



PHARMACOLLEGEHAWASSA CAMPUS

SCHOOL OF PUBLIC HEALTH

**PREVALENCE OF SHORT BIRTH INTERVAL AND
ASSOCIATED FACTORS AMONG MARRIED WOMEN AT
ARORESSA DISTRICT, SIDAMA REGION, ETHIOPIA: A
COMMUNITY- BASED CROSS SECTIONAL STUDY**

MPH THESIS REPORT

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SEPTEMBER2023

HAWASSA, ETHIOPIA

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FACTORS AMONG MARRIED WOMEN AT ARORESSA DISTRICT,
SIDAMA REGION, ETHIOPIA**

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PHARMA COLLEGE HAWASSA CAMPUS IN PARTIAL FULFILLMENT
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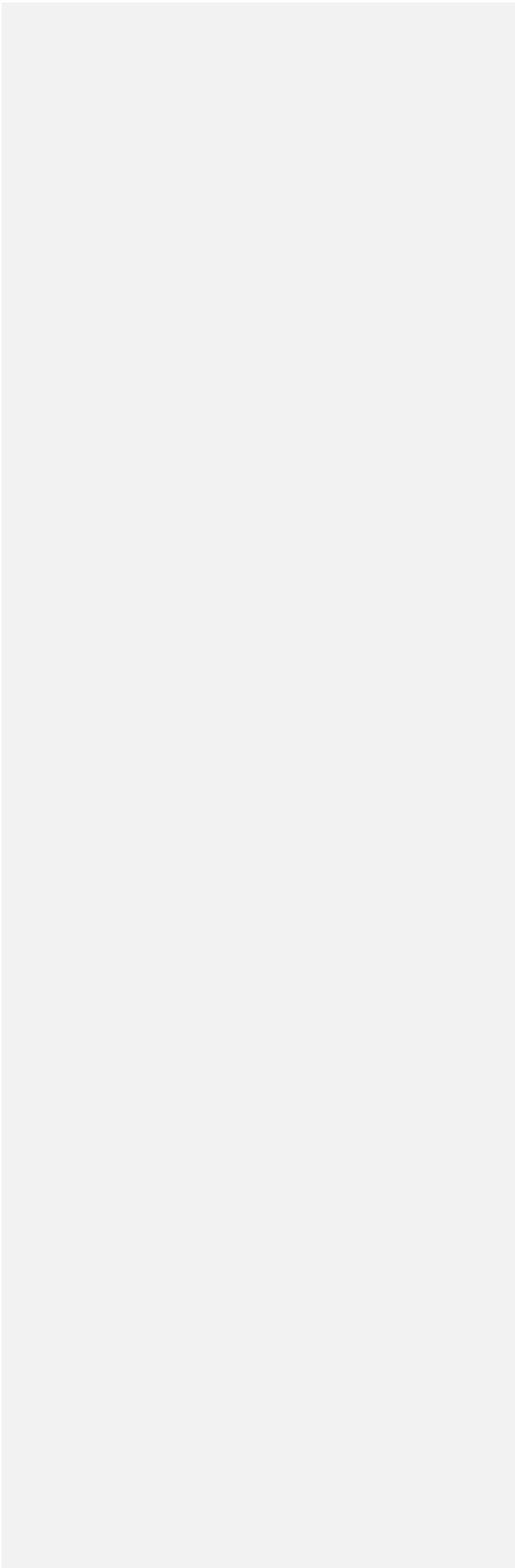
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Declaration

I, Worku Worana, hereby declare that the thesis entitled “Prevalence of short birth interval and associated factors among married women who have at least two consecutive births in Aroresa district”submitted by me to the award of the degree of master of science in public health at Pharma College of Health sciences, is original work and it hasn’t been presented for the award of any other degree.

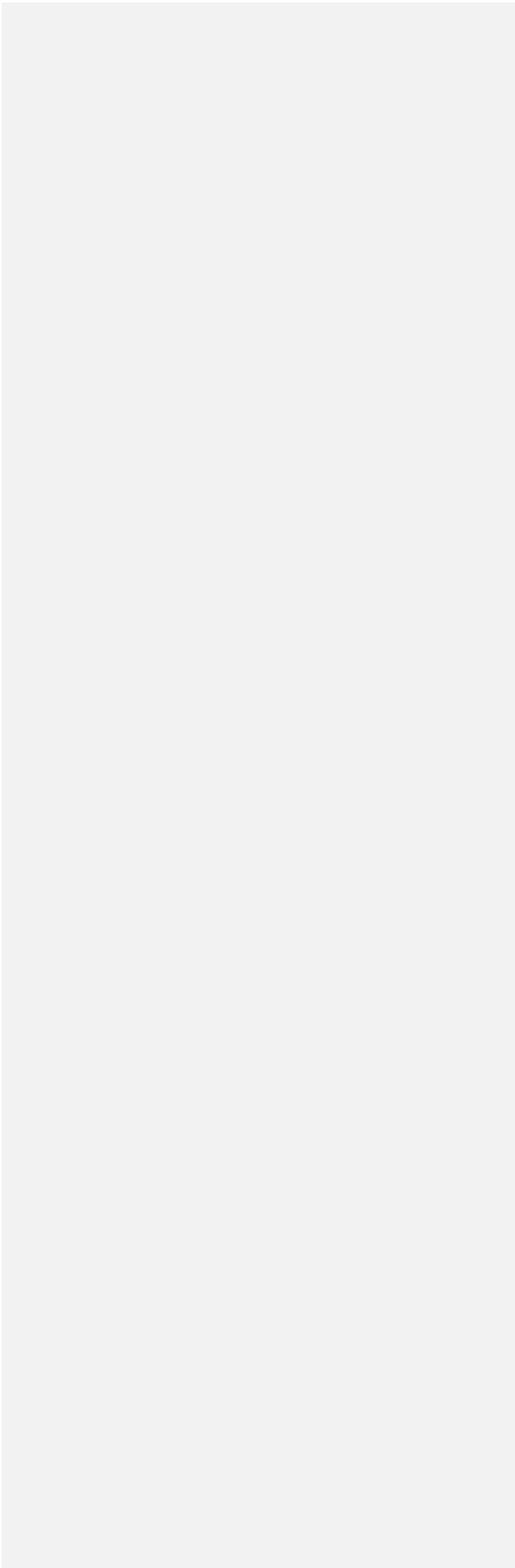
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I hereby certify that I have supervised, read and evaluated this thesis titled “prevalence of short birth interval and associated factors among married women who have at least two consecutive births in Aroresa district”by Worku Worana prepared under my guidance. I recommend the thesis submitted for oral defense.

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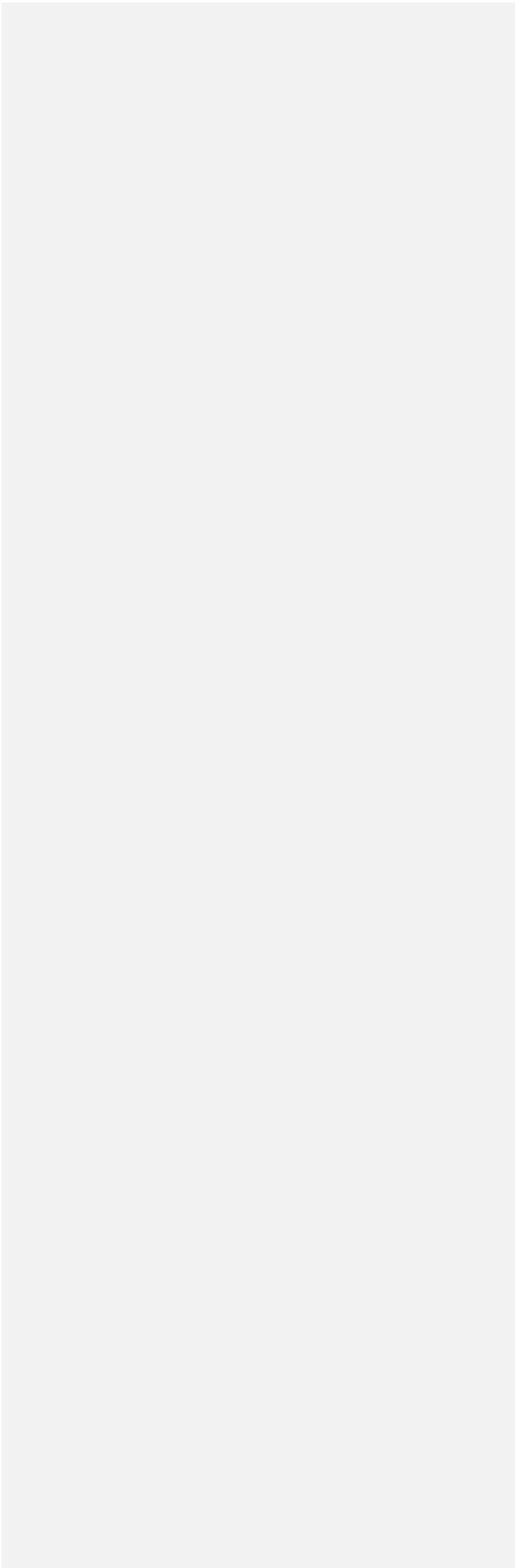
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As a member of the MPH thesis Open Defense Examination, I certify that I have read and evaluated the thesis prepared by Worku Worana. I recommend that the thesis be accepted as fulfilling the requirements for the degree of Master in public health.

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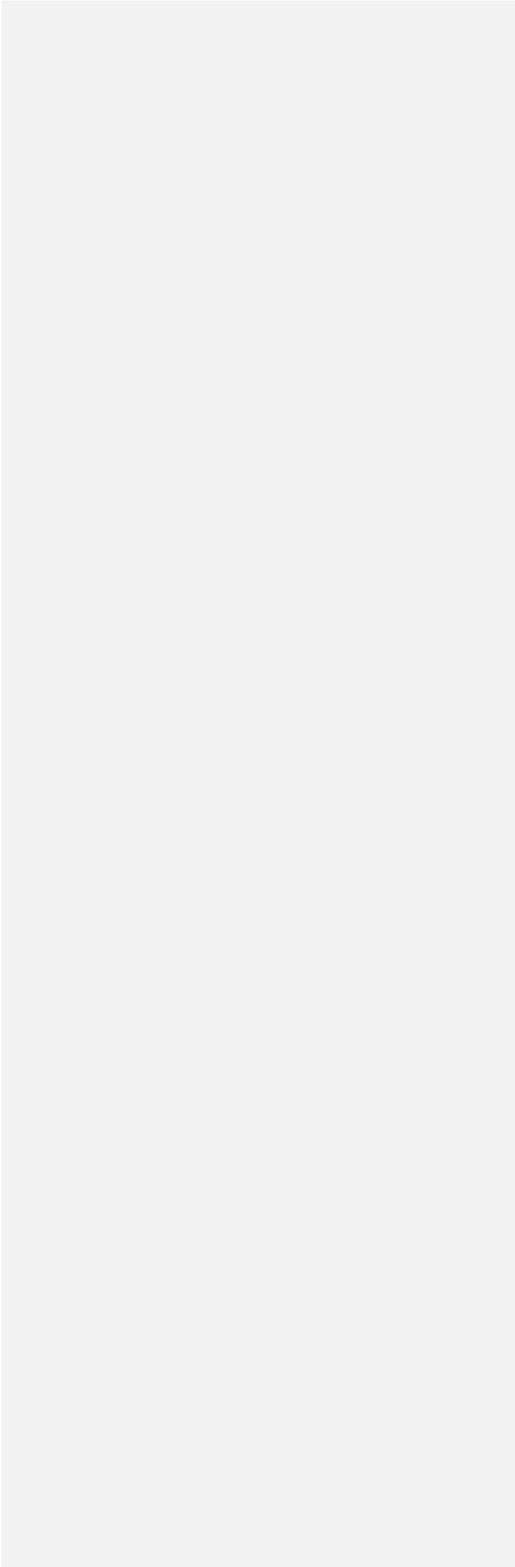
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ABBREVIATIONS AND ACCRONYMS

ANC	Antenatal Care
AOR	Adjusted Odds Ratio
BI	Birth Interval
CI	Confidence Interval
DHS	Demographic Health Survey
ETB	Ethiopian Trade Bank
FMOH	Federal Ministry of Health
FP	Family Planning
GOE	Government of Ethiopia
HEW	Health Extension Workers
MMR	Maternal Mortality Ratio
SBI	Short Birth Interval
WHO	World Health Organization

ABSTRACT

Background: Birth interval has acquired importance in public health and family planning because of its implication for fertility, maternal, and child health. A short birth interval is associated with adverse perinatal, maternal, and infant outcomes. Moreover, too short birth interval lead to high fertility, which in turn contributes to accelerated population growth and undermines developmentefforts.This study aimed to assess the prevalence of short birth interval andits associated factors among married women who have at least two consecutive live births in Aroresa district, Sidaama Region, South East Ethiopia.

Method: - A community-based cross-sectional study was conductedfrom July 1/2023 to August 30/ 2023.The multistage sampling technique was used to select 608women who gave at least two live births. Data were collected by face-to-faceinterviewer questionnaires. Bivariate and multivariable binarylogistic regression analyses were executed.Model fitness and multicollinearity were checked. Statistically significant associations of outcome and independent variables were declared at a P-value of < 0.05.

Result: The prevalence of short birth interval was **47.5% (95%CI 43.7, 51.3)** in the study area. Preceding child being female (AOR = 1.9, 95% CI: (1.32, 2.67)), non- user of contraceptive before conception of the last child (AOR=2.7, 95% (1.9, 3.9)), breastfeeding of the preceding child<24 months (AOR = 2, 95% CI (1.43, 2.9)) and preceding childbeingdead (AOR=2.6, 95% CI: (1.4, 4.9)).werestatistically significant with a short birth interval at a P-value<0.05.

Conclusion:This study found a higher prevalence of short birth intervals in the area compared to previous studies.Factors such as having a preceding female child, not using contraception, breastfeeding for less than 24 months, and having a deceased preceding child were significantly associated with short birth intervals. These factors pose challenges in achieving optimal birth spacing and impact maternal and child health outcomes.

Keywords: - Birth interval duration; Reproductive age women; maternal health; Child health

1. INTRODUCTION

1.1 Background

Birth interval is defined as the time interval between a live birth and the birth of the next child(1).It has conventional special care in public health and family planning because of its insinuation for fertility, maternal, and child health.Two consecutive live births should be separated by at least 33 months, according to the World Health Organization (WHO). A birth interval of less than 33 months is regarded as short, while the ideal birth interval is thought to be between 36 and 59 months(2).Short birth interval (SBI) is recognized to have a negative impact on a range of health outcomes, including preterm delivery, stillbirth, intellectual disability, and developmental delay(3).Children who are born soon after older children experience the same problems. As the interval between deliveries comes closer, the baby weakens and withers (4).

Similar to this, poor pregnancy outcomes linked to shorter pregnancy intervals can be attributed to a number of mechanisms, such as fictitious maternal malnutrition (nutrition stress brought on by prolonged pregnancy and lactation) and potential maternal foliate deficiency. This means that a short birth interval would have an impact on women's ability to recover after pregnancy(3).

Shorter birth intervals are more frequent in low- and middle-income countries, where 17% of married women of reproductive age are reported to have unmet needs for family planning (5).The Sustainable Development Goal of eradicating unnecessary newborn and maternal mortality is hindered by the global health issue of short birth spacing (6).

Globally, the estimated average MMR was 216 per 100,000 live births, but in sub-Saharan Africa, the estimated average MMR was 546 per 100,000 live births(7).The world's population has been expanding quickly in recent decades, despite the fact that rates of population growth are currently far slower in affluent nations than in developing ones. High fertility African nations account for a large portion of this growth. Particularly in Sub-Saharan Africa and Asia, population growth rates are surpassing economic expansion(8).Africa has the world's highest fertility rate and fastest rate of population expansion. Sub-Saharan Africa would account for over 40% of births and 37% of children under the age of five by the year 2050. Without further advancement in the area, the number of deaths among children under the age of five may therefore continue to rise(9).

Shorter gestational intervals and higher baby and child mortality are associated, according to the evidence. It would also have said that there is a connection between short inter-birth intervals and a higher risk of low birth weight, small for gestational age (SGA), labor dystocia, and maternal morbidity and mortality. Shorter intervals between births are also linked to higher rates of premature membrane rupture, third-trimester bleeding, anemia, and puerperal endometritis, all of which increase the risk of hemorrhage, the main cause of maternal death, in women(10).

Similar to many other Sub-Saharan African nations, Ethiopia still has high rates of fertility, maternal mortality, and child mortality. According to recent estimates, the nation still has higher rates of infant, neonatal, and maternal mortality, which are 767 per 100,000 live births, 37 per 1,000 live births, and 59 per 1,000 live births, respectively(11).An organized effort has been made to lower fertility by the Federal Ministry of Health (FMOH), the department of reproductive health, and the regional health bureaus. They have been implementing multifaceted tactics at the local and national levels, creating a supportive climate for family planning to be at the center of a number of significant strategies to address optimal birth spacing and lowering fertility (12).Therefore, for nations like Ethiopia with a population policy aiming to reduce reproduction, it is crucial to determine the amount of birth interval and the factors influencing birth spacing.

1.2. Statement of the problem

A family's socioeconomic situation may be negatively impacted by a short birth interval, and socioeconomic status may also be a decisive factor in a short birth interval. For instance, low socioeconomic status couples might decide to put off having children until their financial condition improves, but a bad socioeconomic situation might develop owing to a shortened gestation period as a result of higher economic demand to care for the pregnancy and child. It is also crucial to note that variables influencing decisions about having children vary between groups and sometimes seem disagreed(13). Poorly spaced pregnancies have been documented worldwide to result into unwanted maternal and child health outcomes. An estimated 11 million under five children die yearly, 99 percent of which occur in developing countries(14). Birth intervals less than 33 months are associated with increased still birth rate and neonatal mortality(15). This outline, combined with high unplanned fertility rates, makes it difficult for women to become productive members of society, limiting their contribution to economic development. With shorter birth intervals, sibling competition increases. It is argued that when a new baby is born, the family would have likely invest more of its limited resources in the newborn's care, leaving the other children to suffer or receive an insufficient share of the resources distributed among siblings. On the other hand, optimal birth spacing provides the family with the greatest health, social, and economic benefits. Despite prior research recommending a 2-year gap between two consecutive pregnancies for improved mother-child outcomes(16), recent evidence showed that births should be spaced at three to five years apart to ensure maximum health benefit for mothers, newborn and older children. However, too long birth intervals (>5 years) are associated with increased risk of complications such as preeclampsia and eclampsia as the mother loses protective effect from the previous pregnancy(10, 17). The study done in rural community of southern Ethiopia showed that Children born too soon after a previous birth, especially if the interval between the births is less than two years, are at increased risk for health problems and death at a young age(17). The median birth interval has not changed significantly over the past 20 years, however the average birth interval has slowly but gradually increased. The median birth intervals in 2000, 2005, 2011, 2016, and 2019 were 33.6, 33.8, 33.9, 34.5, and 35.8 months, according to the Ethiopian Demographic and Health Survey (18).

In addition to having negative effects on health, narrowly spaced birth intervals hasten population expansion and undermine development initiatives. It makes it challenging for women to contribute as productive members of society, reducing their ability to aid in economic growth. Furthermore, it is likely that the family would devote a greater portion of its limited resources to caring for the newborn when one is born, while the other children would only receive an insufficient proportion of the resources(19).Literature from various developing nations, particularly from Africa, revealed that the occurrence of short birth intervals was determined by factors including maternal education, maternal age, early marriage, inability to breastfeed and inadequate knowledge, attitude and practice toward the use of modern contraceptives, and various sociodemographic factors(13, 20).Interventions including encouraging female education and empowerment, raising awareness, improving nursing practices, and increasing the use of modern contraception have been tried to some extent to address these issues (factors); but, those interventions are still not well-practiced in Ethiopia.Even with those initiatives, Ethiopia and the majority of other African countries still struggle to adopt optimal birth spacing.According to a study conducted in the Tselemti district of the Tigray region, there was the lowest prevalence of short birth interval 23.3 %(21). However, a study indicated that the highest prevalence of short birth intervals (59.9%) was seen in Serbo town, Oromia region(22).Other research from southern Ethiopia revealed that the median birth interval there was 33 months, with over half (57.5%) of women practicing shorter birth intervals. The median birth time in a similar study from southern Ethiopia was once more found to be 31 months, which is less than the advised birth time spacing (16, 17).Therefore, more research is required to identify the variables that undermine Ethiopia's ideal birth spacing approach. Therefore, for nations like Ethiopia, which is the most populous in Africa after Nigeria, understanding birth interval practice and factors that affect women's birth interval is crucial.

1.3. Significance of the study

Maternal and infant mortality remain high in our nation, as they are in many other developing Sub-Saharan African nations. A crucial stage in carrying out the proper action is acquiring research-based knowledge about birth interval. Since short birth intervals are a problem that may be controlled, improving mother health requires a better understanding of the determinants. However, there is little data on the factors affecting birth interval in the research area, and even the statistics that are available nationwide are uneven.

The results of this study will give local health care providers and health extension workers crucial information they can use to design effective interventions for mothers at the facility and community levels, which can undeniably help persuade mothers to maximize the time between their children. Additionally, the findings would be useful in informing local, regional, and district health care planners as well as potential national policy makers about the state of the study area's birth interval situation and in developing appropriate strategies for promoting increased use of the ideal birth interval and ensuring further reductions in maternal and infant mortality.

The results of the study may also be useful to other researchers as a starting point for future research.

2. LITERATURE REVIEW

2.1. Magnitude of birth interval

Globally, women, particularly those from developing nations, frequently practice short childbirth intervals. A study of the fertility transition in sub-Saharan Africa reveals that the median birth interval there was longer than in Asia and South America, at 25 months. Sub-Saharan Africa accounts for 20% of all cases with short birth intervals, while Central Asia accounts for 33% of all cases (23). Another cross-sectional study conducted in India among married women reveals that only 40% of them adopt optimal birth spacing, despite the country's average birth interval being 22 months (24).

According to a survey conducted in Saudi Arabia, the average time between births was 2.38 years (25). The results of another study conducted in Babol, Northern Iran, showed that the mean birth interval was 25.7 months (26). The median time between births was found to be 33.4 months in a study from Rufiji, Tanzania (27). The median time between births was 33.5 months, according to a community-based cross-sectional study done in urban Saudi Arabia. In this study, 35.1% of women waited between 2 and 3 years before giving birth, whereas roughly a quarter of women had a mean birth interval of less than 2 years (28). According to a study from Ethiopia, the majority of women (57%) practice short birth interval with the median birth interval being 33 months (29).

2.2. Factors associated with short birth interval

2.2.1 Socio demographic factors

Data from numerous research has shown the importance of sociodemographic factors, economic conditions, and birth history in influencing the interbirth intervals among mothers who are of childbearing age (23). In this regard, illustrative factors that have been repeatedly studied to determine the length of the birth interval include the mother's age at last delivery, marital status, mother's occupation, mother's educational level, mother's religion, mother's place of residence, monthly income, husband's educational level, husband's occupation, the sex of the index child, the index child's survival status, parity, length of breastfeeding, and modern contraception use.

According to a cross-sectional study done in Bangladesh in 2012 with the help of key informants on births and deaths among married women and their children, women who had their first child within less than 33 months of the second were twice as likely to experience a stillbirth or

neonatal death in the subsequent pregnancy(14).In a Tanzanian study, the amount of time between two live births was found to be inversely associated to mother age and non-adherence. The percentage of poorly spaced birth intervals was highest (76%) among the youngest (15–19) women and fell fast with advancing age to as low as 30% among the oldest (45–49) women ($p < 0.001$)(27).According to the 2019 Ethiopian DHS report, young mother age had a strong association with birth interval, supporting the aforementioned findings. From 27.3 months for births to women aged 15 to 19 to 41 months for births to women aged 40 to 49, the median birth gap rises with age(18).Birth intervals are also found to be strongly predicted by female education. A study conducted in Nepal found a high statistical correlation between birth interval and educational attainment. Compared to women with elementary school or no formal education, those with secondary education and higher were more likely to have longer childbearing intervals(30).Higher education among women was an independent predictor of longer birth intervals, according to another study conducted in Jordan(31).According to a study conducted in southern Ethiopia, women who have never had formal education are 1.9 times more likely to practice short birth intervals than those who have. This is in contrast to women who have received formal education. (AOR 1.89, 95% CI (1.15, 3.37)(29).In relation to the respondents' occupations, a study from Nepal revealed that mothers' occupations were proven to be a highly reliable predictor of birth interval. Compared to stay-at-home mothers, working mothers had a higher likelihood of experiencing more frequent births. ($p < 0.05$).The study conducted in Nepal found a strong relationship between spouses' jobs and birth intervals. Compared to women whose husbands were in business and cottage industry, those whose husbands were in agriculture saw longer pregnancy intervals(30).Another research project carried out in Southern Ethiopia revealed that women whose husbands were students were found to be important predictors of short birth intervals(29).Additionally, it has been discovered that a woman's residence has an impact on how long it takes between her pregnancies. Urban women had longer birth intervals than their rural counterparts, according to studies in Nepal and Tanzania. ($p < 0.05$) (30, 32).Another Tanzanian study found that, with a statistically significant difference, rural women had greater rates of short birth spacing (50% versus 45%) than their urban counterparts. ($p < 0.001$) (27).Another significant predictor of birth interval was the respondents' economic condition. Lower family wealth was found to be an independent predictor of shorter birth intervals in a Saudi Arabian study(25). A research done in the Lemo District of Ethiopia,

however, revealed that as one moved from the lowest to the highest quartile of the income index, the median length of the birth interval increased. (AOR = 0.49, 95% CI (0.25, 0.96)) (33). According to a study conducted in Rufiji, Tanzania, children who were born outside of a health facility were more likely to have interbirth intervals that were shorter than the suggested minimum duration than children who were born inside of a health facility. (OR = 1.81, 95% CI (1.68–1.94)) (27). According to a study conducted in Pakistan, the previous birth interval statistically correlates with the present birth interval (34). The index child's gender was discovered to be a significant predictor of respondents' birth intervals. According to a Manipur study, women who had previously given birth to a girl child experienced significantly shorter average birth intervals. ($p < 0.01$) (23). Women who had female index children were more likely to have short birth intervals than moms who had male index children, according to a study conducted in the Oromia Region of Ethiopia (35). Birth intervals were discovered to be significantly influenced by the previous child's survival status. A study conducted in Pakistan found that moms who had lost a child in the past were more likely to have subsequent pregnancies that were close together than mothers who had children who were still alive (34). In a study of multiparous Iranian women, length of breastfeeding was discovered to be a reliable predictor of birth intervals. According to the research, women who breastfed their children for more than 24 months had a higher likelihood of having additional children at a later age than those who breastfed for less than 6 months. (AOR = 0.01, 95% CI (0.004–0.046)) (26). The use of contraceptive methods was also mentioned as one of the key factors affecting birth interval duration.

In conclusion, evidence from numerous studies revealed that the mother's age, occupation, educational level, place of residence, monthly income, husband's educational and occupational status, the index child's sex, index child's survival status, parity, length of breastfeeding, and use of modern contraception were factors found to be independent predictors of short birth interval.

Research conducted in a number of developing and developed nations has shown that short birth intervals have an impact on mother and child health. The limited studies that have been conducted to determine the causes of Ethiopia's short birth interval do have some serious shortcomings. For instance, almost all past research calculated the birth interval's duration using mothers' recollections of their children's birthdays. This could either underestimate or overestimate the length of the birth gap due to recall bias. The third drawback is that many

studies employ various cutoff points to decide if a birth interval is too short or too long. For instance, studies in Yabello, Oromia region, and Lemo, Southern Ethiopia, utilized 36 months as the cutoff point for categorizing birth intervals as short or ideal, and they relied on mothers' memories of their children's birth dates (33, 35). While study done in Gondar, Northwest Ethiopia, solely examined the median time and likelihood of giving birth following index child, it used no cutoff threshold for birth interval duration(36). As a result, rather than relying on maternal memory recall, the length and reasons of birth gaps were evaluated in this study utilizing documented data on the children's birth dates. The World Health Organization's classification of short or regular birth spacing duration served as a useful guide.

2.3. Conceptual frame work

This conceptual framework was taken from many literatures to investigate the causes of short birth intervals. It demonstrates how short birth intervals and a number of directly and indirectly related factors are related in the research area.

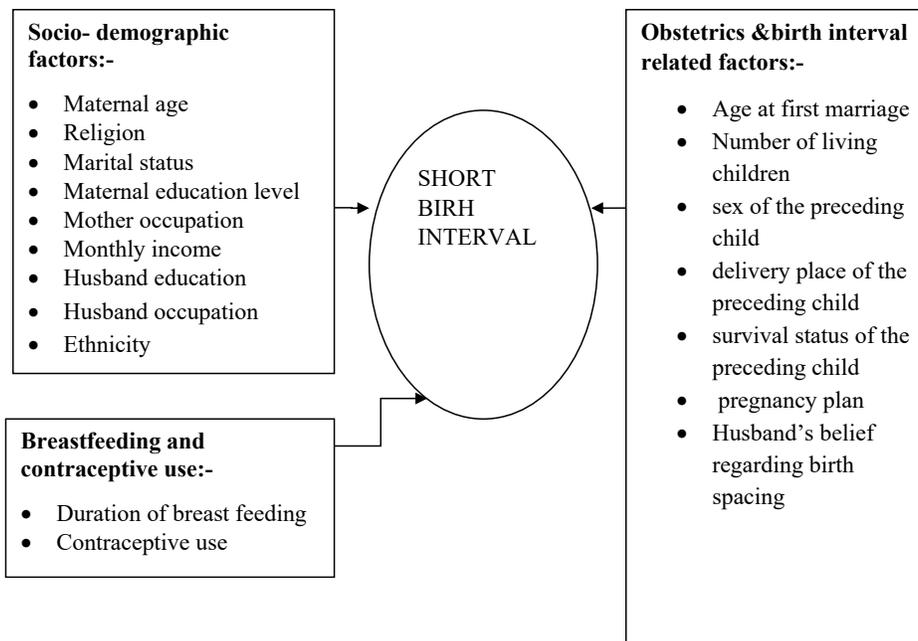


Figure 1: Conceptual frame work: constructed by modifying literatures and showed the associated factors of birth interval (23, 26, 29, 31)

3. OBJECTIVE OF THE STUDY

3.1 The general objective

- To assess the magnitude of short birth interval and associated factors among married women who have at least two consecutive live births in Aroresa district, Sidaama Region, South East Ethiopia, 2023.

3.2 The specific objectives

- To determine the magnitude of short birth interval among married women who have at least two consecutive live births in Aroresa district, Sidaama Region, South East Ethiopia, 2023.
- To identify factors associated with short birth interval among married women who have at least two consecutive live births in Aroresa district, Sidaama Region, South East Ethiopia, 2023.

4. METHODS AND MATERIALS

4.1. Study area and Period

A community-based cross-sectional study was conducted in the Aroresa district, Sidaama Region from June 1/2023 to August 30/ 2023. The district is located 433 kilometers south of Addis Ababa, the capital of Ethiopia, and 182 kilometers south-east of Hawaasa, the capital of the Sidaama Regional State. There are 15 kebeles in the district, and there are 108,770 people living there, according to estimates. The local economies are heavily dependent on agriculture to survive. In the district, there is one primary hospital, one private clinic, five health centers, fifteen health posts, and five drug stores. The district has a decently settled population despite being in a subtropical region.

4.2. Study design

Community-based cross-sectional study was conducted.

4.3 Source and study Population

4.3.1 Source Population

All married women in the Aroresa district who had at least two consecutive live births before data collection.

4.3.2 Study Population

Married women who had at least two consecutive live births before data collection and lived in the Aroresa district were randomly chosen for the study.

4.3.3 Sampling unit

Household residing in a particular kebele in the Aroresa district for a given time period.

4.3.4 Study unit

Married women who are residing in the given area and time period with at least two children in the chosen household.

4.4 Eligibility Criteria's

4.4.1 Inclusion criteria

All married women who have had at least two children.

4.4.2 Exclusive criteria

Not being able to recall the child's birthdate for the previous two live births, despite the absence of a birth certificate or immunization card.

4.5 Sample determination

For objective 1: the sample size is determined using single population proportion formula. Considering the prevalence of short birth intervals (59.9%) obtained from previous study done Serbo town, Oromia region(22). 95% CI and maximum discrepancy of 5% between the sample size and the underlining population. The following single population formula:

$$n = \frac{(Z_{\alpha/2})^2 p(1-p)}{d^2} = \frac{1.96^2}{0.05^2} (0.599) \times (0.401) = 3.84 \times 0.24 / 0.0025 = 368$$

Where, n =sample size, P = prevalence based on previous study, 59.9%, d=margin of error allowed 5%, $Z_{\alpha/2}$ = critical value at 95% CI is 1.96 and design effect=1.5

By taking 10% non-response rate the total sample size is $(368+37) = 405 \times 1.5 = 608$

For objective 2: The sample size for the second objective of this study is determined by considering various variables that was significantly associated with the outcome variables, the confidence level of 95% and the power of 80% calculated by using online open epi (39). The possible sample size is calculated for the selected variables and additional 10 percent contingency is considered for non-response (**See table 1**).

Table1: Sample size determination for study on prevalence of short birth interval and associated factors among married women in Aroresa district, Sidaama Region, South East Ethiopia, 2023.

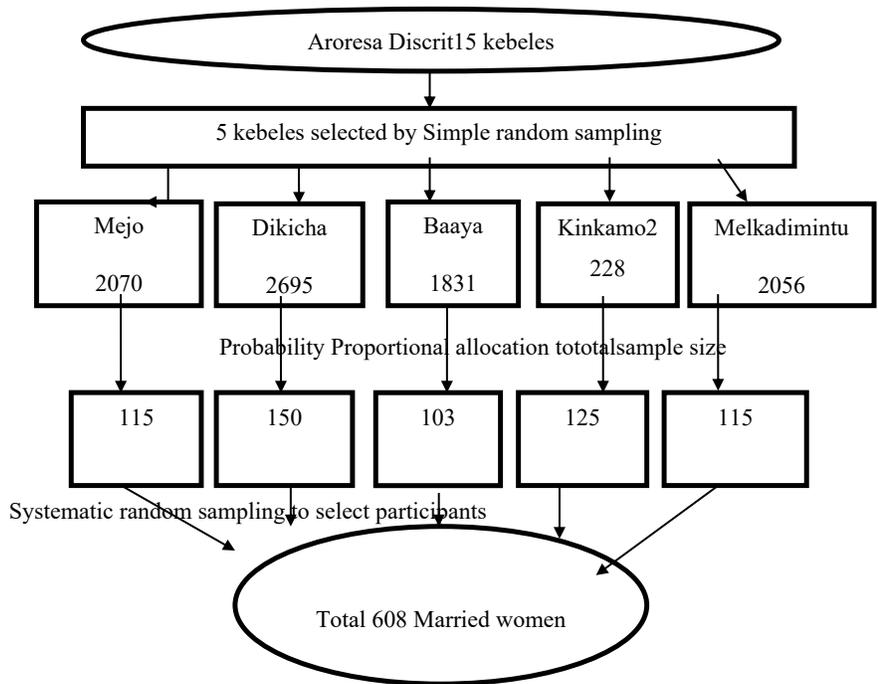
S.no	Variable	CI	Power	Prevalence among unexposed	AOR	sample size	With design effect(1.5)	10% non-response	Ref
1	Contraceptive Use	95%	80%	19%	8.15	42	63	69	(37)
2	<24 month breast feeding	95%	80%	% 11	9.66	44	66	73	(38)
3	Maternal educational status	95%	80%	29.3%	3.05	122	183	201	(38)

By comparing sample sizes calculated for both objectives, maximum sample size (608) is taken as a final sample size for the study.

4.6. Sampling technique and procedure.

The technique of multi-stage sampling was used to choose study participants. There are 15 kebeles in the district. By using simple random sampling technique, five kebeles were chosen from a total of 15 kebeles in the Aroresa district. Before the actual day of data collection, a pre-survey was conducted to create the sampling frame for choosing the households to be included in the simple random sampling approach. Next, the probability proportional sampling method was used to determine the sampling fraction for each of the chosen kebeles. Systematic random sampling was then used to contact each sample household, and the kth household with an eligible mother was then included in the study. Only one respondent was picked by lottery (simple random sampling) whenever more than one eligible respondent was present in the same designated household.

(Below the figure 2)



4.7 Study variables

4.7.1 Dependent variable

- Short birth interval (yes/no)

4.7.2 Independent variables,

Sociodemographic factors: Maternal age, religion, ethnicity, occupational status of the mother, marital status of the mother, educational status of the mother, monthly income, husband's educational status, and husband's occupational status.

Birth history: age at first marriage, number of living children, sex of the preceding child, delivery place of the preceding child, survival status of the preceding child, pregnancy plan and husband's belief regarding birth spacing age

Other factors associated: Breast feeding duration for preceding child, History of family planning use.

4.8 Operational definition and terms

Birth interval: Birth interval is defined as the time interval between a live birth and the birth of the next child (1).

Short birth interval: It is defined as the period of time between two consecutive live births being less than 33 months, which includes the gestation period of approximately 9 months for a fetus in utero (2).

Optimal birth interval: it denotes a birth interval of 33 months and above two consecutive live births (2).

4.9 Data collection tools and procedure

Four nurses with diplomas worked on the data collecting, while two health officers with Bsc were appointed as supervisors. The lead investigator provided two days of training for data collectors and supervisors on how to interact with how they approach the study groups and complete questionnaires. The training covered general study objectives, how to approach study participants, how to approach each item on the instrument, how to collect data, how to include or

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exclude the target data source, how to gain access to study participants, how to submit data, how to handle data, and how to manage time. The lead investigator was in charge of overall oversight.

The data was collected by using a pre-tested structured interviewer-administered questionnaire with data collector guidance. Fluent speakers initially prepared the questionnaire in English, translated it into Sidaamu Afoo, and then translated it back into English to ensure consistency. The questionnaires that evaluate short birth intervals and related factors were modified from reports and literature reviews (23, 26, 29, and 31). This tool includes sociodemographic, cultural, and programmatic elements that influence the short birth interval. To meet the local circumstances and the research goal, the customized and contextualized questionnaires were used.

4.10. Data quality assurance

At different stages of the study, meticulously created and implemented data quality assurance systems. Four data collectors and two supervisors who could speak in English, Amharic, and Sidaamu Afoo were hired for each research area, ideally those who had experience with previous field surveys of this nature. To accomplish the stated goals, the lead investigator provided rigorous training for two days to the chosen data collectors in order to ensure effective and high-quality data collecting.

Before the actual data collection began, a pre-test was conducted on 5% of the questionnaire given to mothers in the Aroresa district, and the questionnaire was modified as appropriate. Prior to receiving each data collector's completed questionnaire, the investigators and supervisors conducted a comprehensive review. In the interim, they randomly selected a questionnaire to cross-check its accuracy and completeness immediately.

4.11 Data processing and analysis

Collected data were coded, entered, and cleaned using Epi Data version 4.2.1 and analyzed using SPSS version 25. Data cleaning was performed to identify outliers or inconsistencies, errors, and missing values. Both descriptive and analytical statistics were executed. Descriptive statistics such as mean and median for continuous data as well as frequency and percentage for categorical data were used to describe the participant's characteristics. Both binary and multivariable logistic regression models were used to determine the association between the independent and the

outcome variables. The model fitness was checked using the HosmerLemeshow test ($P = 0.479$). Multicollinearity was also checked using variance inflation factor (VIF) and tolerance to see the correlation between independent variables. First, bivariate analysis was done to determine the association between each independent and the outcome variables as well as variables that were candidates for multivariable analysis. The results of the bivariate analysis were expressed as crude odds ratios (COR) with 95% confidence intervals (CI). All factors that had an association with the outcome variable at a p-value of 0.25 or less in bivariate analysis were entered into the multivariable model.

Finally, statistical significance was considered at a p-value <0.05 using an adjusted odds ratio (AOR) with a 95% CI.

4.12 Ethical consideration

Pharma College granted ethical approval, and the researcher began the study with the approved document in hand. Due attention was given for the cultural values of the respondents as a whole over the course of the study. To make the research more official, the respondents were informed of its goal. In order to avoid interfering with the respondents' daily schedules, an appropriate time and location were chosen in consultation with them. All private information was kept private. Finally, data was gathered with the study participant's oral consent and after ensuring the anonymity of their responses.

5. RESULTS

5.1. Socio-demographic characteristics of study participants

Out of the 608 married women who had intended to take part in the study during the study period, 596 were interviewed, achieving a 98% response rate. The mean (\pm SD) age of the participants was 32.5 \pm 6.5 years. Women who were older than 36 years old made up the majority (32.9%). Above ninety percent of the women were housewives by occupation, and 37% had no formal education. Four-in-five, 478 (80.2%) of the respondents' husbands are farmers. Around two-in-five 248 (41.6%) of respondents' husbands have completed elementary education (Table 2)

Table 2: Socio-demographic characteristics of Married Women in Aroresa district, Eastern Zone, Sidaama region Ethiopia, 2023.

Variables	Categories	Frequency (N)	Percent (%)
Age of the mother	19-24	58	9.7
	25-30	192	32.2
	31-35	150	25.2
	\geq 36	196	32.9
Religion	Protestant	463	77.7
	Orthodox	12	2
	Muslim	102	17.1
	Catholic	19	3.2
Ethnicity	Sidaama	574	96.3
	Oromo	7	1.2
	Amhara	15	2.5
Marital Status	Married	570	95.6
	Divorce	9	1.5
	Widowed	11	1.8
	Separated	6	1
Women Education	No formal education	219	36.7
	Elementary	230	38.6

	High school	97	16.3
	College and above	50	8.4
Women occupation	Housewife	538	90.3
	Merchant	31	5.2
	Employee/ GO/NG	6	1
	Farmer	12	2
	Student	5	0.8
	Others	4	0.7
Husband educational status	No formal Education	178	29.9
	Elementary	248	41.6
	High school	99	16.6
	College and above	71	11.9
Husband occupation	Farmer	478	80.2
	Merchant	65	10.9
	Employee/ GO/NGO	25	4.2
	Student	13	2.2
	Other	15	2.5
Monthly income	<2000	465	78
	>=2000	131	22

5.2. Obstetrics & birth interval related factors

The majority of respondents (52.9%) who had already child were males, while 329 (55.2%) of the women had no plans to become pregnant. The mothers of 540 respondents (90.9%) who had preceding child were alive (**Table 3**).

Table 3: Obstetrics & birth interval related factors of Married Women in Aroresa district, Eastern Zone, Sidaama region Ethiopia, 2023.

Variables	Categories	Frequency (N)	Percent (%)
Husband idea for birth spacing	Supports	525	88.1
	Opposes	65	10.9
	No idea	6	1
Survival of preceding child			

	Alive	540	90.6
	Dead	56	9.4
previous to last pregnancy is planned	yes	267	44.8
	no	329	55.2
Sex of preceding child	Male	315	52.9
	Female	281	47.1
Place of delivery	Home Delivery	189	31.7
	Health institution	407	68.3
Age at first marriage	<18	352	59.1
	>=18	244	40.9
Number of total live birth	<4	358	60.1
	>=4	238	39.9

5.3. Respondents Breastfeeding practice and contraceptive use characteristics

Out of the 596 mothers who were interviewed, 310 (52%) were breast-feeding for at least 24 months. Following the birth of their first child, 376 (63.1%) women used a contraceptive method.

Table 4: Breastfeeding and contraceptive use factors of Married Women in Aroresa district, Eastern Zone, Sidaama region Ethiopia, 2023.

Variables	Categories	Frequency (N)	Percent (%)
Over all of breast feeding preceding child	< 24 month	286	48
	≥ 24 months	310	52
History of family planning use	Yes	376	63.1

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5.4 Prevalence of short birth interval

The overall prevalence of short birth interval was 47.5% (95%CI 43.1, 51.3) (Figure 3).

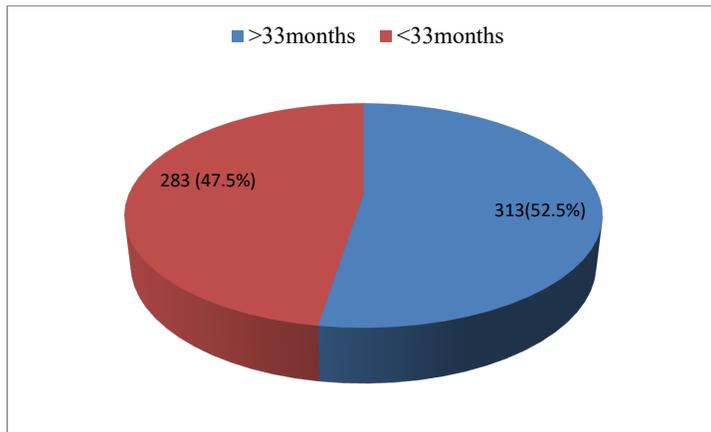


Figure 2: The status of respondents among Married Women in Aroresa district, Eastern Zone, Sidaama region Ethiopia, 2023.

5.5 Factors Associated with short birth interval

In the bi-variable binary logistic regression analysis, a total of nine variables became significant with a short birth interval and a p-value of less than 0.25. After adjusting the confounding variables in the multivariate analysis, the following factors were found to be statistically significant factors of short birth intervals: sex of the preceding child, contraceptive use, status of the index child, and duration of breastfeeding.

The odds of short birth intervals were nearly 2 times more common for mothers whose previous child was a girl than for those mothers whose child was a boy (AOR = 1.9, 95% CI: (1.32, 2.67)).

Women who did not use any form of contraceptive methods were 2.7 times more likely to have short birth interval compared to contraceptive users (AOR=2.7, 95% (1.9, 3.9)).

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In comparison to women who breastfed for more than 24 months, those who did so for less than 24 months had a 2 times more likely to have short birth interval (**AOR = 2, 95% CI (1.43, 2.9)**). Compared to mothers whose index child is alive, women whose index child died were 2.6 times more likely to have a short birth interval(**AOR=2.6, 95% CI: (1.4, 4.9)**) [\(Table 5\)](#).

[Table 5: Outputs of bivariable and multivariable factors associated with short birth interval among married Women in Aroresa district, Eastern Zone, Sidaama region Ethiopia, 2023.](#)

Variables	Category	Short birth interval		COR (95%)	AOR (95%)
		Yes N (%)	No N (%)		
previous to last pregnancy is planned					
	Yes	151 (56.6)	116 (43.4)	1.34 (0.97, 1.86)	1.2 (0.83,1.7)
	No	162 (49.2)	167 (50.8)	1	1
Mother's level of education					
	No formal Education	84 (38.4)	135 (61.6)	0.53 (0.29, 0.99)	0.52 (0.27, 1.001)
	Elementary	127 (55.2)	103 (44.8)	1.05 (0.57, 1.94)	1.102 (0.58, 2.1)
	High school	45 (46.4)	52 (53.6)	0.74 (0.37, 1.46)	0.75 (0.34, 1.54)
	College and above	27 (54)	23 (46)	1	1
Survival of preceding child					
	Dead	37 (66.1)	19 (33.9)	2.33 (1.31, 4.15)	2.6(1.4, 4.9)
	Alive	246 (45.6)	294 (54.4)	1	1
Sex of preceding child					
	Female	153 (54.4)	128 (45.6)	1.70 (1.23, 2.35)	1.9 (1.32, 2.67)*
	Male	130 (41.3)	185 (58.7)	1	1
Place of delivery					
	Home Delivery	101 (53.4)	88 (46.6)	1.42 (1.004, 2.00)	1.38 (0.95, 2.005)
	Health institution	182 (44.7)	225 (55.3)	1	1
Breast feeding duration for preceding child					
	<24 months	152 (53.1)	134 (46.9)	0.55(0.384, 0.74)	2 (1.43, 2.9)*

≥ 24 months	131 (42.3)	179 (57.7)	1	1
History of family planning use				
No	136 (61)	84 (38.2)	2.6(1.84, 3.65)	2.7 (1.9, 3.9)*
Yes	147 (39.1)	229 (60.9)	1	1
Age at first marriage				
<18	187 (52.4)	170 (47.6)	0.8(0.56, 1.12)	1.056 (0.74, 1.51)
≥18	96 (40.2)	143 (59.8)	1	1
Number of total live birth				
<4	188 (52.5)	170 (47.5)	0.76 (0.55, 1.065)	1.396 (0.98, 1.99)
≥4	95 (39.9)	143 (60.1)	1	1

* Variables which strong association with short birth interval

6. Discussion

This study aimed to determine the prevalence of short birth intervals and their contributing factors among married women in the Aroresa district, Eastern Zone, and Sidaama region. Thus,

In this study, the overall prevalence of short birth intervals was found to be 47.5% (95% CI 45.1, 51.3). This result is comparable to the 49.1% found in the study done in Dodota woreda, Oromia region (38). However, this study's findings were higher than those of research conducted in Dembecha, Ethiopia (43.4%) (40), Iran (28.5%) (26), and Bangladesh (24.6%). This gap might be the difference in socio demographic characteristics and study period variation. The difference in prevalence across studies might be socio demographic feature of the study participants, definitions of short birth intervals, accessibility of contraceptive methods and the difference in data collection methods. Moreover, the research conducted in Bangladesh and Iran differs from this finding in terms of socioeconomics. In contrast to this study, where the majority of respondents were uneducated and from rural areas, the women in the studies from Iran and Bangladesh were largely educated and living in metropolitan areas.

On the other hand, the finding of this study is incomparable to the findings from previous studies in the Jimma (59.9%), Lemo districts (57%) and Oromia, Illubabor zone (51.2%) are greater than this one (22, 33, 41). This variation may be the result of different definitions of short birth

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intervals. In contrast to other research that used 36 months, the current study used 33 months, as recommended by the WHO, which may have slightly increased the prevalence of short birth intervals.

The sex of the preceding child was statistically associated with Short birth interval. In comparison to women whose child was a male, women whose preceding child was a female were nearly 2 times more likely to have a short birth interval (AOR=1.9, 95% CI (1.32, 2.67)). This result is comparable with research from other parts of the world, such as Nepal and Pakistan, which found that women who had more females had considerably shorter birth interval than those who had males (3). Also in our country, a study from Jimma Zone Serbo Town (AOR=1.96, 95% CI: (1.05-3.96)) and a study from Arbaminch (AOR: 5.73, 95% CI; (3.18-10.31)) both validate that women have short birth intervals if they have a female preceding child (17, 22). For social, cultural, and religious reasons, societies typically prefer men, and having more men in the family may be advantageous financially. This might be the underlying cause of the pressure on fertility that resulted from couples having children until they reached their desired number of male children.

The use of contraceptive was the other factor that statistically significant factors associated with Short birth interval. When compared to women who had ever used a contraceptive method, women those who never used a contraceptive method had 2.7 times have short birth (AOR = 2.7, 95% CI: 1.9, 3.9). This was similar to a study that was carried out in the rural areas of southern Ethiopia, Arba-Minch district, and Lemo district (17, 33, and 35). This is less likely than a research done in the Illubabor zone of South West Ethiopia, which found that those who do not use contraceptive are 4.12 times more likely to have a short birth interval (AOR = 4.12, 95% CI: 2.7, 5.82) (41). It could be because using contraceptives affects the reproductive process and slows down or stops pregnancies, which lowers the overall fertility rate. Women who never take a contraceptive may also lose the chance to contact a healthcare professional, which can reduce awareness of the results of short birth interval.

The survival status of the index child was another finding of the study that was associated to a short birth interval. When compared to mothers who had a surviving index child, mothers whose index child had died before the conception of the last child had a birth interval that was 2.6 times shorter (AOR = 2.6, 95% CI: 1.4, 4.9). Similar results were obtained from a study conducted in

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Pakistan (34), the Illubabor Zone, Southwest Ethiopia (41), Uganda (42), and Northwest Ethiopia (43), which confirmed that mothers with a dead index child were more likely to have a short birth interval.

Duration of breastfeeding was the other factor associated to short birth interval. Mothers who breastfeed their child for less than 24 months were about 2 times more likely to practice short birth interval as compared to those who breastfeed more than 24 months (AOR = 2, 95% CI: 1.43, 2.9). This is consistent with research conducted in Tigray, Ethiopia (21). This was lower than a study conducted in Southern Ethiopia which revealed that breastfeeding for less than 24 months was 30.8 times more likely to practice short birth interval (AOR = 30.8, 95% CI: (6.97, 136.19) (15). This is a result of lactation amenorrhea, and this might be due to the difference in duration of breastfeeding practice.

This study has admitted a few limitations. First, this study might be exposed to recall bias since birth interval estimation was mainly based on the mother's memory. Second, being cross-sectional study design, it does not establish cause effect relationships between the study variable. Third, the results of this study may not be generalizable to the entire region because it was limited to one district.

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7. Conclusions and Recommendations

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7.1 Conclusion

This study found a higher prevalence of short birth intervals in the area compared to previous studies. Factors such as having a preceding female child, not using contraception, breastfeeding for less than 24 months, and having a deceased preceding child were significantly associated with short birth intervals. These factors pose challenges in achieving optimal birth spacing and impact maternal and child health outcomes.

7.2 Recommendation

Improving Access to Family Planning: Ensuring that women have access to a range of contraceptive methods and family planning services can help them make informed decisions about their reproductive health and effectively space their pregnancies.

Enhance Health Education: The district health office should implement health education programs that specifically target the issue of short birth intervals. These programs should raise awareness about the importance of birth spacing and the risks associated with short intervals. They should also provide information on the various contraceptive methods available and their benefits. Community engagement and involvement of local leaders and influencers will be crucial in promoting a collective understanding and support for family planning.

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This study has admitted a few limitations. First, this study might be exposed to recall bias since birth interval estimation was mainly based on the mother's memory. Second, being cross-sectional study design, it does not establish cause effect relationships between the study variable. Third, the results of this study may not be generalizable to the entire region because it was limited to one district.

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9. ANNEXES

Annex- I Participant information sheet and informed consent form

My Name is-----, I am working as a data collector for the study being conducted by Worku Worana on the assessment of short birth interval and its associated factors among married women in Aroresa district. I kindly request you to give me your attention to explain to you about the study and being selected as a study participant.

Study topic: Prevalence of short birth interval and associated factors among married women who have at least two consecutive births in Aroresa district, Sidaama Region, South East Ethiopia, 2023.

The objective of the study: To assess the magnitude of short birth interval and associated factors among married women who have at least two consecutive births in Aroresa district, Sidaama Region, South East Ethiopia, 2023

Study period June 1/2023 to August 30/ 2023

Process of study: as part of this study different questions are prepared to be completed by you. For unclear questions, if you need clarification you can ask any time. Since your participation in this survey is depends on your voluntary basis you have the full right to refuse, to participate, and to stop at any time. To complete these questions at least takes 20-25 minutes.

Advantage and disadvantage: There is no payment or any special privilege given for your participation in this study but your honest answer to these questions is very important to complete this study that will have an impact on the reduction of neonatal and maternal, morbidity and mortality. Also, you are not obliged to participate or give information you don't want. If you are not feeling good at any time, please don't worry to ask to stop the procedure.

Confidentiality: The confidentiality of the information you provided to me was maintained and couldn't be accessed by a third party but it's used for research only and burnt by the end of the survey. Contact address: If there are any questions or enquires any time about the study or procedures, please contact this address.

Principal investigator: Worku Worana phone 0913372679.

Annex- II

Declaration of informed voluntary consent:

I have read/ will read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions about things that may have been unclear. I will inform that I have the right to withdraw from the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to participate in this study with my initials (signature) as indicated below.

N.B this is to be signed face to face in the presence of the data collector. Please provide a copy of this signed consent to the participant. Identification code _____

Name of the data collector _____ signature _____

Thank you for your cooperation

Annex III: English version questionnaire form

I would like to inform you that the privacy of the respondents will be protected and I will also request you to answer kindly because your answer is important in the whole research and to determine the outcome of the study.

001. Questionnaire ID number _____

002. Address: kebele _____

Part I: Socio-demographic characteristics of participants in Aroresa District, Sidaama Region.

S.N	Characteristics	RESPONSE AND COADING	Skip
101	Age of the mother in years	-----	
102	Religion	1. Protestant 2. Orthodox 3. Muslim 4. Catholic 5. Others	
103	Ethnicity	1. Sidaama 2. Oromo 3. Amhara 4. Others	
104	Marital status	1. Married 2. Divorced 3. Widowed 4. Separated	
105	Education level of the mother	1. No formal Educ. 2. Elementary 3. High school 4. College and above	
106	Occupation of the mother	1. Housewife 2. Merchant	

		3.Employee/ GO/NG 4.Farmer 5. Student 6. Others	
107	Husband educational status	1. No formal Edu. 2. Elementary 3. High school 4. College and above	
108	Husband occupation	1. Farmer 2. Merchant 3.Employee/ GO/NGO 4. Student 5. Others	
109	Income of the mother per month	-----ETB	

Part II: Reproductive characteristics of participants in Aroresa District, Sidaama Region.

S.N	Characteristics	RESPONSE AND CODING	Skip
201	Age at first marriage	-----	
202	Husband idea for spacing	1.Supports 2. Opposes 3. No idea	
203	Number of total live birth	-----	
204	Survival of the index child before the conception of the last child? (The child before the last child)	1.Alive 2.Dead	
205	Is previous to last pregnancy is planned?	1.yes 2.No	
206	Sex of the index child(The child before the last child)	1. Male 2.Female	
207	Birth interval in months	-----	
208	Where was the place of delivery preceding child	1. Home Delivery 2. Health institution 3.Other-----	
209	What was the overall duration of Breastfeeding preceding child?	-----	
210	Contraceptive use before the conception of the last child?	1. Yes 2. No	

Thank you for your time!

