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Fertility intention and its correlates with reproductive-aged married women in Ethiopia: an adapted theory of planned behavior (TPB)

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Abstract

Background In Ethiopia, despite different attempts to manage rapid population growth and reduce the average number of births per woman, the expected changes outlined in the National Health Sector Transformation Plan (HSTP II) and Reproductive health (RH 2015 2020) strategies have not been fully realized over the past decade. The population continues to grow at a rate of 2.7 and fertility rates remain at 4.6. Fertility is one of the three key aspects in shaping population dynamics, as women's fertility intention for children play a significant role in determining actual fertility rates. In addition, it can be an instructive tool for discovering more about overall fertility patterns, which is important for understanding future reproductive behaviors. In women, fertility intention refers to their preferences regarding the number of children they wish to have in the future, considering factors such as the costs and benefits associated with childbearing.

Methods This study used cross-sectional data from Performance Monitoring for Action Ethiopia (PMA-ET) 2020.The hypothesis tested in this analysis was adapted and used TPB constructs as a guiding behavioral theoretical model. The study included 3916 women aged 15–49 years who were not pregnant. Frequencies and percentages were commuted to characterize women. Chi-square tests were conducted to evaluate associations and assess sample cell size adequacy across categories. Multilevel binary logistic regression statistical modeling was employed to identify important factors influencing women's fertility intention. The findings were reported in terms of percentages and odds ratios, with 95% confidence intervals. Statistical significance was established at a significance level of 0.05.

Results Three-quarters 74.9% (95% CI; 72.5%—77.1%) of married reproductive-aged women in Ethiopia intended to have a/another child. Women who reported having a forced pregnancy by partner, Muslim and Protestant religion, 19 years and above old at first sex, and secondary or higher education were found to increase the likelihood of fertility intention to have a child. However, women who reported 30 years of age or older, had three or more live births, had a family size of five or more members, had a moderate family planning (FP) knowledge, positive subjective social norm towards FP and living in Addis and Dire Dawa were found to have lower odds of women's fertility intention.

Conclusion The prevailing strong intention for high fertility in Ethiopia delays efforts to quickly decrease fertility and calls for implementation of multifaceted strategies that maintain high fertility intention rates. Accordingly, demographic and socio-physiological factors were found to affect women's intention to have children. Awareness

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of these influencing factors is crucial for designing fertility programs and policies tailored to demographics strategies. Specifically, these strategies should be sufficiently diverse to create a positive social norm toward FP use, which can lead to information sharing, reduced stigma, and community support that can play significant importance in shaping individuals' fertility intention and reproductive behaviors.

Keywords Fertility intention, Theory of planned behavior, Intention for more children, PMA, Ethiopia

Background

Fertility intention refers to the number of children women want to have in the near future, depending on their assessment of the cons and benefits of childbearing [1–3]. Fertility is one of the three aspects influencing population dynamics [4, 5], while women's fertility intention to have a child plays a crucial role in determining actual fertility rates since it, can be a precursor to actual fertility performance, an instructive tool to discover more about overall fertility patterns, and important for understanding future reproductive behaviors [6–11].

The contribution of fertility rate to rapid population growth is substantial. Recent United Nations projections indicate that the world population will reach 8.5 billion in 2030 and 9.7 billion in 2050, whereas the population of sub-Saharan Africa (SSA) is likely to be double, with an estimated 2 billion in 2040s [12, 13], constituting nearly ¼ of the global population with an equivalent double 2.5% annual growth rate. This represent the highest annual population growth rate among the eight-world sustainable development goal (SDG) regions [12, 14].

Similarly, the Ethiopia's population is one of the fastest growing population in the world, and the annual growth of the population and fertility rates have remained higher at 2.7 and 4.6, respectively [15]. Despite numerous activities have been undertaken to control the rapid population growth and reduce the average births per woman [16–18], achieving the desired level of change was a challenge, as was targeted in the National Health Sector Transformation Plan (HSTP II) and Reproductive health (RH 2015–2020) Strategies in the last ten years [19–21]. Moreover, countries' rapid population growth can exacerbate challenges of eradicating poverty (SDG 1) [22] and put more pressure on already depleted resources, thereby creating a greater obstacles to ensure sustainable development goals (SDG) [23, 24].

Studies have identified factors operating at both societal and individual levels that can determine fertility intention [25–27]. However, there is a relatively lack of literature in Ethiopia and many more sub-Saharan African countries, and more than half of the reproductive women, which makes up a significant proportion of the adult population in Ethiopia, express high fertility intention, although having plenty of children [28, 29]. Understanding fertility intention and its determinants at the national level will help to design and implement public policy programs such as family planning (FP), which is unlikely to be successful if the fertility intention of women does not minimize. It will also be significant for understanding fertility patterns and investing in reproductive health services and contraceptive technologies to slow and eventually change population growth, thereby creating socioeconomic structural transformation within the society [9, 10, 30]. Therefore, this study aimed to determine the prevalence of fertility intention and identify factors associated with it by using adapted theory of planned behavior (TPB) constructs.

The theory of planned behavior (TPB) and fertility intention

TPB as a socio-psychological model was proposed, formulated, and developed by Ajzen in 1980, and it allows the study of decision-making processes that are regarded to intentional behaviors [31]. TPB consider attitudes toward the behavior, social norm toward the behavior, and perceived behavioral control as the important predictors of any behavioral intention that can be influenced by the different belief held by individuals [31, 32]. Behavioral intention according to TBP is defined as a likelihood or subjective probability that individuals perform in a particular way, and it is a proximate antecedent of any certain behavior that can be performed or not [31].

According to Ajzen, the three determinants of intentions attitude, subjective norm, and perceived behavioral control are means to evaluate performing that specific behavior, which are formed via cognitive and emotive processes [31, 32]. With this context, the Theory of Planned Behavior (TPB) provides a coherent framework for understanding fertility intention to use by linking individual attitudes, such as beliefs about its benefits or risks, subjective social norms, including approval or disapproval from important others, and perceived behavioral control such self-confidence, to the decision-making process [32, 33].

Methods and data sources

This study used cross-sectional data from Performance Monitoring for Action Ethiopia (PMA-ET) 2020. Currently, PMA data are one of well-known available up-to-date and robust data on reproductive, maternal, and

newborn health indicators to inform the ministry and different international and national stakeholders. Furthermore, PMA-ET collects reliable data from fully trained resident enumerators (REs) using a customized Open Data Kit (ODK) data collection smartphone application, which facilitates real-time data collection and onsite feedback and supervision.

Appling a quantitative research methodology to access the relationship between dependent and independent variables, the hypothesis tested in this analysis was adapted and used TPB constructs as a guiding behavioral theoretical model. This model was selected because it specifically focused on the behavioral aspects of individuals and provides a means to understand specific decisions about their actions. The constructs of the model mainly considered individuals' attitudes toward the behavior, subjective social norms toward the behavior and, perceived behavioral control, which are critical in determining individuals' likelihood of performing a specific behavior considering other sociodemographic information. On the other hand, the TPB is a well-postulated, developed, and universally applicable model, makes it a reliable and sound socio-pshychological model for predicting and understanding individuals' behavior.

PMA-ET surveys were designed to use two-stage clustering approach with urban–rural, and major regions as strata. PMA-ET 2020 included 231 enumeration areas (EAs) from the previous round drawn from the master sampling frame by the Central Statistical Agency (CSA). A complete fresh listing of households in the selected EAs was conducted, followed by a selection of 35 households per enumeration area using random number generator software. After completing the household survey, all reproductive-age women between the ages of 15 and 49 who were either permanent household members of the selected household or guests who slept with in the household the night before the survey were eligible to participate in the women's interview. A detailed description of the sampling procedure and other methodological issues was provided in a previous report [34].

The PMA-ET provided significant information that may be used to execute and at the same time monitor health programs and initiatives in key areas of the Ethiopian health system, such as family planning, women and girls' RH empowerment, sexual and physical violence, contraceptive counseling, vaccination, and other relevant newborn and maternal health indicators. PMA-ET 2020 was implemented by Addis Ababa University's School of Public Health in collaboration efforts with the Ethiopian Public Health Association, with assistance from the Federal Ministry of Health, Central Statistical Agency, The Foreign, Commonwealth & Development Office (FCDO) (formerly DFID), Bill & Melinda Gates Institute for Population and Reproductive Health (Johns Hopkins Bloomberg School of Public Health), JHSPH, Marie Stops International Ethiopia Office (MSI Ethiopia), and the source of funding is from FCDO and the Bill & Melinda Gates Foundation.

Of the 7629 women of reproductive age who participated in the survey, 2805 who were unmarried or did not living together during data collection period were removed in the first stage of this analysis. An unweighted sample size of 3959 suitable for this analysis considering our purpose was generated after 865 women who were pregnant at the time of the survey and 430 women who reported being sterilized and unable to conceive, who were unsure or uncertain about their intention of fertility, and who had missing values were excluded. A final weighted sample size of 3916 married individual women between the ages of 15 and 49 was obtained by applying sampling weighting factors to the data files in order to guarantee that the calculated findings would be proportionate at the national level [35] Fig. 1.

Dependent variable

"Fertility intention" was the study's outcome variable. Despite the existing lack of consensus among population professionals over the best suitable method for estimating fertility intention, the vast majority of fertility surveys, such as demographic and health surveys (DHSs), carried out in recent years used uniform measurements [3, 9, 36]. In order to calculate the outcome variable, the dependent variable derived from questioned "Would you like to have a/another child or would you prefer not to have any/any more children?", with five response categories, were divided into two "No more/prefer no children = 0" (for married reproductive age women those reported that they prefers not to have any/any more children) and "Have a/another child = 1" (for married reproductive age women those reported that they prefers to have a/another child) (Table 1). The remaining categories of "undecided/do not know" and "no response" were eliminated because the respondents did not indicate their preferred fertility intention, and the individuals who said they "cannot become pregnant" were not likely to get pregnant. For these reasons, their exclusion from the sample was required in order to prevent biased estimates.

Independent variable

Potential independent variables correlated with fertility intention were identified from the survey data after reviewing the pertinent literature. Independent variables were broadly classified into two categories: individual-level variables and enumeration area-level variables. Individual-level variables were further categorized into socio-demographic variables,

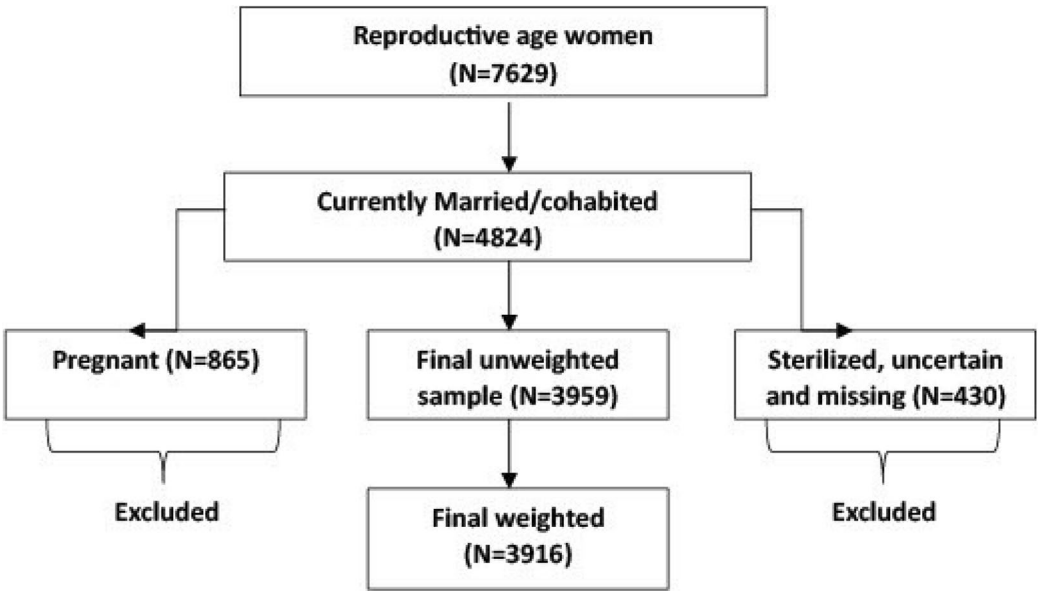

Fig. 1 Schematic presentation of sample of women included in the study using PMA 2020 data

Table 1 Description of dependent variable

Variable	Question & responses		Categories
	Item	Response	
Women's fertility intention			
Fertility intention	Would you like to have a/another child, or would you prefer not to have any/any more children?	Have a/another child = 1	1 = Have a/another child
		No more/prefer no child = 2	0 = No more/prefer no child
		Says she can't get pregnant = 3	Excluded categories
		Undecided/Don't know = -88	
		No response = -99	

including age, education, wealth status, religion, parity, and actual behavioral control variables, including IPV, forced pregnancy, FP knowledge, FP ever used, etc. And Socio-psychological variables are constructs adapted from the theory of planned behavior (TPB) attitude toward FP, subjective social norm toward FP, and perceived behavioral control over FP use. The enumeration area variables are region, residence, FP information. Table 2 provides the list of possible variables that are correlate with fertility intention.

Composite variables were constructed using the "Yes" or "No" questions for the "FP knowledge" and "FP information" variables. "Region" was grouped into five categories: "Other regions" represented Afar, Somali, Benishangul, Gambella, and Harari. The remaining regions except Tigray (because of the outbreak of the war during the study period, Tigray was not included in the 2020 PMA) were categorized accordingly.

Socio-psychological variables provide assessments of subjective social norms towards FP, attitude toward FP, and perceived behavioral control over FP utilization which are derived from the constructs of TPB from the existing data set. These constructs evaluated from the respondents to a series of questions on a five-point Likert scale, with 1 representing "Strongly agree" and 5 indicating "Strongly disagree,". Since these response scales have been reversed, higher scores now correlate with higher observed pressure. Five Likert scale variables combine to form "Attitude toward FP", which is then categorized into two categories: "Favorable FP attitude" if it is above the mean and "Unfavorable FP attitude" if it is below the mean. "Subjective social norm towards FP" is also constructed by summing four variables and categorized 0 = "Negative subjective social norm towards FP" if above mean and 1 = "Positive subjective social norm towards FP" if below mean. "Perceived FP control" is the product of four variables, with 0 denoting "Unable perceived FP

Table 2 Sample characteristics and tabulation of fertility intention across individuals and enumeration area-level independent variables, PMA 2020 (weighted, n = 3,916)

	Weighted Freq	Weighted %	Fertility intention	
			No more %	Have a child %
Age				
15–19 years	254	6.5	2.5	97.5
20–24 years	665	17.0	4.4	95.6
25–29 years	876	22.4	10.7	89.3
30–34 years	746	19.1	23.9	76.1
35–39 years	727	18.6	38.4	61.6
40–44 years	400	10.2	58.3	41.8
45–49 years	248	6.3	66.5	33.5
Education				
No Education	1798	45.9	36.3	63.7
Primary	1410	36.0	18.9	81.1
Secondary Plus	708	18.1	9.2	90.8
Religion				
Orthodox	1583	41.2	28.9	71.1
Protestant	1047	27.3	24.9	75.1
Muslim	1213	31.6	20.2	79.8
Wealth quintile				
Lower quintile	1636	41.8	28.1	71.9
Middle quintile	807	20.6	31.6	68.4
Higher quintile	1472	37.6	18.3	81.7
Parity				
Two or fewer births	1689	43.1	6.5	93.5
Three to five births	1391	35.5	26.4	73.6
Six or more births	835	21.3	60.7	39.3
FP Knowledge				
Poor Knowledge	503	12.8	21.5	78.5
Moderate Knowledge	2315	59.1	27.2	72.9
Good Knowledge	1098	28.0	22.5	77.5
IPV sex, phy				
No IPV	3518	91.7	25.1	74.9
At least one IPV	318	8.3	24.7	75.3
Husband forced pregnancy				
Not Forced	3626	94.5	25.7	74.3
Forced	212	5.5	14.8	85.2
Family size				
1 to 5 members	2974	76.0	18.6	81.4
Above 5 members	942	24.1	45.6	54.4
Age at first sex				
10 to 15 years	1277	32.9	33.1	66.9
16 to 18 years	1559	40.1	24.7	75.3
19 and above	1051	27.0	15.8	84.2
Vesit health facility				
No	1485	37.9	28.2	71.8
Yes	2431	62.1	23.2	76.8
FP ever used				
No	1137	29.0	21.6	78.4
Yes	2778	71.0	26.5	73.5

Table 2 (continued)

	Weighted Freq	Weighted %	Fertility intention	
			No more %	Have a child %
Attitude to FP				
Unfavorable FP attitude	1344	34.3	24.4	75.6
Favorable FP attitude	2572	65.7	25.5	74.5
Subjective social Norm towards FP				
- subjective social norm to FP	1675	42.9	22.1	77.9
+ subjective social norm to FP	2233	57.2	27.5	72.5
Perceived FP Control				
Unable perceived FP control	1560	39.8	25.2	74.8
Able perceived FP control	2356	60.2	25.1	74.9
Regions				
Other Regions	283	7.2	16.8	83.3
Amhara	968	24.7	27.8	72.2
Oromia	1719	43.9	24.1	75.9
SNNPR	748	19.1	28.6	71.4
A. Ababa/D. Dawa	197	5.0	20.5	79.5
Residence				
Urban	1016	26.0	16.6	83.4
Rural	2900	74.0	28.1	71.9
FP information				
No Information	2529	64.6	26.0	74.0
Have an Information	1386	35.4	23.5	76.5

control " if the mean is below it, and 1 denoting " Able perceived FP control " if the mean is above it. Tables 5 and 6 in Appendix present the full description and coding of the main predictor and control variables.

Statistical analysis and measurements

Two merged data set i.e., household (HQ) and female respondent (FQ) datasets were used, and STATA v16 was utilized to analyzed the results and ArcGIS 10.4 software was also used to visualize the proportion of fertility intention to have more children by region except Tigray region. To check and verify the item response rate and existence of nonresponse, which was then removed from the analysis, tabularization was performed for each independent variable. After that, variables were recoded according to the standard to provide categories that made biologically plausible categories that were followed by checking the distribution of the variable, to ensure that the cell sample size was adequate, using the mean and proportion whenever the relevant categories were merged [37].

To characterize the study population, frequencies and percentages were computed. Chi-square test statistics were calculated to assess the overall cell sample size adequacy and relationships between the independent variables and the two categories of fertility intention. It was also used to verify whether the sample size of each cell was adequate. In each stage of exploratory data analysis, the sampling weights that were generated using the multistage sampling approach were considered. [35]. The variance inflation factor (VIF) was used to examine the predictors for any indication of multicollinearity; however, there was no sign of multicollinearity detected. (mean VIF = 1.57, maximum VIF = 1.96, and lowest VIF = 1.07).

Furthermore, we attempted to assess the coherence of the constructs related to the main predictors of TBA, namely women's attitude towards FP, perceived subjective social norms toward FP, and women's perceived FP control. The acceptable Cronbach's alpha value for these constructs ranged from 0.6 to 0.7.

Multilevel binary logistic regression statistical modeling was run to identify important predictors of women's fertility intentions. In the bivariate analysis, a 0.25 cut-off p-value was used to identify a candidate variable for multilevel multivariable logistic regression analysis [38]. The results are presented as percentages and odds ratios with 95% confidence intervals (CIs) and statistical significance were declared using a p-value of 0.05.

Four models were run; the first was the null model, in which no factors were added, after which the intracluster correlation coefficient (ICC) was determined to

quantify the proportion of variability in the outcome variable within enumeration areas (EAs) relative to the overall variability. The ICC was found to be 0.1407, a sign of strong clustering or group-level variance, which justifies the use of multilevel logistic regression. Individual-level variables were included in the second model, whereas only enumeration area-level variables were included in the third model. Both individual and enumeration area-level independent variables were incorporated in the final model. To assess each model's goodness-of-fit, the ICC, log-likelihood, Akaike information criterion (AIC), and Bayesian information criterion (BIC) were computed. Based on the analyses, the model with a lower AIC and BIC and a higher log-likelihood was selected as the best-fit model, from which the adjusted odds ratio was computed and reported.

Moreover, Fertility intention is highly culturally embedded and women from the same enumeration area (EA) have commonalities. Thus, assuming that each observation is independent while using single level conventional regression might not be kept due to the clustering nature of observation which led us to use a multilevel model building process to account for the clustering of observations within each EA with regard to fertility intention [39]. Furthermore, either the use of stratified multistage cluster sampling, or unequal probabilities of selection from source populations for study population, due to oversampling of key population subgroups national/from some regions make nationally representative data such PMA to have complex data in nature and data structure. Therefore, sampling weights were applied during the estimation of proportions and the respective confidence interval to account for the sample design and unequal selection probabilities from the source population to the study samples [35].

Ethical consideration

The PMA Ethiopia survey was administered rigorously under the ethical rules and regulations of the World Health Organization and the IIRB of the Ethiopian Health and Nutrition Research Institute (EHNRI). All round PMA surveys were also conducted after ethical approval was obtained from both the EHNRI and the Bloomberg School of Public Health at Johns Hopkins University in Baltimore, USA.

Furthermore, all methods outlined in PMA-ET were carried out in conformance with the regulations and standards set out by the IIRB. Informed consent was obtained from every participant prior to inclusion in the study. Participants were fully informed about the purpose, risks, and benefits of the study before giving their verbal informed consent. Since this was just a secondary further analysis of the result, which is already in the public domain, we did not require further consent for this analysis or clinical trial number. However, we applied for authorization on the PMA data website, and on March 14, 2022 access to the data was granted after reviewing and checking our request.

Results

Overall, 3916 weighted eligible individual women were included this analysis considering our purpose. Table 2 presents the characteristics and proportion of fertility intention of the sample across individual-level socio-demographic, socio-psychological and enumeration area-level independent variables. A little lower than 1 in 4 (22.4%) of women aged 25–29, whereas 18.1% of participants women in this analysis had a secondary and above educational level, while 45% of them did not have formal education. Most, three quarter (74%) of, the sampled population is living in rural areas, and depending on its population size, the Oromia region had the maximum sample share (43.9%). Orthodox Christianity was identified as the leading religion (41.2%), followed by Muslims (31.6%), while a slightly higher percentage (1 in 3 (37.6%)) of women fall into the higher wealth quintile. Nearly one in four (23.63) women had more than five live births, while 24.1% of the sampled women had more than five household members. In addition, one-third (32.9%) of women started sex in the 10–15 years of age category and 71% reported that they had ever used FPs.

Approximately 8% of the sample women experienced at least one form of intimate partner violence and 5.5% of them were forced to get pregnant by their partner. Nearly one in three women (34.3%) reported that they had an unfavorable attitude to FP use and (39.8%) were unable to control FP use, whereas (42.9%) perceived that the society had a negative norm towards FP.

The fertility intention to have a child was high among women with an unfavorable FP attitude (75.6%) and also with favorable FP attitude (74.5%), women with negative subjective social norms to FP use (77.9%), secondary and above educational levels (90.0%), women aged 15–19 (97.5%), urban residents (83.4%), and women who have two or lower parity (93.5%). In contrast, among women who had six or more births (39.3%), aged group 45–49 (33.5%), family size above five members (54.4%) had a low fertility intention to have a child.

Figure 2 presents the proportion of fertility intention to have a child across different regions of Ethiopia. Fertility intention to have a child varies significantly throughout Ethiopian regions. In particular, the percentage of fertility intention to have a child varies from 67.8% in Benishangul Gumz to 96.4% in the Afar region. In Addis Ababa (79.2%), the capital city, and Dire Dawa (81.6%), an urban municipality, substantial of the population found a strong fertility intention to have a child.

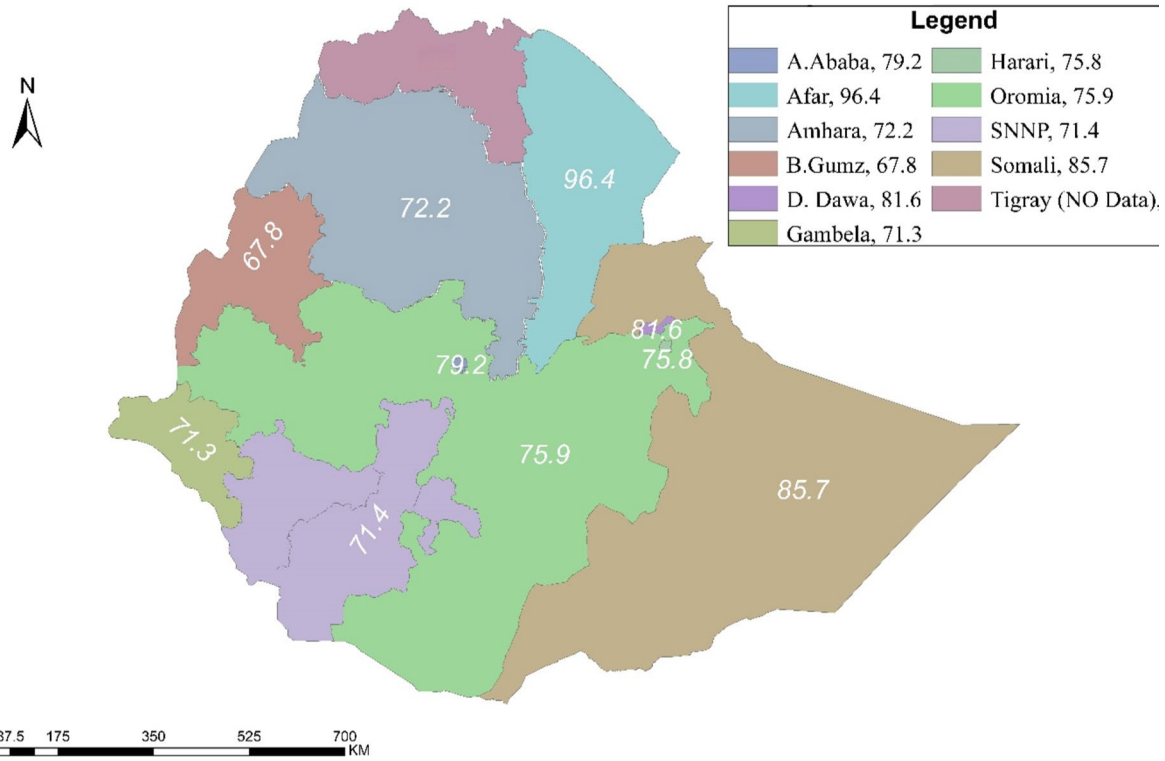

Fig. 2 proportion of fertility intention to have a child across different regions of Ethiopia

Table 3 Prevalence of fertility intention with 95% CI

Dependent variable	Freq. (W)	Prevalence	[95%_Conf	Interval]
No more/prefer no child	984	0.251	0.229	0.275
Have a/another child	2932	0.749	0.725	0.771

Benishangul Gumz, Gambela, and SNNPR demonstrate slightly lower but still noteworthy proportions at 67.8%, 71.3%, and 71.4, respectively, followed by the Amhara region (72.2%). The Afar and Somali regions stands out with an exceptional 96.4% and 85.7%, respectively, whereas Oromia at (75.9%) and Harari at (75.8%) align closely with the national average.

Table 3 presents the prevalence of fertility intention (weighted) with 95% CIs. Nearly three-quarters, 74.9% (95% CI; 72.5%—77.1%), of married reproductive-aged women in Ethiopia had fertility intention to have a/another child, while 25.1% (95% CI; 22.9%—27.5%) preferred not to have a/more child.

Table 4 reveals the multilevel binary logistic regression analysis results of the correlates of fertility intention to have a child among reproductive-age married women in Ethiopia. The log-likelihood, representing the probability of observing the data given the model, improves progressively as more variables are included. The null model, which includes no predictors and accounts only for the random effects of clustering within enumeration areas (EAs), has the lowest log-likelihood value (-2209.31), reflecting its limited explanatory power. When individual-level variables are included in Model II, the log-likelihood improves significantly to -1541.60, indicating that these variables contribute substantially to explaining fertility intention. Model III, which includes only enumeration area-level variables, has a log-likelihood of -2191.62, an improvement over the null model but not as substantial as Model II, demonstrating that individual-level variables have a greater impact on model fit. The final model (Model IV), which combines both individual- and enumeration area-level variables, achieves the highest log-likelihood value of -1535.91, reflecting the best fit among all models. The differences in log-likelihood between models confirm the importance of including both individual- and area-level variables to explain the variability in fertility intention. The reduction in deviance and improvement in the Akaike Information Criterion (AIC = 3125.83) and Bayesian Information Criterion (BIC = 3263.91) further support the final model as the best-fitting representation of the data.

Table 4 Multilevel binary logistic regression analysis of fertility intention among reproductive-aged married women in Ethiopia, PMA 2020

Variables	Null Model	Model II AOR 95% CI	Model III AOR 95% CI	Model IV AOR 95% CI
Age				
15–19 years		1		1
20–24 years		0.42 (0.13–1.33)		0.43 (0.14–1.37)
25–29 years		0.23 (0.07–0.74)		0.24 (0.07–0.78)
30–34 years		0.14 (0.04–0.47)		0.15 (0.04–0.5)**
35–39 years		0.1 (0.03–0.31)		0.1 (0.03–0.34)***
40–44 years		0.04 (0.01–0.15)		0.05 (0.01–0.16)***
45–49 years		0.04 (0.01–0.14)		0.04 (0.01–0.15)***
Education				
No Education		1		1
Primary		1.07 (0.82–1.41)		1.12 (0.85–1.48)
Secondary Plus		1.56 (1.01–2.39)		1.71 (1.08–2.71)**
Religion				
Orthodox		1		1
Protestant		1.43 (0.97–2.1)		1.61 (1.05–2.48)
Muslim		2.53 (1.78–3.61)		2.53 (1.75–3.66)***
Parity				
Two or fewer births		1		1
Three to five births		0.37 (0.24–0.57)		0.36 (0.23–0.55)***
Six or more births		0.11 (0.07–0.19)		0.11 (0.06–0.19)***
FP Knowledge				
Poor Knowledge		1		1
Moderate Knowledge		0.63 (0.43–0.94)		0.67 (0.45–0.99)**
Good Knowledge		0.6 (0.37–0.96)		0.65 (0.41–1.04)
Husband forced pregnancy				
Not Forced		1		1
Forced		2.31 (1.25–4.24)		2.33 (1.27–4.25)***
Family size				
1 to 5 members		1		1
Above 5 members		0.72 (0.53–0.99)		0.73 (0.53–0.99)**
Age at first sex				
10 to 15 years		1		1
16 to 18 years		1.03 (0.76–1.4)		1.06 (0.78–1.45)
19 and above		1.56 (1.1–2.21)		1.64 (1.14–2.35)***
Visit health facility				
No		1		1
Yes		1.04 (0.79–1.37)		1.03 (0.78–1.35)
Subjective social Norm to FP				
- subjective social norm to FP		1		1
+ subjective social norm to FP		0.82 (0.66–1.02)		0.8 (0.65–0.99)**
Regions				
Other Regions			1	1
Amhara			0.54 (0.25–1.15)	0.83 (0.4–1.75)
Oromia			0.66 (0.31–1.40)	0.58 (0.29–1.17)
SNNPR			0.52 (0.24–1.13)	0.52 (0.23–1.16)
A. Ababa/D. Dawa			0.45 (0.19–1.06)	0.35 (0.15–0.8)**
Residence				
Urban			1	1

Table 4 (continued)

Variables	Null Model	Model II AOR 95% CI	Model III AOR 95% CI	Model IV AOR 95% CI
Rural			0.47 (0.34–0.67)	1.1 (0.75–1.6)
Var (EA)	0.54	0.65	0.42	0.62
ICC EA_ID	0.141	0.165	0.112	0.157
Loglikelihood	-2209.31	-1541.60	-2191.62	-1535.91
AIC	4422.62	3127.21	4397.24	3125.83
BIC	4435.17	3264.16	4441.15	3263.91

* p value < 0.05 ** p value < 0.01 *** p value < 0.001

The odds of fertility intention to have a child on conditional EA-level random effects vary across different categories of age, education, FP knowledge, age at first sex, and region. Woman who had attained secondary or above education, who are believers of Protestant and Muslim religion, who reported a forced pregnancy by their husband or partner, who were aged 19 or more at first sexual intercourse were found to have a higher odds of fertility intention to have a child. On the other hand, women who were 30 years or older, who had three or more live birth orders, who had moderate FP knowledge, who had five or more family members, who had a positive subjective social norm towards FP, and who lived in Addis Ababa and Dire Dawa were found to have a lower odds of fertility intention to have a child.

According to the result of the final fitted model, women age 30–34 years (AOR: 0.15 (95% CI: 0.04–0.5)), 35–39 years (AOR: 0.1 (95% CI: 0.03–0.34)), 40–44 years (AOR: 0.05 (95% CI: 0.01–0.16)) and 45–49 years (AOR: 0.04 (95% CI: 0.01–0.15)) was found to lower the odds of fertility intention to have a child compared with women aged 15–19 years. Likewise, the odds of fertility intention to have a child were 89% less with married women who had six or more live births (AOR: 0.11 (95% CI: 0.06–0.19)) and 64% (AOR: 0.5 (95% CI: 0.33–0.77)) lower odds with those three to five live births, than among married women who had two or fewer live births. Those women who had a moderate FP knowledge were found to have a decreased odds of fertility intention to have a child (AOR: 0.67 (95%CI: 0.45–0.99)) compared with those who had poor FP knowledge. Similarly, a family size of more than five members lowers the odds of fertility intention to have a child by 27% (AOR: 0.73 (95% CI: 0.53–0.99)) compared to 1 to 5 family size. In addition, fertility intention to have a child was 20% lower among married women who have a positive subjective social norm toward FP (AOR: 0.8 (95% CI: 0.65–0.99)) than among married women who have a negative subjective social norm toward FP. Living in Addis Ababa and Dire Dawa towns was found to lower the odds of fertility intention to have a child (AOR: 0.35 (95% CI: 0.15–0.8)) than living in other regions.

In contrast, women who had more than a secondary plus level of education (AOR: 1.71 (95% CI: 1.08–2.71)) have an increased odds of fertility intention to have a child than those who attended no formal education. Similarly, the odds of fertility intention to have a child were 1.61 (AOR: 1.61 (95% CI: 1.05–2.48)) and 2.53 (AOR: 2.53 (95% CI: 1.75–3.66)) times higher among married women who are believers of the Protestant and Muslim religions, respectively, than among women who are believers of the Orthodox religion. The odds of fertility intention to have a child were 2.33 (AOR: 2.33 (95% CI: 1.27–4.25)) times higher among women who were forced to get pregnant by their husband than among women who were not forced to get pregnant. Similarly, women who were 19 years or older at first sexual intercourse were found to have higher odds of fertility intention to have a child (AOR: 1.64 (95% CI: 1.14–2.35)) than women who were 10–5 years of age at first sexual intercourse.

Discussion

Substantial fertility intention is generally among the immediate causes of rapid population growth, and it has an influential role in explaining existing fertility trends [10, 28]. It also has a negative influence on the health of the mother and newborn. Accordingly, it is crucial to focus on issues related to women's fertility intention to have a child that enable to better understand fertility behavior and regulate population growth [11]. Thus, at a time of rapid population growth in Ethiopia, this study quantified the proportion of fertility intention to have a child and identified the correlates among married reproductive-age women in Ethiopia, thereby generating timely national-level indicators to regulate such rapid population growth based on an adapted TPB, socio-psychological behavioral model.

Generally, 74.9% (95% CI; 72.5%—77.1%) of women in Ethiopia expressed fertility intention to have a child,

whereas, 25.1% (95% CI; 22.9%—27.5%) of women prefer not to have any/more children. This result is corresponding to that of a previous study conducted in the SSA countries of Senegal (74.1%), Cote d'Ivoire (75.8%), Burkina Faso (72.8%), and Congo DR (72.8%) and is higher than that of similar studies conducted in Ethiopia and other East African countries of Tanzania (70.36%), Uganda (59.25%), Rwanda, and Kenya (48.87%) and (48.75%), respectively [29, 40–46]. However, the result is also lower than those reported in Niger and other Central African countries [29, 47]. Variation in sample size, study duration and period and differences in variable measurements and categories of the outcome variable might be related out of the multiple possible explanations that accounts for this disparity in these studies. In addition, actual settings, like variation in sociocultural elements and belief and norms regarding family size as well as existing differences in access to FP services and health related infrastructure, disparities in government strategies and policies to contraceptive use, and variation in economic conditions might also contribute to such differences [48–50].

Fertility intention to have a child resulted in considerable variation across the different regions of Ethiopia: particularly, the percentage of fertility intention to have a child varied from 67.8% in Benishangul Gumz to 96.4% in the Afar region, which in line with [42]. This might be related with the lack of regional-specific fertility programs and interventions that promote health behaviors that can help maintain and preserve fertility, including fertility awareness methods (FAMs), and external factors such as sociocultural perception and religion may contribute to its share, as witnessed in the Ethiopian reproductive health strategic plan 2020–2025 [21]. The result, as in line with previous studies [15, 40], also showed that, living, in Addis Ababa and Dire Dawa towns minimizes fertility intention to have a child. This might be related to the fact that these two cities are the only metropolitan and municipality cities in the country, and because of urbanization, access to health facilities and health information via different channels are more readily available than in the remaining regions of the country.

The finding that elder women (aged 30–49) were found to have lower odds of fertility intention to have a child than the younger ones (aged 15–19) is consistent with different studies conducted in Ghana, Uganda, Nigeria, Guatemala, Niger, and Ethiopia [29, 40–47, 51, 52]. Such differences in fertility intentions among older and younger women might be associated with conditions such as biological and economic. Biologically, fertility declines with increasing age, women with older ages may emphasize on their health and livelihood, and rather than including an additional child they might prefer to deal with their already extending family's needs. Various studies on the outcome of paternal age vs fertility have indicated that advanced age is related to decreased fertility and has a higher risk of genetic disorders in the born offspring [53, 54]. Economically, this days, fostering children involves a huge cost of expenses related to healthcare, school, and other life necessities [55]. Older women may have fulfilled their desired family size and might focused on activities related to their existing family well-being or concentrated on other livelihood priorities.

In line with different previous studies conducted in Africa and Asia [2, 29, 47, 52, 56, 57], women who had three or above live birth orders and family size higher than five individuals were more likely to have a reduced fertility intention to have a child than women who had two or fewer live births and a family size of less than five members, respectively. A reasonable explanation for such findings might be that women involved in various pregnancies might be more familiar with emotional and the physical challenges such as fatigue, stiffness, and nausea related to pregnancy and childbirth and may specify to hinder additional births and pregnancies [58, 59]. Furthermore, such women might have exceeded or reached their expected family size and may be worried about additional parental important resources such as financial stability, energy, and time, which might be a question with each additional offspring. As a result, women with a larger family size and those with higher parity may realize and have less intention to have more or additional births.

Likewise, as confirmed in earlier studies, women who have moderate FP knowledge are less likely to have a child [41, 43, 60]. Women who have a better knowledge of family planning might have a clearer understanding of the consequences and responsibilities associated with having more or additional children. In addition, they might have access to health services and may be more aware of contraceptive methods, including their effectiveness, and the importance of spacing or limiting the number of children, which helps them to make informed decisions regarding fertility [61]. John Bongaarts (2020) implies and suggests that knowledge of FP and different programs can significantly reduce the intention to fertility [49]. Similarly, Caldwell (2005) also indicated that one of the causes of Asian fertility decline was the spread of family planning knowledge and strong governmental family planning initiatives and programs [62].

In the multilevel binary logistics regression analysis, among the socio-psychological variables of TPB, positive subjective social norm toward FP were found to minimize fertility intention to have a child after controlling for potential confounders. This is in line with qualitative studies conducted in S. Africa, Malawi, and Kenya [2, 63]. It is interesting that individuals are usually influenced by

the norms and expectations of their sociocultural environment, which might lead to the adaptation and encouragement of responsible reproductive choices, including limiting the number of children they have, sharing information and resources openly about family planning methods with in the communities that can facilitate informed choices and minimize taboos concerting contraceptive uses. Additionally, positive subjective social norms toward family planning lead to suitable environment of empowerment, information sharing, reduced stigma, and community support, all of which may play critical roles in shaping individuals' fertility intentions and reproductive behaviors[64].

Women who had more than a secondary level of education were found to have an increased odds of fertility intention to have a child. This might result from a greater inclination to delay starting a family and having children in favor of prioritizing their career of educational objectives and achieve stable employment at earlier ages. Similarly, they may have a better awareness of the natural limitations of fertility and the possible risks associated with delaying childbirth. As a result, individuals may feel pressure to have children before biological age-related decline in fertility becomes a concern.

In her article discussing the relationship between, education and fertility intentions, Testa (2014) argued that women who invest more in their education may not necessarily plan to have fewer children compared with those with low levels of education. [65, 66]. Hashemzadeh (2021) in his systematic review pointed out that in countries where women have access to higher education opportunities, there are also other factors influencing fertility, such as overall life satisfaction, well-being and trust levels. [67]. Accordingly, similar findings were observed in studies conducted in Guatemala, Ethiopia, and Uganda [41–43, 45, 51]. However, these results differ from research indicating that higher education is associated with lower fertility intention for children [10, 29, 40, 44]. These variations could be due to differences in study populations, methodologies, and measurements; hence, further investigation is needed to explore the connection between education and intention for children among, reproductive women.

In line with the existing literature, the religion of the women was found to be associated with fertility intention [10, 40, 41, 46, 52, 68]. The likelihood of fertility intention to have a child was higher among women of the Protestant and Muslim religions. According to social identity theory, people's characteristics and thoughts of identity are constructed and shaped by their fellowship in different social groups, including religion or cultural thoughts [69]. According to a qualitative study conducted by Abdi et al. 2020 [63] in two Muslim villages in Kenya, women with a Muslim background intended to have more children because they believed and saw children as a blessing from God and a source of happiness. Cranney (2015) also showed that there is a positive relationship between religion and fertility intention, and nonbelievers have a lower intention to have children than religious people [70].

Other determinants that have an increasing effect on fertility intention to have a child were age at first sex and forced pregnancy. In most Ethiopian cultures and social circumstances, it is expected or preferred to postpone having children and engaging in sexual activity until after reaching certain milestones, such as finishing school, getting married, or finding better employment [71]. Women who follow these norms by avoiding having sexual intercourse until later in life may have a greater intention to have a child if they believe they fulfill their own goals or satisfy society's expectations. Additionally, women who delay sexual activity might be highly intense in picking their date and forming long lasting relationships with. They are more likely to express an intention to have a child in the context of stable and supportive relationships when they prioritize partners who share their values and aspirations for family formation [72, 73].

Forced pregnancy may indicate a significant power disparity over women's relationships and control over their own reproductive decisions and limited autonomy. This power disparity may extend to other characteristics such as her intention to have a child [61, 74–76]. A qualitative study conducted in South Africa and Malawi revealed that women expressed the assumption of all marriages should produce babies, and married women usually reported that they are unable to oppose their husband's ambition and request for sex or pregnancy [2].

The study is plausible since it adapted and used socio-psychological behavioral model of TPB and utilizes national dataset with multistage sampling technique. The inclusion of the Theory of Planned Behavior (TPB) in this study offers valuable insights into the factors influencing fertility intentions in Ethiopia, a context that has been less explored in TPB-based research. While TPB has been widely used to examine fertility intentions in other countries, our study highlights how the results in Ethiopia may differ due to unique socio-cultural, economic, and regional factors. This study contributes new knowledge by applying TPB in a low-income, sub-Saharan African context, where fertility behaviors are shaped by different cultural and policy-related influences compared to other international settings [77]. Therefore, the findings can be generalized to all married reproductive aged Ethiopian women. Despite these strengths, it is infeasible to indicate the time trend analyses and unable to include one of the important regions of Tigray because of the under taking conflict.

Conclusion

In Ethiopia, approximately three-quarter reproductive-aged married women expressed fertility intention to have a child. This strong intention for high fertility in Ethiopia delays efforts to quickly decrease fertility and calls for the implementation of multifaced strategies that maintain this high fertility intention rates. Accordingly, various demographic, sociocultural and socio-psychological factors were found to impact women's intention to have children. It was observed that women who were forced into pregnancy by their partners, identified as Muslim and protestants, were 19 years or older at the time of their first sexual experience and had completed at least secondary education showed a stronger likelihood of fertility intention to have children. On the other hand, women aged 30 and above, who had already given birth to three or more children, had families with five members or more, have moderate family planning knowledge, a positive subjective social norm, and living in Addis Ababa and Dire Dawa were less likely to have an intention for more/additional children.

Awareness of these influencing factors is crucial for designing fertility programs and policies tailored to demographic strategies. Factors such as age, education, and religious background should be considered when developing initiatives focused on educating individuals about rights and family planning options. Prioritizing education on these topics is especially important for couples and unmarried teenage girls. Implementing measures that empower women in making decisions related to reproduction and promoting gender equality are steps in addressing issues related to forced pregnancies.

Efforts aimed at improving access to information on family planning methods and promotions for all individuals, especially for those with fewer children along with targeted interventions that target diverse religious and cultural communities are necessary. Messaging strategies should be diverse enough to create a positive social norm toward FP use, which can lead to information sharing, reduced stigma and community support that can play significant importance in shaping individuals' fertility intention and reproductive behaviors. Therefore, it is crucial for, targeted public health initiatives to consider these factors carefully when addressing fertility control and enhancing programs on, a national and regional scale.

Appendix

See Appendix Tables 5 and 6.

Table 5 Description of main predictor variables

Group	Variable	Question & responses		Categories
		Item	Response	
Attitude to FP	wge_fp_aut_seek_partner	If use FP, husband/partner seek another sexual partner	Strongly agree = 1	0 = Non favorable Attitude 1 = Favorable Attituded
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
	wge_fp_aut_trouble_preg	If use FP, trouble getting pregnant next time	Strongly agree = 1	
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
	wge_fp_aut_could_conflict	could be conflict in relationship/marriage if use FP	Strongly agree = 1	
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	

Table 5 (continued)

Group	Variable	Question & responses		Categories
		Item	Response	
	wge_fp_aut_abnormal_birth	If use FP, children may not be born normal	Strongly agree = 1	
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
	wge_fp_aut_sideeffects_disrupt	If I use FP, body may experience side effects, disrupt relations with husband/partner	Strongly agree = 1	
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
Subjective social Norm towards FP	norm_fp_acceptable_before	acceptable for woman to use family planning before has children	Strongly agree = 1	0 = Low Subjective social norm 1 = High Subjective social norm
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
	norm_fp_promiscuous	Women use family planning considered promiscuous	Strongly agree = 1	
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
	norm_fp_responsible	Couples use family planning financially responsible	Strongly agree = 1	
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
	norm_fp_women_decide	Women should be decide about family planning	Strongly agree = 1	
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
Perceived FP control	WGE 1	Can decide to switch from one FP method to another if want	Strongly agree = 1	0 = unble to control 1 = Able to control
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
	WGE 2	feel confident telling my provider what important when selecting FP method	Strongly agree = 1	
			Somewhat agree = 2	

Table 5 (continued)

Group	Variable	Question & responses		Categories
		Item	Response	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
	WGE 2	feel confident discussing FP with husband/partner	Strongly agree = 1	
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	
	WGE 2	If want to use contraception, can tell husband/partner	Strongly agree = 1	
			Somewhat agree = 2	
			Neither agree nor disagree = 3	
			Somewhat disagree = 4	
			Strongly disagree = 5	

Table 6 Description of control variables

Group	Variable	Question & Responses		Categories
		Item	Response	
Socio-demographic variables	Age (FQ_age)	Respondent's completed number of years since birth	Number of completed years since date of birth	1 = 15–19
				2 = 20–24
				3 = 25–29
				4 = 30–34
				5 = 34–49
	Education attainment (Educat)	Respondent's educational attainment level	Never attended = 0	No Education = 0
			Primary = 1	Primary = 1
			Secondary = 2 Technical & vocational = 3 Higher = 4	Secondary Plus = 2
	Region (FQ_Region_new)	Region where respondent live	Amhara = 3	3 = Amhara
			Oromia = 4	4 = Oromia
			SNNPR = 7	7 = SNNPR
			A/Ababa = 10 D/Dawa = 11	10 = A/Ababa & D/Dawa
			Afar = 2	0 = Other Regions
			Somali = 5	
			Benishangul = 6	
			Gambela = 8	
			Harari = 9,	
	Place of residence	Type of Place where respondent resides	urban = 1	1 = urban
			rural = 2	2 = rural

Table 6 (continued)

Group	Variable	Question & Responses		Categories
		Item	Response	
	Religion (FQreligion)	Respondent's religion	Protestant = 1	2 = protestant
			Orthodox = 2	1 = Orthodox
			Muslim = 3	3 = Muslim (3)
			Catholic = 4	4 = Other
			Traditional = 5	
			Wakefeta = 6	
			Non-believers = 7	
			Other = 96	
	wealth quintile	Respondent's economic status	Lowest quintile = 1	1 = Lower quintile
			Lower quintile = 2	
			Middle quintile = 3	2 = Middle quintile
			Higher quintile = 4	3 = Higher quintile
			Highest quintile = 5	
			No = 0	0 = Monogamy
	Parity	Respondent's number of live births	Number of live births she has	0 = No child
				1 = 1—2 children
				2 = 3 and above children
	Husband/Part Force prevenance	Tried to force or pressure to become pregnant	Yes = 1	1 = Yes
			No = 0	0 = No
		Said would leave you if did not get pregnant	Yes = 1	1 = Yes
			No = 0	0 = No
		Told would have a baby with someone else if did not get pregnant	Yes = 1	1 = Yes
			No = 0	0 = No
		Hurt physically because did not get pregnant	Yes = 1	1 = Yes
			No = 0	0 = No
	IPV Sexual physical	Made respondent to feel afraid by threating stalking you	Yes = 1	1 = Yes
			No = 0	0 = No
		Physically hurt, push, slap, punch, or kick respondent	Yes = 1	1 = Yes
			No = 0	0 = No
		Physically force or pressure respondent to having sexual intercourse with him	Yes = 1	1 = Yes
			No = 0	0 = No
Actual Behavioral Control variables	Contraceptive Knowledge	Respondent's knowledge on types of contraceptive	Number of contraceptives types the respondent heard	1 = 0–4 2 = 5–9
	FP Information	Respondent's media exposer to radio, tv	Yes = 1	1 = at least one media exposer
			No = 0	0 = no media exposer

Abbreviations

AIC: Akaike information criterion
AOR: Adjusted odds ratio
BIC: Bayesian information criteria
CI: Confidence interval
CSA: Central statistical agency
DHS: Demographic and health survey
EA: Enumeration areas
FP: Family planning
HSTP: Health sector transformation plan
ICC: Intra-cluster correlation coefficient
PMA-ET: Performance monitoring for action ethiopia
RH: Reproductive health
SDG: Sustainable development goal
SSA: Sub-saharan africa
TPB: Theory of planned behavior
VIF: Variance inflation factor

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Author contributions

FT conceptualized the study, obtained and analyzed the data, wrote the original and final drafts of the manuscript, interpreted the results and critically

revised the final manuscript. SA contributed to the conceptualization of the study, interpretation of the results and critically reviewed the final manuscript. FT and SA also participated in field work implementation and project facilitation. KM contributed to the conception of the idea and critically reviewed the final manuscript, including language and grammar corrections and editions. All authors reviewed and approved the final manuscript.

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Declarations

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Not applicable.

Competing interests
The authors declare no competing interests.

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