


Knowledge of the Ovulatory Period and Associated Factors Among Reproductive Women in Ethiopia: A Population-Based Study Using the 2016 Ethiopian Demographic Health Survey

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Purpose: In the era of increasing health risks, refusals, discontinuations, and with high unmet needs for modern contraception, assessing knowledge of the ovulation period and identifying its associated factors among reproductive women are crucial to recommend natural family planning methods as an option. So, the aim of this Demographic Health Survey analysis was to assess knowledge of the ovulation period and its associated factors among reproductive women in Ethiopia.

Methods: A secondary data analysis using the 2016 Ethiopian Demographic Health Survey was done by applying the principles of cross-sectional study design. Descriptive statistics and logistic regressions were used. Odds ratio with 95% confidence interval was used to interpret associations, and a significant association was declared at a p -value of <0.05 .

Results: A total of 15,683 women aged from 15 to 49 years were included in this analysis. Of them, only 3,699 (23.6%) were found to be knowledgeable about a woman's ovulation period. Women with age >39 years (AOR=1.77; 95% CI=1.52, 2.06), being urban resident (AOR=1.93; 95% CI=1.76, 2.12), having higher educational status (AOR=4.39; 95% CI=3.77, 5.11), getting family planning counselling within the last 12 months (AOR=1.33; 95% CI=1.20, 1.48), use of family planning (AOR=1.23; 95% CI=1.11, 1.37), being pregnant (AOR=1.22; 95% CI=1.03, 1.46), living with husbands (AOR=1.19; 95% CI=1.08, 1.31), and having menstruation within the last 6 months (AOR=1.30; 95% CI=1.18, 1.42) were factors associated with increased knowledge of the ovulation period among reproductive women.

Conclusion: Knowledge of the ovulation period among reproductive women in Ethiopia was low. Factors significantly associated with knowledge of the ovulation period were identified, and recommendations were forwarded accordingly.

Keywords: knowledge, ovulation period, reproductive women, Ethiopia

Introduction

The menstrual cycle is a monthly event of natural changes that occur in the uterus and ovary of mature women. With two subdivisions—the ovarian cycle and uterine cycle—it is an essential phenomenon for sexual reproduction.^{1,2} The ovarian cycle consists of the follicular phase, ovulation, and luteal phase. Ovulation is the process of rupturing a Graafian follicle; releasing an egg. Being the most pertinent event for the occurrence of pregnancy, ovulation occurs about midway through the menstrual cycle.³

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Knowledge of the physiology of the menstrual cycle, specifically the ovulation period, is basic to decide fertility probabilities. It is also vital to recommend or use family planning methods (FPMs) which are utilized by a significant number of women worldwide.^{1,4,5} According to the United Nations (2013), commitments to control the rate of fertility in countries worldwide is obligatory due to the impact of population size on determining the living standards of the population. Hence, women are utilizing modern contraceptives;^{6,7} commonly, hormonal methods that are associated with different health risks including obesity, hypertension, and cancer. Currently, the discontinuation rate of modern contraceptives is increasing with magnitudes varying between 19% and 36% worldwide.⁸

In Ethiopia, the discontinuation rate of modern contraception reaches about 37%; and 19.5% of discontinuations are attributable to side effects. Women are discontinuing modern methods without adopting alternative methods. This usually leads to many undesirable health risks such as unwanted pregnancy, unwanted or unplanned childbearing, miscarriage, and abortion.⁸ Furthermore, about 12% of married women are estimated to have unmet needs for family planning worldwide. This reaches about 24% in sub-Saharan Africa.⁹

Since they can prevent 75–85% of pregnancies, the World Health Organization (WHO) recommends natural family planning methods (NFPs) as an option for couples who do not wish to use other contraceptive methods for family reasons, health concerns, or because of religious beliefs. NFPs may also be an option for women who have an unmet need for modern contraceptives; especially in developing countries like Ethiopia.¹⁰ Among the NFPs, the rhythm method is a natural procedure used to avoid conception by regulating times for intercourse, specifically during ovulation.⁵ Currently, NFPs including DOT fertility apps, two days method, and standard days method are considered to be as effective as modern contraception; even the United States Agency for International Development (USAID) supports those methods as modern contraceptives.^{11–13} Accurate knowledge of one's ovulation period is vital for using those effective NFPs of contraception.

Generally, in the era of increasing health risks, refusals, discontinuations, and with high unmet needs for modern contraception, assessing knowledge of the ovulation period among reproductive women is crucial to recommend NFPs as an option. Identifying factors associated with knowledge of the ovulation period is also vital to design

factor-oriented strategies targeted to increase knowledge of the ovulatory cycle. This in turn will increase the utilization of NFPs among reproductive women who are unable to use modern contraceptives. Despite this, research studies addressing the issue of knowledge of the ovulation period among reproductive women are limited. As per the investigators' knowledge, there is no prior study conducted in Ethiopia. So, this Demographic Health Survey was conducted to assess knowledge of the ovulation period and its associated factors among reproductive women in Ethiopia.

Methods

Study Design and Period

A secondary data analysis using the 2016 Ethiopian Demographic and Health Survey (EDHS) (the fourth and most recent DHS in Ethiopia) data, collected from January 18 to June 27, 2016, was done by applying the principles of cross-sectional study design.

Samples, Sampling Procedure, and Data Collection

The survey had included a nationally representative sample of reproductive women from the nine regions and two administrative cities in the country selected with a two-stage stratified sampling technique. In the first stage, regions of the country were stratified into urban and rural settings and 645 strata were selected. Then, representative households were selected and the survey interviewer interviewed only the pre-selected households without replacement. For this study, all women samples (n=15,683) of the 2016 EDHS were included. The questionnaires were adapted by EDHS from the DHS Program's standard Demographic and Health Survey questionnaires to reflect the population and health-related issues relevant to Ethiopia.

Study Variables

The dependent variable of interest was knowledge of the ovulation period among reproductive women. Independent variables which were considered to be associated with knowledge of the ovulation period were age, residence, educational status, occupation, living with husbands, getting counseling on family planning methods within the last 12 months, using family planning methods, recent sexual activity (within last 4 months), having menstruation within the last 6 months, and being pregnant.

Statistical Analysis

Descriptive statistics were employed to describe socio-demographic characteristics of study participants and to determine the percentage of knowledgeable women. Binary and multiple logistic regressions were used to identify factors associated with knowledge of the ovulation period. Odds ratio with 95% confidence interval was used to interpret associations and a significant association was declared at a p -value of <0.05 .

Operational Definition

Reproductive women: Women aged 15–49 years.

Knowledge of ovulation period: In Ethiopian Demographic Health Survey (EDHS) data, knowledge of the ovulation period was assessed from reproductive women by asking them a single but pertinent question of “when do you think the ovulation period of a woman is?” Women’s response was categorized as “during menses/period”, “immediately after period ended”, “at middle of the menstrual cycle”, “immediately before menses/period starts”, “at any time”, “did not know”, and “other.” So, in this research a woman who replied “At the middle of the menstrual cycle” was considered knowledgeable about the ovulation period; while the rest were considered as non-knowledgeable.

Result

Socio-Demographic Characteristics of the Respondents

A total of 15,683 reproductive women were included in this DHS analysis, with a mean age of 27.94 ± 9.16 years. Nearly two-thirds of the participants (65.9%) were rural residents. Regarding educational status, 44.8% of the participants were not educated at all (Table 1).

Knowledge of the Ovulation Period

Among the total of 15,683 women who participated in the survey, around one-fourth (25.6%) of them think that ovulation in a woman occurs immediately after menses/period ended (Table 2).

From Table 2, women who respond that the ovulation period is in the middle of the menstrual cycle were considered as knowledgeable about the ovulation period; while the rest were considered as not knowledgeable. Therefore, only 3,699 (23.6%) were found to be knowledgeable about a woman’s ovulation period (Figure 1).

Table 1 Socio-Demographic Characteristics of Women Included in this Demographic Health Survey Analysis (N=15,683), Ethiopian Demographic Health Survey 2016

Variables		Frequency	Percentage
Age (years)	15–19	3,498	22.3
	20–24	2,903	18.5
	25–29	2,845	18.1
	30–34	2,241	14.3
	35–39	1,917	12.2
	40–44	1,302	8.3
	45–49	977	6.2
Residence	Rural	10,335	65.9
	Urban	5,348	34.1
Educational status	No education	7,033	44.8
	Primary	5,213	33.2
	Secondary and above	3,437	21.9
Marital status	Never in union/ not married	4,278	27.3
	Ever married	11,405	72.7
Occupation (within last 12 months)	No occupation (not working)	8,045	51.3
	Has occupation (working)	7,638	48.7

Factors Associated with Knowledge of the Ovulation Period

On multiple logistic regression, age, residence, educational status, living with husbands, getting counseling on family planning methods, currently using family planning methods, having menstruation within the last 6 months, and being currently pregnant were found to be significantly associated with knowledge of ovulation period among reproductive-age women at a p -value of <0.05 (Table 3).

Women aged >39 years and 20–39 years were found 1.8 times and 1.6 times more likely to be knowledgeable about the ovulation period than women whose age was less than 20 years respectively. Urban residents were found 3 times more likely to be knowledgeable about the ovulation period than rural residents. Women who are educated to higher levels and secondary levels were 4.4 times and 3 times more likely to be knowledgeable about the ovulation period than non-educated women respectively. Having an occupation was not significantly associated with knowledge of the ovulation period.

Women who got counseling about family planning within the last 12 months were found 33% more likely

Table 2 Frequency and Percentage Distribution of Women's Response Regarding Knowledge of the Ovulation Period, Ethiopian Demographic Health Survey, 2016

Question		Frequency (n)	Percent (%)
When do you think the ovulation period of a woman is?	During menses or period	482	3.1
	Immediately after menses or period ended	4,021	25.6
	At the middle of the menstrual cycle	3,699	23.6
	Immediately before menses or period begins	1,153	7.4
	At any time	3,087	19.7
	Do not know	3,241	20.7
	Total	15,683	100.0

to be knowledgeable on the ovulation period than women who did not get counseling. Similarly, women who use family planning were found 23% more likely to be knowledgeable on the ovulation period than their counterparts. Being currently pregnant and having menstruation within the last 6 months were found to be significantly associated with increased knowledge of the ovulation period among reproductive women in Ethiopia—as women who were currently pregnant and women who have menstruation within the last 6 months were found 22% and 30% more likely to know about the ovulation period than their counterparts.

Discussion

This DHS analysis had revealed knowledge of the ovulatory period and its associated factors among reproductive women in Ethiopia. A total of 15,683 reproductive women were included in the analysis and only 23.6% were found to be knowledgeable about women's ovulatory period. This was in line with the results of a cross-sectional study conducted in 29 African countries, as it had revealed

the average knowledge of ovulation among those countries to be 21.5%.¹⁴ But, it was lower than a study conducted in Michigan state¹ which revealed that about 32.8% of women know the timing of ovulation. Similarly, the result of this DHS analysis was lower than a study conducted in Ghana,¹⁵ which showed that about 38% of women know the period of ovulation to be halfway in the menstrual cycle. On the other hand, the result of this study was higher than studies conducted in India¹⁶ and Australia.¹⁷ This difference might be due to differences in socioeconomic status (educational level) of the study participants, study settings, and study population. Generally, reports from many literatures showed that women have low to modest knowledge of the ovulatory period, fertile window, or fertility.^{1,16-19} So, the authors of this study believe in the need for an intervention to bridge this knowledge gap.

In this DHS analysis, age was found to be significantly associated with knowledge of the ovulatory period. Women with advanced age were found to be more knowledgeable than women at an early age. This result was in line with a study conducted in Uganda, as it showed women at later ages of their reproductive lives have more accurate knowledge of their ovulation period than individuals at the early stages.²⁰ A study conducted among reproductive women in the United States had also revealed similar findings.²¹ Studies conducted in Bangladesh,²² Spain,²³ and Pakistan²⁴ had reported similar findings. A systematic review conducted by Pedro et al¹⁸ and an international study conducted by Bunting et al²⁵ had also revealed the association between age and fertility awareness. The reason behind this association might be explained by repeated exposure and being more experienced in reproduction among aged women, since age is a big educator in human life.

Residence was another factor significantly associated with knowledge of the ovulation period. Urban residents were more knowledgeable than rural residents, which was in line with a study conducted by Bunting et al²⁵ and

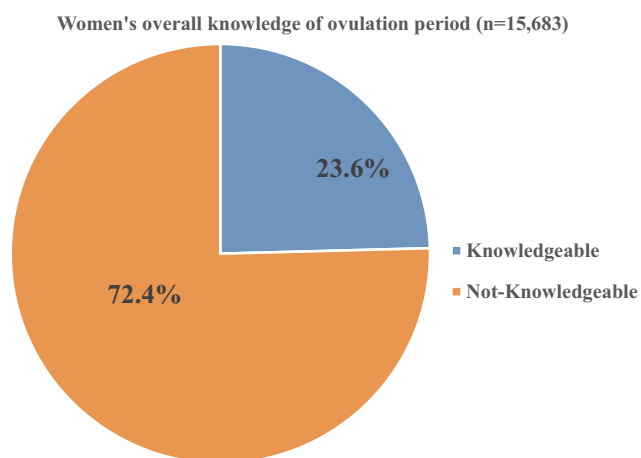
**Figure 1** Percentage distribution of knowledge about the ovulation period among reproductive women in Ethiopia, Ethiopian Demographic Health Survey 2016.

Table 3 Binary and Multiple Logistic Regression Analysis for Factors Associated with Knowledge of the Ovulation Period, Ethiopian Demographic Health Survey 2016

Variables		Knowledge of Ovulation Period		COR (95% CI)	AOD (95% CI)
		Not Knowledgeable	Knowledgeable		
Age (years)	<20	2,850	648	1	
	20–39	7,361	2,545	1.52 (1.38, 1.68)	1.56 (1.39, 1.75)*
	>39	1,773	506	1.26 (1.10, 1.43)	1.77 (1.52, 2.06)*
Residence	Rural	8,674	1,661	1	
	Urban	3,310	2,038	3.22 (2.98, 3.47)	1.93 (1.76, 2.12)*
Educational status	Not educated	6,022	1,011	1	
	Primary	4,035	1,178	1.74 (1.56, 1.91)	1.71 (1.54, 1.89)*
	Secondary	1,377	861	3.72 (3.34, 4.15)	3.05 (2.68, 3.46)*
	Higher	550	649	7.03 (6.16, 8.02)	4.39 (3.77, 5.11)*
Living with their husband	No	5,464	1,771	1	
	Yes	6,520	1,928	0.91 (0.85, 0.98)	1.19 (1.08, 1.31)*
Occupation	No	6,335	1,710	1	
	Yes	5,649	1,989	1.30 (1.21, 1.40)	0.99 (0.91, 1.07)
Get counseling on family planning methods (within last 12 months)	No	10,419	2,981	1	
	Yes	1,565	718	1.60 (1.46, 1.77)	1.33 (1.20, 1.48)*
Currently use family planning	No	9,677	2,694	1	
	Yes	2,307	1,005	1.57 (1.44, 1.70)	1.23 (1.11, 1.37)*
Recent sexual activity (within last 4 weeks)	No	6,183	1,945	1	
	Yes	5,801	1,754	1.04 (0.97, 1.12)	
Have menstruation within last 6 months	No	5,176	1,237	1	
	Yes	6,808	2,462	1.51 (1.40, 1.64)	1.30 (1.18, 1.42)*
Currently pregnant	No	11,106	3,455	1	
	Yes	878	244	0.89 (0.77, 1.04)	1.22 (1.03, 1.46)*

Note: *Significance at $p < 0.05$ on multiple logistic regression.

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio.

a study from Bangladesh.²² Urbanization increases access to the internet, media, and health care. So, the association between residence and knowledge of the ovulatory period might be explained by increased access to information related to reproduction among urban residents through the media, internet, or counseling than rural residents.

Women who had got family planning counseling within the last 12 months were found to be more knowledgeable on the ovulatory period. Similarly, women who are currently using any family planning method were also more knowledgeable. These associations might be due to exposure to information related to the ovulatory cycle during counseling for FPMs. Counseling on family planning can increase knowledge of reproduction and increase family planning utilization. A randomized control trial (RCT) conducted in

Sweden had revealed that family planning counseling intervened by reproductive life plan counseling can increase fertility knowledge.²⁶ Studies conducted in Pakistan²⁷ and India²⁸ had reported that quality and patient-centered counseling on family planning is vital for utilization and continuation of family planning methods. But the literature had demonstrated a gap in family planning counseling. Commonly, natural family planning methods and the ovulatory cycle are not addressed. Despite the availability of more effective natural family planning methods like the standard days method, two days method, DOT fertility app, and others, health care workers are not adequately trained to provide natural family planning services to patients.^{11,12,19}

Women with secondary/higher education were found to be more knowledgeable about the ovulation period

than women with no education. This result was similar to a study conducted in Uganda.²⁰ A systematic review conducted by Pedro et al¹⁸ had also revealed similar findings. The reason behind this association might be due to the fact that higher education gives an opportunity to understand the physiology of reproduction. Currently, different educational approaches targeted to increase fertility awareness are emerging and researched. A pre–post interventional study conducted in Canada had demonstrated fertility education websites can increase an individual's fertility awareness.²⁹ Another study conducted in Rwanda had revealed that an entertainment–education serial radio drama can increase fertility awareness.³⁰ A randomized control trial conducted in Spain had also shown that tailored oral education (personalized fertility information) can increase fertility awareness in reproductive women,²³ and increased fertility awareness and education in turn increase family planning utilization.^{31,32} So, in the era of increased discontinuation and refusal to modern contraceptives, incorporating NFPMs in family planning counseling and fertility education for reproductive women are crucial.

Conclusion

Knowledge of the ovulation period among reproductive women was found to be low in Ethiopia. Age, residence, educational status, living with husbands, getting counseling on family planning methods, currently using family planning methods, having menstruation within the last 6 months, and being currently pregnant were found to be significantly associated with knowledge of the ovulation period.

Future Implication and Recommendations

Hormone-based family planning methods are associated with health risks. Discontinuation and refusal of women to those methods are increasing. In the era of increasing refusal of hormone-based family planning, fertility-awareness-based family planning methods may be an option. Furthermore, in developing countries like Ethiopia, natural methods of family planning (fertility-awareness-based family planning) might be important—because they could solve the issue of accessibility to family planning services and the religious-related myths towards family planning utilization.

If applied correctly, fertility-awareness-based family planning can prevent 75–85% of pregnancies, and knowledge of the ovulation period will help to apply fertility-

awareness-based methods correctly. So, the researchers recommend formal ovulatory cycle/fertility education to be incorporated in family planning services and in maternal and child health services. Efforts should be tried to disseminate fertility education to reproductive women through social media including radio and television. Since this research is based on the DHS, it was impossible to address non-socio-demographic factors possibly associated with knowledge of the ovulation period. So, it is better if further research studies are encouraged addressing this issue.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Consideration

During the survey, informed consent was obtained from every study participant. The privacy of the participants was kept by making the questionnaires anonymous. For the purpose of this research output, the publicly available dataset was obtained from the EDHS website (<https://dhsprogram.com/>) through registering with the DHS website and, as such, no ethical approval was required to share datasets from the EDHS.

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Author Contributions

Both authors made a significant contribution to the work reported, in the conception, study design, execution, acquisition of data, analysis and interpretation; took part in drafting, critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interest.

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