.79 to 1.19)			0.80 (0.62 to 1.02)
≥35	1039	2259	0.46 (0.37 to 0.56)		0.53 (0.42 to 0.66)			0.43 (0.32 to 0.58)**
Religion								
Orthodox	1838	1955	1		1			1
Muslim	754	2311	0.39 (0.30 to 0.52)		0.44 (0.34 to 0.58)			0.58 (0.43 to 0.78)**
Protestant	956	1093	0.99 (0.74 to 0.1.31)		1.08 (0.81 to 1.44)			1.31 (0.93 to 1.84)
Others*	55	163	0.47 (0.24 to 0.90)		0.50 (0.27 to 0.95)			0.69 (0.36 to 1.31)
Knowledge of modern family planning								
Poor	1851	3850	1		1			1
Good	1752	1673	1.87 (1.59 to 2.20)		1.69 (1.43 to 200)			1.57 (1.32 to 1.86)**
Husband's residency								
Living with her	3392	4904	1		1			1
Living elsewhere	211	619	0.47 (0.36 to 0.62)		0.43 (0.32 to 0.57)			0.42 (0.29 to 0.60)**
Household-level variables								
Wealth status								
Poorest	380	1327	1			1		1
Poorer	643	1171	1.66 (1.25 to 2.20)			1.66 (1.25–2.22)		1.56 (1.17 to 2.06)*
Middle	755	1098	1.89 (1.43 to 2.50)			1.95 (1.46–2.59)		1.77 (1.33 to 2.35)**
Richer	810	995	2.21 (1.67 to 2.12)			2.28 (1.22–3.02)		1.96 (1.49 to 2.59)**
Richest	1015	931	2.66 (1.99 to 3.55)			2.69 (2.01–3.61)		1.48 (1.05 to 2.08)*
Decision maker								
Respondent alone	482	910	1			1		1
Jointly	2434	3329	1.48 (1.19 to 1.83)			1.38 (1.12–1.71)		1.30 (1.04 to 1.62)*
Husband alone	687	1284	1.26 (0.97 to 1.645)			1.21 (0.92–1.58)		1.19 (0.91 to 1.56)
Community-level variables								
Region								
City administration	192	184	1				1	1
Pastoralist	65	435	0.08 (0.06 to 0.12)				0.17 (0.12 to 0.26)	0.28 (0.18 to 0.42)**
Semi pastoralist	1982	3457	0.49 (0.37 to 0.65)				1.10 (0.77 to 1.57)	1.19 (0.77 to 1.62)

Continued

Table 8 Continued

Variables	Demand satisfied		Crude odds ratio (95% CI)	Model 0 (ICC: 38.9%)	Model 1 AOR (95% CI)	Model 2 AOR (95% CI)	Model 3 AOR (95% CI)	Model 4 AOR (95% CI)
	Yes	No						
Agrarian	1363	1448	0.91 (0.72 to 1.56)				1.79 (1.26 to 2.54)	1.72 (1.21 to 2.44)**
Residency								
Urban	825	680	1				1	1
Rural	2778	4843	0.41 (0.30 to 0.54)				0.44 (0.32 to 0.60)	0.56 (0.37 to 0.83) **

*p<0.005, **p<0.001, others : skilled manual, unskilled manual, don't know and others.
AOR, adjusted OR; ICC, intraclass correlation coefficient.

that demand satisfaction among women whose husbands were living elsewhere distant from them was reduced by 58% than those living together. This is complemented by studies in Nepal.[42 43] Those women whose husbands lived elsewhere apart from them may have less often sexual contact. As a result, women may believe pregnancy may not occur by infrequent sexual contact. However, as there is the potential of unplanned sexual intercourse, avoiding unintended pregnancy cannot be assured. In particular, this problem is ignored in Ethiopia but requires profound women's counselling to bring down unwanted/unplanned pregnancy and population growth.

DSFMCs among women who have good knowledge was increased by 57% compared with those who have poor knowledge. The result is complemented with a study in the Metekel zone,[44] a study in the Oromia region[45] and a study among tertiary hospitals in north-west Ethiopia[46] and Nigeria.[47] From the findings, we can generalise that as knowledge increases, women can identify different modern contraceptive method options, their respective side effects and coping mechanisms that would increase their adherence to FP utilisation. In addition, having good knowledge of contraceptive methods may also help the women to be empowered and convince her husband and tackle other social barriers. The government of Ethiopia and other concerned bodies have to work to increase the knowledge in women and in their husbands. Because, as studies at different corners of the world have shown, men's educational level is directly associated with women's FP utilisation.[48]

The primary decision makers regarding the use of FP among couples are one of the factors affecting the use of FP. The odds of demand satisfied among women who agreed to use FP methods along with husbands was increased by 30% compared with those who have decided by themselves. This result is supported by a follow-up study in Jimma, a systematic review and meta-analysis in Ethiopia,[49] a study in Nigeria,[50] a study in Kwazulu-Natal, South Africa.[51] The result indicates that promoting spousal discussion of FP should be advocated as a viable policy tool for narrowing the gender gaps in partners' fertility intentions in Ethiopia. Thus, the concerned bodies need to work on behaviour change communications to improve couple communication and increase male support for voluntary FP.

The study revealed that demand satisfied among women with wealth status of poorer was 56%, middle 77%, richer 96%, and the richest 48% higher compared to the poorest. This is consistent with studies in Zambia,[35] Nigeria,[40] Africa,[52] a multicountry analysis,[53] Pakistan,[54] Malawi[7] and rural India.[55] As income increases, women's participation in the labour force also increases; thereby, their understanding and decision-making power on the contraceptive method would become better. Thus, women's involvement in the labour force needs to be encouraged to minimise the problem.

Women's demand satisfaction was affected by the types of regions in Ethiopia. Accordingly, the demand satisfied among women from the pastoralist regions was

reduced by 72% compared with women from administrative cities. However, the demand met for women was increased by 72% among agrarian regions. The result is equivalent to another study in Ethiopia.[56] The discrepancy might be explained by different factors; it may be associated with the accessibility of modern contraceptive methods. Although FP services are exempted in regions all over Ethiopia, the distribution of users among regions is variable; agrarian and semi-agrarian regions accounted for more than 90% of the total users. The five pastoralist (emerging) regions, namely Somali, Harari, Gambela, Afar and Benishangul Gumzile, made up only 5.5% of the total.

The pastoralists are located on the country's border, where there are frequent droughts, insecurity and hard-to-reach topography. Due to droughts, insecurity and hard-to-reach topography, there is a shortage of health professionals and infrastructure and limited availability of health services on top of FP. On the contrary, agricultural regions are relatively developed. There is no shortage of health workers compared with pastoralists. Many non-governmental organisations are involved better among agrarian regions as compared to pastoralists, infrastructures and health facilities are relatively better in agrarian regions and except some districts and kebeles (smallest administrative unit), majority of the agrarian regions are reachable. The observed variability among regions may reflect the inequality in terms of service accessibility that requires compensatory policy interventions in addition to the current interventions. In addition, lifestyle might be also a contributing factor; in the pastoralist community, most of the time, husbands live far from their home to find food for their animals which make the women ignorant about the use of the modern contraceptive methods, as their contact time is quite infrequent. However, this may not be a guarantee for preventing unwanted pregnancy.

Demand satisfied among rural dwellers was reduced by 44% than among urban dwellers. This finding was supported by studies from different countries namely; Bangladesh,[57] Pakistan,[54 58] Zambia,[59] Myanmar,[15] rural Nepal,[41] Royal community of London.[60] This finding gives insight by indicating how the rural residents have been affected by the problem and giving birth to babies without their intention and untimely. The low demand satisfaction among rural residents would lead the people to have more children, face various pregnancy complications, maternal mortality and other sequelae. The poor demand satisfaction may be associated with poor access because of living in far-reaching areas, health professionals' negligence that they may not be keen to go far, the poor knowledge of women, and lesser women empowerment. In addition, most rural women are not educated and cannot differentiate between available methods. The study's finding calls for a need to design a comprehensive and sustainable strategy that includes healthcare professionals and partners and massive service promotion, which are vital strategies to improve the satisfaction.

Strength and limitation of the study

The study used a large sample size at the national level to enhance its representativeness. In addition, data for this study were extracted from DHS sources collected using uniform survey instruments that allow detailed international and subnational comparisons by producing quality results.[61]

The possible limitations might be recall bias, particularly for age and other retrospective data relying on past events.

CONCLUSIONS

Compared with the national and international recommendations, DSFMC methods for married or in-union women was low. Women's age, religion and husband's current living place were individual-level factors, whereas household wealth status, women's knowledge of modern contraceptive methods, decision makers to use, and residency were household-level factors. Furthermore, region and residency were identified as community-level factors associated with DSFMC methods. Thus, improving the accessibility of modern contraceptive methods and information, particularly in the rural area and pastoralist regions, may increase their demand satisfaction. The frequent advocation of spousal discussion and behavioural change communication would improve the joint decision-making between two couples towards FP use. Considering social determinants like the engagement of religious leaders will minimise religion-related factors. Developing viable policy, particularly for women who are residing away far from their husbands, is recommended. Improving women's and their husbands' knowledge of the programme is a fundamental strategy to increase their demand for modern contraceptive methods across the country.

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