



ARSI UNIVERSITY COLLEGE OF HEALTH SCIENCES DEPARTMENT OF
MIDWIFERY

**UTILIZATION OF EARLY OBSTETRIC ULTRASOUND SCAN AND
ASSOCIATED FACTORS AMONG PREGNANT WOMEN ATTENDING
ANTENATAL CARE AT PUBLIC HEALTH FACILITIES IN ASELLA
TOWN, ARSI, OROMIA, ETHIOPIA, 2024**

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Acronyms and Abbreviations

ANC	Antenatal care
AOR	Adjusted odds ratio
ARTH	Asella Referral and Teaching Hospital
BOH	Bad Obstetric History
COR	Crude odds ratio
CS	Cesarean section
EDHS	Ethiopian Demographic Health Survey
EOUS	Early Obstetric Ultrasound Scan
ETB	Ethiopian Birr
FIGO	Federation of international gynecology and obstetrics
HC	Health Center
HCW	Health Care Workers
HMIS	Health Management and Information System
LMIC	Low- and middle-income countries
SDG	Sustainable developmental goal
SPSS	Statistical package for social sciences
SSA	Sab-Saharan Africa
SVD	Spontaneous vaginal delivery
USG	Ultrasonography
WHO	World Health Organization

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Abstract

Background: Early obstetric ultrasound utilization remains a global challenge, particularly in developing countries. Despite WHO recommendations for routine scans before 24 weeks gestation, many women face challenges that limit utilization of ultrasound services. Addressing these issues is crucial for improving early utilization of ultrasound scan services.

Objective: To assess the utilization of early obstetric ultrasound scan and associated factors among pregnant women attending antenatal care at public health facilities in Asella town, Arsi, Oromia, Ethiopia, 2024.

Methods and materials: A facility-based cross-sectional study was conducted on 462 pregnant women antenatal care at public health facilities in Asella town. The Study units were selected through systematic sampling technique. Data were collected by structured questionnaires which were developed from different literatures, and entered into Epi-data 3.1 and exported to SPSS 25. To find associated factors of early obstetric ultrasound scan, bivariate and multivariate logistic regressions were performed. The presence and strength of associations were estimated using AOR with a 95% CI, and statistical significance was deemed at a $p < 0.05$.

Results: A total of 462 women answered to the questionnaire, yielding a response rate of 100%. Prevalence of early obstetric ultrasound utilization in the study area was 76.4%. Multivariate logistic regression analysis revealed that variables like History for obstetric ultrasound scan (AOR 4.597, 95% CI: 2.022-10.454), Information/advice during ANC visit (AOR 3.961, 95% CI: 1.786–8.784), Knowledge about early obstetric ultrasound (AOR 5.057, 95% CI: 1.353–18.898) and ANC (AOR 5.030, 95% CI: 2.519–10.044) were predictors of early obstetric ultrasound utilization.

Conclusion: The prevalence of early obstetric ultrasound utilization was relatively high in the study settings compared with previous studies. History for obstetric ultrasound scan, Information/advice during ANC contact, History for Obstetric complication, Knowledge about early obstetric ultrasound and ANC contacted were predictors of early obstetric ultrasound utilization. Therefore, Stakeholders need to improve women's awareness on the benefits of early obstetric ultrasound screening.

Keywords: utilization, early obstetric ultrasound, Referral hospitals, Asella town

1. Introduction

1.1. Background

An early ultrasound scan is often a routine part of antenatal care before 24 weeks of gestational age to see baby's anatomy in detail. This also offers the parents and practitioner the picture of overall health of baby and pregnancy. Ultrasound scan (USS) is an imaging diagnostic procedure that mainly uses sound waves of frequency greater than 20 Kilohertz (20 K-Hz). Unlike X-Rays, gamma rays, and many others, USS uses safe non-ionizing energy. It is a non-aggressive, less expensive tool with real-time imaging capabilities(1).

Routine obstetric ultrasound has been one of the most important advances in antenatal care worldwide. Ultrasound is a safe, nonionizing modality that meets the World Health Organization (WHO) standard for the use of technology(2). It is affordable, accessible, acceptable, and scientifically sound. However, it raises social, ethical, and economic dilemmas for both health workers and the mothers(3).

The use of ultrasound has quickly gained acceptance in medicine because of its non-invasive, cost-effective, and safe for the mother, and fetus(4). Nowadays, antepartum ultrasound has become an essential part of antenatal care (ANC) worldwide. Consistent with the recommendations of the World Health Organization (WHO); an ultrasound scan should be a part of routine prenatal care, specifically, one ultrasound scan before 24 gestational age is suggested for every pregnant woman(5).

Ultrasound during pregnancy is mostly used to estimate fetal age, number of fetuses, placental localization, screening of vertebrate malformation, fetal growth, and fetal presentation, to diagnose obstructed labor, incomplete miscarriage, hydatidiform mole, and ectopic pregnancy(6)(7). Additionally, it's psychological effects on the initiation of bonding, reduction of tension, depression, hostility, and corporal symptoms when USS is well established(2). Identification of malformations and obstetric complications by routine USS provides early information and helps in creating timely selections based on physiological conditions for termination, acceptable treatment at birth, and prompt transfer to units specialized within the care of the newborn(8).

The World Health Organization (WHO) recommends that all pregnant women get at least one obstetric ultrasound before 24 weeks of gestational age(5). Routine obstetric ultrasound has been one of the most significant advancements in antenatal care globally(9)(10). It is helpful for determining multiple pregnancies and gestational age, and it may be associated with a lower likelihood of inductions after 42 weeks(5). It is an essential radiological examination tool, which recently has been widely used in antenatal maternity care. With the global increase in pregnancy percentages due to the advanced improvement of technology, there come the needs for improved technology such as ultrasound(10).

High percentage of maternal mortality in the developing world, particularly in Ethiopia, may due to poor utilization of early obstetric ultrasound scan to prevent complications of pregnancy. Mixed cultural and societal opinions of ultrasound services in developing countries, as well as a lack of effective communication between care givers and pregnant women, are believed to influence service uptake(11). Hence, this study aimed to assess utilization of early obstetric ultrasound scan and associated factors among pregnant mothers attend antenatal care at public health facilities in Asella town.

1.2.Statement of the Problem

Early obstetric ultrasound utilization in developing countries faces significant challenges, impacting maternal and fetal health outcomes. Despite WHO recommendations for at least one ultrasound before 24 weeks gestation, barriers such as high costs, limited access to trained personnel, and inadequate healthcare infrastructure hinder access(12). Cultural perceptions and lack of awareness about the benefits of ultrasound further contribute to low utilization rates. These obstacles contribute to lower utilization rates, impacting maternal and fetal health outcomes. Additionally, disparities in access between urban and rural areas exacerbate the problem, leading to increased maternal and neonatal morbidity and mortality. Addressing these issues is crucial for improving prenatal care services(13).

Pregnant women in developing countries are more likely to have complications during pregnancy and die, and their newborns are more likely to have complications during birth or die after delivery; however, many of the problems may be avoided with adequate prenatal care involving early ultrasound scan, which is one of the most significant components of prenatal care(14). Moreover, generally speaking, presenting to obstetric care later in pregnancy can lead to adverse outcomes such as low birth weight, infant and neonatal mortality and congenital malformations(15). Finally, late access to prenatal care can result in missed opportunities of timely screening using diagnostic tests such as early prenatal ultrasound(16).

Early obstetric ultrasound utilization in sub-Saharan Africa is critically low, despite its proven benefits for maternal and fetal health. The region faces significant barriers, including inadequate healthcare infrastructure, and a severe shortage of trained personnel. Cultural beliefs and misinformation about ultrasound safety further hinder acceptance and utilization(17). Furthermore, geographic disparities limit access, particularly in rural areas where awareness and service availability are minimal. These challenges contribute to high rates of perinatal morbidity and mortality, underscoring the urgent need for improved access to ultrasound services as part of comprehensive maternal healthcare in the region(7). The region has also the highest levels of perinatal mortality globally, where the estimated perinatal mortality was 34.7 per 1000 births(18). Intrauterine growth retardation (IUGR) is a major cause of perinatal mortality and morbidity, and early ultrasound may be useful in identifying expectant mothers who are at early risk.

The ultimate goal of antenatal ultrasound scan services should be to support equitably provided, high-quality care (including experience of care) and individual clinical encounters that are safe, informative and integrated as part of the package of antenatal care. Pregnant individuals and their partners/families should be provided with clear information about the purpose of routine antenatal ultrasound, potential consequences of fetal anomaly detection and any out of pocket costs for services(19).

There is the mildest awareness of obstetric ultrasound scanning during pregnancy in a different region in sub-Saharan Africa. Still now, there is limited data on the actual level of understanding of SSA women. The mildest knowledge influences the pregnant and fetus health even on the fetal mortality rate. When pregnant women don't realize the importance of obstetric ultrasound scanning, they may not do it. The ignorance of the appropriate time for scanning lead to delay it, therefore, the early detection of the fetal abnormality will not happen, and the treatment is become difficult or impossible and often forces us to abortion. At the same time, we can avoid such problems by early obstetric ultrasound scanning(20).

Ethiopia is undertaking many activities to improve the quality of maternal health care service utilization, reduce maternal and neonatal morbidity and mortality, and achieve sustainable development goals(21). However, there's still a high share of maternal and neonatal morbidity and mortality which might result from the poor utilization of prenatal ultrasound scans to stop the complications of physiological condition(22).

As per my knowledge, there are only a few studies that assess utilization of ultrasound and factors that influence utilization of obstetric ultrasound screening services in public hospitals in Ethiopia, and no studies have been conducted in study area. Therefore, this study aimed to assess utilization of early obstetric ultrasound and factors that influence utilization of early obstetric ultrasound scanning services among antenatal women at public health facility in Asella town, Ethiopia.

1.3. Significance of the Study

This study was proposed to assess Utilization of early obstetric ultrasound scanning and associated factors among pregnant women attending antenatal care. The results of this study also helpful for designing appropriate strategies locally that improve utilization of early obstetric ultrasound scan by mothers, specifically during first and second trimester of pregnancy.

The findings of the study will also recommended Asella town health facilities to mobilize and sensitize the pregnant mothers to increase awareness and utilization of early obstetric ultrasound scan through awareness creation toward early obstetric ultrasound scan utilization to increase child and mothers survival by decreasing complications during pregnancy.

Furthermore, this study possibly tries to bring to light some of very important socio demographic factors that determine the utilization of early obstetric ultrasound scan in the study area. And the study also help service providers in planning and providing more efficient utilization of early ultrasound scan counselling at all level. It also hopes that results of the study helps as a baseline for future studies to enhance utilization of early ultrasound scan at health facilities to prevent complications at early period of pregnancy.

2. Literature Review

This section reviews related literature on utilization of early ultrasound scan, on socio demographic factors, knowledge, and other associated factors that affect utilization of early ultrasound scan among pregnant mothers who attend antenatal care, mainly those studies that are carried out in developing countries and also used to develop conceptual framework to study the association between utilization of early ultrasound scan and factors that affect utilization of early ultrasound scan in the study area.

2.1.General Overview of Ultrasound Scan

Ultrasound has been used in obstetrics since the 1950s and has become an essential part of current prenatal care(23). The use of ultrasound in pregnancy can provide valuable information that can predict fetal outcomes and aid in the detection of cardiac, gastrointestinal(24), renal, and neural abnormalities(13) as well as chromosomal anomalies including Down's syndrome(25).

In high-income countries, ultrasound is a routinely used imaging assessment during pregnancy. Examination of the fetus, uterus, placenta and surrounding anatomy via ultrasound can generate results that inform clinical diagnosis and decision-making, and optimally improve experience of care. Importantly, ultrasound measurement of the fetus enables accurate gestational age estimation, which in turn facilitates appropriate, time-sensitive prevention and treatment interventions during pregnancy(26). Routine antenatal ultrasound may also enable earlier detection of pregnancy states that are not readily apparent, but require special management, such as multiple pregnancies and placenta praevia. However, in many low-income and middle-income countries, access to routine, high-quality ultrasound within antenatal care (ANC) remains inconsistent(27).

The use of ultrasound scans by pregnant women varies widely across the globe(28). In western medicine, it has nearly universal coverage in obstetrics, where routine screening is an integral part of the prenatal examination(29). The use of obstetric ultrasound was found to be relatively high in rural eastern China, impacted by diverse socio-demographic and clinical factors such as the availability and accessibility of services as well as access to information(9).

The study conducted in Canada reveals that about 68% of Canadian women received an optimally timed prenatal ultrasound. Only around 27% of Canadian women received early ultrasounds and 4.3% received late ultrasound. This was influenced by a number of factors including: being younger, underweight, born outside of Canada, having a high household income and receiving prenatal care(30).

In Sub-Saharan Africa, the use of ultrasound scans by pregnant women also varies(31), its use limited by several factors(28). In Lagos State, Nigeria, there was an increase in the use of ultrasound scans by pregnant women(9), whereas in Kano, Northern Nigeria, there was a decrease in the use of ultra-sound scans(32). In eastern Africa, the use of obstetric ultrasound by pregnant women also varies(33). In Nairobi, Kenya, the use of ultrasound scans by pregnant women is influenced by women's awareness of the services and their benefits, the availability of services, customer care, the availability of support, and the quality of the services offered(33). In Uganda, the services are more popular in towns and urban centers than in rural areas, which was linked to poverty, education level, lengthy distance to health facilities, lack of services, and perceived poor quality of services(9).

The study done in Addis Ababa hospitals reveals that, the majority of respondents (70.3%) had undergone obstetric ultrasound screening in their current pregnancy. Of these, 36.1% of those screened were scanned once, 25.5% twice, and 8.7% three or more times. More than half (51.0%) of the study participants consider two ultrasound examinations to be ideal during their pregnancy, 26.5% claimed three times is ideal, 15.1% claimed one, 5% claimed four and above; and 2.5% do not know what number of ultrasound examinations are ideal during pregnancy(9).

According to the study conducted in in Jimma town public health institutions, the proportion of prenatal ultrasound utilization in this study was 60.7%. This study also revealed that there was a strong association between participants' knowledge of prenatal ultrasound and the utilization of prenatal ultrasound. But the proportion of prenatal ultrasound utilization during pregnancy was lower than the world health organization (WHO) recommendation. So, educating mothers on the purposes of obstetric ultrasound and/ or including a prenatal ultrasound screening as part of antenatal care is needed(22).

2.2.Factors affecting utilization of early ultrasound scan

2.2.1. Socio-demographic factors

A cross sectional study done in Canada shows, women who were under 20 years of age was less likely to have an early ultrasound scan. This is consistent with findings that women who are under 20 years of age are more likely to have late access to prenatal care, which can reduce their likelihood of receiving earlier ultrasound compared to optimally timed ones. Teenage mothers may delay access to prenatal care due to not realizing that they are pregnant, or due to fears of confirming that they are pregnant or the fear that someone else might subsequently discover their pregnancy(30).

The finding from a study conducted in Kenya on barriers and enablers that influence the utilization of ultrasound screening services revealed that, high household income increases the ability of women to cover their travel expenses. Lack of money was identified by the respondents as the main barrier to accessing ultrasound screening. Prenatal ultrasound utilization was directly affected by monthly household income. Respondents' household with very low income was less likely to utilize prenatal ultrasound than those who had a household with high monthly income(12).

The study conducted in Addis Ababa hospitals shows that educational status, marital status, occupation of pregnant women, monthly house-hold income was associated with the utilization of obstetric ultrasound scan. Pregnant women whose educational status was limited to primary schools were more likely to utilize obstetric ultrasound compared to those with no formal education. Women's occupation was another socio-demographic variable that affect utilization of obstetric ultrasound, government-employed women, self-employed women and women working as a student were more likely to utilize obstetric ultrasound than those women working as housewives(9).

A study conducted in Jimma public hospitals reveal that, women's residency was significantly affecting the utilization of obstetric ultrasound. In this study, women living in urban areas were six times less likely to utilize prenatal ultrasound than those living in rural areas. This is maybe due to the accessibility of better information and awareness about prenatal ultrasound in urban areas than in rural areas and the variation in the distance of the health facilities. Another reason may be the low expansion of infrastructure in the rural parts of our country compared to urban

areas and rural women are more vulnerable to the violation of reproductive rights as they do have less decision-making ability on obstetric procedures (obstetric ultrasound scan) than urban pregnant women(22).

2.2.2. Obstetric history related factors

Several obstetric variables influenced the reasons identified for wanting prenatal ultrasound scan. Women in their first pregnancy were more interested in seeing the baby (and for the father to see the baby) than women with previous deliveries. The finding that women with experience of a previous spontaneous or induced abortion had significantly different reasons from other women for wanting prenatal ultrasound was predictable, but perhaps surprising in its strength(34).

The study conducted in Saudi Arabia found that knowledge level regarding obstetric ultrasonography was significantly higher among women with multiparous. This result may be explained by the fact that the experience of previous pregnancy plays a significant role to increase the knowledge, and their health care providers also participate in improving the percent among multiparous women through their routine follow up during pregnancy(35).

Women's previous exposure to ultrasound was another variable that was significantly associated with the utilization of obstetric ultrasound. Those respondents with previous exposure to ultrasound were more likely to utilize prenatal ultrasound than those who had no previous exposure. This might be because of their understanding of its purposes and benefits, such that they readily go for the examination(13).

The majority of the pregnant women utilized obstetric ultrasound scan if there were pregnancy complications history to determine the health status of the fetus as well as the gestational age of the fetus. Many women also willingly use ultrasound scan to determine fetal sex(9).

The study done in Jimma showed that history of abortion had a significant effect on prenatal ultrasound scan utilization. Those respondents with a history of abortion were six times more likely to utilize prenatal ultrasound than their counterparts. This might be because of the perceived fear of losing their pregnancy and the complications associated with it. Furthermore, mothers with a history of abortion might feel that their abortion was related to poor utilization of ANC service(22).

2.2.3. Knowledge related factors

Many women did not view ultrasound in pregnancy as a screen for abnormalities and indicated non-medical reasons for desiring ultrasound scan, such as to see the baby, to experience the pregnancy as more real and to discover the sex of the baby. Women have generally been found to have a good knowledge and understanding of the clinical grounds for ultrasound scanning(34).

The cross sectional study conducted in Saudi Arabia found that knowledge level regarding obstetric ultrasonography was significantly higher among women with multiparous. This result may be explained by the fact that the experience of previous pregnancy plays a significant rule to increase the knowledge, and our health care providers also participate in improving the per cent among multiparous women through their routine follow up during pregnancy(35).

When pregnant women don't realize the importance of obstetric ultrasound scanning, they may not do it. The ignorance of the appropriate time for scanning lead to delay it, therefore, the early detection of the fetal abnormality will not happen, and the treatment is become difficult or impossible and often forces us to abortion. At the same time, we can prevent by early obstetric ultrasound scanning(19).

The finding from the study done in Addis Ababa hospitals revealed that, a strong association between the educational status of women and utilization of obstetric ultrasound. Pregnant women with elementary level education were more likely to utilize prenatal ultrasound than those with no formal education. This may be due to accessing information and understanding the purpose of ultrasound examination during pregnancy(9).

The finding from the study conducted in Jimma revealed that there was a strong association between participants' knowledge of prenatal ultrasound scan and the utilization of prenatal ultrasound. Mothers who had good knowledge were more likely to utilize prenatal ultrasound than their counterparts. A good knowledge of prenatal ultrasound knew its purposes and they are eager and readily go for it even when their doctor has not requested it. Hence, providing information on prenatal ultrasound in rural community is paramount(22).

2.2.4. Health services related characteristics

Women in Sub-Saharan Africa are yet to embrace early pregnancy ultrasound screening due to factors that vary from individual challenges in health seeking behaviors to health facilities capacity limitations and unclear national policies environment(28). While WHO recommends at least one Obstetric Ultrasound for pregnant women(36), FIGO recommends two ultrasound screens for all pregnant women during the first and second trimesters to mitigate risks associated with adverse perinatal outcomes.

In Kenya, only 62% of pregnant women have access to skilled care and comparatively, 50% of pregnant women in rural areas receive skilled care compared to 82% of their counterparts in the urban area(12). Among the factors contributing to limited quality of ANC care is lack of adequate diagnostic services, cost of care in primary health care settings and shortage of qualified professional human resource for health in underserved settings.

In addition to lack of standardized obstetric ultrasound training guidelines for frontline health workers in Sub-Saharan Africa (SSA) countries, lower knowledge among pregnant women on usefulness of obstetric ultrasound(37) has contributed to poor uptake of the service. Mixed cultural and societal perceptions in developing countries as well as lack of appropriate communication between caregivers and pregnant women on ultrasound scan services(38) have also been presumed to influence uptake of the service. The limitations of appropriate technology and lack of skilled caregivers in obstetric ultrasound scan in developing countries' health care settings(11) are among the reasons affecting uptake of the service.

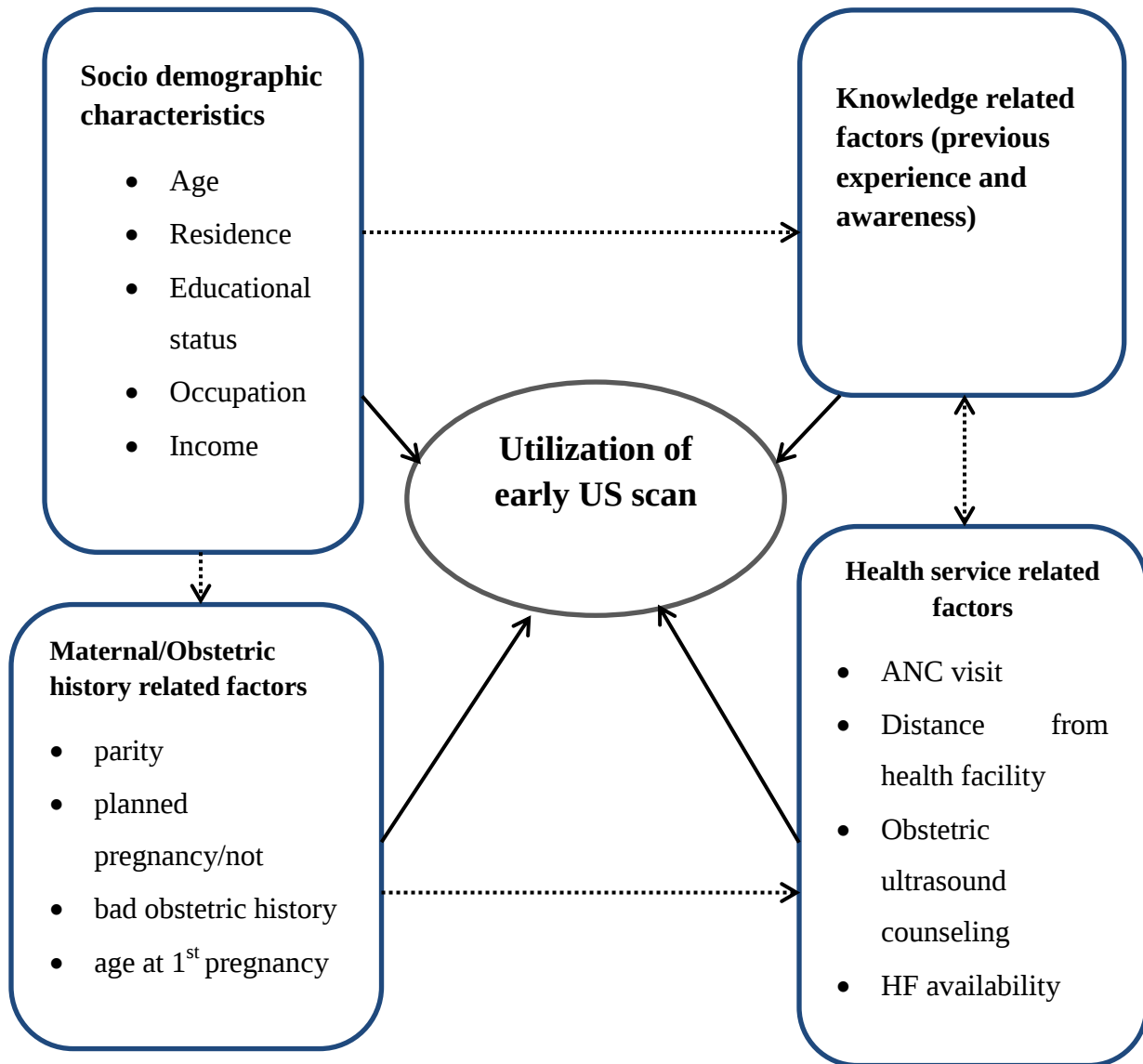
Studies conducted in limited resource settings reveal that cost of care alone has no influence on perinatal outcomes although it does affect utilization of a health service. Limited technology and lack of expert staff in areas of radiography and ultrasonography in primary health care settings(39) have grossly affected the health devolved units to implement the Managed Equipment Services (MES) in Kenya which is meant to take technology closer to the people(17).

The first barrier to implementation may be cultural and health system barriers to early entry to antenatal care, including systemic factors that impede positive relationships between health workers and clients(37). Other bottlenecks may include lack of trained staff for ultrasound practice and equipment maintenance, unclear practice and referral guidelines, limited equipment

and routine supplies, inconsistent attention to infection prevention and control and environmental controls for equipment, routine quality assurance measures, and importantly, strong capacity to triage and manage complications safely and appropriately(38). Referral pathways for those with follow-up needs and abnormal findings suspected or diagnosed through obstetric ultrasound are necessary for comprehensive services, but are inadequate alone, as timely clinical management of complications will optimize impact of routine early antenatal ultrasound scan on health outcomes(11).

A cross sectional study done in Addis Ababa shows that, the expense of ultrasound services was also shown to be common barriers to using ultrasound services. This is common in low and middle-income countries, in which 71% of patients referred did not seek to be examined due to the high costs involved, and 16% could not afford transportation fare to the referral health facilities that had ultrasound machines(9).

2.2.5. Conceptual Framework



Source:-Developed after reviewing different related literatures(13)(22)(12)(19)

Figure 1 Conceptual framework of the study on utilization of early obstetric ultrasound scan among pregnant women attending ANC at public health facilities in Asella town, Arsi, Oromia, Ethiopia, 2024.

3. Objectives

3.1.General objective

- To assess utilization of early obstetric ultrasound scan and associated factors among pregnant women attending antenatal care at public health facilities in Asella town, Arsi, Oromia, Ethiopia, 2024.

3.2.Specific Objectives

- To determine the magnitude of utilization of early obstetric ultrasound scan among pregnant women attending antenatal care at public health facilities in Asella town, Arsi, Oromia, Ethiopia, 2024
- To identify factors associated with utilization of early obstetric ultrasound scan among pregnant women attending antenatal care at public health facilities in Asella town, Arsi, Oromia, Ethiopia, 2024.

4. Methodology

4.1.Study area and period

This study was conducted at public health facilities in Asella town, from October 10 to November 10, Arsi, Oromia, Ethiopia, 2024. This is located at 165 km away from Addis Ababa, capital city of Ethiopia and located south east Oromia regional state. According to a CSA assessment from 2007, there are 250, 000 people living in the town (40). Currently there are three public health facilities in the town, one referral hospital and two health centers. Also Asella is home of two private hospitals, and more than 15 private clinics. At public health facilities in Asella town around 1438 pregnant mothers receive antenatal care each month.

4.2.Study design

A facility-based cross-sectional study design was conducted.

4.3.Population

4.3.1. Source Population

The source population of this study was all pregnant women attending antenatal care services at public health facilities in Asella town.

4.3.2. Study Population

The study population of this study was selected pregnant mothers who were attending ANC during the data collection period.

4.3.3. Study unit

The study unit of this study was individual pregnant mothers who were selected by systematic random sampling.

4.4.Inclusion and exclusion criteria

4.4.1. Inclusion criteria

All pregnant women who came for antenatal care during the study period were included in the study.

4.4.2. Exclusion criteria

Pregnant women who were refused to participate, acutely and severely ill at the time of data collection were excluded from the study.

4.5. Sample Size and Sampling procedures

4.5.1. Sample size determination

The sample size was calculated using a single population proportion formula for the first objective. The required sample size for this study was determined using the following assumptions: margin of error (d) =5%, confidence level =95% ($Z_{\alpha/2}=1.96$), and 76.1% prevalence for early ultrasound utilization in Jimma Zone of Oromia regional state(22).

$$n = \frac{(Z_{\alpha/2})^2 P (1 - P)}{d^2}$$

$$n = \frac{(1.96)^2 * (0.761(1-0.761))}{(0.05)^2} = 280$$

Then, by adding 1.5 design effect and 10% nonresponse rate, a total of 462 pregnant mothers were the final sample size for the first objective of study.

The sample size determination for the second objective calculated by EPI Info was 326 pregnant mothers which was calculated from three independent variables of previous study done in Jimma Zone(22). Therefore, by comparing the sample size for the first and second objectives, the final sample size for this study was 462 mothers.

Table 1 Sample size Calculation for study conducted on utilization of early obstetric ultrasound scan and associated factors among pregnant mothers attending ANC at public health facilities in Asella town, Arsi , Oromia, Ethiopia, 2024

S.no	Factors associated with utilization of early obstetric US	Assumptions					Sample Size	10 % nonresponse rate	Final Sample size
		CI	Power	Ratio	Prevalence of unexposed group	Prevalence of exposed group			
1.	History of abortion	95%	80%	1	18.8%	47.2%	270	27.0	297
2.	Knowledge of OUS	95%	80%	1	29%	62.7%	216	21.6	238
3.	Residence (Rural)	95%	80%	1	23%	38.7%	296	29.6	326

4.5.2. Sampling Procedures

All public health facilities found in the town were included in the study by principal investigator, to get an adequate sample size. The allocation of the sample to health facilities was performed proportionally based on the average number of clients who received early antenatal care at each facilities in the month proceeding the data collection period. A systematic sampling technique was used to select study respondents. The respondents were selected in the order by which they came to health facilities. respondents' card numbers were used to systematically select study respondents every 3 interval taking $K=N/n = 3$ (where N is the source population and n is the sample size for this study).

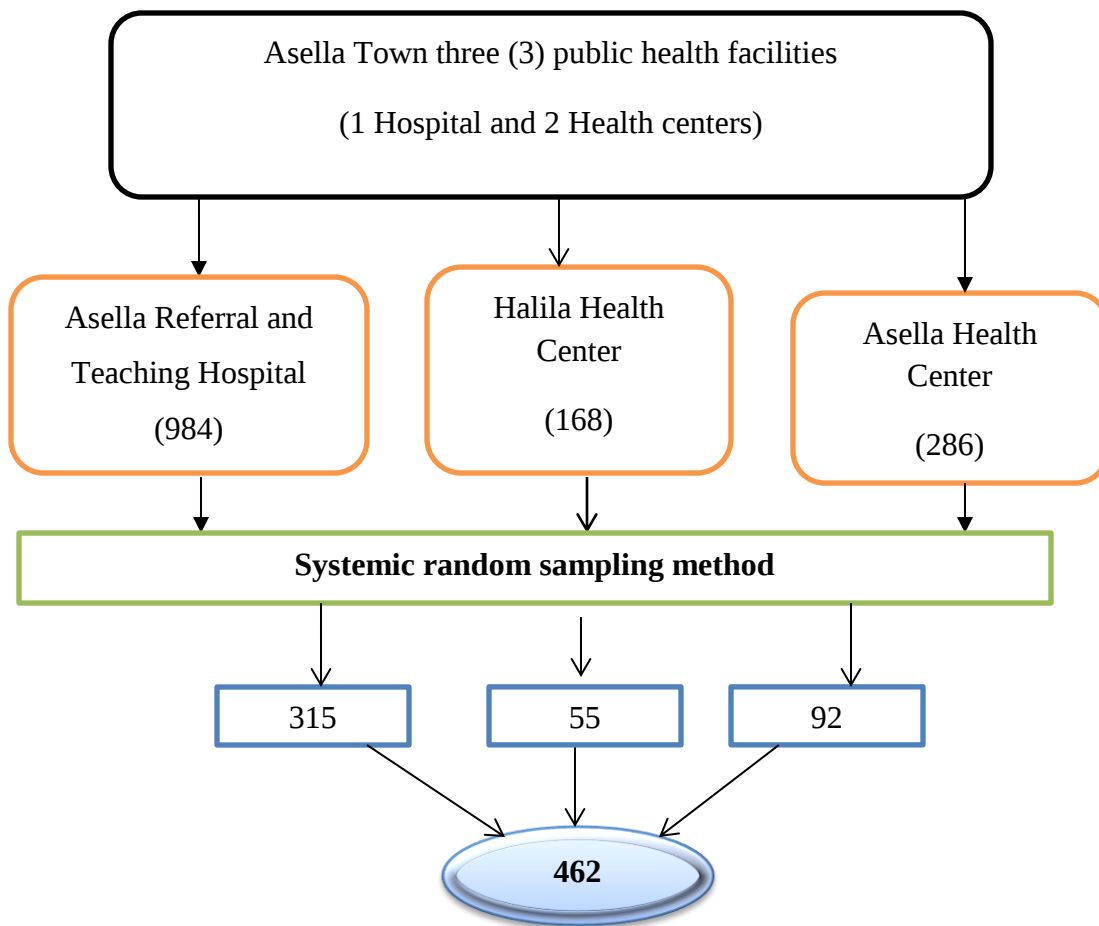


Figure 2: Schematic Presentation of the sampling procedure for the study on utilization of early obstetric ultrasound scan among pregnant women attending ANC at public health facilities in Asella town, Arsi, Oromia, Ethiopia, 2024

4.6.Study Variables

4.6.1. Dependent variable

- Early obstetric ultrasound utilization

4.6.2. Independent Variables

- Socio-demographic factors: age, religion, ethnicity, educational status, marital status, educational status of husband, respondent's occupation, residence
- Obstetric and other factors: parity, gestational age, previous obstetrics related complication, awareness towards prenatal ultrasound, exposure of obstetrics ultrasound.
- Knowledge related factors
- Health service related factors

4.7.Operational Definitions

Abdominal Obstetric ultrasound: It is also known as prenatal ultrasound, is the use of medical ultrasonography in pregnancy, in which sound wave is used to create a real-time visual image of the developing embryo or fetus in the uterus (womb) by scanning women abdomen. The procedure is a standard part of prenatal care in many countries, as it can provide a variety of information about the health of the mother, the timing , progress of pregnancy, health and development of the embryo or fetus(41).

Early Ultrasound Scan: an early ultrasound is often a routine part of antenatal care before 24 weeks of gestational age to see baby's anatomy in detail. This also offers the parents and practitioner the picture of overall health of baby and pregnancy(22).

Distance from the facility: long distance was defined as taking more than one hour to reach the health facility and short distance was defined as taking less than half an hour(42).

Waiting time: a long waiting time was defined as waiting for services for >30 min and not long if receiving services within 30 min(42).

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4.8.Data collection procedures and tool

Data were collected by three diploma midwives through face to face interview by structured questionnaires which were developed by reviewing different literatures and supervised daily by one BSc midwives. The supervisors were responsible for supporting the data collectors, checking filled out questionnaires daily for completeness and logical consistence then provided feedback for data collectors. The investigator also participating in the supervision of the data collection and daily feedback on gaps identified.

4.9.Data Quality Control

Three data collectors and one supervisors who were fluent speaker of Afan Oromo language and worked in the same facility was selected and trained on procedures of data collection techniques, approaching participants, ethical issues, quality of data and advantage of collecting the actual data as well as the role and responsibilities they behave as data collectors and supervisors.

The pre-test was done by data collectors on 5% of the total sample size outside of the study facility (Bekoji Hospital) which have the same socio-demographic characteristics with study facilities. During pre-test lack of clarity on some words were faced and modification was done accordingly before the actual data collection period. Onsite supervision was carried out during the whole period of data collection in daily basis. At the end of each day, questionnaires was reviewed and cross checked for their completeness, accuracy and consistency by the supervisor and investigator, in case error faced corrective measures were taken and remark was given in the next morning before data collection started to data collectors. After the data collected data clearance and coding done by investigator and careful data entry was employed by the investigator to control data quality.

4.10. Data processing and analysis procedures

The collected data was checked for error, completeness and accuracy by investigator, it was coded and entered using EPI data version 3.1 and exported to SPSS version 25.0 software packages for analysis. To reduce the excessive number of variables and resulting instability, only Variables in binary logistic regression screening found at a p-value less than 0.25 was further considered into multiple logistic regressions to avoid confounders. The Hosmer-Lemeshow goodness of fitness test was performed. The strength of association was measured by odds ratios with 95% CI. Adjusted odds ratio along with 95% CI was used to identify predictors for utilization of early ultrasound scanning. A P-Value of less than 0.05 was taken as statistically

significant. Descriptive statistics was calculated and finally obtained results were presented by using simple frequency tables, and charts.

4.11. Ethical consideration

Ethical Approval was received from Arsi University, Asella Referral and Teaching Hospital. Official letter of co-operation was also obtained from Arsi University, Asella Referral and Teaching Hospital before the study had taken place both to ensure legitimacy and build trust with local authorities and study communities. Participation in this study was purely voluntary. Informed verbal consent was obtained from each respondent during the data collections and they informed about purpose and benefit of the study along with right to refuse. The investigator was also ensuring that all collected information was kept confidentially. Moreover, Confidentiality of study respondents would be assured by using questionnaire identification number and privacy during interview.

4.12. Dissemination of result

The final report of the study will be presented and discussed in Arsi University, Asella Referral and Teaching Hospital, department of Midwifery. Finally, the result of the study will be disseminated to Asella town Health Office, Administrative Offices and other relevant stakeholders after defence. Furthermore, manuscript will develop and efforts will be made to publish on peer reviewed journal.

5. Result

5.1.Socio-demographic characteristics of the respondents

A total of 462 ANC attending mothers were involved in the study, yielding a response rate of 100%. The mean ($\pm$ SD) age of respondents was 28.65 ($\pm$ 5.363) years. Majority (94.6%) of them were married. About 333 (72.1%) and 236 (51.1%) of them were Oromo in ethnicity and Muslims in religion respectively. One hundred eighty eight (40.7%) were house wives. Among study respondents 334 (72.3%) were urban residents (Table 2).

Table 2 Socio-demographic characteristics of utilization of early obstetric ultrasound scan among pregnant women attending ANC at public health facilities in Asella town, Arsi , Oromia, Ethiopia, 2024 (n=462).

Variables	Frequency	Percentage (%)
Age of the mother in years		
≤ 20	21	4.5
21-25	126	27.3
26-30	171	37.0
31-35	80	17.3
≥ 36	64	13.9
Religion		
Orthodox	190	41.1
Muslim	236	51.1
Protestant	25	5.4
Wakefata	11	2.4
Educational Status		
Read and write only	19	4.1
Primary	129	27.9
Secondary	187	40.5
Diploma and above	127	27.5
Ethnicity		
Oromo	333	72.1

Amhara	100	21.6
Gurage/Silte	9	1.9
Tigre	11	2.4
Others	9	1.9
Occupation		
Housewife	188	40.7
Farmer	66	14.3
Merchant	82	17.7
Gov't employee	107	23.2
Daily labor	19	4.1
Marital Status		
Married	437	94.6
Widowed	14	3.1
Divorced	8	1.7
Single	3	0.6
Residence		
Urban	334	72.3
Rural	128	27.7
Monthly Income in ETB		
Below 500	47	10.2
500-1000	84	18.2
1000-2000	106	22.9
Above 2000	225	48.7

5.2.Obstetric conditions of the respondents

Around 258 (55.8%) of women reported that they got their first pregnancy between 20-24 years. A total of 322 (69.7%) study respondents were multiparous. Four hundred eight (88.3%) of respondents received at least one ANC visits. From the total study respondents, only 89 (21.8%) had started antenatal follow up before 12 weeks of gestational age (Table 3).

Table 3 Obstetric history of respondents of utilization of early obstetric ultrasound scan among pregnant women attending ANC at public health facilities in Asella town, Arsi, Oromia, Ethiopia, 2024 (n=462).

Variables	Frequency	Percentage (%)
Age at First Pregnancy (years)		
15-19	80	17.3
20-24	258	55.8
25-29	106	22.9
30-34	15	3.2
>35	3	.6
Gravidity		
GI	140	30.3
GII	129	27.9
GIII	93	20.1
GIV and above	100	21.6
Parity		
One	123	38.1
Two	95	29.5
Three	55	17.0
Four and more	49	15.4
History of Abortion		
Yes	81	17.5
No	381	82.5
ANC contact previous pregnancy		
Yes	408	88.3
No	54	11.7
Number of ANC contact during pregnancy(408)		
Once	69	16.9
Twice	63	15.4

Three	112	27.4
Four	96	23.5
Five & above 8	68	16.8
Advice on EOUS during ANC contact		
Yes	321	78.7
No	87	21.3
GA at first ANC contact		
<12wks	89	21.8
12-16wks	113	27.7
16-24wks	146	35.8
>24wks	60	14.7
Previous mode of delivery		
SVD	232	72.0
C/S	84	26.1
Instrumental	6	1.9
History of Obstetric Complications		
Yes	206	44.6
No	256	55.4

5.3. Knowledge of Respondents on Utilization of early Obstetric Ultrasound

Among respondents, 346 (74.9%) of them had mentioned at least more than one about danger signs of pregnancy. Majority of the respondents, 351 (76%) had information about early obstetric ultrasound scan and 344 (74.5%) of them reported that they knew the importance of obstetric ultrasound scan. Moreover, 332 (71.9%) of respondents had experience of obstetric ultrasound scan utilization for previous pregnancy (Table 4).

Table 4 knowledge of respondents about utilization of early obstetric ultrasound scan among pregnant women attending ANC at public health facilities in Asella town, Arsi , Oromia, Ethiopia, 2024 (n=462)

Variables	Frequency	Percentage (%)
Reported Knowledge about danger signs of Pregnancy		
Yes	346	74.9
no	116	25.1
Had information about EOUS scan		
Yes	351	76.0
No	111	24.0
Importance of OUS scan		
To estimate GA	344	74.5
To know fetus sex	326	70.6
To identify fetal Anomaly	115	24.9
To identify fetal numbers	105	22.7
To locate placenta	23	5.0
To locate place of implantation	13	2.8
To identify fetal presentation	160	34.6
To identify molar pregnancy	11	2.4
Perceived time to start EOUS Scan		
<12wks	98	21.2
12-16wks	117	25.3
16-24wks	185	40.1
>24wks	62	13.4
History for OUS scan		
Yes	332	71.9
No	130	28.1
Place of EOUS scanning		
Health center	102	26.4

Hospital	269	69.7
Private clinic	15	3.9

5.4. Magnitude of Utilization of Early Obstetric Ultrasound Scan

The magnitude of utilization of early obstetric ultrasound scan at public health facilities in Asella town were 295 (76.4%) and about 91 (23.6%) mothers were scanned for the first time after their gestational ages reached more than 24 weeks (Table 5).

Table 5 utilization of early ultrasound scan among pregnant women attending ANC at public health facilities in Asella town, Arsi , Oromia, Ethiopia, 2024 (n=462).

Variables	Frequency	Percentage (%)
Scanned for OUS during current Pregnancy		
Yes	386	83.5
No	76	16.5
Number of scan during current Pregnancy		
Once	40	10.4
Twice	84	21.7
Three & more	262	67.9
GA at first scan during current pregnancy		
<12wks	82	21.2
12-16wks	110	28.5
16-24wks	103	26.7
>24wks	91	23.6
Place of EOUS scanning		
Health center	104	22.5
Hospital	267	57.7
Private clinic	15	3.2

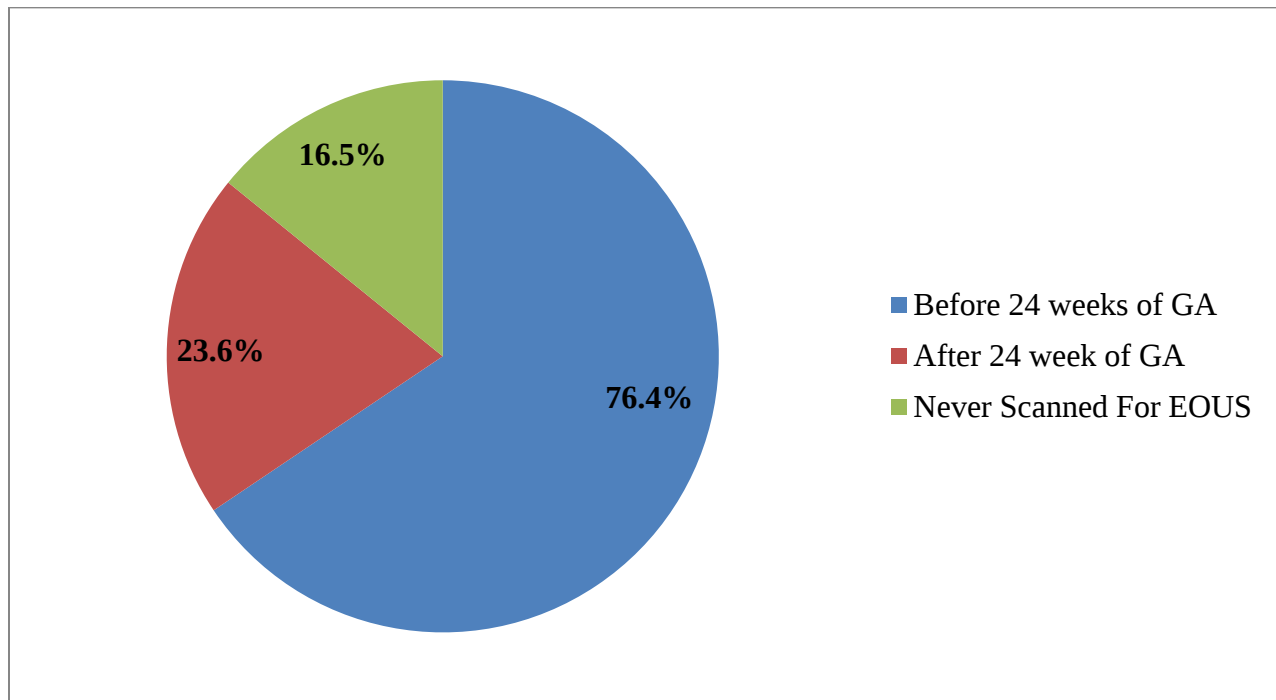


Figure 3 Magnitude of utilization of early obstetric ultrasound scan among pregnant women attending ANC at public health facilities in Asella town, Arsi, Oromia, Ethiopia, 2024 (n=462)

5.5.Factors associated with Utilization of Early Obstetric Ultrasound Scan

In the bivariate analysis variables such as; History of Obstetric ultrasound scan (COR 9.267, 95% CI: 4.836–17.750), Antenatal care follow up (COR 4.050, 95% CI: 2.186-8.682), monthly income 500-1000 (COR 0.434, 95% CI 0.186–1.012), monthly income 1000-2000 (COR 1.509, 95% CI 1.142–1.995), monthly income >2000 (COR 1.883, 95% CI 1.091–3.249), whether pregnancy were planned (COR 1.885, 95% CI: 1.045–3.399), Information or advice during Antenatal care (COR 9.103, 95% CI: 4.909–16.880), History for Obstetric complication (COR 2.040, CI: 1.212-3.435), Information of Knowledge about early obstetric ultrasound scan (COR 22.292, CI: 12.069-41.173) and Knowledge about danger signs of pregnancy (COR 0.835, CI: 0.465-1.501) had shown independent association with utilization of early obstetric ultrasound scan (Table 6).

Table 6 Factors associated with utilization of early obstetric ultrasound scan by Binary logistic regression among pregnant women attending ANC at public health facilities in Asella town, Arsi , Oromia, Ethiopia, 2024.

Variables	EOUS Scan		COR	P-value
	Yes	No		
Residence				
Urban	108	20	1	
Rural	278	56	1.088 (0.623-1.898)	1.898
History of Abortion				
Yes	68	13	1	
No	318	63	1.036(0.540-1.989)	0.915
History for OUS scan				
Yes	245	12	9.267(4.836-17.750)	0.001 [*]
No	141	64	1	
ANC Follow up				
Yes	350	55	4.050(2.186-7.507)	0.001 [*]
No	33	21	1	
Monthly Income				
<500	47	1	1	
500-1000	77	7	0.434(0.186-1.012)	0.053 [*]
1000-2000	76	30	1.509(1.142-1.995)	0.004 [*]
>2000	186	39	1.883(1.091-3.249)	0.023 [*]
Does Pregnancy Planned				
Yes	328	57	1.885(1.045-3.399)	0.035 [*]
No	58	19	1	
Information/advice about EOUS Scan				
Yes	298	21	9.103(4.909-16.880)	0.001 [*]
No	53	34	1	
History for Obstetric Complications				
Yes	181	25	2.040(1.212-3.435)	0.026 [*]

No	181	51	1	
Reported Knowledge about EOUS Scan				
yes	334	17	22.292(12.069-41.173)	0.001*
no	52	59	1	
Knowledge about Danger signs of Pregnancy				
Yes	99	17	0.835(0.465-1.501)	0.147*
No	287	59	1	
Occupation of The Mother				
Employee	67	15	1	
Farmer	160	25	0.818(0.294-2.280)	0.701
Housewife	20	2	0.724(0.271-1.930)	0.218*
Merchant	89	18	0.688(0.198-1.892)	0.906
Daily laborer	50	16	1.018(0.482-2.149)	0.963
Parity				
Nullipara	272	53	1	
Multipara	114	23	0.966(0.565-1.655)	0.229*

NB: $p < 0.05$ = * candidate predictors of EOUS Scan utilization in Binary Logistic Regression

Multivariate logistic regression analysis revealed that variables like History for obstetric ultrasound scan for previous pregnancy (AOR 4.597, 95% CI: 2.022-10.454), Information or advice during Antenatal care (AOR 3.961, 95% CI: 1.786–8.784), History for Obstetric complication (AOR 2.797, 95% CI: 1.462– 5.354), whether pregnancy were planned (AOR 2.647, 95% CI: 1.291–5.426), Information of knowledge about early obstetric ultrasound scan (AOR 5.057, 95% CI: 1.353–18.898) and Antenatal care (AOR 5.030, 95% CI: 2.519–10.044) were the independent predictors of early obstetric ultrasound scan utilization after controlling the potential confounders (Table 7).

Table 7 Factors associated with utilization of early obstetric ultrasound scan by multiple logistic regression analyses among pregnant women attending ANC at public health facilities in Asella town, Arsi , Oromia, Ethiopia, 2024.

Variables	EOUS Scan		AOR	P-value
	Yes	No		
Residence				
Urban	108	20	1	
Rural	278	56	0.810 (0.425-1.544)	0.523
History for OUS scan				
Yes	245	12	4.597(2.022-10.454)	0.001 [*]
No	141	64	1	
ANC Follow up				
Yes	350	55	5.050(2.519-10.044)	0.001 [*]
No	33	21	1	
Monthly Income				
<500	47	1	1	
500-1000	77	7	0.667(0.471-0.945)	0.063
1000-2000	76	30	2.056(0.923-4.581)	0.078
>2000	186	39	1.983(1.091-3.259)	0.107
Does Pregnancy Planned				
Yes	328	57	2.647(1.291-5.426)	0.008 [*]
No	58	19	1	
Information/advice about EOUS Scan				
Yes	298	21	3.961(1.786-8.784)	0.001 [*]
No	53	34	1	
History for Obstetric Complications				
Yes	181	25	2.797(1.462-5.354)	0.002 [*]
No	181	51	1	
Reported of Knowledge about EOUS Scan				
yes	334	17	5.057(1.353-18.898)	0.016 [*]

No	52	59	1	
Knowledge about Danger signs of Pregnancy				
Yes	99	17	1.935(0.765-2.802)	0.167
No	287	59	1	
Occupation of The Mother				
Employee	67	15	1	
Farmer	160	25	0.818(0.294-2.280)	0.701
Housewife	20	2	0.724(0.271-1.930)	0.518
Merchant	89	18	0.688(0.198-1.892)	0.906
Daily laborer	50	16	1.018(0.482-2.149)	0.963
Parity				
Nullipara	272	53	1	
Multipara	114	23	0.876(0.453-1.598)	0.899

NB: $p < 0.05 = *$ predictors of EOUS Scan utilization in Multiple Logistic Regression

6. Discussion

This study aimed to assess the utilization of early obstetric ultrasound scan and associated factors among pregnant women attending antenatal care at public health facilities in Asella town. History for obstetric ultrasound scan, Information/advice on obstetric scan during ANC contact, History for Obstetric complication, planned pregnancy/not, Knowledge about early obstetric ultrasound and ANC visit were independent predictors of early obstetric ultrasound utilization.

The results of this study indicate that about 76.4% of pregnant women in Asella town public health facilities received an optimally timed early obstetric ultrasound scan before 24 weeks of gestational age and only 23.6% of women scanned after 24 weeks of gestational age. This study is consistent with the findings of early obstetric ultrasound utilization recorded in Jimma public health institutions 76.1% (22). In contrast, the finding of the current study was higher than studies conducted in public hospitals of Ethiopia 53.2%(9), Canada 27.4%(30) and study conducted in Nigeria 21%(12). The discrepancy may be explained by the study setting and socio-demographic characteristics of the study participants. This may also explained by methodological variations (parameters measured), and time of study differences.

The obstetric ultrasound scan utilization in this study was 83.5 %[(95% CI); (81.7%-85.3%)]. This finding is consistent with the findings of obstetric ultrasound utilization recorded in the Northern Nigeria 83.5%(43). However, the finding of the current study was lower than studies conducted in cross-sectional study in rural Eastern China 96.1%,(44) and the United Kingdom 96%(45). This difference may probably due to socio-demographic differences between Ethiopia and the two countries. Moreover, the difference may be due to disparities in the sample size and the health service system. It seems that advancement and reform in maternal and child health policies in China and the United Kingdom enables women to utilize diagnostic imaging relatively easily.

In contrast, the finding of the current study was higher than studies conducted in Jimma public health institutions 60.7%(22), in Kenya suggested that utilization of obstetric ultrasound was 49.7%(12), Hospitals of Ethiopia 70.3%, and study conducted in Canada 77%(30). The possible reason for this discrepancy may be due to the variation in sample size and health policy towards maternal and child health care in other countries and Ethiopia.

This study also showed that women's previous exposure to obstetric ultrasound was significantly associated with the utilization of early obstetric ultrasound. Those respondents with previous exposure to obstetric ultrasound were 4.59 times more likely to utilize early obstetric ultrasound than those who had no previous exposure. This might be because of their understanding of its purposes and benefits, such that they readily go for the examination.

In this study, the majority of the pregnant women utilized early obstetric ultrasound there were pregnancy complications to determine the health status of the fetus as well as the gestational age of the fetus. This study also showed that history of obstetric complications had a statistically significant association with early obstetric ultrasound utilization. Those respondents with a history of obstetric complications were 2.79 times more likely to utilize early obstetric ultrasound than their counterparts. This finding is in line with a study conducted in Jimma public health institutions(22). This might be because of the perceived fear of losing their pregnancy and the complications associated with it. Furthermore, mothers with a history of obstetric complications might feel that their complications were related to poor utilization of ANC service.

Around 65% of respondents had ever heard about early obstetric ultrasound scan services, and most respondents obtained information or advice about early obstetric ultrasound services from health workers. This study revealed that mothers who had information or advice from health providers during ANC follow up were 3.96 times more utilize early obstetric ultrasound scan than their counterparts. This result is supported by study conducted in Uganda(31).This implied that since most respondents had ever heard of early obstetric ultrasound scan services, they would be better able to make use of this service during pregnancy as it presented many benefits.

The finding of this study revealed that there was a strong association between respondents' reported knowledge about importance of early obstetric ultrasound and the utilization of early obstetric ultrasound. Mothers who had good knowledge about importance of early obstetric ultrasound were 5.06 times more likely to utilize early obstetric ultrasound than their counterparts. This finding is consistent with the results of different studies conducted in Jimma public health institutions(22), semi urban pregnant women in developing nations, at urban health centers in Uganda(46) and Nigeria(47). This may be due to the fact that those with a good knowledge of early obstetric ultrasound knew its purposes and they are eager and readily go for it even when their health providers has not requested it.

The present study also found that receiving early prenatal care was strongly associated with a higher likelihood of early obstetric ultrasound utilization. The odds of early obstetric ultrasound scan were 5.03 times higher among mothers who had early prenatal care than their counterparts. This is in line with the study done in Canada(30), Nigeria(48), Kenya(12) and Uganda(31). Pregnant women who had early antenatal visit have an advice and counselling about early obstetric ultrasound scans. This indicates that as the knowledge of pregnant women toward obstetric ultrasound increases, more women are going to use early obstetric ultrasound and results in early prevention and management of obstetric problems and the long-term effect will be reduction of prenatal mortality(5). This might be explained as knowledge toward early obstetric ultrasound increases, belief regarding the ability of early obstetric ultrasound to estimate the outcome of pregnancy and help divert the negative outcomes also increases.

7. Conclusion and Recommendations

7.1.Conclusion

Given its demonstrated benefits, obstetric ultrasonography remains one of the most significant improvements in prenatal care world-wide. The magnitude of early obstetric ultrasound utilization 76.4% (± 1.70) was relatively high in the study settings compared with previous studies. Exposures to obstetric ultrasound scan in previous pregnancy, Information or advice during antenatal contact, History for Obstetric complication, whether pregnancy was planned or not, Knowledge about early obstetric ultrasound and antenatal care contact were predictors of early obstetric ultrasound utilization.

7.2.Recommendations

The study revealed various socio-economic factors, obstetric factors and knowledge related factors influencing the utilization of early obstetric ultrasound scan services among pregnant mothers in the study area. Although majority had ever heard about early obstetric ultrasound scan services, most had ever used ultrasound scan services after second trimester of pregnancy.

Asella referral hospital and Asella town health office should increase the number of trained ultrasound professionals and ultrasound machines especially in primary health care units could help to reduce clients' waiting time and possibly cost of the scans. Creating more awareness of the value of early ultrasound scan and allowing students to administer exams only under the supervision of qualified professionals may also help to increase utilization of early obstetric ultrasound scan in teaching hospitals. Hence, providing information on early obstetric ultrasound in rural community is paramount. Stakeholders need to improve women's knowledge on the benefits of early obstetric ultrasound screening to improve utilization of early obstetric ultrasound scan.

Asella town health office and Asella referral hospital need to have sustainable financing mechanisms for women to access routine ANC ultrasound services as recommended by WHO by provide training frontline health care professionals.

Further, other studies need to be conducted on early OUS scan before 12 weeks of gestational age by different study design so as to generate further evidence for improving pregnancy outcomes.

8. Strength and Limitations of the Study

Being the first study to assess early obstetric ultrasound scan in the study area is the major strong side of this study. In addition, the study tried to include public health facilities where most pregnant women in the study area receive antenatal care.

Regarding limitations, since the study design was an institutional-based cross-sectional study, the study does not represent those women who had ultrasound scan and antenatal care contents at a private clinic. Moreover, the study shares the limitations of cross-sectional study design.

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Annexes

English Version Questionnaire

Arsi University Asella Referral and Teaching Hospital Department of Midwifery

Participant information sheet and consent form

Good morning/afternoon dear participant! My name is _____, I am working as a data collector for the study being conducted at public health facility of Asella town on title “Utilization of early ultrasound scan and associated factors among pregnant women who attending antenatal care at Asella town public health institutions, 2024”. Facility based cross sectional study design by Sr Fatuma Adem, Who is a candidate of MSc/Maternity and Reproductive health in Arsi University Asella Referral and teaching Hospital Department of Midwifery. The finding of this study is going to feed into plan of stakeholders working on how best to strengthen and improve maternal health services in the town especially related to Utilization of early ultrasound scan. The information that will be obtained using this interview will be used only for research purpose. The confidentiality and anonymity is fully assured, as your name is not required and only the researcher will have access the results. It will not affect you in anyway, and the entire interview may take 20-30 minutes. Should you take part in this study? If yes continue to sign consent form, if no stop here.

Declaration of informed voluntary consent form for the participant

I have been informed that the purpose of this study is assessing Utilization of early ultrasound scan and associated factors among pregnant women who attending antenatal care at Asella town public health institutions. I have understood that participation in this study is entirely voluntarily. I have been told that my answer to the question will not be given to anyone else and not reports of this study identify me in any way. I understood that participation in this study does not involve risks.

Participant’s signature _____ Date _____

Interviewer’s name _____ Signature _____ Date _____

Address of principal investigator: Tell: +251961316262 e-mail: fatumaadem6262@gmail.com

Part 1: socio-demographic and socioeconomic variables

№	Questions	Responses	Skip
101	Age (in completed years)	_____	
102	What is your residence?	1. Urban 2. Rural	
103	To which religion do you belong?	1. Orthodox Christian 2. Muslim 3. Protestant 4. Wakefata 99. Other, specify _____	
104	What is your level of education?	1. Read and write only 2. Primary 3. Secondary 4. Preparatory 5. Diploma and above	
105	To which ethnic group do you belong?	1. oromo 2. Amhara 3. Tigre 4. Silte 99. Other, specify _____	
106	What is your occupation?	1. Housewife 2. Farmer 3. Merchant 4. Government employee 5. Daily labor 99. Other (specify) _____	
107	Monthly income	1. below 500 birr 2. 500-1000 birr 3. 1000-2000birr 4. Above 2000 birr	

108	What is your current marital status?	1. Single 2. Married 3. Divorced 4. Widowed 99. Other (specify)	
109	Education level of husband	1. Read and write only 2. Primary 3. Secondary 4. Preparatory 5. Diploma and above	
110	Husband occupation	1. House wife 2. Merchant 3. Daily labourer 4. Farmer 5. Gov't employee 6. Other (specify)	

Part 2: Obstetric and medical related factors

No	Questions	Responses	Skip
201	Your age when you get 1 st pregnancy?	1. 15-19 years 2. 20-24 years 3. 25-29 years 4. 30-34 years 5. >= 35years	
202	Was current the pregnancy planned?	1. Yes 2. No	
203	Number of pregnancies?	1. G/I 2. G/II 3. G/III 4. Above three	

204	Number of Births?	1. P/I 2. P/II 3. P/III 4. more than III	
205	History of births outcome?	1. Number of alive children____. 2. Number of died children____. 3. Number of still birth_____	
206	History of Abortion?	1. Yes 2. No	
207	If there is abortion?	1.Number of spontaneous A____ 2.Number of induced A____	
208	Was you receive antenatal care service when you were pregnant of the last child?	1. Yes 2. No	If no, skip to Q210
209	How many times did you contact ANC for your last pregnancy?	1. One contact 2. Two contact 3. Three contact 4. Four contact 5. More than 8 contact	
210	First ANC visit for pregnancy{GA}	1. Less than 12 weeks 2. Between 12 and 16 weeks 3. between 16 and 24 weeks 4. greater than 24 weeks	
211	During ANC visit for last pregnancy, have you ever been informed /advised about early OUS scan?	1. Yes 2. No	
212	Did you ever scan by OUS?	1. Yes 2. No	
213	Previous mode of delivery	1. SVD 2. C/Section 3. Instrumental	
214	History of previous obstetric complication	1. Yes 2. No	

215	History of medical illnesses	1. Yes 2. No	
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Part 3: Health service utilization

№	Questions	Responses	Skip
301	Distance from health facility?	_____ km	
302	What type of health facility is it?	1. Health center 2. Hospital 3. Private clinic	
303	Does the health facility provide ultrasound scan service?	1. Yes 2. No 3. I don't know	
304	Who decides for seeking health facility (for OUS scan)?	1. Self 2. Husband 99. Other, specify _____	
305	Waiting time	_____ hrs	

Part 4: knowledge questions on early OUS

№	Questions	Response	Skip
401	Did you know danger signs (complications) during pregnancy?	1. Yes 2. No	If no, skip to Q403
402	Type of complications you know (more than one answer is possible)	1. HEG 2. Abortion 3. Ectopic pregnancy 4. Molar pregnancy 5. Fetal malformation 6. IUGR 7. IUFD 8. Other specify _____	
403	Did you have information about obstetric US?	1. Yes 2. No	If no, skip to Q404
404	If yes, mention the source of	1. Doctors	

	information about obstetric US (more than one answer is possible)	2. Midwives 3. Nurse 4. Media 5. Family/neighbors 99. Others (specify) _____	
404	Did you know importance of obstetric US? (More than one answer is possible)	1. To estimate GA 2. To know sex of fetus 3. To identify fetal anomaly 4. To identify number of fetus 5. Location of placenta 6. Ectopic pregnancy 7. Fetal presentation 8. Hydatidiform mole 99. Other (specify) _____	
405	Did you have information about when to start obstetric US scan?	1. Yes 2. No	
406	When to start obstetric US scan after pregnancy?	1. Before 12 weeks 2. 12-16 weeks of GA 3. 16-24 weeks of GA 4. $\geq$ 24 weeks of GA	
407	Does EOUS have disadvantage?	1. Yes 2. No	If no, skip to 409
408	If yes, what are they?	1. Expensive 2. Not found nearby HF 3. Long waiting time 4. Others _____	
409	Did you have experience to use OUS for previous pregnancy?	1. Yes 2. No	If no, skip to Q501
410	If yes, how many times during a single pregnancy?	1. Only once 2. Two times 3. Three times and more	

Part 5: Utilization of Obstetric ultrasound scans

N ^o	Question	Response	Skip
501	Did you scanned for EOUS during current pregnancy?	1. Yes 2. No	If no skip to 505
502	If you scanned, when?	1. Before 12 weeks 2. 12-16 weeks of GA 3. 16-24 weeks of GA 4. >= 24 weeks of GA	
503	What did you know about your fetus after OUS scanning?	1. GA 2. Fetal position 3. Fetal presentation 4. Fetal sex 5. Fetal malformation 6. Others specify _____	
504	Where did you access your OUS?	1. Health center 2. Hospital 3. Private clinics/hospitals	
505	If not scan of early OUS, what was the reason?	1. Lack of awareness 2. Financial constraints 3. Lack of access to OUS 4. Lack of skilled HPs 5. No referral linkage from health providers 99. others, _____	
506	Is early ultrasound scanning during pregnancy important?	1. Yes 2. No	

Part 6: Individual folder review (secondary data)

S.N	Question	Response	Skip
601	Medical record number (MRN)?	_____	
602	Is there ultrasound request or results in the individual folder of the mother?	1. Yes 2. No	
603	Gestational age at first ultrasound scan in the individual folder of the mother?	_____ weeks	
606	Does the finding of the ultrasound scanning shows normal pregnancy?	1. Yes 2. No	
604	Does the documented information match with the answer given by respondents?	1. Yes 2. No	

Thank you for your cooperation!!!

Afan Oromo Version Questionnaire

Yuunibarsitii Arsii Hospitaalaa Rifeeralaa Asallaatti Muummee Midwaayifeerii

Fuula Odeeffaannoo

Akkam bultan/ooltaan? Ani maqaan koo _____ kan jedhamu, qorannoo mata duree “Tajaajila qorannoo Altiraasawuundii yeroo ulfaa fi sababoota addaa addaa gochaa kana dhorkaan adda baasuuf” gargaaru irraatti Ogeessaa odeeffannoo funanudha. Qorannoon kun dursiituu qorannichaa Sr. Faxumaa Aadam yuunibarsiiti Arsiitti kadhimaamtuu barnoota digrii 2ffaa midwaayifeerii kan ta’aniin geeggeffama. Akkuma beekamuu tajaajilli itti fayyadama Altiraasawuundii yeroo ulfaa biyyaa keenyaa keessaatti baay’ee xiqqaadha. Kun immoo du’aati fi midhamaa ciimaa hadhoolii fi daa’imaa dhalattuu irraatti qaqqabsisuu danda’a. kanaf qorannoon kuni tooftalee du’aati hadhoolii fi daa’immaan hir’isuu keessaatti gahe olaanaa qaba. Bu’aan qorannoo kanarraa argamu karoora fi eeruu rakkoolee mata duree kanan walqabatan qaama dhimmii ilaallatuuf kenna. Iccitii eeguuf jecha maqaan keessan hin barra’u. Akkasumas ragaan isiin keennitan martii iccitiidhaan qabama. Gaaffannoo irratti hirmaachuu barbaadduu? Eyyeen yoo ta’e gaaffannoo itti fufi, Lakki yoo ta’e gaaffannoo dhaabi.

Unkaa waligaltee hirmaanna gaaffannoo

Qorannoon kun qorannoo Altiraasawuundii yeroo ulfaa hadhootaaf kennamu fi sababoota addaa addaa gochaa kana dhorkaan irraatti akka dalagamu natti himame jira. Hirmaannaan kiyyaa guutumaan guutuutti fedhii kiyyaa qofa irratti kan hundaa’edha. Mirgi hirmaachuu fi diduu kiyyaa yeroo kamiyyuu kan naf eggameedha. Gaaffilee deebisuu yoo hin barbaannee hin dirqisifamuu. Qorannoo kana irraatti hirmaachuun dhibbaa tokkollee akka hin qabne anatti himame jira. Kaayyoon qorannoo kanaa waan naa galeef hirmaachuudhaaf mallattoo kiyyaan mirkaneessa.

Mallattoo hirmaattuu _____ guyyaa _____

Maqaa Nama ragaa funanuu _____ Mallattoo _____ Guyya _____

Teessoo Qorataa :- Bilbila: 0961316262, fatumaadem6262@gmail.com

Kutaa 1: Gaaffilee haala jireenya fi Haawasummaa

T.L	Gaaffilee	Deebii	Hubaachisa
101	Umrrii haadha waggaadhaan	_____	
102	Iddoo jireenyaa?	1. Magaala 2. Badiyyaa	
103	Amantaa hordoftu	1. Ortodoksii 2. Muslimaa 3. Protestantii 4. Waaqeeffataa 99. Kan biroo _____	
104	Sadarkaa barnoota haadha	1. Barreessuu fi dubbisuu kan dandeessu 2. Kutaa 1-8 3. Kutaa 9-12 4. Kolleejjii fi isa ol	
105	Sabummaa?	1. oromoo 2. Amhaara 3. Somaali 4. Guragee 99. Kan biroo _____	
106	Haala hojii hadhaa warraa	1. Hadhaa warraa 2. Qonnaan Bultuu 3. Daldaltuu 4. Hojjeettuu mootummaa 5. Hojii guyyaa 99. Kan biroo _____	
107	Galii haadha kan ji'aa qarshii Itiyoophiyaatin	5. Qarshii 500 gadi 6. Qarshii 500-1000 7. Qarshii 1000-2000	

		8. Qarshii 2000 ol	
108	Haala fuudha fi heeruma haadha?	1. Kan hin Heerumnee 2. Kan heerumtee 3. Kan hiiktee 4. Kan dhirsii irraa du'e 99. Kan biroo _____	
109	Sadarkaa barnoota abbaa warraa	1. Barreessuu fi dubbisuu kan danda'u 2. Kutaa 1-8 3. Kutaa 9-12 4. Kolleejjii fi isa ol	
110	Haala hojii abbaa warraa	1. Qonnaan Bulaa 2. Daldalaa 3. Hojjeetaa mootummaa 4. Hojii guyyaa 5. Kan biroo _____	

Kutaa 2: Gaaffilee Tajaajilaa fayyaa hadhaa (seenaa wal- hormaata)

T.L	Gaaffilee	Deebii	Hubaachisa
201	Yeroo jalqabaatif gaafa ulfooftee waggaa meeqaa turtee?	1. Waggaa 15-19 2. Waggaa 20-24 3. Waggaa 25-29 4. Waggaa 30-34 5. Waggaa 35 ol	
202	Ulfii daa'ima amma kun kan karoorfamee ture?	1. Eeyyeen 2. Miti	
203	Yeroo meeqaa ulfooftee?	5. G/I 6. G/II 7. G/III	

		8. G/IV fi isaa ol	
204	Baayinaa da'umsaa?	1. P/I 2. P/II 3. P/III 4. P/IV fi isaa ol	
205	Ijoollee meeqaa godhattee?	1. Kan lubbuun jiran _____. 2. Kan du'an _____.	
206	Ulfii sirraa bahe jira?	1. Eeyyeen 2. Miti	
207	Ulfi bahe yoo jiratee, gosaa kami?	1. Kan ofiin bahe 2. Kan yaalaan bahe	
208	Hordoffii daa'umsa duraa gootee beektaa?	1. Eeyyeen 2. Miti	
209	Marsaa meeqaaf hordoffii da'umsaa duraa gootee?	1. Yeroo tokko 2. Yeroo lama 3. Yeroo sadii 4. Yeroo afur 5. Yeroo saddeet	
210	Yeroo jalqabaa hordoffii ulfaa eegaltuu torbee meeqa ture?	1. Torbee 12 gadi 2. Torbee 12-16 3. Torbee 16-24 4. Torbee 24 booda	
211	Yeroo hordoffii ulfaa tasiisaa turtee sanatti, gorsii/ odeeffannoon waa'ee qorannoo altiraasawundii yeroo ulfaa godhamu dhageessee beektaa?	1. Eeyyeen 2. Miti	

212	Qorannoo altiraasawundii yeroo ulfaa taasistee beektaa?	1. Eeyyeen 2. Miti	
213	Haala daa'umsaa yeroo darbee?	1. SVD 2. Baqaqsanii yaalutin 3. Meeshaalee birootin	
214	Baalan ulfaa fi da'umsaan walqabate, kan si mudatee jira??	1. Eeyyeen 2. Miti	
215	Rakkoolee fayyaa biroo qabdaa?	1. Eeyyeen 2. Miti	

Kutaa 3: Itti fayyadama taajajila fayyaa

T.L	Gaaffilee	Deebii	Hubachiisa
301	Manni kee dhabbataa fayyaa irraa hangaam fagataa?	_____ km	
302	Dhaabbatni fayyaa naannoo keessan jiru isa kamiidha?	1. Buufata Fayyaa 2. Hospitalaa 3. Kilinikaa dhuunfaa 99. Kan biroo _____	
303	Dhabbatni naannoo keetti argamuu tajaajilaa altiraasawuundii ni kenna?	4. Eeyyeen 5. Miti	
304	Gara dhabbataa fayyaa akka deemtuuf eenyuutuu murteessaa?	1. ofii kootif 2. Abbaa warraa 99. Kan biroo	
305	Tajaajila argachuuf hangaam turtaa?	_____sa'atiidhaan	

Kutaa 4: Gaaffilee waa’ee hubannoo itti fayyadama altiraasawundii ilaalchisee

T.L	Gaaffilee	Deebii	Hubachiisa
401	Mallattoolee balaa cimaa yeroo ulfaa mudaatan beektaa? (deebiin tokko ol ni danda’ama)	3. Eeyyeen 4. Miti	
402	Gosaa balaa cimaa yeroo ulfaa mulatan maal fa’a beektaa? (deebiin tokko ol ni danda’ama)	9. Haqqee fi lollojii cimaa 10. Dhiigaa yeroo ulfaa 11. Gadameessaa alatti ulfa’u 12. Ulfaa seexanaa 13. Haala uumama daa’imaa sirrii hin taanee 14. Ulfii qancaruu 15. Ulfii graatti du’u 16. Kan biroo _____	
403	Waa’ee qorannoo altiraasawundii yeroo ulfaa godhamu odeeffannoo qabda?	1. Eeyyeen 2. Miti	
404	Deebiin eeyyeen yoo maddii odeeffannoo keetii eessaa? (Deebiin tokko ol ta’u danda’a)	1. Doktoraa 2. midwaayiiifeerii 3. Narsii 4. midiyaa 5. Maatii/Firaa 99. Kan biroo _____	
405	Fayidaalee qorannoo altiraasawundii yeroo ulfaa beektaa? (Deebiin tokko ol ta’u danda’a)	9. Umrii ulfaa tilmaamuuf 10. Saala beekuuf 11. Rakkoo haala uumama daa’imaa beekuuf 12. Lakkoofsa ulfaa beekuuf 13. Teessumaa oobbaatii beekuuf	

		14. Ulfaa gadameessaan ala beekuuf 15. Haala ta'umsaa beekuuf 16. Ulfaa seexaanaa beekuuf 100. Kan biroo _____	
406	Waa'ee qorannoo altiraasawundii yeroo ulfaa godhamuu yoom akka eegaaltuu odeeffannoo qabda?	3. Eeyyeen 4. Miti	
407	Odeeffannoo yoo qabatee, torbee meeqaaffaatti eegaltaa?	5. Torbee 12 dura 6. Torbee 12-16 7. Torbee 16-24 8. Torbee 24 ol	
408	Qorannoon altiraasawundii yeroo ulfaa kuni dhiibbaa qaba jette yaadda?	3. Eeyyeen 4. Miti	
409	Eeyyeen yoo jette, maal fa'a?	5. Gatiin qaalii ta'u 6. Dhiyootti hin argamu 7. Yeroo dheeraa nama tursiisa 8. Kan biroo _____	
410	Qorannoo altiraasawundii yeroo ulfaa godhamuu kana, Ulfaa marsaalee duraatif fayyadamtee jirtaa?	3. Eeyyeen 4. Miti	
411	Eeyyeen yoo ta'e, yeroo meeqaa fayyadamtee?	4. Yeroo tokko 5. Yeroo lama 6. Yeroo sadi fi isaa ol	

Kutaa 5: itti fayyadama altirasawundii yeroo ulfaa godhamu

T.L	Gaaffii	Deebii	Hubachisa
501	Ulfaa amma kanaf qorannoo altiraasawundii gootee jirtaa?	3. Eeyyeen 4. Miti	
502	Yoo qoratamtee, torbee meeqaaffatti ture?	5. Torbee 12 dura 6. Torbee 12-16 7. Torbee 16-24 8. Torbee 24 ol	
503	Waa'ee ulfaa keetii qorannoo altiraasawundii booda maal bartee?	7. Umrii ulfaa 8. Saala ulfaa 9. Rakkoo haala uumama daa'ima 10. Lakkoofsa ulfaa 11. Teessumaa oobbaatii 12. Ulfaa gadameessaan ala 13. Haala ta'umsaa 14. Ulfaa seexaanaa 15. Kan biroo _____ _____	
504	Tajaajila altirasawundii kana eessaatti n argattee?	4. Buufata fayyaa 5. Hospitaala 6. Kilinikaa dhunfaa	
505	Hin qoratamne yoo ta'e, sababni maalii?	6. Hubannoo dhabuu 7. Hanqinaa qarshii 8. Iddoon fagoo ta'u 9. Ogeessii leenjii'ee dhabamu 10. Oleergaan xiqqaa ta'u 99. kan biraa _____	
506	Fayidaalee qorannoo altiraasawundii yeroo ulfaa beektaa?	3. Eeyyeen 4. Miti	

Kutaa 6: odeeffannoo kardii dubartoota ulfaa irraa argame

T.L	Gaaffii	Deebii	Hubachisa
601	Lakkoofsaa kaardii	_____	
602	Kaardii dubaartii ulfaa kana keessaa guuci qorannoo altiraasawundii jiraa?	3. Eeyyeen 4. Miti	
603	Umriin ulfaa kan guuca altiraasawundii kaardii keessaa jiru meeqaa ture?	_____ torbeedhaan	
606	Ragaan qorannoo altiraasawundii kaardii keessaa jiru, ulfaa fayyaa qabeessaa agarsiisaa?	3. Eeyyeen 4. Miti	
604	Odeeffannoon dubartii ulfaa irraa argattee fi kaardii keessaa jiru walfakkaata?	3. Eeyyeen 4. Miti	

Hirmaanna keessaaniif Galatoomaa!!!

Declaration of Investigator

I, the undersigned student of Maternity and Reproductive Health Nursing, declare that this thesis work is my original work in partial in partial fulfillment of the requirements for a Master's of Science degree in maternity and reproductive health nursing to my knowledge.

Name of investigator: _____

Signature: _____ Date_____

Declaration of Advisors

We, the undersigned Advisors, declare that this thesis is our original work in partial in partial fulfillment of the requirements for a master's of science degree in maternity and reproductive health nursing for the stated student above to our best knowledge. We confirmed that this thesis is ready for examination with our approval as the university advisors.

Name of primary Advisors:	Signatures	Date
_____	_____	_____

Name of secondary Advisors:	Signatures	Date
_____	_____	_____

Department Head:	Signatures	Date
_____	_____	_____