2022-04

Determinants of Infertility Among Married Women Attending Health Facilities in Bahirdar City, North West Ethiopia 2021.

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A THESIS SUBMITTED TO DEPARTMENT OF EPIDEMIOLOGY AND BIOSTATISTICS, SCHOOL OF PUBLIC HEALTH, COLLEGE OF MEDICINE AND HEALTH SCIENCES, BAHIR DAR UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH IN EPIDEMIOLOGY.

April 6, 2022

Bahir Dar, Ethiopia

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April 6, 2022 BahirDar,Ethiopia

ACKNOWLEDGEMENTS

I would like to extend my deepest gratitude to my advisor Mr. Kassawmar Angaw(MPH, Assist.professor)and Mr. Worku Awoke (Assoc.professor) for their many useful advice, constant encouragements and guidance.

I would like to thank our study participants and data collectors for their willingness and cooperation.

I would also like to thank to Felege Hiwot comprehensive specialized hospital, Tibebe Gion Specialized hospital, Gamby Teaching generalized hospital, Adinace CH, Dream care CH Afilace CH and Eyasta Specialty clinicfor their permission and supporting data collection.

Finally, I would like to gratitude my colleagues and all individuals who built up me directly or indirectly to develop this thesis.

ABSTRACT

Background: Infertility is a serious health issue affecting approximately 15% of couples worldwide. Infertility may bring about unhappy married lives, divorces, and high levels of psychiatric morbidity.Despite the fact that it is a major concern in Ethiopia, scientific data is insufficient to identify significant infertility factors**.**

Objective:-To identify determinants of infertility among married women in Bahir Dar city, North Western Ethiopia 2021.

Methods: - An institution-based unmatched case–control study was conducted among married women attending health facilities in Bahir Dar for infertility diagnosis and treatment from October 1, 2021, to November 15, 2021. Study participants were chosen using a systematic random sampling technique.Data were collected from 173 cases and 346 controls using an interviewer-administered structured questionnaire and document review, which was then entered into Epi Info version 3.1, exported to Excel, and analyzed using SPSS version. Variables with P-value ≤0.25 in the simple binary analysis were included in the multiple logistic regression models. Backward stepwise LR method, Odds ratio with 95% confidence interval and the level of statistical significance set at $p<0.05$ wasused to identify the determinants of infertility.

Results:- the determinants of women's infertility were age of women>30 (AOR = 1.697, 95% CI: 1.118-2.576), Abortion history (AOR = 2.246; 95% CI: 1.262-3.998), irregular patterns of menstruation flow (AOR = 2.310, 95% CI=1.447-3.687), hormonal disorder(AOR = 8.625, 95% CI=3.652-20.366), and history of STI (AOR = 3.638; 95% CI: 1.946-6.801) were significantly associated with women's infertility.

Conclusion: Age of women, history of abortion, irregular patterns of menstrual flow, history of STI, endocrine disease, and stress were independent determinants of infertility in women. As a result, couples should receive health education on not delaying parenthood, STI, Hormonal disorders, and abortion.

Key words: - married women, infertility, determinant

ACRONYMS

ACH	Afilace Comprehensive Hospital
AOR	Adjusted Odds Ratio
CH	Comprehensive Hospital
CI	Confidence Interval
DMPA	Depot-medroxy progesterone acetate
DCCH	Dream Care Comprehensive Hospital
EPI-INFO:	Epidemiological Information
ESC	Eyasta Specialty Clinic
FHCSH	Felege Hiwot Comprehensive specialized Hospital
GGTH	Gamby Generalized Teaching Hospital
NGO	Non-governmental organization
OPD	Outpatient department
OR	Odds Ratio
PI	Principal investigator
PNC	Post natal care
STD	Sexually transmitted disease
STI	Sexually transmitted infection
TGSH	Tibebe Gion Specialized Hospital
WHO	World Health Organization

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1. INTRODUCTION

1.1. BACKGROUND

Infertility is defined by the World Health Organization as a failure to achieve a clinical pregnancy in childbearing age after 12 months or more of regular unprotected sexual intercourse[1].Infertility is classified into two i.e., Primary and Secondary. Primary Infertility, when there is no history of conception or pregnancy. Secondary Infertility, when the inability to conceive after one or more successful pregnancies[2]. Infertility also includes the inability to carry a pregnancy to the delivery of a live baby. Infertility affects male, female or both reproductive systems.Some couples will have no reason with which to explain their infertility, even the investigations have been extensive [3].

Infertility affects both men and women. However, it is the woman who is often accused of being infertile, especially in developing countries. Historically, the main factors of women infertility were infections such as gonorrhea and sexually transmitted diseases, but today, they have been replaced multifactorial like socio-demographic factor, reproductive health factor, and lifestyle/behavioral factor etc. Furthermore, the increasing prevalence of medical disorders such as diabetes, hypertension, and hypothyroidism and lifestyle diseases such as obesity and addictions in the young has also shown to contribute to the problem of infertility. The causes of infertility generally derive from 3 major sources: physiological dysfunctions, preventable factors and unexplained issues [4]. Physiological causes of female infertility include tubal blockage, abnormal ovulation, congenital malformation and endometriosis [5].

The magnitude of infertility varies across countries and regions. Despite the increasing rate of population in developing countries, the problem of infertility remains worrisome. Estimating the exact level of infertility rate for a population is found to be extremely difficult. This is due to the fact that, infertility is a complicated scenario from its investigation up to the course of its treatment towards the intended success. The estimated prevalence of infertility has a general estimation worldwide that affects 15% of couples (48.5 million) at some point during their reproductive lives [6]. The estimated infertility rate in Canada is 11.5% to 15.7%. One out of seven English couples suffers from fertility problems [7]. Infertility among women aged 20 to 44 years in Africa ranged from less than 10% in Togo and Rwanda to over 25% in Cameroon and

the Central African Republic[8].The average prevalence of infertility in developed countries is 3.5-16.7% and in developing countries is 6.9-9.3%[9].

Magnitude of infertility in Ethiopian context is currently not available yet, A study done by Abdulahli Hassan in Alemaya, shows 2% of women between the ages of 30 and 39 were childless, while in Addis Ababa and Metu, the levels were 8% and 16%, respectively[10].

Some doctors and researchers would say that infertility is becoming an epidemic, and infertility treatments are becoming more popular as couples look for ways to start a family. About 17% of couples in industrialized countries seek help for infertility, which may be caused by ovulatory failure, tubal damage or endometriosis, or a low sperm count [11].

Infertility has severe negative social consequences for infertile couples, especially women, who are more likely to experience violence, divorce, social shame, emotional stress, depression, anxiety, and low self-esteem. Childlessness affected the social, psychological, marital and economic conditions of infertile women. It was also found that infertility has a potential to affect the sexual life of women which resulted from the severe psychological trauma[12].

Infertility has till now been a private matter to be resolved individually. However, the World Health Organization (WHO) has recognized it as a public health issue worldwide[13].

Infertility is regarded as a personal issue; however the impact of infertility on women varies from society to society, depending on the culture. Studies from some of the African countries have established that marital instability, such as separation and divorce, are much higher among infertile couples[14].

It's a multifaceted issue influenced by social, economic, and cultural factors. Infertility isn't just a solely medical issue because resultant psychosocial consequences such as anxiety, depression, marital difficulties, and societal stigmatization have been reported[5].

Many societies of Ethiopia put strong value for having children by considering them as the main purpose of marriage. Besides this, people consider child bearing as a primary function of being a woman. This condition sets the stage for women are to be viewed and valued in the context of bearing and rearing children.

In many underdeveloped countries including Ethiopia, it appears to be a neglected issue.Because it is not a life-threatening disease, it is not given top emphasis amid other pressing health issues. However, the negative psychosocial consequences of this problem are quite profound.

Perceptions in the community about the causes and treatment of infertility are by large deficient and wrong[15].

Infertile couples seek treatment for their problem from a variety of sources and individuals. Studies done in Africa show that couples prefer to go to sites for treatment according to the perception they have as a possible cause of the infertility. These places and persons include spiritualists (churches), traditional healers, witchcrafts, and finally modern medicine (health facilities)[16, 17].

1.2. Statement of the problem

In most of the developing countries including Ethiopia and South-East-Asian countries in particular, infertility has been relatively neglected as a health problem and as a subject of social science research. In these countries, the program's main focus remains on the consequences of high fertility and how to regulate it, rather than understanding the multiple mechanisms of infertility. Infertility affects a huge number of couples, according to data from various nations.[18].. For many couples, the inability to bear children is a tragedy. The expectations of society, family, religion and culture nurture a sense of failure, loss and exclusion in infertile couples. Therefore, infertility is generally considered as a difficult condition for individuals and couples.

In many African countries, the success of marriage overlies on the ability of a woman to bear children. Being infertile results in a serious psychological trauma and social stigma, in some cases, it may end up with social disgrace and exclusion, verbal and physical abuse, and marriage violence and breakup. Especially for women, infertility significantly reduces their quality of life, expose for multiple sexual partners, sexually transmitted diseases, increased sexual dysfunction, and poor kinship[19]. Therefore, it is a real personal, social, and public health issue, mainly in developing countries.

Infertility is a multifactorial problem and needs to be seen in the local context of the factors causing it. In Ethiopia, the prevalence of infectious diseases being high contributing to infertility becomes a major factor. Thus, infertility needs to be seen in context to the local population. Furthermore, infertility not only is a medical challenge but also takes a major toll psychologically and socially challenged on the couples[20]. Thus, we have undertaken this study

to know the commonest determinants of infertility prevalent locally and to know the prevalence of each factor in order to ensure the prompt and effective management of these cases.

Being infertile or barren woman informs the worthless condition of the woman to the community, husband, and his family, her family or her own eyes. Thus, the inability to bear children has the potential to bring social stigma, marital instability or divorce, economical problem, health challenges and also psychological trauma even to the extent of suicide[21].

All in all, the pros and cons of being childless are very devastating, especially for women, which is basically related to psychological, social, marital and health burdens. It is with in this context that the current study was proposed.

Despite the fact that it is a major concern in Ethiopia, scientific data is insufficient to identify significant infertility factors. This lack of insufficient data leads to a lack of infertility preventive strategies as well as adequate and modern diagnostic and treatment centers,. As a result, this research looks into the probable links between infertility and socio-demographic, reproductive health, chronic disease and lifestyle factors in Ethiopia.

1.3. Significant of the study

The primary aim of this study is to identify determinants of infertility among married women, so that health care providers can provide effective, comprehensive and quality cares for the respective patients. Furthermore this study will also be used to determine the most important predictors of infertility; hence health care professionals will be alert to tackle it.

It also provides valuable information for different stakeholders and program managers to design appropriate strategy that will improve women's reproductive health.

For scientific society and researchers, the findings of this study will also provide frameworks for further investigation of underlying risk factors for women's infertility.

2. LITERATURE REVIEW

2.1. Determinants ofinfertility

2.1.1. Socio-demographic factors

A study done in china 2015 to assess the relationship between age at menarche and infertility among Chinese rural women shows that infertility were statistically associated with women's age, age at marriage, higher education level, employed women, socioeconomic status, and married life duration[22].

Age is one of most prevalent risk factor of infertility. When age increases the quality and quantity women's eggs begin decline. A case control study conducted in Qatar shows that age were significantly associated with infertility[23]. Also Women marrying after 30 years of age had the highest rate of infertility Because of age already crossed the peak reproductive period and age increases exposure of STI increase and cause tubal block [24-26].A study conducted India Age at marriage, educational status, present age were associated to infertility[27]. In a study conducted in Iran, it was discovered that couples with illiterate women had a higher risk of infertility than couples with women who had completed high school[28].Another study in India found a statistically significant link between greater education and infertility. Employed women and socioeconomic status were also found to be increasing risk factors for infertility in this study. also another study to evaluate the relationship with socio-economic status and infertility, Socio-economic status of women affects infertility[29].Another socio-demographic risk factor is residing in an urban area, which is strongly linked to infertility[30].

2.1.2. Lifestyle/behavioral factors

The behavioral factors such as excessive intake of caffeine, smoking and consumption of alcohol too are associated with reduced reproductive outcomes**[31, 32].**Lifestyle practices can increase risk of infertility. Smoking, caffeine intake,consumption too much alcohol and mental stress affects infertility[33, 34]. A Community-Based Cross-Sectional Study in Indian shows that stress is significantly associated with infertility[29]. Excess stress affects the function of hypothalamus gland. The toxins inhaled from cigarette smoke can affect fertility by causing damage reproductive organs, eggs and sperm. Heavy and prolonged alcohol consumption can also cause imbalance in the hormone of reproductive systems. Potential mechanisms through which alcohol

may impair fertility include an alcohol-related rise in estrogen leading to decreased follicle stimulating hormone secretion and impaired ovulation[35, 36].. high levels of caffeine intake may delay conception among fertile women[37].Obesity is associated with many adverse maternal and fetal effects prenatally, but it also exerts a negative influence on female fertility. Obese women are more likely to have ovulatory dysfunction due to dys-regulation of the hypothalamic-pituitary-ovarian axis[38].A cross-sectional study in which the BMI, WC and WHR of 726 Australian women were obtained, aiming to analyze the association between those measures and the characteristics of their menstrual cycles. Compared with those of normal weight, obese women were at least twice as likely to have an irregular cycle[39].

2.1.3. Reproductive health related factors

According to a case control study conducted in Dessei 2020, age at first pregnancy, age at menarche, many sexual partners, number of days of menstruation flow, and STI history all increased the chance of infertility[40]. According to a study conducted in China in 2015, rising age at menarche was linked to an increased risk of infertility. [22]. A cross-sectional study done in Yazd 2014-2015 shows that history of abortion and family history of infertility were increased risk of infertility[41]. Another study conducted shows that history of recurrent miscarriages/stillbirth was as twice as common among female with secondary infertility [42, 43]. A case control study done 2021 in India shows that the risk factors of infertility were age of women, duration of married life, family history of infertility, frequency of menstrual cycle, dysmenorrhea were major factors of infertility[34].Another reproductive health factor women's who has a history of an ectopic pregnancy were increased risk of infertility [44]. A case-control study done in England to assesslinkage between tubal Infertility and the Intrauterine Device shows that tubal infertility is associated with IUD use[45]. A case-control study in south-eastern Iran conducted by Ansari H et al. (2016), reported that women with irregular menstruation were significantly associated with secondary infertility, compared to their regular cycle counterparts [46]. Also a study conducted in Qatar shows that menstrual irregularities were significantly associated with women's infertility[23].

2.1.4. Disease and infertility

According to a study conducted in Malaysia in 2019, diabetes mellitus, thyroid problems, cardio vascular disease and adrenal disease were all linked to an increased risk of infertility in

women[47, 48].According to European a clinical study of 245 women with unexplained infertility in 2016 the likelihood of achieving pregnancy was lower in women with asthma compared with those without asthma[49]. A prospective clinical study done in India confirms the presence of a strong relationship between genital TB and infertility[50]. STDs are more easily transmitted to women and they can lead to pelvic inflammatory disease and may cause adhesion (scarring), blocked fallopian tubes, ectopic pregnancy, miscarriages and uterine scarring[40, 51].un-matched case control study conducted Rwanda shows that HIV and other STI were statically associated with infertility[52].Another study conducted in USA shows that PID is significantly associated with tubal factorinfertility[53].Several studies have demonstrated that the anxiety had a negative effect on fertility. The women with long-standing infertility suffer more from nervousness, panic attacks, agitation, and intolerance. Infertility affects psychological well-being of women.[54, 55].

a case-control study conducted Odisha reported that women's was History of thyroid disorder were more likely infertile compared with no history of endocrine disorder[56]. A study conducted India to investigate the correlation of thyroid and prolactin hormones levels with female infertility thyroid disorder is associated with infertility[57]. Another study conducted Maulana Azad Medical College (MAMC), New Delhi for hormonal evaluations showed thatthyroid hormones have profound effects on reproduction and pregnancy [58].A case control study in Jorhat city shows that thyroid disorder were significantly associated with infertility[59].

2.2. conceptual framework

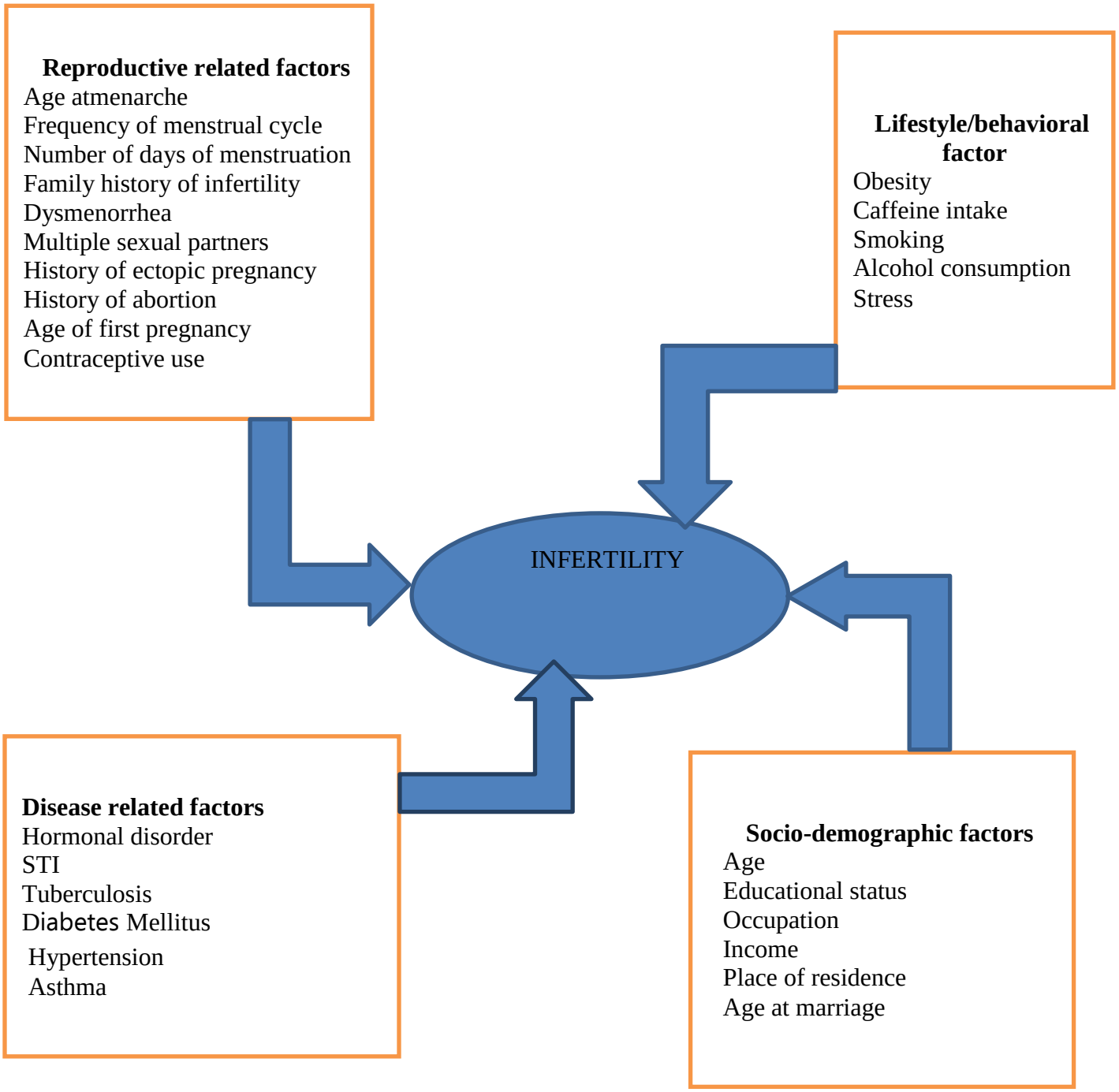

Figure 1conceptual framework to showing the relationship between infertility and associated factors Bahir Dar city, 2021.

3. OBJECTIVE

To identify determinants of infertility among married women attending health facility in Bahir Dar city, North West Ethiopia 2021.

4. METHODS AND MATERIALS

4.1. Study Area and period

The study was conducted from October 1 to November 15, 2021, in Bahir Dar city (the capital city of the Amhara region) which is the second largest and populous region in Ethiopia, located approximately 565 km northwest of Addis Ababa capital city of Ethiopia. The total population of the town is 348, 778 of whom 179,849 (52%) are female. The city has three comprehensive specialized public hospital serving approximately five million people within and outside the city, ten public health centers, ten public health posts, four private hospitals, seventeen private medium clinics, twelve junior private clinics, and five Non-Governmental organization (NGO) comprehensive health facilities. The study were conducted in all health facilities which provide infertility diagnosis and treatment services at Bahir Dar city (Felege Hiwot Comprehensive Specialized Hospital (FHCSH), Tibebe Gion specialized hospital (TGSH), Gamby teaching hospital (GTH), Adinace comprehensive hospital, Afilace comprehensive hospital, Eyasta specialty clinic and Dream care comprehensive hospital).

4.2. Study design

An institution based unmatched case control study method was conducted in Bahir Dar city.

4.3. Source Population

Case: - All infertile married/cohabited women within reproductive aged (15-49 years) who attends health facilities for infertility diagnosis and treatment service at Bahir Dar city.

Controls: - all married/cohabited women within reproductive aged (15-49 years) who attend health facilities for first postnatal care at Bahir Dar city.

4.4. Study population

Cases: - All married women aged 15-49 years who were diagnosed infertility attending Felege Hiwot Comprehensive Specialized Hospital (FHCSH), Tibebe Gion specialized hospital (TGSH), Gamby teaching hospital (GTH), Adinace comprehensive hospital, Afilace comprehensive hospital, Eyasta specialty clinic and Dream care comprehensive hospital during study period who fulfill the inclusion criteria were the study population.

Controls: - The married women aged 15-49 years who were attending Felege Hiwot Comprehensive Specialized Hospital (FHCSH), Tibebe Gion specialized hospital (TGSH), Gamby teaching hospital (GTH), Adinace comprehensive hospital, Afilace comprehensive

hospital, Eyasta specialty clinic and Dream care comprehensive hospital health facilities for 1st Post natal care follow up in Bahir Dar city, at the time of data collection who fulfill the inclusion criteria were the study populations. Controls are supposed to be those seeking healthcare (PNC) at the same setting and mostly attributed to the same population pool where cases came from. A ratio of 2:1 was utilized for controls to cases.

4.5.Inclusion and Exclusion criteria

4.5.1. Inclusion criteria

Case: - Married women aged 15-49 years who reports failure to achieve a clinical pregnancy after 12 months or more with regular unprotected sexual intercourse visiting obstetric and gynecologic OPD at the time of data collection and lives with husband at Bahir Dar city**Control: -** any married women within reproductive aged (15-49 years) who are visiting 1st post natal care follow up on similar day of cases interviewed at the time of data collection.

4.5.2. Exclusion criteria

For case: -women if they met any of the following exclusion criteria at the time of interviewwere excluded.

Has not been sexually active in the last 12 months (or provided inconsistent information about sexual activity).

Who were using contraceptives one year prior to the date of interview.

Who was undergone menopause.

Who were critically ill and unable to respond during the data collection period were excluded.

For controls: - women who were critically ill and unable to respond during the data collection period were excluded.

4.6. Sample size determination

The required sample size was computed using open Epi Info version 7.2.1 by considering the assumption that the ratio of cases to controls is 1:2, the power is 80, the confidence level is 95%, the odds ratio (OR) is 2.79, and the proportion of exposed controls (P2) is 85.7% (by taking the STI associated with female infertility from the recent study conducted in Dessei[40]. Taking the response rate of 10%, the final sample size was 541, and since the ratio of cases to controls was 1:2, 180 samples were cases and 361 were taken as controls. Study participants were selected using a systematic random sampling technique for both cases and controls (every two cases and control).

Table 1: Sample size determination of the determinants of infertility in Bahir Dar city, Northwest Ethiopia, 2021.

Variable	OR	P-value	Power	% of control exposed	Sample size	Case	Control
Age at the first pregnancy	2.89	<0.05	80%	49.5%	158	53	103
menstruation flow in days	4.17		80%	7 1.3	162	58	104
History of STI	2.79	<0.05	80%	85.7	491	164	327
Age at menarche	3.2	<0.05	80%	39.9	126	42	84

4.7. Sampling Procedure and techniques

Systematic Random sampling technique was used to select the study participants. The sample size was allocated proportionally and every 2 cases interval in each selected health facility based on average monthly client flow, as reviewed from the registration book.For each case, two controls (who are achieving delivery) were selected consecutively from the same health facilities on the same day as soon as the cases were diagnosed.

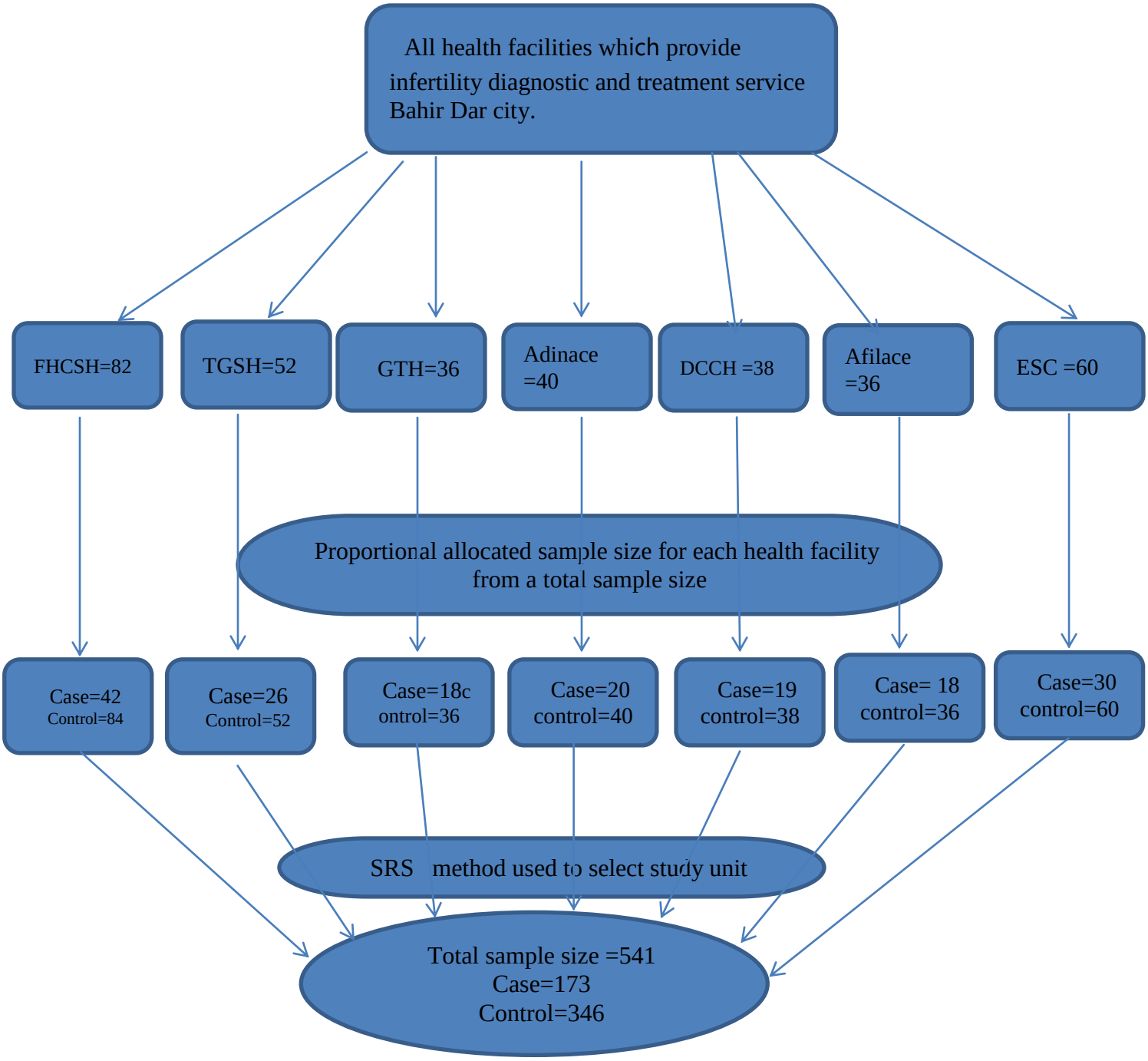

Figure 2 Schematic presentation of sampling procedure on determinants of infertility among married women attending health facilities in Bahir Dar city, Northwest Ethiopia, 2021

4.8. Data collection tool and Techniques

Data was collected from subjects by using pre tested structured interviewer-administered questioner that adapted from studies of Butajira and American society for reproductive medicine infertility history forms[60] and document review(to see the diagnosis of infertility and history of chronic disease and fill the data which is missed by respondents or not well answered). The questionnaire was first preparing in English and then translated in to Amharic and back to in English for its consistency. The data extraction tool hasinfertility history, socio-demographic factors, Reproductive factors, lifestyle/behavioral factors and disease related factors. Data were collected by seven BSC nurses under the supervision of four supervisors. The data collectors were received training through explaining in details objective of study and all sections of the questionnaire, as well as, interviewing few clients in front of the assigned data collectors. The questionnaire was pretested using a convenient sample of 10 eligible cases and 10 controls to test for the clarity, understandability, feasibility and timeliness to complete the questionnaire before one week of data collection process and necessary amendments were done. Those piloted participants were later omitted.The completed questionnaires were reviewed on daily basis and revised for data completion and consistency by the PI.

4.9.Study variables

4.9.1. Dependent variables

Infertility (Yes/No)

4.9.2. Independent variables

Independent variables that were studied in the married women are presented in figure 1. These factors are factors which were studied by investigators both in the developed and developing countries.

Socio-demographic factors were Age, educational status, occupation, Income, Place of residence and age at marriage.

Lifestyle/behavioral factor were obesity, caffeine intake, smoking, alcohol consumption and stress.

Reproductive related factors were age at menarche, frequency of menstrual cycle, number of days of menstruation, family history of infertility, dysmenorrhea, multiple sexual partners, history of ectopic pregnancy, history of abortion, age of first pregnancy and contraceptive use.

Disease related factors were endocrine disorder, STI, tuberculosis, diabetes Mellitus, hypertension and asthma.

4.10. Operational definition

Cases: - defined asany women within the reproductive age (15–49 years), who reports failure to achieve a clinical pregnancy and diagnosed by doctor after 12 months or more of regular unprotected sexual intercourse, attending health facilities for infertility diagnosis and treatment and fulfill the following criteria.

Stays married/cohabited for at least the past 12 months.

Who had not conceived in the past (primary infertility) or, in the last 12 interview.

Who had conceived in the past but not 12 months up to the date of the interview(secondary infertility).

Who was not using contraceptives in the time period one year prior to the date of interview?

Either was not breast-feeding or, was breast feeding but had been 12 months or more since she had seen her first post-delivery menses.

Controls: - defined as; any delivered woman within the reproductive age (15–49 years), attending Post natal care at Hospital. Controls are supposed to be those seeking healthcare (PNC) at the same setting (Hospital) and mostly attributed to the same population pool where cases came from.

Determinant: any factor, whether event, characteristic or other definable entity, that bring about a chance in health condition or other definable characteristics.

Primary infertility: -is when couples have never had children, or have been unable to achieve pregnancy after one year of living together despite having unprotected sexual.

Secondary inferti1ity:- a situation where a couple had achieved pregnancy but could not achieve it for the last one or more years despite having unprotected sexual intercourse.

Adequate sexual intercourse: - The couple should try to have sexual intercourse every two days during the fertile period of her menstrual cycle.

Multiple sexual partners: - a women who had two or more sexual partner in her life time.

Abortion/miscarriage: - the spontaneous loss of a woman's pregnancy before the 20th week that can be both physically and emotionally painful.

First postnatal care: - is the health care for women and their child for the first 24 hours after the delivery was completed

Irregular menstruation cycle: -a menstrual cycle is that continually falls outside of regular ranges for an unexpected reason also it includes missed, delayed or erratic periods or abnormal bleeding patterns.

Hormonal disorder: - hormones are chemicals produced by glands in the endocrine system and released into bloodstream. An imbalance occurs when there is too much or too little of a hormone. Ifa study participant answers yes, consider as a hormonal disorder and if the answer is unknown check document if any recorded hormonal disorder she considered having hormonal disorder.

4.11. Data Quality Management

Emphasis was given for developing the data collection instrument. Content and face validity of the constructed questionnaire were established by extensive literature review,It therefore adopted from studies of Butajira and American society for reproductive medicine infertility history forms [61]. Finally the questioner was evaluated by advisors and experts. Adequate training of the data collector and supervisor were done through explaining in details all sections of the questionnaire and measurement techniques, as well as, interviewing few clients in front of the assigned data collector. Questionnaires were translated into the Amharic language and then retranslated back to English for its consistency. Prior to data collection, the questionnaire was piloted using a convenient sample of 10 eligible cases and 10 controls having similar settingwith the study conducted to test for the clarity, understandability, feasibility and timeliness to complete the questionnaire. Questions that were found difficult or miss-leading to be answered by the women during the pretesting were merged on the final questionnaire and method of data collection were changed from self-administered to interviewer administered because 4% of pretested participants were unable read and write. Those piloted participants were later omitted. The completed questionnaires were reviewed on daily basis and revised for data completion and consistency by the supervisor and PI. Systematic random sampling technique and multivariate analysis will be used to minimize selection bias and to control confounder effects respectively.

4.12. Data Analysis procedure

Data was checked for completeness and entered into Epi Info version 7.2.1 and exported to SPSS version 23 for analyses. Body mass index (BMI) was computed as weight (kg)/square of height (m2).Summary statistics of socio demographic variables were present using frequency tables.Quantitative variables were described by mean and standard deviation statistics. Simple binary logistic regression analyses were conducted to see the association between each independent variable and infertility. Since the dependent variable is dichotomous, binary logistic regression has been applied for the multivariate analysis. The dependent variable has been categorized as “1 = Yes (women experiencing infertility)" and “0 = No” to assess the potential determinants of infertility. Variables with $p \leq 0.25$ used as a cutoff point to select candidate variable for final model or multiple binary logistic regressionsto identify determinants of infertility and improve the chances of retaining meaningful confounders.The Backward stepwise LR method was used and Odds ratios with its 95% confidence interval were computed to assess the strength of association of factors with infertility. All statistical tests were two-tailed and a $P < 0.05$ was considered to indicate statistical significance. Multicollinearity was checked using standard error (less than 2). The final model fitness wascheckedby Hosmer-Lemeshow goodness-of-fit.

4.13. Ethical considerations

The ethical clearance was obtained from institutional ethical review board of Bahir Dar University. A written permission was obtained from selected health facilities. A written and informed consent was obtained from all the clients prior to participation in this study. Anonymous data was taken and privacy and confidentiality was maintained during the interview.

5. RESULT

Socio-demographic characteristics of study participants

A total of 519 participants (173 cases and 346 controls) were included in the study having a response rate of 95.9%. The mean age of cases and controls was 30.2 (±5.104) and 29.89 (±5.343) years, respectively. The mean age at marriage was 21.96 (±4.058) years for cases and 19.22 (±3.71) years for controls. One hundred thirty seven (79.2%) of cases and 277 (80.1%) of controls lived in the urban area. One hundred fifty two (87.9%) of cases and 331(95.7%) of controls had no family history of infertility(table 2).

Table 2: Socio-demographic characteristics of study participants Bahir Dar city, Ethiopia, 2021.

Variable	Category	infertility problem			
		No		YES	
		Count	N %	Count	N %
age	<30	191	55.20%	66	38.20%
	>=30	155	44.80%	107	61.80%
residence of the clients	Rural	69	19.9%	36	20.8%
	Urban	277	80.1%	137	79.2%
religion	Orthodox	267	77.2%	138	79.8%
	Muslim	58	16.8%	28	16.2%
	Protestant	21	6.1%	7	4.0%
educational status	Unable to read and write	27	7.8%	12	6.9%
	Primary school	43	12.4%	28	16.2%
	Secondary school	91	26.3%	60	34.7%
	Diploma and above	185	53.5%	73	42.2%
occupational status	House wife	113	32.7%	63	36.4%
	Merchant	58	16.8%	42	24.3%
	daily Laborer	8	2.3%	1	0.6%
	Government/private	167	48.3%	67	38.7%

Reproductive characteristics of study participants

Table 3 shows the distribution of study participants according to their reproductive characteristics. Among 173 cases, 110(63.6%) suffered from secondary infertility which means that they faced problems in conceiving following a pregnancy while the remaining 63(36.4%) experienced primary infertility. The duration of infertility ranges from 1 to 26 years with a mean duration of 4.94+/- 3.897 years. One hundred three (59.5%) of cases and 219 (63.3%) of controls had greater than 3-day menstruation flow. Nineteen (28.8%) of cases and 85 (24.6%)) of controls had a history of the first pregnancy before 21 year. Seventy-tree (42.2%) of cases and 137 (39.6%) of controls had a history of dysmenorrhea. Fifty-eighth (33.5%) of cases and 53 (15.3%) of controls had an irregular menstrual pattern. Two (1.2%) of cases and 1 (0.9%) of controls had history of ectopic pregnancy. Thirty-seven (21.4%) of cases and 29(8.4%) of controls had history of abortion history. Seventy-nine (45.7%) of cases and 181(52.3%) of controls started their first menstruation at the age of 15 and above. One hundred sixty one (93.1%) of cases and 332(95.6%) of controls had 26-32 days menstrual cycle.

Sexual Characteristics From the total respondents, 50 (28.9%) of cases and 57 (16.5%) of controls had multiple sexual partners. About thirty-three (19.1%) of cases and 20 (5.8%) of controls had a history of sexually transmitted infection (table 3).

Table 3: Reproductive and family planning characteristics of study participants at Health facilities Bahir Dar, Ethiopia, 2021.

Variable	Category	infertility problem			
		No		YES	
		Count	N %	Count	N %
ever pregnant	No			110	63.6%
	Yes	346	100%	63	36.4%
Outcome of last pregnancy	Abortion and ectopic	15	4.3%	33	19.1%
	Still birth	10	2.9%	3	1.7%
	Alive baby	321	92.8%	29	16.8%
History ectopic pregnancy	No	343	99.1%	171	98.8%
	Yes	3	0.9%	2	1.2%
abortion history	No	317	91.6%	136	78.6%
	Yes	29	8.4%	37	21.4%
Family history of infertility	No	331	95.7%	152	87.9%
	Yes	15	4.3%	21	12.1%
Irregular pattern menstrual cycles	No	293	84.70%	115	66.50%
	Yes	53	15.30%	58	33.50%
Dysmenorrhea	No	209	60.4%	100	57.8%
	Yes	137	39.6%	73	42.2%
age first menstruation	< 15 years	173	50.0%	94	54.3%
	> =15 years	173	50.0%	79	45.7%
Menstrual cycle	26-32 days	332	96.00%	161	93.10%
	<26and>32 days	14	4.00%	12	6.90%
Multiple sexual partners	No	289	83.5%	123	71.1%
	Yes	57	16.5%	50	28.9%
contraceptive use	No	97	28.00%	65	37.60%
	Yes	249	72.00%	108	62.40%
type of contraceptive	No	97	28.00%	65	37.60%
	short acting FP	180	52.00%	81	46.80%
	long acting FP	69	19.90%	27	15.60%

Family Planning Characteristics of Study Participants:- Among the total study participants, 108 (62.4%) of cases and 249 (72. %) of controls used family planning. Among contraception users 81 (46.8%) of cases and 180 (52 %) of controls used short acting family planning whereas twenty seven (15.6%) of cases and 69(19.9%) of controls used long acting family planning (Table 3).

Lifestyle /Behavioral Characteristics of Study Participants.

Table 4 shows the distribution of study participants according to their lifestyle history. one hundred twenty eight (74%) of cases and 273(78.9%) of controls were ever drunk caffeine on the other hand 118(68.2%) of cases and 259(74.9%) of controls were currently uses caffeine. The lifetime prevalence of alcohol drinking was 60(34.7%) among cases and 139(39.3%) among controls. The smoking status of study participants were 2(1.2%) of cases and 2(0.6%) of controls were current smoker, two (1.2%) of cases and 8(2.3%) of controls were ex-smoker and the remaining 169 (97.7%) of cases and 336(97.1%) of controls were never smokes. The lifetime prevalence of chat chewing was 14(8.1%) among cases and 21(6.1%) among controls. Fifteen (8.7%) of cases and 21 (6.1%) of controls were found to be underweight. On the other hand, 20 (11.6%) of cases and 32 (9.2%) of controls were overweight. Two (1.2%) of cases and 2(0.6%) of controls were found to be obese (Table 4).

Table 4:-Lifestyle/behavioral characteristics of study participants at Health facilities, Bahir Dar, Ethiopia, 2021.

Variable	Category	infertility problem			
		No		YES	
		Count	N %	Count	N %
Ever drunk Caffeine	No	73	21.1%	45	26.0%
	Yes	273	78.9%	128	74.0%
No of cup caffeine per day	<=3 cup	32	11.80%	18	14.10%
	>3 cup	240	88.20%	110	85.90%
currently drink Caffeine	No	87	25.1%	55	31.8%
	Yes	259	74.9%	118	68.2%
Ever drunk alcohol	No	210	60.7%	113	65.3%
	Yes	136	39.3%	60	34.7%
currently drunk alcohol	No	235	67.9%	126	72.8%
	Yes	111	32.1%	47	27.2%
Cigarette smoking status	current smoker	2	0.6%	2	1.2%
	ex- smoker	8	2.3%	2	1.2%
	3 Non smoker	336	97.1%	169	97.7%
ever chewed chat	No	325	93.9%	159	91.9%
	Yes	21	6.1%	14	8.1%
currently chewed chat	No	337	97.4%	169	97.7%
	Yes	9	2.6%	4	2.3%
Obesity scale	Under weight	21	6.10%	15	8.70%
	Normal	293	84.70%	138	79.80%
	over weight	32	9.20%	20	11.60%

Disease characteristics of study participants

The disease characteristics of study subjects are shown in table 5. Eleven (6.4%) of cases and 19(5.5%) of controls were history of pelvic surgery. Fifty (28.9%) of cases and 57(16.5%) of controls were history of STI. Nine (5.2%) of cases and 24(6.9%) of controls were disorder of hypertension. Seventeen (9.8%) of cases and 23(6.6%) of controls had asthmatic disorder. Two (1.2%) of cases and 2(0.6%) of controls were history of tuberculosis. Two (1.2%) of cases and 7(2 %) of controls were history of Diabetes myelitis. Twenty-six (15%) of cases and 8(2.3%) of controls were endocrine disorder. Forty-six (26.6%) of cases and 34(9.8%) of controls were stress disorder (Table 5).

Table 5: Disease related characteristics of study participants at Health facilities, Bahir Dar, Ethiopia, 2021.

Variable	Category	Infertility problem			
		No		YES	
		Count	N %	Count	N %
Pelvic surgery	No	327	94.5%	162	93.6%
	Yes	19	5.5%	11	6.4%
History of STI	No	289	83.5%	123	71.1%
	Yes	57	16.5%	50	28.9%
Tuberculosis	No	344	99.4%	171	98.8%
	Yes	2	0.6%	2	1.2%
Hypertension	No	322	93.1%	164	94.8%
	Yes	24	6.9%	9	5.2%
Asthma	No	323	93.4%	156	90.2%
	Yes	23	6.6%	17	9.8%
Diabetes mellitus	No	339	98.0%	171	98.8%
	Yes	7	2.0%	2	1.2%

Hormonal disorder	No	338	97.7%	147	85.0%
	Yes	8	2.3%	26	15.0%

Determinants of Women's Infertility

In this study, different determinant factors were assessed using bivariate and multivariate logistic analysis. All the independent variables that in the simple binary regression analysis had an association with infertility presence in the women's with a p value less than 0.25 were included in a multivariate logistic regression model.

In bivariate analyses, the following variables were statistically significant at the 95% CI level age of women>30, abortion history, family history of infertility, Irregular patterns of menstrual flow, multiple sexual partner, contraceptive use, hormonal disorder, history of STI, ever caffeine, history of asthma, Menstruation cycle. All the above variables included in the multiple logistic regression models. (Table 6)

Table 6 the simple binary logistic regression analysis on Determinants of infertility among married women Bahir Dar city, Ethiopia, 2021

Variables	Category	Control, n (%)	. Case, n (%)	COR(95% CI)	Sig.
Age	<30	191(55.20%)	66(38.20%)	1	
	>=30	155(44.80%)	107(61.80%)	1.998(1.376-2.9)	0.001*
Abortion history	No	317(91.6%)	136(78.6%)	1	
	Yes	29(8.4%)	37(21.4%)	2.974(1.757-5.032)	0.001*
Family history of infertility	No	331(95.7%)	152(87.9%)	1	
	Yes	15(4.3%)	21(12.1%)	3.049(1.529-6.077)	0.002
Menstruation cycle	26-32 days	332(96.00%)	161(93.10%)	1	
	<26and>32 days	14(4.00%)	12(6.90%)	1.768(0.799-3.909)	0.160
Ever Caffeine	No	87(25.1%)	55(31.8%)	1	
	Yes	259(74.9%)	118(68.2%)	0.761(0.496-1.165)	0.209
Current caffeine	No	73(21.1%)	45(26%)	1	
	Yes	273(78.9%)	128(74%)	0.721(0.482-1.077)	0.110
STI	No	326(94.2%)	140(80.9%)	1	
	Yes	20(5.8%)	33(19.1%)	3.842(2.131-6.929)	0.001*
Hormonal disorder	No	338(97.7%)	147(85.0%)	1	
	Yes	8(2.3%)	26(15.0%)	7.473(3.305-.895)	0.001*
Asthma	No	323(93.4%)	156(90.2%)	1	
	Yes	23(6.6%)	17(9.8%)	0.653(0.339-1.258)	0.203
Multiple sexual partners	No	289(83.5%)	123(71.1%)	1	
	Yes	57(16.5%)	50(28.9%)	2.061(1.3353.182)	0.001
Contraceptive	No	97(28.00%)	65(37.60%)	1	
	Yes	249(72.00%)	108(62.40%)	0.647(0.44-0.953)	0.028
Type of contraceptive	No	97(28.00%)	65(37.60%)	1	
	short acting FP	180(52.00%)	81(46.80%)	1.712(0.993-2.952	0.057
	long acting FP	69(19.90%)	27(15.60%)	1.15(0.686-1.927)	0.053
Pattern menstrual cycles	No	293(84.70%)	115(66.50%)	1	
	Yes	53(15.30%)	58(33.50%)	2.788(1.813-4.288)	0.001*

After adjustment for other preconditions, we generated a multivariate logistic regression model with backward stepwise LR method to analyze the independent factors for infertility. The binary logistic regression model assumptions were checked. All variables standard error were lessthan two (2) and Hosmer-Lemeshow goodness-of-fit test shows 0.381. Five factors (age of women >30, abortion history, family history of infertility, Irregular patterns of menstrual flow, hormonal disorder, and history of STI)were remained the final condensed model(Table 7).

In this study, the odds of having infertility for a women whose age above 30 years was 1.697 times higher than women whose age less than 30 years (OR = 1.697, 95% CI: 1.118-2.576), Abortion history is a significant associated with female infertility. Women with abortion history have 2.246 times higher than no history of abortion (AOR = 2.246; 95% CI: 1.262-3.998). Irregularity of menstrual cycles is a significant associated with female infertility. Women with irregular menstrual cycle have 2.310 times higher than regular menstrual cycle (AOR = 2.310, 95% CI=1.447-3.687). Hormonal disorder is a significantlyassociated with female infertility (AOR = 8.625, 95% CI=3.652-20.366). We show that the odds of having infertility women's with history of STI was 3.638 times higher than women's no history of STI (AOR = 3.638; 95% CI: 1.946-6.801). But Contraceptiveuse, type of contraceptive used, family history of infertility, menstrual cycle, multiple sexual partner, History of asthma, Ever Caffeine, Current caffeine were not statistically significant association with infertility in multivariate logistic regression.(Table 6)

Table 6: Bivariate and multivariate logistic regression analysis on Determinants of infertility among married women Bahir Dar city, Ethiopia, 2021.

Variables	Category	Control, n (%)	. Case, n (%)	COR(95% CI)	Adjusted OR(95%CI)	Sig.
Age	<30	191(55.20%)	66(38.20%)	1	1	
	>=30	155(44.80%)	107(61.80%)	1.998(1.376-2.9)	1.697(1.118-2.576)	0.013*
Abortion history	No	317(91.6%)	136(78.6%)	1	1	
	Yes	29(8.4%)	37(21.4%)	2.974(1.757-.032)	2.246(1.262-3.998)	0.006*
STI	No	326(94.2%)	140(80.9%)	1	1	
	Yes	20(5.8%)	33(19.1%)	3.842(2.131-6.929)	3.638(1.946-6.801)	0.001*
Hormonal disorder	No	338(97.7%)	147(85.0%)	1	1	
	Yes	8(2.3%)	26(15.0%)	7.473(3.305-.895)	8.625(3.652-20.366)	0.001*
Irregular menstrual	No	293(84.70%)	115(66.50%)	1	1	

cycles	Yes	53(15.30%)	58(33.50%)	2.788(1.813-4.288)	2.310(1.447-3.687)	0.001*

6. DISCUSSION

The aim of this study was to assess determinants of infertility among married women who were seeking healthcare services in Bahir Dar city. Accordingly, women's age, history of abortion, history of STI, hormonal disorder and irregular patterns of menstrual flow were identified as determinant factors of women's infertility.

In the current study, the odds of having infertility for a women whose age above 30 years was 1.697 times higher than women whose age less than 30 years (OR = 1.697, 95% CI: 1.118-2.576). This result is in line to the result of the studies conducted in Zambia, Iran and Qatari[23, 25, 28]. This might be related to increasing age, the trend of infertility risk increases in a step manner. Fertility declined beginning as early as the middle of the third decade. The biological basis of this decline include decline in the number of oocytes from birth to menopause, the quality of existing oocytes diminishes with age and on an average, intercourse frequency declines with age [26]. Female fertility is at its peak between the ages of 18 and 24 years, while, it begins to decline after age 27 and drops at a somewhat greater rate after age 35. In terms of ovarian reserve, a typical woman has 12% of her reserve at age 30 and has only 3% at age 40and 81% of variation in ovarian reserve is due to age alone[61, 62], making age the most important factor in female infertility.

The current study revealed that history of abortion was found associated with women's infertility. Women's with abortion history had higher odds of developing infertility (AOR = 2.246; 95% CI: 1.262-3.998).This is in line with a study conducted in Rwanda by Dhont N et al[43].Another support of our finding, a study conducted china by Zhou Z etal.[42].This is similar with a study conducted in Yazd[41]. This is may be related with women who have multiple surgical abortions using a curette are at risk of scarring of the inner lining of the uterus (Asher man syndrome) and reproductive tract infection. This condition is associated with difficulty in becoming pregnant in the future.

In the present study, the menstrual factors associated with infertility were menstrual cycle irregularity. The odds of infertility among women whose irregular menstruation flow were 2.310 times higher than those among women whose menstruation flow was regular(AOR = 2.310, 95% CI=1.447-3.687).This is in line witha study conducted India[63].Another study supporting our

finding, S. Musa et al(2020) in Qatar [23]. This might be related to physical stress, psychological stress, medication side effects and hormonal disorders. The inability of women at ovulation and regulation of hormone levels leads to hormonal imbalances. These hormonal disorders are characterized by symptoms such as irregular menstrual cycles, excessive bleeding or very little bleeding, absence of menstruation, or long menstruation periods which are risk factors for infertility.This is similar with a case-control study in south-eastern Iran conducted by Ansari H et al. [46].This is 1.6 times higher comparing to our finding. The possible justification could be study participants difference. This study participants were both primary and secondary infertility but the above study were only secondary infertility.

The odds ofhaving infertility for a women's with history of STI was higher than that of the women who were no history of STI.Women who had a history of STI were 3.638 times more likely to be infertile than those who did not have a history of STI (AOR=3.638; 95% CI: 1.946-6.801). This result is in line with the studies conducted in Dessei (Ethiopia), Nigeria, Rwanda, and Iran[28, 40, 51, 52]. The possible justification could be due to the fact that women with a history of STI are more likely to become infertile because chlamydial and gonococcal infections like salphangitis and pelvic inflammatory disease cause alterations in the tubal mucosa, intra-tubal adhesion, and distal tubal obstruction which finally result in infertility by interfering fertilization[64]. Sexually transmitted diseases can directly or indirectly cause infertility in women and in men. When STDs are left untreated, infections can develop that cause infertility by moving up the reproductive system and spreading to the woman's uterus, ovaries and fallopian tubes causing damage, scarring or inflammation.

In the current study, participants with history of hormonal disorder were more likely to have infertility than those with no history of hormonal disorder. The odds of infertility among women who have hormonal disorder were 8.625 times higher than those among women who have noendocrine disorder (AOR=8.625, 95% CI=3.652-20.366).This is in line with a study conducted Odisha by B. Gomati etal[56].This was also seen in a study by Hymavathi k et al. [57]. The possible justification could thyroid disorders as the most common presenting factor, hypothyroidism in particular. Infertility in women can lead to emotional and psychological stress. Hypothyroidism and hyperthyroidism can result in menstrual irregularities and an ovulatory cycles disturbance, thus affecting the fertility[65]. Hormonal imbalance and infertility the hypothalamus, through the release of gonadotropin releasing hormones, controls the pituitary

gland which directly or indirectly controls most other hormonal glands in the human body. Thus, alterations in the chemical signals from the hypothalamus can affect the pituitary gland, ovaries, thyroid, mammary gland and hence, hormonal abnormalities [66]. Hormonal imbalance is an important cause of anovulation. Women with hormonal imbalance will not produce enough follicles to ensure the development of an ovule [67].In contrast to our results in Jorhat city (India)[59]. This is approximately 16 times highercomparing with our result. The possible justification could be prevalence of thyroid disorder is lower in our study participants compare with this study. Also study participants were only primary infertility.

7. STRENGTH AND LIMITATION OF STUDY

Strength of This study first, Controls were selected from the same population where cases came from, which would minimize selection bias. Since this is unmatched case-control study, a ratio of 2:1 (controls to cases) was utilized to increase the statistical power of the study. Second, data collection tool (interviewer administered questioner with document review) was utilized to reduce information bias.

These are some limitation in this study. First, this is a hospital-based study and findings may not be representative for the general population.

Due to the retrospective nature of case-control studies, recall bias could increase the likelihood that infertile women recall and report exposures.

In addition, this study was based on interviewer administered questionnaire; hence, specialized laboratory investigations to ascertain the cause of infertility were not evaluated.

8. CONCLUSION

In conclusion,age of women, history of abortion, irregular patterns of menstrual flow, history of STI, and endocrine disease were independent determinants of infertility in women. As a result, couples should receive health education on not delaying parenthood, STI, Hormonal disorders, and abortion.

9. RECOMMENDATION

For health professional: -Health educationshould provide not delaying parenthood and the identified (STI, Endocrine disorder and abortion) factor of infertility for Women's at health facility, school and community level.

For ministry of health; -Strengthen public health as well as hospital-based health promotion programs importantly toward modifiable risk factors (e.g. STIs). Moreover, detecting, preventing, and managing modifiable risk factors through awareness creation, screening and early management of chronic diseases (e.g. STI, Hormonal disorder, etc.), may contribute at reduction of incidence and severity of infertility. Such interventions can be delivered at premarital, family planning, post-natal and antenatal clinics at primary health care with early referral to secondary care if required.

For researcher

Further additional studies are needed using prospective follow up to confirm this finding.

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11. ANNEX

ANNEX 1: INFORMATION SHEET

Title of the research: Determinants of infertility among married women attending health facilities for infertility diagnosis and treatment service in Bahir Dar city,NorthWest Ethiopia, 2021.

Name of Principal Investigator: Zerihun Achameyeleh Goshu

Phone number: +251975618468

E-mail: achameyelehzerihun@yahoo.com

Name of the Organization: Bahir Dar University, collage of medicine and health science, school of public health, Department of Epidemiology and Biostatistics.

Sponsor for the project: Self

Purpose of the Research Project: -to identify determinants of infertility among married women'sattending health facilities for infertility diagnosis and treatment service in Bahir Dar city, North West Ethiopia 2021.

Risk: The study will not harm patients and retrieved information will be used for only the study purpose since the information for the study is collected from patient. The name of the patient isn't recorded during data extraction and all information that taken from patient charts will be kept confidential.

Benefit: It has no direct benefit for one whose chart is included in this study. However; it will have direct benefits for health professionals and program managers.

Annex 2: English consent form

My name is _..... I am working as data collector in the study conducted by Zerihun Achameyelehpost graduate student of Bahir Dar University, College of medicine and institution of public health, and Department of Epidemiology. These questionnaires are prepared to assess determinants of infertility among married women attending health facilities for infertility diagnosis and treatment service. This study is designed to generate information for program expansion and designing strategies for preventions of infertility. To attain this purpose, you're honest and genuine participation by responding to the question prepared is very important.

If you have been interviewed you will not be interviewed again.If not, I request you to respond to my questions genuinely. Confidentiality and consent we would like to know your some personal issues, your answers and ideas are completely confidential in secured. Your name will not be written on this form. You can refuse to answer a single question even to the extent to stop the interview at any time you want if you are not comfortable. We appreciate your kindness to be part of the study. The interview will take about 20-30 minutes. Are you willing to participate? If the answer

Yes---------- Continue

No---------- stop

Supervisor name……signature……Date…….

Thank you very much!!

Annex 3: Amharic consent form

እዝል :-የ አሚኮማጠይቅ

ባ/ዳርዩንቨርስቲ

በባህርዳርከተሞሚገ ዝካለመቻልጋርተያያዥቸግሮችንየ ሚዳስስማጠይቅ፤ 2013 ዓ.ም፡ ፡

የ ተቋመኸም _____

በጥናቱለመሳተፍፍቃደኛስለመሆናቸወየ ሚ ልጸበትፎርም

እንደምንሰነበቱ? የ ኔስም _____

ይባላል፤ የ ባ/ዳርዩኒቨርሲቲየ ኢፒዲሞሎጂየ ድህረምረቃተማሪየ ሆነ ወአ/ቶዘሪሁንአቻምሞ ለህበሚያደርገ ዉጥናትላ ይመረጃሰብሳቢነኝ፡ ፡ ፈቃደኛከሆኑከእርግዝናጋርየ ተያያዙቃለማጠይቅአደርግልዎታለሁ፡ ፡ የ ዚህጥናትአላማሞሚ ገ ዝአለመቻልጋርተያያዥቸግሮችንመዳሰስነ ው፡ ፡ ለአላማመመሳካትየ እርስዎንትብብርእንሻለን፡ ፡ የ እርስዎማነ ትምሆነ አድራሻበማጠይቁወስጥአይካተትም፡ ፡ እንዲሁምየ እርስዎማነ ትምሆነ የ ሰጡትምላሽየ እርስዎስለምሆኑበም ንምሁኔታአይገ ለጽም፡ ፡ በዚህጥናትለመሳተፍየ እርስዎሙፍቃደኝነ ትስንጠይቅያለምን ምአስገ ዳጅነ ትሲሆንፍቃደ ኛካልሆኑከመጀመሪያወማሆነ ቃለማጠይቁንከጀመሩምበኃላከመሃልላይሙረጥይችላሉ፡ ፡ በጥናቱለመሳተፍኛነ ዎት?

1. አዎ ……..ይቀጥሉ

2. አይደለሁም…….ያቁአርጡ

የ ተቆጣጣሪወስም_____ ፊርማ_____ ቀን _____

ስለትብብርዎእናመሰግናለን!!!

ANNEX 4: DATA EXTRACTION TOOLS

This is data collection tool intended Determinants of infertility among married women attending health facilities for infertility diagnosis and treatment service in Bahir Dar city, North west Ethiopia, 2021.

Data collection Date ---------- MRN ----------

Data collector Name----------

Principal Investigator: Zerihun Achameyeleh Goshu

Phone number: +251975618468

E-mail: achameyelehzerihun@yahoo.com

Table 7: English version questioner

Section-1 Socio demographic Information

S. N	Question	Answer	Skip
1	What is your Age (in completed years)	…..years	
2	Residence	Urban Rural	
3	What is your religion?	1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5. Other (specify)…..	
4	What is your educational status?	Unable to read and write Primary school Secondary school Diploma and above	
5	What is your occupation?	House wife Merchant Laborer Civil servant	

		Other specify…..	
6	Monthly household income in Ethiopian Birr	……birr	
7	Duration of married life	……..years	
8	What is your Age at marriage?	……year	
9	What is your Height?	……meters	
10	What is your Weight?	…..kg	

Section- 2 Reproductive related questions

11	Have you ever been pregnant?	No Yes	If your answer is no, skip to Q 17
12	What was your age at your first pregnancy?	….year	
13	How many pregnancies do you have till now?	…….	
14	What was Outcome of pregnancy?	Abortion Still birth Alive baby ectopic Other (specify)….	
15	Do you haveHistory of ectopic pregnancy?	No Yes	
16	Do you have abortion history?	No Yes	
17	Do you have infertility problem?	No Yes	
18	How long you trying to achieve pregnancy?	____yr. ____month	
19	Do you have Family history of infertility?	No Yes	
20	Have you adequate sexual relations? The couple should try to have sexual intercourse every two days during the fertile period of her menstrual cycle.	No Yes	
21	What is your Age the first menstruation	……years	

	started?		
22	How long are your menstrual cycles on average (from day one to day one)?	…..days	
23	How many days of bleeding do you have? (average days)	…..days	
24	How do you describe the pattern of your last three menstrual cycles?	Regular Irregular	
25	Do you have Dysmenorrhea during menstruation?	No Yes	
26	Do you have Multiple sexual partners?	No Yes	
27	Have you ever had used modern contraceptive?	No Yes	If your answer is No, skip to Q 31
28	What type are you using?	IUD Injectable Implant OCP Condom Tubal ligation Other (specify)….	
29	How long you used contraceptive?	…….years	
30	Are you in the past 12 months taking any contraceptive?	No Yes	

Disease related questions

31	Do you have pelvic surgery?	No Yes	
32	have you ever had genital tuberculosis	No Yes	
33	have you ever had hypertension	No Yes	
34	Have you ever had asthma	No	

		Yes	
35	have you ever had diabetes mellitus	No Yes	
36	Have you ever had endocrine disorder?	No Yes	If your answer is no, skip to Q 38
37	What type of endocrine disorder do you have	Pituitary Adrenal Thyroid Other (specify)…	
38	Have you ever had abnormal Vaginal discharge?	1. No 2. Yes	
39	Have you ever had genital ulcer?	1. No 2. Yes	

Section- 3 Lifestyle /behavior related questions

40	Have you ever drunk Caffeine?	No Yes	If your answer is No, skip to Q 43
41	Do you drink Caffeine currently?	No Yes	
42	How many cup caffeine intake per day	…..cup	
43	Have you ever drunk any alcoholic beverage?	No Yes	If your answer is No, skip to Q 45
44	Do you drink alcoholic beverage currently?	No Yes	
45	What is your cigarette smoking status	Current smoker Ex-smoker Non-smoker	If your answer is No, skip to Q 47
46	If answer is 1, how many cigarettes a day	……	
47	Have you ever chewed khat?	No Yes	If your answer is No, skip to

			Q 49
48	Do you chew Khat currently?	No Yes	
49	Do you have suffered from stress?	No Yes	

Section- 4 Husband related question

50	Is your partner seeing a doctor for evaluation of infertility?	No Yes	
51	Does his doctor feel that your partner has an infertility problem?	No Yes I don’t know	

መግለጫ ለሚርገ ዝጋርተያ ያነ ኸነ ትያላቸዉችግሮችንየ ሚያ ጠና ማጠይቅ

- ምርጫሽን አክብቢ
- ምርጫሽን ከቀየ ርሽየ መጀመሪያ ዉን ምርጫ ጥፊ

Table 8: Amharic version questioner

የ መጀመሪ ዎች 10 ጥያ ቄዎችማህበራዊጉዳይይማለከታል

ተ.ቁ	ጥያ ቄዎች	አማራጭመልሶችና ኮድ	መግለጫ
1	እ ድሜሽ ስንትነ ወ?	……ዓመት	
2	መኖሪያ አድራሻ ሄትነ ወ?	ገጠር ከተማ	
3	ሀይማኖትሽ ምን ድንነ ወ?	ኦርቶዶክስ ሙስሊም 3. ፕሮቴስታንት 4. ካቶሊክ	

		5. ሌላ ይገለፅ	
4	የትምህርት ደረጃ?	ማንበብ እና መፃፍ የማይችል አንደኛ ደረጃ ሁለተኛ ደረጃ ዲፕሎማ እና ከዚያ በላይ	
5	የስራ ሁኔታ?	የቤት እመቤት ነጋዴ የቀን ሰራተኛ የመንግስት ሰራተኛ ሌላካለ ግለጭ………	
6	ወርሀዊ ገቢሽ ስንት ነው?	……….ብር	
7	በጋብቻ ምን ያህል ጊዜ ቆያችሁ?	………አመት	
8	ስታገቢ እድሜሽ ስንት ነበር?	………አመት	
9	ቁመትሽ በሜትር ስንት ነው?	………ሜትር	
10	ክብደትሽ ስንት ነው?	……….ኪ.ግራም	

ከመራቢያ አካል ጋር የተያያዙ ጥያቄዎች

11	ከአሁን በፊት አርግዘሽ ታውቂያለሽ?	የለም አዎ	ሜልስሽ የለም ከሆነ ወ 17
12	ለመጀመሪያ ጊዜ ስታረግዢ እድሜሽ ስንት ነበር?	……አመት	
13	አርግዘሽ የምታቂ ከሆነ ከአሁን በፊት ምን ያህል ጊዜ አርግዘሻል?	……..	
14	ከአሁን በፊት አርግዘሽ ካወቅሽ የመጨረሻ ሽያው እርግዝና ውጤቱ ምን ነበር?	ወርጃ ሞቶ የተወለደ በህይወት የተወለደ ከማህጸን ውጭ ሌላ ካለ ይገለፅ	
15	ከማህን ውጭ እርግዝና አጋጥሞሽ ያውቃል?	የለም	

		አዎ	
16	ወርጃአጋጥሞሽያዉቃል?	የለም አዋ	
17	የሚገዝችግርአለብሽ?	የለም አዋ	
18	ለሚገዝመክራሚድረግከጀመርሽምንያህልግዜሆነ ሽ?	….አመት…. ወር	
19	የሀኪምየ ምርመራዉጤት		ከቻርቱይሞላ
20	በቤተሰብወስጥሚገዝየ ሚያስቸግረወአለ?	የለም አዋ	
21	በቂየ ሆነ ግብረስጋግንኙነ ትታድርጊያለሽ? (እርግዝናለፈጠርበሚቻልበትወቅትበየ ሁለትቀኑየ ምታደርጊከሆነ)	የለም አዋ	
22	ለመጀመሪያግዜየ ወርአበባስታይእድሜሽስንትነ በር?	…..አመት	
23	የ ወርአበባበየ ስንትቀንይመጣል?	……ቀን	
24	የ ወርአበባስንትቀንይቆያል?	…….ቀን	
25	ያለፉትሶስት3 ወራትየ ወርአበባሽንሁኔታእንዴትትገ ልጫዋለሽ?	መጀበኛ/ወቅቱንጠበቆየ ሚመጣ መጀበኛያልሆነ	
26	በወርአበባግዜህመምአለሽ?	የለም አዋ	
27	ከአንድበላይየ ወሲብጉአደኛኖሮሽያዉቃል?	የለም አዋ	
28	ዘመናዊየ ቤተሰብምታኔአገ ልግሎትተጠቅመሽታዉቂያለሽ?	የለም አዋ	መልስሽየ ለምከሆነ ወ 32
29	ተጠቃሚከሆንሽየ ተጠቀምሽወደ ቤተሰብምጣኔአገ ልግሎትአይነ ት?	በማህንየ ሚቆመጥ መድሬ በከንድስርየ ሚቆመጥ በአፍየ ሚዋጥከኒን ኮንዶም ቱቦመቁአጠር	

		ሌላ ካለ ይገለፅ ….	
30	የ ቤተሰብ ምጣኔ አገልግሎት ለምን ያህል ግዜ ተጠቀምሽ?	…….አመት	
31	ባለፈዉ 12 ወራት የ ቤተሰብ ምጣኔ አገልግሎት ተጠቅመሽ ታዉቂያለሽ?	የ ለም አዎ	

ከበሽታጋር የ ተያያዙ ጥያቄዎች

32	የ ሚህን ቀዶጥገና ተሰርቶልሽ ያዉቃል?	የ ለም አዋ	
33	የ ሚራቢያ አካልቲቢ ታመሽ ታዉቂያለሽ?	የ ለም አዋ	
34	የ ደምገፊት በሽታ ታመሽ ታዉቂያለሽ?	የ ለም አዎ	
35	የ አስምባሽታ ታመሽ ታዉቂያለሽ?	የ ለም አዎ	
36	የ ስካር በሽታ ታመሽ ታዉቂያለሽ?	ለም አዎ	
37	የ ሆርሞን ችግር አጋጥሞሽ የ ዉቃል?	የ ለም አዎ	መልስሽ የ ለምከሆነ ወ 39
38	ለጥያቄቁጥር 37 መልሱአዎ ከሆነ የ ሆርሞን የ ሄትኛዉሆርሞን ችግር ነዉ?	የ ፒቱታሪ እጢ ችግር አድሬናል እጢ ችግር የ እንቅርት ችግር ሌላ ግለጭ…	
39	የ አባላዘር በሽታ አሞሽ ያዉቃል? (ከብልትሽ ያልተለመደ ፈሳሽ፣ በብልትአካባቢ ቁስለት፣ ሽንትስትሸኝ ማቃጠል)	የ ለም አዋ	

ከእኑኗርጋር የ ተያያዙ ጥያቄዎች

40	ቡና ጠጥተሽታውቂያለሽ?	የለም አዎ	ሚልስሽየለምከሆነ ወ 44
41	ቡና የምትጠጪከሆነ ፣ ምን ያህልአመትጠጥተሽል?	…..አመት	
42	በአሁኑሰአትቡና ትጠጪልሽ?	የለም አዎ	
43	ቡና የምትጠጪከሆነ በቀን ምን ያህልስኒ ትጠጪልሽ ?	…..ስኒ	
44	አልኮልተጠቅሚታውቂያለሽ?	የለም አዎ	ሚልስሽየለምከሆነ ወ 47
45	አልኮልየ ምትጠቀሚከሆነ ምን ያክልአመትጠጣሽ?	….አመት	
46	በአሁኑሰአትአልኮልትጠቀሚልሽ?	የለም አዎ	
47	ሲጋራአጨስሽታውቂያለሽ?	በአሁኑሰአትአጨስሁ ከአሁን በፊትአጨስኩ በር አጨስኩአላውቅም	ሚልስሽየለምከሆነ ወ 49
48	ለጥያቄቁጥር 47 ሚልሽ 1 ከሆነ ፣ በቀን በአማካኝምን ያህልታጨሺልሽ?	……ሲጋራ	
49	ጫትቅሚታውቂያለሽ?	የለም አዎ	ሚልስሽየለምከሆነ ወ 52
50	ጫትየ ምትቅሚከሆነ ምን ያህልአመትቅሚል?		
51	በአሁኑሰአትጫትትቅሚያለሽ?	የለም አዎ	
52	በአሁኑሰአትየ ሚያስጨክሽነ ገርአለ?	የለም አዎ	

ስለትዳርጉደኛየ ሚጠየ ቁጥያቄዎች

53	ባለቤትሽምርመራአድርጎ ያውቃል?	የለም አዎ አላወቅም	
54	የ መዉለድችግርእንዳለበትአረጋግጠአል?	የለም አዎ	

		አላ ወቅም	

ANNEX 5: APPROVAL SHEET

The undersigned examining committee certify that the thesis presented by *Zerihun Achameyeleh* entitled: *Determinants of infertility among married women attending health facilities in Bahir Dar city, NorthWest Ethiopia, 2021.*Submitted to Bahir Dar University, College of Medicine and Health Sciences, School of Public Health, Department of Biostatistics and Epidemiology, in partial fulfillment of the requirements for master of degree in Epidemiology compiles with the regulation of the University and meets the accepted standards with respects to originality and quality.

Place of submission: Department of Biostatistics and Epidemiology, College of Medicine and Health Sciences, Bahir Dar University.

Date of Submission: __April 6, 2022

Principal investigator:

Name	Signature	Date
Zerihun Achameyeleh	_____	_____

Appendix 6: Advisor's approval form

Appendix 6: Advisor's approval form

Bahir Dar University

College of Medicine and Health Sciences, School of Public Health,

Department of Biostatistics and Epidemiology

Approval of Dissertation/thesis for defense

I hereby certify that I have supervised, read, and evaluated this thesis/dissertation titled *"Determinants of infertility among married women attending health facilities in Bahir Dar city, North West Ethiopia, 2021"* by *Zerihun Achameyeleh* prepared under my guidance. I recommend the thesis/dissertation be submitted for oral defense (mock-viva and viva voce).

Advisors

Name	Signature	Date
1. Mr. Kassawmar Angaw (MPH, Assist prof)		25/04/2022
2. Mr. Worku Awoke (Assoc. professor)		25/04/2022

Head of department

Name	Signature	Date
Mr. Gebeyaw Wudie (MPH)		18/08/2014

Appendix 7: Examiner's approval form

Bahir Dar University

College of Medicine and Health Sciences, School of Public Health,

Department of Biostatistics and Epidemiology

Approval of Dissertation/thesis for defense result

We hereby certify that we have examined this dissertation/thesisentitled "*Determinants of infertility among married women attending health facilities in Bahir Dar city, North West Ethiopia, 2021*" by*Zerihun Achameyeleh.* We recommend and approve the dissertation/thesisa degree of "MPH in Epidemiology"

Board of Examiners

External examiner's name	Signature	Date
_____	_____	_____
Internal examiner's name	Signature	Date
_____	_____	_____
Chair person's name	Signature	Date
_____	_____	_____