College of Medicine

Short Birth Interval and Its Determinants of Reproductive-Age Women in Ethiopia: Multilevel Regression Model

By

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Declaration

I, Henna Umer Kelel, hereby declared that this dissertation is my original work and has not been presented for any other awards at the University of Malawi or any other institution.

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Abstract

Introduction: A birth interval is the length of time between two successive live births. World Health Organization is recommended that individuals and couples should wait for at least 2–3 years between births to reduce the risk of adverse maternal and child health outcomes. Short birth interval also has a negative consequence on perinatal, neonatal, and child health outcomes.

Objective: This study aimed to assess the level and determinants of the short birth interval among reproductive-age women in Ethiopia.

Method: National population-based cross-sectional study design was employed. The total weighted sample included in the analysis was 6,155 women who have given birth five years preceding the survey. Multilevel Logistic regression models (bivariate and multivariate) were used to assess the association between dependent and independent variables. In multiple multilevel logistic regressions those variables' P-value <0.05 was considered as a statistically significant variable for short birth interval and presented with 95% CI and AOR.

Result: The prevalence of short birth interval was 48.5%, [95% CI, 47.18- 49.69]. The predictors associated with short birth intervals like rural residence [AOR=1.4, 95% CI: 1.1,1.7**]**, women's being Muslim religion (AOR=2.3, 95% CI: 1.9-2.7**),** women whose age at first birth from 18 to 34 years [AOR=1.2, 95% CI:1.1, 1.4, p<0.001] were found to be statistically significant determinants of short birth interval.

Conclusion: Half of the women have reported the short birth interval experience in Ethiopia. The main factors for short birth intervals were women who lived in rural settings, women being religious, and women age at first marriage. These factors addressed through the maternal and child

health program should intensify their program on influencing mothers by giving information about the necessity of using modern contraceptives in spacing children.

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Acronyms and Abbreviations

AOR	Adjusted odds ratio
CI	Confidence interval
COR	Crude odds ratio
DHS	Demographic and health survey
EAs	Enumeration areas
ECA	Ethiopia Central Statistical Agency
EDHS	Ethiopia demographic and health survey
MMR	Maternal mortality ratio
PBI	Preceding birth interval
PHC	Ethiopia Population and Housing Census
PPA	Postpartum amenorrhea
SBI	Short Birth interval
USAID	United States Agency for International Development
WHO	World Health Organization

Operational Definitions

- **Short birth interval-** is when the time between two successive births has a time of 35 months or less.
- **Optimum birth interval -** is when the time between two successive births has time equals 36 months or longer.

Chapter 1: Introduction

1.1 Background

The birth interval is the length of time between two successive live births. Optimal spacing until the succeeding pregnancy is the resting period that permits the mother time to recover from pregnancy and labor [1].

The high fertility rate is a global concern because it can affect the overall economic, political, and social aspects of a country. Moreover, high fertility is one of the issues for health professionals as it has serious implications on the health of mothers and children. It is advised Individuals and familie consider health risks and benefits with other conditions such as age, fecundity, access to health services, social and economic circumstances, and personal preferences in making choices for the timing of the next pregnancy [2].

World Health Organization (WHO) and other international organizations recommend that individuals and couples should wait for at least 2–3 years between births to reduce the risk of adverse maternal and child health outcomes. Recent studies supported by the United States Agency for International Development (USAID) suggest that an interval of 3–5 years might help to reduce these risks even further [2].

Evidence showed that a short birth interval has adverse effects on maternal, perinatal, and neonatal outcomes. The hypothetical contributing mechanisms which explain the association between short inter-birth intervals and adverse outcomes were maternal nutritional depletion, folate depletion,

cervical insufficiency, vertical transmission of infections, suboptimal lactation related to breastfeeding pregnancy overlap, sibling competition, the transmission of infectious diseases among siblings, incomplete healing of uterine scar from previous cesarean delivery, and abnormal remodeling of endometrial blood vessels [3,4].

Sub-Saharan Africa is the region with the worst reproductive health indices and the lowest contraceptive use rate (23%). These are a result of three unhealthy behaviors of getting pregnancies too early, too many, and too closely spaced. Healthy Timing and Spacing of Pregnancy Benefits women and families delay, space, or limit their pregnancies, attain the healthiest outcomes for women, newborns, and children, help the family to have free and informed contraceptive choice, and Takes into account desired family size [5].

According to the 2010 DHS data from Tanzania, more than three-quarters (78%) of non-first births to young women age 15–19 occur within an interbirth interval of fewer than 24 months, with over half of births (51%) occurring in the second year postpartum. A longer time between births permits the next pregnancy and delivery to happen at full gestation and growth. A birth interval of at least 36 months before couples deliver the next child is recommended for mothers and their children [6,7].

The actual total fertility rate in Ethiopia is 4.6 children whereas the wanted fertility rate is 3.6 children. In other words, on average, women in Ethiopia have one child more than they wanted. The levels of contraceptive use over the past 16 years increased (from 8 percent in 2000 to 36 percent by 2016), Ethiopia has witnessed large reductions in fertility [8].

According to the United Nations report countries which have a fertility rate of more than 3.2 children per woman are defined as having high fertility countries. Ethiopia is one of the countries having high fertility [9].

Couples want many children to support family enterprises such as agriculture and for security in old age. Also, high child mortality leads parents to have more children to protect against loss or to replace losses [10]. Women with short intervals between births are at increased risk of preterm birth. Sibling competition rises in the situation of shorter interbirth intervals. It is claimed that when a newborn comes, it is likely that the family will invest more of its limited resources in the form of care to the newborn and the other children are more likely to suffer [11].

Access to contraception information and services is essential to achieving three to five-year birth intervals. As for older children under age five, three to five-year birth spacing may decrease the risk of childhood death as well as reduce the likelihood of stunting and being underweight. When births are spaced at least three years apart, children can receive the full nutritional benefit of breastfeeding for the recommended two years. Children can also benefit from additional time and nurturing from parents when their younger sibling is at least three years younger [12].

1.2 Statement of the Problem

WHO reported that 295,000 maternal deaths occurred in 2017 globally, in another word 808 women died from childbirth-related complications around the world every day. Sub-Saharan Africa accounts for approximately 66% of the maternal death most of these deaths could have been prevented. It seems Sub-Saharan Africa is not to make any significant progress in reducing

maternal mortality ratio(MMR), 2015 it was reported 546 MMR whereas in the current report it stood at 542 and the lifetime risk of maternal death was estimated at 1 in 37 compared with just 1 in 7800 in Australia and New Zealand [13,14].

Timing and spacing of pregnancy are important for the health and survival of the newborn and the mother, unintended pregnancy and short birth interval are still among the contributing factors for the high maternal and child mortality in developing countries like Ethiopia. The benefits of pregnancy planning and child spacing on maternal, infant, and child health has been well documented [15]. Globally, there were 3.1 million neonatal deaths in 2013 and most of these occurred in south Asia and sub-Saharan Africa.

Ethiopia Demographic and Health Survey (EDHS) 2016 showed there is high maternal mortality, 412 deaths per 100,000 live births and more than 42% of under-five mortality was neonatal deaths. Short birth intervals increased the risk of maternal death and adverse pregnancy outcomes (neonatal mortality, low birth weight, and pre-term delivery) [16]. According to WHO estimates Ethiopia has 14,000 maternal mortality in 2017 with an uncertainty interval from 10,000 to 20,000, which classifies the country as high maternal mortality occurring country[13].In Ethiopia, studies revealed a shorter birth interval affects fertility as well as neonatal and infant mortality. Promoting the length of birth interval for a minimum of two years results in a decline in infant mortality by half (50%) and reduces the fertility rate by 43% [17].

Pregnancy and childbirth are events associated with both positive and negative significant health outcomes. Studies have shown that adverse maternal and perinatal outcomes are associated with

early, closely spaced, and high parity pregnancies. Short inter-pregnancy intervals were shown to be associated with higher risks of adverse health effects like obstructed labour, preterm birth, low birth weight, and increased neonatal death. Beyond the health implications, closely spaced birth intervals accelerate population growth and undermine development efforts. It makes it difficult for women to become productive members of society, thereby limiting their contribution to economic development [18,19]. A longer interval between successive births has a greater benefit in reducing abortions, complications related to unsafe abortion, and unwanted pregnancies. It also advances children's development by improving the nutritional status of the preceding child [20].

1.3 Literature Review

A study showed the prevalence of short birth interval in developing countries (46%), in Enugu, south-eastern Nigeria (48.6%) and Yazd, Iran (49.76%) [21-23], in Tanzania (48.4%) [24], in the Democratic Republic of Congo (30.2%)[25], rural setting Bangladesh (24.6%)[26], Dabat district, Northwest Ethiopia (39.1%) [7], Northern Ethiopia (40.9%) [16], Northern Ethiopia (23.3%) [27]. in Yumbe Hospital, Uganda (52.4%) [28], Jimma Zone, Southwest Ethiopia (59.9%) [29], and Kassala, Eastern Sudan (60.6%) [30].

In a study conducted in Bangladesh, 24.6% of women had a birth interval shorter than 33 months and the odds of having a short interval increases with age, the likelihood of a short birth interval increased by 11% with each additional year of age (AOR=1.11, 95% CI, 1.08-1.15). Parity of four or more was associated with a 72% decrease in the odds of a short birth interval compared to parity of one at the start of the birth interval (AOR 0.28, 0.19-0.41) [26].

A study revealed that the factors influenced women to get short birth interval were living in rural area [AOR = 1.52, CI: 1.12, 2.05], women attended secondary school and above [AOR = 0.27, CI: 0.05, 0.54], lack of media exposure [AOR = 1.35, CI: 1.18, 1.56], breastfeeding duration [AOR = 0.79, CI: 0.77, 0.82], having six and more ideal number of children [AOR = 1.14, CI: 1.09, 1.20] and having preferred waiting time to birth two years and above [AOR = 0.86, CI: 0.78, 0.95] [21]. In the study, rural women [OR = 2.7 (95%CI: (1.4, 5.1)], women who were not using contraceptives are [OR = 1.6(95% CI: 1.1, 2.2)] times more likely to give birth within a short period than users. Women with the highest wealth quartile were 51% more likely to have a short birth interval than with the lowest wealth quartile [1].

A study conducted in the Democratic Republic of Congo by multivariate Bayesian geo-additive regression analyses, among the whole sample of women, living in rural areas [OR = 1.07, 95% CR: (0.97, 1.17)], exclusive breastfeeding [1.08 (1.00, 1.17)] and women with primary education [1.06 (1.00, 1.16)], were consistently associated with a higher risk of short birth intervals [25].
In research done among Saudi Arabian women, the Mean age was 32 years (SD ±6.27). Half the women (48.8%) had completed high school or college education. Women perceive that ideal birth interval should be less than 2 years, which are 22 (5.2%). The mean birth interval was 33.5 (SD ±17.8) months. Short birth interval (< 2 years) was more common in younger women (25 years), whereas the longer birth intervals were more common in women of older age groups ($P < 0.05$) [31].

A case-control study conducted in Arba Minch District; Ethiopia found that 49.5% (315) of women have three to four live children. 12.4 % (79) women gave birth in health institutions for their

preceding child and 62.6 % (398) women had planned pregnancy. Regarding contraception utilization, 54.8 % (349) utilized modern contraceptive methods after the delivery of the preceding child. Mothers who breast-fed the preceding child for less than 24 months were 60 times more likely to have short interbirth intervals than their counterparts of mothers who breast-fed for 24 months or more (AOR: 60.19, 95% CI (31.61–114.59)) [11].

A finding from Sanajaoba and co-authors revealed that the duration of breastfeeding is negatively associated with the risk of having subsequent birth in such a way that a one month increase in the duration of breastfeeding leads to a decrease in the risk of having subsequent birth by 2 percent (RR=0.982 with 95% CI: 0.974- 0.991). Parity has also had a significant positive impact on the risk of having subsequent birth. Its value of RR=1.051 with 95% CI: 1.013-1.091 shows that when the parity is increased by one, the risk of having subsequent birth is increased by at least 5 percent [32].

A DHS study by Jean and co-investigators found that about 9% (604 out of the 7074 non-first births) were born within 18 months of an older sibling. More than half 7561(56%) proportion of births was from mothers aged less than 25 years, 9992(74%) with no or primary education. Compared with children whose preceding birth interval (PBI) is 36 months or longer, those with a short PBI length (of 18–23 months) have an infant mortality rate that is approximately 37% higher ($p < 0.10$) [33].

Mothers having first birth at a younger age are more likely to have a shorter birth interval (mothers age 21- to 25 years categories have 14 percent increased birth intervals than that of their younger

counterparts (having birth on or before reaching 15). Mothers having first birth after 36 years have 74 percent larger intervals than mothers having first birth before age 15. Place of residence was found to be a significant birth interval and the result suggests that urban women have a longer birth interval than rural women (AOR=1.052 (CI, 1.016-1.090)). Regarding religion, the study found that Muslims have a 15 percent shorter birth interval than that of other religion women [34].

A finding by Samuel and co-authors found that 467(57.6%) of the study subjects had short birth intervals (<36 months) whereas 290(35.8%) women had optimum birth intervals (36-60months). The median duration of the actual birth interval was 33 months (SD+/-16.7) for the last two successive births. Rural women are more likely to have short birth intervals than urban women [OR = 2.7 (95%CI: (1.4, 5.1)]. Women who were not using contraceptives are 1.6times more likely to give birth within a short period than users [OR = 1.6(95% CI: 1.1, 2.2)]. Women with the highest wealth quartile were 51% more likely to have short birth intervals than with the lowest wealth quartile [1].

Evidence showed that unwanted Pregnancies were 2 times more likely to have short inter-pregnancy intervals compared to intended pregnancies (AOR=2.21(CI, 1.43, 3.41). The odds of short inter-pregnancy intervals were inversely associated with age at the conception of the pregnancy (OR7.91† (CI, 3.35, 17.6). In contrast, births to women initiating childbearing before age 30 years were significantly less likely to have shorter inter-pregnancy intervals than births to women aged 30 years and older at first birth. Births were more likely to be short inter-pregnancy intervals if born to high parity women or women [35].

1.4 Conceptual Framework

Different variables were assessed and identified from the EDHS data set that was believed to influence short birth intervals among reproductive-age women. Majorly these variables were categorized under four categories namely socio-demographic, past obstetric and birth history, fertility control, and awareness and mediating factors (Fig 1)

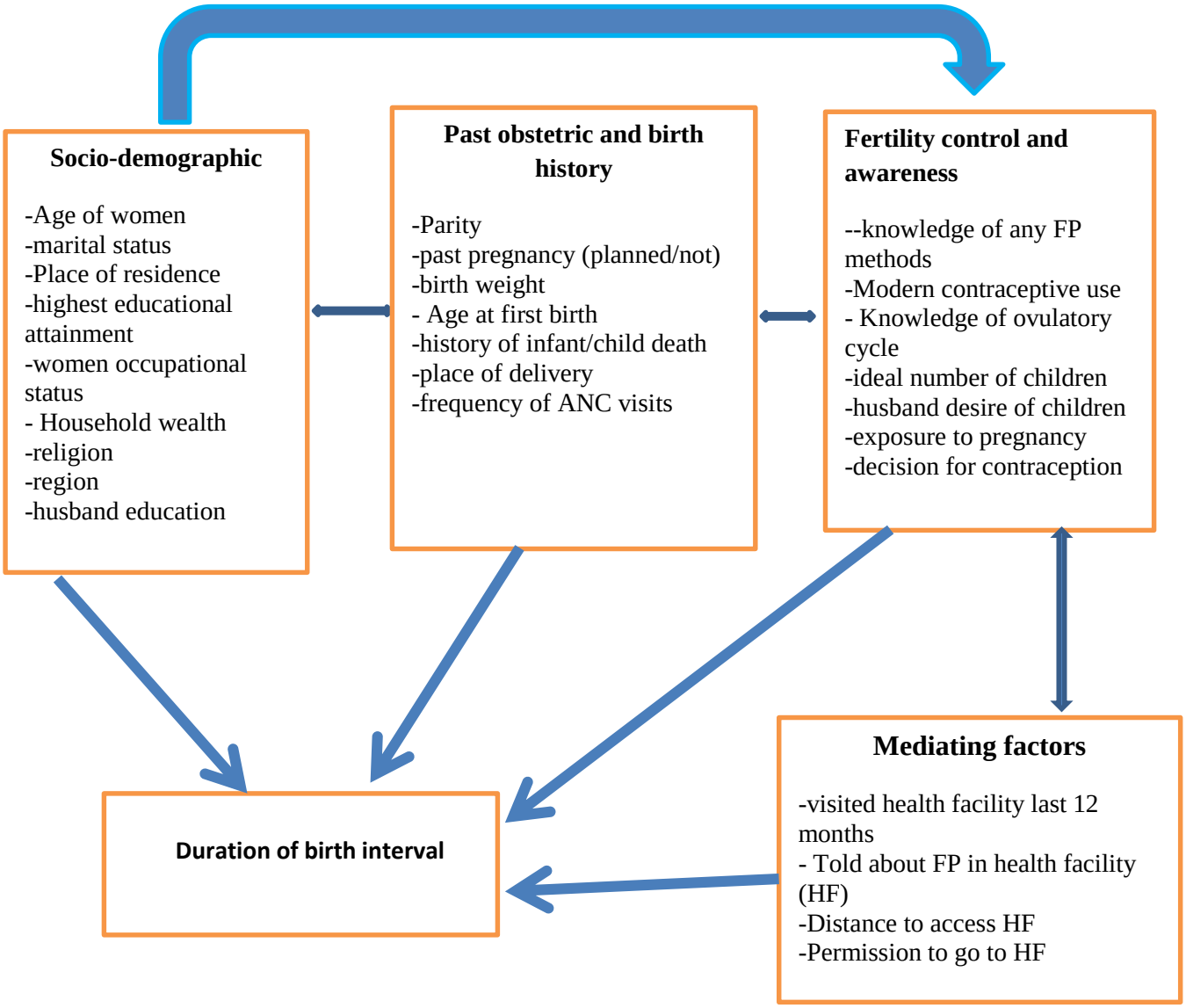


Figure 1: A conceptual framework for determinants of short births interval among reproductive age group women in Ethiopia, 2020.

1.4 Justification of the Study

This study aims to assess important predictors of the short birth interval among reproductive-age women in Ethiopia. A birth interval is an important area in determining a population growth rate in a country, the shorter the birth interval women have is more likely the women to have many children throughout their reproductive age span. This data is a country based representative sample, hence it is a larger sample of reproductive-age women which produces credible data Using EDHS data.

Ethiopia is the second-most populous country in Africa next to Nigeria and 14th in the world. According to the UN world population prospectus, the current population of Ethiopia is 112 million which is one of the fastest-growing countries in the world with a population growth rate of 3.02% per year [36].

Furthermore, adequate birth spacing improve health for mothers and children is essential for the development of effective counseling protocols, policies, programs, and evidence-based interventions to address the remediable determinants of poor maternal, perinatal, and infant health. Ethiopia has experienced a significant number of infant and neonatal mortality compared to the overall average rate of infant and neonatal mortality reported in Africa [37].

Some studies have been conducted in Ethiopia related to birth interval though they were with smaller sample sizes and in a specific community. Hence the current study will do further analysis of a national-based survey which will help us to understand the determinants of short birth intervals throughout the country.

Furthermore, using a large sample size will make the research produce a sound statistical conclusion (the power of the study which is the probability of finding statistically significant results), and overall, the study finding will be representative for all reproductive-age women in Ethiopia.

1.5 Objectives

1.5.1 General Objective

This study aimed to assess the prevalence and determinants of the short birth interval among reproductive-age women in Ethiopia.

1.5.2 Specific Objectives

a. To determine the prevalence of short birth intervals among reproductive-age women in Ethiopia.
b. To assess the association between socioeconomic factors and short birth interval among reproductive-age women in Ethiopia.
c. To identify the association between past obstetric history and short birth interval among reproductive-age women in Ethiopia.

Chapter 2: Methods

2.1 Types of Research Study

A national population-based cross-sectional study design was employed. The data were extracted from the 2016 Ethiopia Demographic and Health Survey (EDHS).

2.2 Study Place

The study was conducted in all regions of Ethiopia. Ethiopia is divided into nine geographical regions and two administrative cities. The sample for the 2016 EDHS was designed to provide estimates of key indicators for the country as a whole. The Survey sample was stratified and selected in two stages. Each region was stratified into urban and rural areas, yielding 21 sampling strata. Samples of EAs were selected independently in each stratum in two stages. Implicit stratification and proportional allocation were achieved at each of the lower administrative levels by sorting the sampling frame within each sampling stratum before sample selection, according to administrative units in different levels, and by using a probability proportional to size selection at the first stage of sampling.

The 2016 EDHS is the fourth in a series of Demographic and Health Surveys conducted in Ethiopia in 2000, 2005, and 2011. The main objective of the 2016 EDHS is to provide up-to-date information on fertility and childhood mortality levels, fertility preferences, awareness, approval, and use of family planning methods, maternal and child health, domestic violence, knowledge, and attitudes toward HIV/AIDS and other sexually transmitted infections and prevalence of HIV among the adult population. All women aged 15-49 and men aged 15-59 who are the usual

members of the selected households and those who spent the night before the survey in the selected households are eligible to be interviewed in the survey.

2.3 Study Period

Data were extracted from National Health and Demographic survey data set for analysis purposes; therefore, this study is the analysis of secondary data. This study was conducted from January 2020-December 2020.

2.4 Study Population

2.4.1 Source Population

All reproductive age group women in Ethiopia.

2.4.2 Study Population

Women who gave life birth five years preceding the survey and women who have 2 or more children.

2.5 Inclusion and Exclusion Criteria

2.5.1 Inclusion Criteria

Reproductive-age women who gave live birth five years preceding the survey. The last closed birth interval was used for each woman if women had 3 births in the last 5 years, would only include the interval between 2nd and 3rd births, and so on. The women were not included in some open birth intervals.

2.5.2 Exclusion Criteria

Women who have one child have been excluded from analysis because they do not have a preceding birth interval.

2.6 Study Variables

2.6.1 Dependent Variables

The outcome variable for this study is the birth interval which was dichotomized as a short and optimal birth interval.

2.6.2 Independents Variables

a. **Socio-demographic characteristics of the women:** Age of women, marital status, Place of residence, highest educational attainment, women occupational status, Household wealth, religion, region, husband education

b. **Women obstetric and birth history: -** Parity, history of infant\child mortality, age at first birth, wanted the last birth, succeeding birth interval, past pregnancy (planned/not), Duration of amenorrhea, Preceding birth interval, Marriage to the first birth interval, and birth weight

c. **Fertility control and awareness related: -** Knowledge of any family Planning methods, Modern contraceptive use, duration of breastfeeding, knowledge of ovulatory cycle, the ideal number of children, and decision for contraception use.

d. **Mediating factors: -** They visited a health facility in the last 12 months, talked about FP in a health facility (HF), Distance to access HF, Permission to go to HF, and distance to access HF.

2.7 Sample Size Determination

On the 2016 EDHS, 15,683 women who participated in this study used data from 7,193 women who gave birth five years preceding the survey. Women who have one child have been dropped

from the data set because the outcome variable is a birth interval. The final sample size was 5723 (unweighted), by using complex survey analysis; the weighted sample size was 6155 women (**figure** 2).

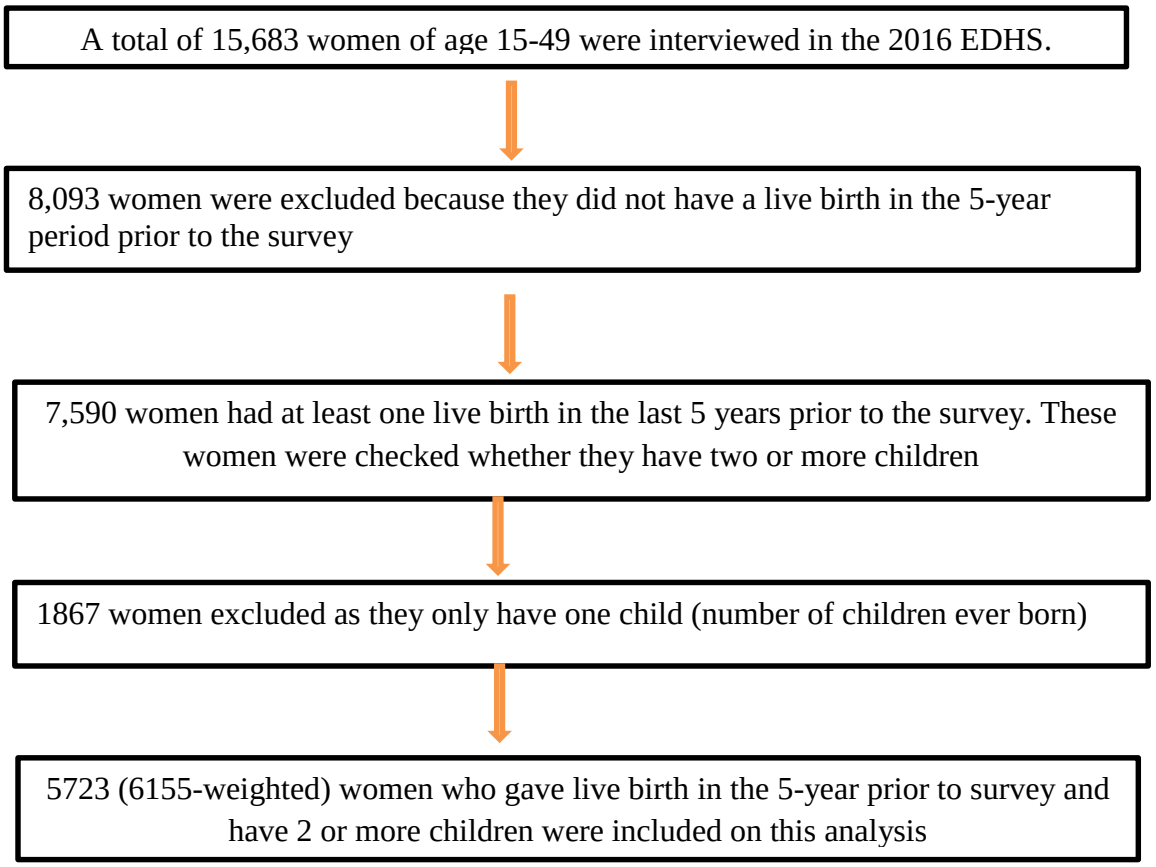


Figure 2*:* Schematic presentation of the sampling procedure of reproductive age women in Ethiopia, 2020.

2.8 Sampling Frame and Procedure

The sampling frame used for the 2016 EDHS is the Ethiopia Population and Housing Census (PHC), which was conducted in 2007 by the Ethiopia Central Statistical Agency (ECA). The census frame is a complete list of 84,915 enumeration areas (EAs) created for the 2007 PHC. An EA is a geographic area covering on average 181 households.

In the first stage, a total of 645 EAs (202 in urban areas and 443 in rural areas) were selected with probability proportional to EA size (based on the 2007 PHC) and with independent selection in each sampling stratum. A household listing operation was carried out in all of the selected EAs from September to December 2015. The resulting lists of households served as a sampling frame for the selection of households in the second stage.

In the second stage of selection, a fixed number of 28 households per cluster were selected with an equal probability of systematic selection from the newly created household listing. All women aged 15-49 who were either permanent residents of the selected households or visitors who stayed in the household the night before the survey were eligible to be interviewed.

2.9 Data Source/Collection

Data were extracted from the EDHS 2016, after official access to the data was granted. Women questionnaire was used for this study which is an individual record in the EDHS data set. Women who gave birth five years preceding the interview were the focus of the current study. There were 16,583 women eligible for the survey; of these 15,683 women were interviewed yielding a 94.6% response rate.

2.10 Data Management and Statistical Analysis

EDHS 2016 women record was used for this study purpose and based on sampled weight 6,155 women were included in the analysis. These are women who have given birth five years preceding the 2016 national survey and have two or more children. The outcome variable for this study is the birth interval which was recorded and dichotomized as short birth interval and optimum birth

interval. Different independent variables that were selected for this research were recorded and analyzed with the dependent variable.

Stata 14.2 was used for descriptive and inferential statistics. A multilevel logistic regression model was used to assess the association between dependent and independent variables. For multistage clustered samples, the dependence among observations often comes from several levels of the hierarchy. The problem of dependencies between individual observations also occurs in survey research, where the sample is not taken randomly but cluster sampling from geographical areas is used instead. In this case, the use of single-level statistical models is no longer valid and reasonable. Hence, to draw appropriate inferences and conclusions from multistage stratified clustered survey data, we used multilevel modeling[38]. To explain the study population about relevant variables, descriptive statistics like frequency distribution table, pie chart, histogram, and summary measures were computed for important variables. Frequencies were first determined followed by cross-tabulations to compare frequencies. To identify statistically significant variables for a short birth interval, a bivariate analysis was done for each independent variable to outcome variable separately. Those variables p-value < 0.1 in bivariate were imported to multiple Multilevel logistic regression for further analysis at multivariate level. This is because these variables showed an influence on the outcome variable and there is a need to identify whether each has been confounded by another variable or not.

In multiple Multilevel logistic regression those variables P-value <0.05 were considered as a statistically significant variable for short birth interval and were presented with 95% confidence interval (CI) and adjusted odds ratio (AOR). The sampling used during the EDHS 2016 is a two-stage stratified cluster sample methodology. Hence to ensure the actual representativeness of

survey results at the national level, sampling weights were used during the analysis. This study was aimed to identify different factors that plays important role in short birth interval among reproductive-age women in Ethiopia.

Multicollinearity was checked for all independent variables using correlation and variance inflation factor (VIF). Husband education, women's place of childbirth, age of women, distance to the health facility, region women were the residing and marital status of the women were dropped because of Multicollinearity from the model. Variance inflation factor (VIF<5) was achieved for all other variables. The goodness of fit (gof) test was checked for the fitted model and the model was statistically significant with a p-value of 0.6.

2.12 Dissemination Plan of the Results

The finding of this result will be submitted to the College of Medicine Research and Ethics Committee (COMREC), College of Medicine Library, the Health Sciences Research Committee, and University Research and Publication Committee (URPC). The result will be presented at local and international conferences and workshops and finally will be published in peer-reviewed journals.

2.13 Ethical Considerations

Hence this research will use data from EDHS; there is no direct contact with study subjects. On the data, there is no identifier of the study participants like their name. Though the data accessed for this study will not be shared with a third party for any reason.

Chapter 3: Results

3.1 Socio-Demographic Characteristics of Women

This study analyzed a weighted sample of 6,155 reproductive-age women from the 2016 EDHS dataset. Almost 90% of these women are rural residents which means only one in ten women are urban residents. The mean age of women is 31 years with a standard deviation of 6 years (31.2±6.4). Regarding education, 71.2% (4,386) do not have formal education, and 23.5% of women attended primary education.

Orthodox and Muslim religions account for 36.5% and 38.4% respectively. Regarding the working status of women, 28.6% (1,762) of women were currently working and the rest were not. Concerning the wealth index, 45.4% (2,793) of study subjects were poorest and 33.1% were richer (**Table 1**).

Table 1*:* Sociodemographic characteristics of women who have given birth in the last five years and before the survey (weighted N=6155)

Variables	Categories	Frequency	Percentage (%)
Age of women	15-19	39	0.6
	20-24	758	12.3
	25-29	1,805	29.4
	30-34	1,606	26.1
	35-39	1,194	19.4
	40-44	545	8.9
	45-49	205	3.4
	Mean ±SD	31.2±6.4	
Residence	Urban	634	10.3
	Rural	5,521	89.7
Region	Tigray	405	6.6
	Amhara	1303	21.2
	Oromia	2581	42
	Somali	238	4
	SNNPR*	1335	22
	Other**	292	4.2
Marital status	Married	5,877	95.5
	Divorced	268	4.3
	Single	10	0.2
Respondent currently working	Yes	1,762	28.6
	No	4,393	71.4
Wealth index	Poorest	2,793	45.4
	Middle	1,321	21.4
	Richest	2,041	33.1
Highest educational level	No education	4,386	71.2
	Primary school	1,447	23.5
	Secondary school	211	3.4
	College and above	111	2
Religion	Orthodox	2,248	36.5
	Catholic	56	0.9
	Protestant	1,351	21.9
	Muslim	2,360	38.4
	traditional	140	2.3
Husband highest education	no education	3,013	51.3
	Primary school	2,258	38.42
	Secondary & higher	605	10.3
Frequency of listening to a radio	Not at all	4,560	74.1
	Less than once a week	781	12.7
	At least once a week	814	13.2

*SNNPR= South Nation Nationalities People Region. ******Other= (Gambelia, Harari, and Afar)

3.2 Birth History and Fertility Control

Regarding age at first birth of study women 43.7% (2,694) women were given birth to their first birth less than 18 years. More than 3 in 10 women have 6-14 births 34.5% (2,122) whereas 46.1% (2,841) women have 3-5 children (**Table 2**).

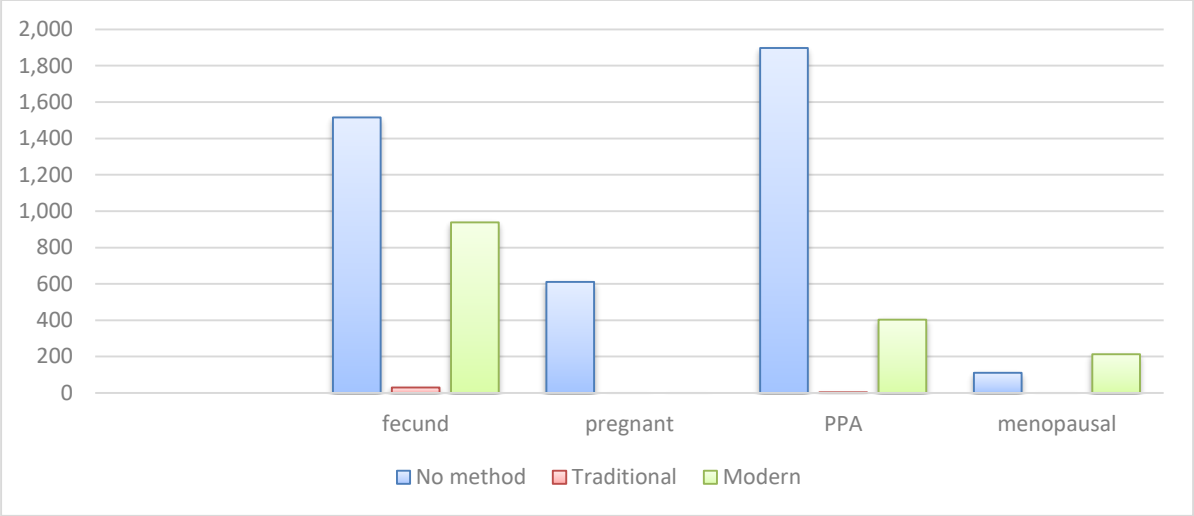
Table 2: Birth history and fertility control of women who have given birth in the last five years and before the survey (weighted N=6155)

Variables	Categories	Frequency	Percentage (%)
Women age at first birth	<18 years	2,694	43.7
	18-34 years	3,458	56.2
	35-40 years	3	0.1
	Mean ±SD	18.5 ±3.4	
Birth intervals (BI)	Short BI (8-35 months)	2,981	48.5
	Optimum BI (≥36 months	3,163	51.5
	Mean ±SD	42.4±23.8	
Parity	2 births	1,192	19.4
	3-5 births	2,841	46.1
	6-14 births	2,122	34.5
Current family planning	No using any method	4,062	66
	Others modern method	745	12
	Depo Provera	1,348	22
Wanted last-child	wanted then	4,421	72
	wanted later	1,066	17
	wanted no more	668	11
The desire for more child	Wants more	3,532	57.4
	Wants no more	2,601	42.2
	Infecund\sterilized	22	0.4
Place of delivery	Home	4,447	72.2
	Health facility	1,708	27.8
Frequency of ANC visits	No ANC	2,506	40.7
	1-4 visits	2,742	44.5
	5 or more	907	14.8
Knowledge of ovulatory cycle	I don't know	1,041	16.9
	At any time	2,019	32.8
	Middle of the cycle	3,095	50.3

Table 3*:* Mediating factors for women who have given birth in the last five years and before the survey (weighted N=6155)

Variables	Categories	Frequency	Percentage (%)
Permission to go to health care	Big problem	2,310	37.5
	Not a big problem	3,845	62.5
Money for health care	Big problem	3,796	61.7
	Not a big problem	2,358	38.3
Distance to a health facility	Big problem	3,677	59.7
	Not a big problem	2,478	40.3
Husband desire for children	Both want the same	2,251	38.4
	Husband wants more	1,525	26.0
	Husband wants fewer	465	7.9
	Don't know	1,623	27.7

Around two-thirds of women 4,062 (66%) were not using any family planning currently. More than half of 3,532(57.4%) women have a desire to have more children. From the study subject, 10% of the women were pregnant. More than 4 in every ten women were currently fecund 42.2% (2,598); of this 58% were unmet need for family planning (women who did not use any method) (Fig 3).



		No method	Traditional	Modern
Exposure	Fecund	1,515	31	939
	Pregnant	611	0	0
	Postpartum amenorrhic	1,897	3	403
	Infecund, menopausal	111	0	213

Figure 3: Cross-tabulation of women exposure to pregnancy and their current family planning utilization status for women of the reproductive age group in Ethiopia, 2020

3.3 Prevalence of Short Birth Interval

The prevalence of short birth intervals in the current study is 48.5% (, 95% CI, 47.18- 49.69). The birth interval of the 6,155 participants was studied and 48.5%of women had short birth intervals which were a birth interval of less than or equal to 36 months with a median preceding birth interval of women were 35 months with an interquartile range of 25. The actual birth distribution of women in the last five years is presented below by histogram (**fig 4**).

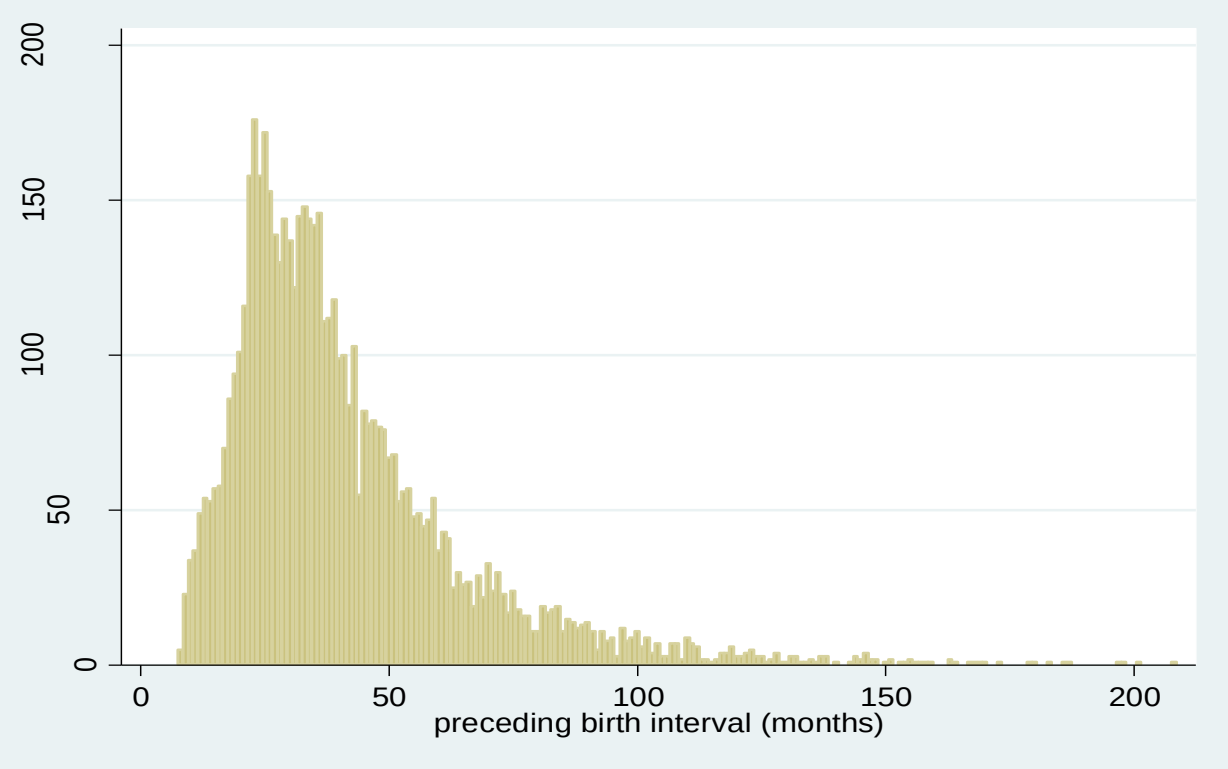


Figure 4: Actual preceding birth distribution of the last five years of reproductive-age women in Ethiopia, 2020

3.4 Factors of Short Birth Interval

3.4.1 Socio-Demographic Factors for Short Birth Interval

Different factors were analyzed to determine predictors of the short birth interval among reproductive age group women by using multilevel logistic regression modeling. Women's religion, place of residence, wealth index, and women working status was found to be statistically significant determinants of birth interval. Women who reside in rural areas are 1.4 times more likely to experience a short birth interval compared to urban resident women [AOR 1.4 (1.1-1.7); P<0.006]. Muslim women had higher odds of having a short birth interval as compared to the Orthodox religion. Muslim women experience a short birth interval 2.3 times more likely than orthodox women [AOR 2.3(1.9,2.7); P<0.001]. Women who currently working were 20% less

likely to have a short birth interval compared to their counterparts [AOR 0.8(0.7, 0.9); P<0.009]. Women who were from the middle and richest wealth quintile were negatively associated with birth interval. The odds of short birth interval reduce by 20% and 30% as the women are from the middle and richest wealth index as compared to women from the poorest wealth index [AOR 0.8(0.7, 0.9), p<0.009] and [AOR 0.7(0.6, 0.9), p<0.001].

3.4.2 Birth History and Fertility Control Factors

There is a statistically significant association between the number of children women have ever born and their birth interval in which, the odds of short birth interval 1.2 times more likely to have women whose age at first birth from 18 to 34 years as compared to women who have age less than 18 years at first birth [AOR 1.2 (1.1, 1.4), p<0.001]. Women who currently use family planning and women who have a desire to have more children were statistically significant determinants for the short birth interval. The odds of having a short birth interval reduces by 20% for women who currently use depo Provera family planning methods when compared to women who do not use any method [AOR 0.8(0.7, 0.9), p<0.04].

The odds of short birth interval decrease by 30% for women who do not want more children compared with women who want to have more children [AOR 0.7(0.6, 0.8), p<0.001]. Regarding the number of antenatal care women have, women who have 5 or more ANC visits have lower odds of short birth interval compared to women who do not have ANC visits for their recent birth history [AOR 0.7(0.6, 0.9), p<0.002].

Women's knowledge of the ovulatory cycle, permission to go to the health facility, and the husband's desire to have more children were not statistically significant in the multilevel model **(Table 4**).

Table 4: Short birth interval and associated factors among women of reproductive age in Ethiopia bivariate and multilevel logistic regression output.

Variables		**Crude OR, 95% CI**	**P-value**	**Adjusted OR, 95% CI**	**P-value**
Residence	Urban	1		1	
	Rural	2(1.7-2.4)	0.001	**1.4(1.1-1.7)**	**0.006**
Religion	Orthodox	1		**1**	
	Catholic	2.5(1.3-4.9)	0.008	**2.4(1.1-4.9)**	**0.02**
	Protestant	1.5(1.2-1.9)	0.001	**1.4(1.1-1.7)**	**0.003**
	Muslim	2.9(2.4-3.4)	0.001	**2.3 (1.9-2.7)**	**0.001**
	Traditional	2.7(1.7-4.4)	0.001	**1.9(1.1-3.1)**	**0.01**
Respondent currently working	No	1		1	
	Yes	0.7(0.6-0.8)	0.001	**0.8(0.7-0.9)**	**0.009**
Wealth index	poorest	1		**1**	
	middle	0.7(0.6-0.9)	0.001	**0.8(0.7-0.9)**	**0.009**
	richest	0.6(0.5-0.7)	0.001	**0.7(0.6-0.9)**	**0.001**
Women age at first birth	< 18 years	1		1	
	18-34 years	1.1(1-1.3)	0.004	**1.2(1.1-1.4)**	**0.001**
	35-40 years	0.9(0.1-7.6)	0.922	4.4(0.4-49)	0.2
Parity	2 births	1		1	
	3-5 births	1.0(0.8-1.1)	0.953	0.9(0.8-1.0)	0.17
	6-14 births	1.3(1.1-1.5)	0.001	1.1(0.9-1.3)	0.15
Modern contraceptive	No using any method	1		1	
	Depo Provera	0.6(0.5-0.8)	0.001	**0.8(0.7-0.9)**	**0.04**
	Others modern method	0.7 (0.5-0.9)	0.002	1(0.8-1.2)	0.9
The desire for more child	wants more child	1		1	
	Don't want more child	0.8(0.7-0.9)	0.001	**0.7(0. 6-0.8)**	**0.001**
	Infecund\sterilized	0.3(0.1-0.7)	0.014	0.9(0.4-2.)	0.8
Frequency of ANC visits	No ANC	1		1	
	1-4 visits	0.7(0.6-0 .8)	0.001	0.9(0.7-1.0)	0.06
	5 or more	0.55(0.47-0 .64)	0.001	**0.7(0.6-0.9)**	**0.002**
Knowledge of ovulatory cycle	I don't know	1		1	
	At any time	1.2(1.03-1.39)	0.017	1(0.8-1.2)	0.9
	Middle of the cycle	1.03(0.9-1.17)	0.753	1 (0.8-1.1)	0.6
Permission to go to health care	Big problem	1		1	
	Not a big problem	0.6(0.5-0.7)	0.001	1(0.9-1.1)	0.9
Husband desire of children	Both want the same	1		1	
	Husband wants more	1.2(1.04-1.36)	0.007	1(0.9-1.2)	0.4
	Husband wants fewer	1(0.8 -1.2)	0.873	0.9(0.7-1.1)	0.2
	Don't know	1.2(1.0-1.3)	0.017	1(0.9-1.2)	0.9

Adjusted odd ratio P< 0.05 is Significantly associated.

Chapter 4: Discussion

This paper aimed to recognize the level and factors of short birth intervals in Ethiopia. The overall prevalence of short birth intervals (less than 36 months) among the childbearing women was 48.5% (2,981). This shows that almost half of women reported the experience of the short birth interval among women of childbearing age in Ethiopia evidenced by the 2016 demographic and health survey of secondary data analysis. The short birth interval was common among women from rural residences, women being religious and, women within adult age was significantly associated. Other factors like parents having the highest wealth index, women who use Depo Provera, women currently working, and women who have a frequency of ANC visits of more than five births were protective for the short birth interval in Ethiopia.

This study, reveals that almost half of women (48.5%, 95% CI, 46.18- 49.69) in Ethiopia had a short birth interval. In this study unmet need for family planning was 58%, which might contribute to an increased short birth interval. The result of the current study prevalence was in line with a population study conducted in Iran (48%), South-Eastern Nigeria (49%), developing regions in Ethiopia (46%), and Tanzania (48.4%) [21-24]. This finding is higher than a study conducted in the Democratic Republic of Congo (30.2%) [25], rural setting Bangladesh (24.6%) [26], Dabat district, Northwest Ethiopia (39.1%) [7], Northern Ethiopia (40.9%) [16], Northern Ethiopia (23.3%) [27]. This could be the variation of the study period and socio-demographic characteristics. The difference in prevalence across studies might be the socio-demographic feature of the study participants, the time gaps between the study periods, accessibility of contraceptive methods, and the difference in data collection methods. Some studies are institutional-based this

may contribute to the difference in the prevalence of short birth intervals, probably due to socio-demographic differences between women who came to health institutions and women who were selected from the community.

Nevertheless, the prevalence is lower than a study conducted in Yumbe Hospital, Uganda(52.4%) [28], Jimma Zone, Southwest Ethiopia (59.9%) [29], and Kassala, Eastern Sudan (60.6%) [30]. This might be described by the difference in study designs and the small sample size in the preceding studies. Furthermore, this disparity might be explained by a difference in cut-off values used to determine a short birth interval. Those previous studies considered short birth intervals if birth intervals were less than 36 months, while in this study short birth intervals were defined as less than 33 months.

In this study, it was found that the odds of the short birth interval among women whose live counterparts were higher compared to women who were urban dwellers. The current findings are consistent with the previous studies conducted in developing regions of Ethiopia [21], in Southern Ethiopia [1], and the Democratic Republic of Congo [25]. This might be explained by women living in the counterparts who are socio-economically disadvantaged [26], inaccessible to modern contraceptive methods, shortage of social services and access to health information, low educational status and unemployment opportunities could have brought about variation by residence. Consequently, they are more likely to experience a short birth interval compared to women residing in an urban area of the country.

Childbearing time intervals showed variance by the age of the young or adult women had short birth intervals more than older age women. This finding is in correspondence with studies conducted in Lemo district, southern Ethiopia [1], Arba Minch District, Ethiopia [11], and a study conducted in northern Ethiopia [16]. This might be due to adult women being more likely to have children for a variety of reasons such as high childbearing reproductive age groups, mostly women who give birth at those age groups with less risk of pregnancy and being early on in the family-building process. Instead, older women are later in their childbearing process and are likely to have achieved their desired family size and hence likely to have long subsequent spacing; they are also likely to be less fertile leading to longer spacing. Also, this might be described as older women are more likely to have the desired number of children with their ages.

This study revealed that as being Muslim followers more likely to have the odds of a short birth interval when compared to Orthodox Christians and other religions. This finding is similar to a study done in Selemti district, Northern Ethiopia [27]. Although not always significant Coptic-orthodox, Protestant, and Others like catholic and traditionalists tend to space births more distantly than Muslims [39]. This might be due to the non-use of modern contraceptive methods among Muslim followers compare with other religions. This shows that a study conducted in Bahir-Dar reported 63.9% of Orthodox Christian followers versus 36.1% of Muslim followers were using modern family planning methods [40]. Besides, the possible reason might be a difference in the desire for having many children among Muslims.

Women having high parity were more experienced by short birth intervals compared with those women who have less parity. This finding was inconsistent with a study were conducted in rural

Bangladesh women who achieve higher-order parities were less likely to experience short birth intervals [26]. This could be explained based on the year of women get at the first marriage was matters. This explanation has supported the study conducted in Ethiopia women aged between 20 and 24 years at first marriage have more short birth intervals [41].

In this study, results reveal that women who use modern contraceptives method were less likely to have a short birth interval compared with those women who haven't used modern contraceptives. This finding is in line with the study done in Arba Minch District, Ethiopia [11], and the study was done in rural pastoral communities of southern Ethiopia [20]. In another way, the study done in different places shows that those women who do not utilize modern contraceptives have fewer short birth intervals [16,27]. This is shown clearly that the purpose of the contraceptive method is either to limit or space births [42].

This could be due to modern family planning utilization that can delay the subsequent pregnancy. This implies that women use any contraceptive methods, they are deliberately avoiding short birth intervals.

The wealth index of the women was also a determinant of short interbirth intervals. Consistent with evidence from a study done in Arba Minch District, Ethiopia [11] and a study done in Saudi Arabia [43]. This can be partly explained by the fact that wealthy women are more likely to access health care information and afford health care services and materials and thus can easily apply scientifically recommended interbirth spacing. Similarly, women in the better wealth category

could probably have better access to information and education and hence could have longer birth intervals [1].

The strength of the study was based on the most current EDHS with a nationally representative large sample size. Moreover, this study applied multilevel modeling to handle the hierarchical nature of the EDHS data. Study subjects were selected randomly with an adequate sample size that has been taken so that it is more representative of all regions. Finally, the sample size of this study generalization of the results of factors to the whole population. Even though, some limitations should be considered when interpreting the results of this study. The reproductive variable like breastfeeding, postpartum amenorrhea, and sexual abstinence was not furtherly analyzed because of a lack of adequate and reliable information but these were believed to be important determinant predictors in other studies so it was not possible to examine the effects of these variables on birth spacing practices. Also, the study might have recall bias since the participants were asked about their birth history that took place 5 years or more before the survey. Finally, as any cross-sectional study cause and effect relationship was not possible to establish for the factors in the study for it is impossible which factor occurs first.

Chapter 5: Conclusion and Recommendation

5.1 Conclusion

The prevalence of birth spacing was 48.5% in this study which is an indication that almost half of women reported the experience of the short birth interval among women of childbearing age in Ethiopia.

The main factors that determine women's experience of the short birth interval were women who live in rural settings, women being Muslim and protestant religion, and women age at first marriage were statistically significantly associated with short birth interval. Similarly, Other factors like parents having the highest wealth index, clients who use modern contraceptive methods, women having the regularity of prenatal visits more than five births, and women near to menopausal age were protective for the short birth interval in Ethiopia.

5.2 Recommendations

a. Based on the above findings, the following recommendations are suggested: Greater attention should be given to adults ages (18-34 years old) being they are more vulnerable to have a short birth interval.

b. Education needs to be intensified to ensure that more mothers accept and practice spacing births using the currently approved birth spacing interval (36-60 months). So that the minister of health should encourage and promote female health education through health extension workers and adult education in each region.

c. In Ethiopia, all levels of health departments should give attention and work on creating awareness about the importance of spacing children. They should better induce the childbearing age mothers that birth spacing is the most crucial intervention for the health of both mother and the child born to her, even helpful in building one's economic condition of the individual to the country level at large.

d. In Ethiopia, the health bureau particularly, the maternal and child health program should escalate their program on influencing mothers through giving information about the necessity of using modern contraceptives in spacing children and to improve their health as well as the child especially.

e. Furthermore, Federal, Zonal, and district health officials, and health extension workers should provide information on the importance of birth intervals for communities and societies at large. Similarly, they should strongly ensure the mothers in the rural resides as family planning is cost-free and even make available those contraceptive methods so that mothers will get access to use easily.

f. The findings of this study show that women's social status was consistently significant with short birth intervals. Therefore, any concerned body working relevant to these issues, government, and non-government organizations should design projects (income-generating and education) to support women especially to those none educated and having the lower social status to increase their economic independence and decision-making power to improve their status at home or in the community.

g. Moreover, male education should also be encouraged by local stakeholders. Most women do not make decisions about family planning by themselves, messages about

birth spacing for husbands and other family members also should be given in different ways.

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Appendices

Appendix 1: Introduction and Consent (used in EDHS)

Hello. My name is _____. I am working with the Central Statistical Agency (CSA). We are surveying health and other topics all over Ethiopia. The information we collect will help the government to plan health services. Your household was selected for the survey. The questions usually take about 30 to 60 minutes. All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time. In case you need more information about the survey, you may contact the person listed on the card that has already been given to your household.

GIVE CARD WITH CONTACT INFORMATION

DO YOU HAVE ANY QUESTIONS? MAY I BEGIN THE INTERVIEW NOW?

SIGNATURE OF INTERVIEWER_____ DATE_____

RESPONDENT AGREES TO BE INTERVIEWED (1=YES, 2=END)

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED (2=END)

RECORD THE TIME (IF YES)

HOURS . . . . MINUTES . . . .

Appendix 2: Questionnaire

Questionnaire (data extraction tool) for level and determinants of the short birth interval among reproductive age group (15-49 years) women in Ethiopia, 2020 a logistic regression analysis

s.no	Socio-demographic characteristics	Response	Skip
101	What is your current marital status	1. Married 2. Living with a man 3. Not in union	
102	did you live in an urban or a rural area	1. urban area 2. rural area	
103	What is your occupation	_____	
104	How old were you at your last birthday	age in completed years____	
105	What is the highest level of school you attended?	1. Primary 2. Secondary 3. technical/vocational 4. higher	
106	What is your religion?	1. orthodox 2. catholic 3. protestant 4. Muslim 5. other	
107	What was the highest level of school he attended?	1. Primary 2. Secondary 3. technical/vocational 4. higher	
108	Wealth index combined (recoded)	1. poorest 2. poorer 3. middle 4. rich 5. richest	

109	what is your (husband's/partner's) occupation	_____	
	Past obstetric and birth history		
201	Have you ever given birth	1. yes 2. no →	Go to 301
202	Do you have any son or daughter who gave birth who are now living with you	1. sons at home _____ 2. daughters at home_____	
203	How old were you when you first started living with your husband?	Age in completed years _____	
204	Have you ever given birth to a boy or girl who was born alive but later died	1. Yes 2. no	
205	Did you give birth between 2010-2015?	3. Yes 4. no	
206	How many births have you given between 2010-2015	_____	
207	How many months were there between the previous birth and recent birth	_____	
	When you got pregnant, did you want to get pregnant at that time	1. Yes 2. No	
208	After birth Was weighed at birth?	1. Yes 2. no →	Go to 301
	How much did your baby weigh?	1. Kg from card _____ 2. Kg from recall _____ 3. I don't know	
	Fertility control and awareness		
301	From one menstrual period to the next are there certain days when a woman is more likely to be pregnant?	1. Yes 2. no ⇒ 3. DON'T KNOW	Go to 304

302	If yes when	1. just before her period begins 2. during her period 3. right after her period has ended 4. halfway between two periods 5. other	
304	After the birth of a child, when can a woman become pregnant	1. before her menstrual period has returned 2. Is this time just before her period begins? 3. during her period 4. right after her period has ended 5. halfway between two periods 6. Don't know	
305	Are you using any family planning methods to delay or avoid pregnancy	1. Yes 2. no	
306	Did the health worker talk to you about Family planning?	1. Yes 2. no	
308	Would you like to have (a/another) child, or would you prefer not to have any (more) children	1. have (a/another) child 2. no more/none 3. can't get pregnant 4. undecided	
	Mediating factors		
401	In the last 13 months, have you visited a health facility to care for yourself	1. Yes 2. no	
402	Who decide about contraceptive use for yourself	1. respondent 2. husband/partner 3. respondent and husband	

		4. someone else 5. other _____	
401	Who usually makes decisions about health care for yourself	6. respondent 7. husband/partner 8. respondent and husband 9. someone else 10. other _____	
402	When you are sick and want to get medical advice or treatment, is each of the following a big problem or not a big problem	1. Permission to go 2. Getting money 3. Distance 4. Go alone	

……..…THE END……