MEKELLE UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING

MAGNITUDE AND DETERMINANTS OF LOW BIRTH WEIGHT AMONG NEWBORN BABIES IN PUBLIC HOSPITALS OF MEKELLE CITY, TIGRAY REGION, ETHIOPIA, 2024

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A THESIS SUBMITTED TO MEKELLE UNIVERSITY, COLLEGE OF HEALTH SCIENCE, SCHOOL OF NURSING, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN PEDIATRICS AND CHILD HEALTH NURSING.

JUNE, 2024

MEKELLE, ETHIOPIA

Advisor’s Approval Sheet

This is to certify that the thesis entitled “Magnitude and Determinants of Low Birth Weight Among Newborn Babies in Public Hospitals in Mekelle City, Tigray Region, Ethiopia, 2024” is submitted in partial fulfillment of the requirements for the Degree of Masters with specialization in “Pediatrics and Child Health Nursing” to the graduate program of the School of Nursing, College of Health Sciences at Mekelle University, and has been carried out by Desta Fitsum**,** under my supervision. Therefore, I recommend that the student fulfilled the requirements and, hence, submit the thesis to the department.

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Declaration

I declare that this thesis is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis have been accordingly acknowledged.

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Acknowledgements

I would like to thank Mekelle University, College of Health Sciences, and School of Nursing for the opportunity to pursue my education and complete this thesis. My sincere gratitude goes to my advisors, Tsige Araya and Mekuria Kassa, for their invaluable guidance, support, and constructive feedback throughout the process.

I like to express my deepest gratitude to my colleagues & my families for their advice & unwavering support to do this thesis.

I would like to acknowledge all the staff of hospitals for their willingness, support, and cooperation in providing me with data and the necessary information about the study area. I also thank all data collectors & supervisor for their active role to participate in this study.

I would also like to thank all mothers who participated in this study and their commitment in responding to our questions.

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List of Abbreviations & Acronyms

ABO	Adverse Birth Outcome
ANC	Antenatal Care
AOR	Adjusted Odd Ratio
CI	Confidence interval
EDHS	Ethiopian Demographic and Health Survey
ELBW	Extremely Low Birth Weight
ETB	Ethiopian Birr
G	Gram
HTN	Hypertension
IFA	Iron and Folic Acid
IUGR	Intrauterine Growth Retardation
Kg	Kilograms
LBW	Low Birth Weight
LMICs	Low and Middle-Income Countries
MICS	Multiple Indicators Cluster Survey
NMR	Neonatal Mortality Rate
PI	Principal Investigator
PTB	Preterm Birth
SDG	Sustainable Development Goal
SGA	Small Gestational Age
SNNPR	Southern Nation Nationality People’s Representative
SPSS	Statistical Package for Social Sciences
UNDP	United Nation Development Program
UNICEF	United Nations International Children’s Emergency Fund
VLBW	Very Low Birth Weight
WHO	World Health Organization

Abstract

Background: Low birth weight is a serious global public health issue which is associated with increased risks of neonatal morbidity, mortality, and later health complications. Low birth weight is present in over 20 million neonates annually, and the vast majority live in low and middle-income countries, particularly in Sub-Saharan Africa. In Ethiopia, the prevalence of Low birth weight is strongly heterogeneous by place, and the prevalence has been between 7.8% and 40%. It has remained a challenge despite global efforts through comprehensive maternal and newborn care. This study addresses the persistent challenge of low birth weight in Ethiopia by identifying context specific risk factors, offering critical evidence to guide targeted interventions and reduce neonatal morbidity and mortality in high burden, resource limited settings.

Objective: The objective of this study was to assess the magnitude and determinant factors of low birth weight among newborn babies in public hospitals in Mekelle City, Tigray, Ethiopia, in 2024.

Methods: An institutional-based cross-sectional study was conducted. A total sample size of 383 was determined by using Epi Info version 7.2. Participants were selected using systematic random sampling. Data were collected using a semi-structured interviewer-administered questionnaire, that was pre-tested on 5% of the total sample outside the study area to ensure clarity, consistency. The collected data were entered into Epi Info version 7.2, then exported to SPSS version 27 for analysis. Both bivariate and multivariable logistic regression analyses were conducted and variables with a p-value less than 0.2 in the bivariate analysis were entered into the multivariable model. Adjusted odds ratios with 95% confidence intervals were calculated to assess the strength of associations, and statistical significance was determined at a p-value less than 0.05. Ethical clearance was obtained from the Institutional Review Board (IRB) of Mekelle University, and informed consent was secured from all participants.

Result: The prevalence of low birth weight is 13.1%. Rural residence (AOR=4.17, 95% CI: 1.19, 14.52), short birth intervals (AOR=5.3, 95% CI: 1.73, 16.17), ANC attendance <4 visits (AOR=5.28, 95% CI: 1.68, 16.53), maternal anemia (AOR=9.31, 95% CI: 2.59, 33.42) and preterm birth (AOR=4.39, 95% CI: 1.38,13.97) significantly associated with LBW.

Conclusion and recommendation: Maternal age, rural residence, short birth interval, inadequate ANC follow-up and maternal anemia were significantly associated with low birth weight. Efforts should be made to identify women with high odds of low birth weight.

Keywords: Low Birth Weight, Determinants, Prevalence, Newborn, Tigray, Ethiopia

1. INTRODUCTION

1.1. Background

According to the World Health Organization (WHO), a newborn weighing less than 2500 grams, regardless of gestational age, is classified as low birth weight (LBW) (1). This definition, adopted in 1976, has remained a global standard. LBW is further classified into very low birth weight (<1500 g) and extremely low birth weight (<1000 g) (2, 3). Newborns with LBW are approximately 20 times more likely to die than those with normal birth weight. Birth weight is ideally measured within the first hours after delivery, before postnatal weight loss occurs (1, 4).

LBW reflects a newborn's vulnerability to disease and survival risk and is closely linked to long-term health, growth, and development. The primary causes are preterm birth, intrauterine growth restriction, or both. LBW remains a major global public health challenge and is a leading cause of neonatal morbidity and mortality (5).

Globally, over 20 million babies are born with LBW each year, representing 15–20% of all births. The burden is heaviest in low- and middle-income countries (LMICs), particularly in Sub-Saharan Africa, which accounts for about 25% of global LBW cases. Eastern and Western Africa have the highest proportions, with LBW rates nearly double those found in Europe (6, 7, 8, 9).

Africa is a continent that has high rates of about 25% of all LBW newborns, with the majority born in Eastern and Western Africa (11% and 14%, respectively). The most recent studies have shown a high rate of child mortality. It is expected that in sub Saharan Africa, LBW represents 14.3%, which is approximately twice the rate of LBW in European countries (10).

In Ethiopia, LBW prevalence varies widely. A 2015 hospital-based study in Tigray reported a prevalence of 14.6%. Another 2014 study found 9.9% in Axum and 6.3% in Laelay Maichew. National figures range from 7.8% in Jimma to 40% in Gondar, as reported in the Ministry of Health's Newborn and Child Survival Strategy. This variability underscores the influence of regional, socioeconomic, and healthcare system factors (4, 11, 12).

To address this, the World Health Assembly set a global target to reduce LBW by 30% by 2025. Strategies include improving maternal care across prenatal, antenatal, intrapartum, and postnatal phases. Ethiopia has adopted WHO guidelines, focusing on comprehensive maternal and newborn care, promoting breastfeeding, skin-to-skin contact, and timely interventions like antibiotics and antenatal corticosteroids. Therefore, this study aimed to identify contextual determinants of low birth weight in the study area (13).

1.2 Statement of the problem

Birth weight is a critical determinant of a newborn’s survival and future health. Globally, more than 20 million babies are born with low birth weight (LBW). Alarmingly, 95.6% of these births occur in developing countries, where the prevalence (16.5%) is more than twice that seen in developed nations (7%). In Ethiopia, the burden is particularly severe. A study conducted in 2014 reported a national LBW prevalence of 32%, a significant increase compared to earlier estimates. This indicates that LBW continues to be a pressing public health issue in the country (10, 14, 15).

Children born with LBW face significantly higher health risks. They are approximately 20 times more likely to die than those born with normal weight (8). LBW is linked to both short-term complications such as respiratory distress, jaundice, anemia, and infections, and long-term outcomes including chronic lung disease, neurodevelopmental delays, cerebral palsy, and mental impairment. These children often have underdeveloped immune systems, making them more susceptible to infectious diseases. The burden of LBW also strains healthcare systems especially in low resource settings due to the long-term care and medical support these infants require (6, 10).

Children born with low birth weight are more likely to die prematurely compared to infants of normal birth weight. Likewise, these children experience more morbidity, both in the short and long term. Among these, respiratory distress, sleep apnea, heart problems, jaundice, anemia, chronic lung disorders, mental retardation, and cerebral palsy are the problems associated with low birth-weight babies. There is also a greater vulnerability to infectious diseases due to a poorer immune response (7, 16).

Numerous maternal and environmental factors contribute to the occurrence of LBW. Studies have shown strong associations with maternal age, nutritional status, pre-pregnancy weight, parity, anemia, adverse birth histories, educational level, antenatal care (ANC) attendance, and low socioeconomic status. Behavioral factors such as chat chewing and cigarette smoking during pregnancy also play a role. In addition, contextual factors like food insecurity, dietary practices, and environmental conditions are emerging as significant but underexplored determinants in the Ethiopian context (7).

Several maternal and child health interventions have been introduced in Ethiopia, including efforts to improve ANC coverage, maternal nutrition, and birth preparedness. While some success has been recorded, most interventions rely on general approaches and are guided by evidence from developed countries. Moreover, the focus has largely been on broader maternal health indicators, with limited attention paid to identifying the context specific drivers of LBW, particularly in urban areas like Mekelle City.

Despite existing prevention strategies, LBW remains highly prevalent in Ethiopia, suggesting that critical determinants remain unaddressed. There is a notable lack of in-depth studies exploring maternal nutrition, food security, and environmental exposures as they relate to LBW, especially in northern urban settings. This study aims to address that gap by identifying the magnitude and contextual determinants of LBW among newborns in public hospitals of Mekelle City in 2024. The findings will contribute localized, actionable evidence to inform tailored interventions and strengthen maternal and newborn health programs in the region (17).

1.3 Significant of the study

Low birth weight remains a major contributor to neonatal and infant morbidity and mortality in Ethiopia. By identifying the magnitude and contextual determinants of LBW in public hospitals of Mekelle City, this study provides critical insights into an issue that directly affects child survival and development.

The findings of this research will provide local, context specific evidence necessary for designing and implementing targeted interventions. Current policies often rely on generalized data, much of which is drawn from studies in different geographic or socioeconomic contexts. This study will help ensure that interventions are relevant and appropriately tailored to the needs of the local population.

There is limited research in Ethiopia that examines the relationship between low birth weight and factors such as maternal nutrition, food insecurity, and environmental exposures. This study will address these under researched areas and expand the scientific understanding of LBW determinants in urban Ethiopian settings.

Health planners, program implementers, and policymakers can use the study's findings to strengthen maternal and newborn health programs. It will also help in prioritizing resource allocation by identifying the most influential and modifiable risk factors for LBW.

The study contributes to the growing body of knowledge on maternal and child health in low resource settings. It may also serve as a reference for future researchers interested in exploring related issues in Ethiopia or similar contexts.

The identification of possible factors for low birth weight in the area was have greater input for program managers and policymakers in designing, proper implementation, and evaluation of programs on reduction of low birth weight and improvement of newborn care to achieve sustainable development goal (SDG) 3 of ensuring healthy lives and promoting well-being for all at all ages.

2. LITERATURE REVIEW

There is considerable variation in the prevalence of low birth weight across regions and within countries; however, the great majority of low birth-weight births occur in low and middle-income countries and especially in the most vulnerable populations (10, 14).

Causes of low birth weight are multi-factorial but are related to either obstetrical factors like preterm birth (shortened gestation, <37 weeks), which directly contributes to 28% of neonatal deaths, or intrauterine growth restrictions (15). Malnutrition, infection, illiteracy, chat chewing, cigarette smoking, alcohol drinking, malaria, short inter-pregnancy intervals, and teenage pregnancy have been identified as modifiable risk factors for low birth weight (10, 18, 19).

2.1 Magnitude of Low Birth Weight

A cross sectional study done in India on determinants of low birth weight from 253 newborns shows that 73 (28.8%) were low birth weight newborns, the proportion being significantly higher among females than males (61.6% Vs 38.4%) (20). In a study conducted on the prevalence and determinants of low birth weight in Nigeria, a total of 49 male (6.3%) newborns out of the 780 live singletons recruited weighed < 2500 g. A higher prevalence of LBW was observed among female newborns (7.9%) (21).

A cross sectional descriptive study was carried out of all the multi-para mothers; the prevalence of LBW was found to be 39%; (22). Another Multiple Indicators Cluster Survey (MICS) study done in Ghana on the prevalence of low birth weight and associated maternal factors shows that the prevalence of LBW was 9.2% (23). In addition, the prevalence and determinants of low birth weight in Nigeria in Benin City were 6.3% (21). A cross sectional analytic study done on factors associated with low birth weight among neonates born at Olkalou District Hospital, Central Region, Kenya, shows the prevalence of LBW was 12.3% (18).

Maternal associated factors of low birth weight: a hospital based cross sectional mixed study in Tigray, Northern Ethiopia, in 2015 shows the prevalence of LBW was found to be 14.6% (24).

A facility based cross sectional study conducted on the prevalence and associated factors of adverse birth outcomes among women attending the maternity ward at Negest Elene Mohammed

Memorial General Hospital in Hosanna Town, SNNPR, Ethiopia, shows the prevalence of LBW was 32 (9.8%) (25).

A comparative cross sectional study on the prevalence and factors associated with low birth weight in Axum and Laelay Maichew Districts, North Ethiopia, shows the prevalence of low birth weight was 9.9% and 6.3% in Axum and Laelay Maichew districts, respectively (26).

Prevalence and Determinants of Small Size Babies in Ethiopia: Results from in-Depth Analyses of the Ethiopian Demographic and Health Survey 2011. This in -depth analysis of the survey data set was conducted using representative data collected from all regions of the country. An average of 30.3% of Ethiopian babies were reported as small at birth by moms, and a non-linear but declining trend was observed during the study periods (27).

In an institutional based cross sectional study conducted at four maternity hospitals in Asmara, Eritrea, on Determinants of Low Birth Weight, the prevalence rate for LBW in the selected maternity hospitals was 9.1% (95% CI: 7.1–11.0), and the mean (SD) birth weight (g) for all neonates, normal birth weight (NBW), and LBW were 3143.6 (513.1), 3240.6 (421.7), and 2169.4 (279.9), respectively (1).

2.2 Determinants of Low Birth Weight

2.2.1 Demographic & Socioeconomic Factors

According to a cross-sectional study conducted on maternal associated factors in Pakistan, mothers with low levels of education and low weight were at greater risk of producing low birth weight babies as compared to those who had a high level of education. Furthermore, mothers with less than 18 years of age and those aged 35 or more had a higher risk of low birth-weight outcomes. Mothers with low socioeconomic status were at higher risk of having low birth weight children (28).

According to the study done in Assosa Zone, Benishangul Gumuz Regional State, Residence, woman’s educational status, were significantly associated with LBW and preterm birth (4).

According to the study done in India on Maternal determinants of low birth weight among Indian children: Evidence from the National Family Health Survey-4, 2015-16, Regarding socio demographic characteristics. The prevalence of LBW decreased with the increase in age in women, with women aged 15–24 years having a higher proportion of LBW babies than those aged 35 years or older (19% vs. 17.3%). A higher percentage of mothers had LBW children who married before 18 years compared with those who married at 18 years or later (18.6% vs. 16.9%). The incidence of LBW decreased with an increase in maternal educational level. The prevalence of LBW was 6.3% lower among higher educated women as compared to women who had no formal education (13.3% vs. 19.6%). The occurrence of LBW also had a decreasing trend from the bottom to the upper quintiles of household wealth, where the percentage of LBW was 5.5% lower in the richest quintile than the poorest household. Children's LBW was common among those who lived in rural areas (17.9%), belonged to scheduled castes (18.4%), scheduled tribes (19.5%), and Hindus (17.8%). The prevalence of LBW also varied across geographical regions. The highest incidence of LBW was found in the north region (20%), followed by the central (19.5%) and west (18.5%) regions (5).

According to a study done on the sociodemographic determinants of low birth weight: Evidence from the Kassena Nankana districts of the Upper East Region of Ghana, the prevalence of low birth weight was 13.8% (95% CI: 13.10, 14.6) and more in female babies than in males (15.5% vs. 12.2%; p<0.0001). Determinants of low birth weight after controlling for confounding factors were sex of neonates (OR = 1.32, 95% CI [1.14, 1.52]; p<0.0001), maternal age (p = 0.004), and mothers who are not married (OR = 1.44 [1.19, 1.74]; p<0.0001) (16).

The study done on the prevalence and associated factors of adverse birth outcomes among women attending the maternity ward at Negest Elene Mohammed Memorial General Hospital in Hosanna Town, SNNPR, Ethiopia, shows being a government employee (AOR = 4.5, 95% CI = 1.25, 15.9), rural residence (AOR = 3.5, 95% CI = 1.57, 7.93), and age < 20 years (AOR = 4.9, 95% CI = 11.29, 18.6) was associated with low birth weight (25).

A cross-sectional mixed study design was done on maternally associated factors of low birth weight in three zonal hospitals in Tigray, Northern Ethiopia, with a sample size of 308. Residence of the mother was strongly associated with low birth weight, and mothers residing in rural areas were more than four times more likely to have LBW babies when compared to those mothers who live in urban areas (24).

Another study was done on the prevalence of low birth weight and associated maternal factors in Ghana. The descriptive statistics show that mothers in rural areas tend to give birth to lower-birth weight children than women who live in urban areas (23).

2.2.2 Maternal Factors

According to a cross sectional study conducted in Pakistan, mothers with a last pregnancy interval of less than 12 months were at higher risk of having low birth weight children (28, 29). Another study done in India on maternal determinants of low birth weight, found that the inter pregnancy interval and the number of antenatal visits had a statistically significant association with low birth weight ($p<0.01$). Overall, about 45.6% of the mothers were found to be anemic, and about 48.05% of the anemic mothers delivered low birth weight babies and the association was statistically significant ($p<0.05$). Iron and folic acid supplementation during pregnancy also had a significant association with low birth weight ($p<0.05$). This data shows a significant positive effect of iron and folic acid supplementation during pregnancy (5).

According to the study done in Ghana on maternal determinants of low birth weight and neonatal asphyxia, the investigators found that mothers who did not take some foods that were forbidden for pregnant women had a low birth weight compared to those who did not taboo any food during pregnancy ($p = 0.032$). Low birth weight babies were high among mothers who did not have an additional meal to their normal meals during pregnancy ($p = 0.006$), and mothers who delivered preterm were more likely to have low birth weight babies ($p = 0.041$) (30).

Maternal associated factors of low birth weight: a hospital based cross sectional mixed study in Tigray, Northern Ethiopia, on 308 deliveries shows the gestational age of the fetus on the risk of having low birth weight babies. The odds of being LBW in babies born before the gestational age of 37 weeks were 18 times higher when compared to babies born at the gestational age of 37 weeks and more (24).

Prevalence and Factors Associated with Low Birth Weight among Teenage Mothers in New Mulago Hospital: A cross sectional study in Uganda shows gestational age less than 37 weeks had a higher risk of delivering low birth weight compared with those who had gestational age greater than or equal to 37 weeks [AOR 3.302; $P = 0.00001$] (31).

A study conducted on factors associated with low birth weight among neonates born at Olkalou District Hospital, Central Region, Kenya, shows premature births (OR = 3.65, 95% C.I. = 1.31-10.38) had a higher risk of low birth weight than term births (18).

According to a study done on risk factors and adverse perinatal outcomes associated with low birth weight in Northern Tanzania, Multivariate logistic regression showed maternal anemia (RR 1.7; 95% CI 1.4–2.2) and being delivered preterm (RR 2.0; 95% CI 1.8–2.3) were significantly associated with the delivery of low birth weight infants (29).

A cross sectional study conducted on the prevalence of low birth weight and associated factors among neonates in public hospitals, Addis Ababa, Ethiopia, shows a close association between low birth weight newborns and prematurity, primi-parity, a short inter-pregnancy interval, and the delay of the first antenatal visit (2, 32, 33).

A cross-sectional study conducted on the Prevalence and Factors Associated with Low Birth Weight among Teenage Mothers in New Mulago Hospital shows young maternal age and ANC attendance were not associated with LBW. Low birth weight is bivariately associated with use of antenatal care facilities and gestational age (31).

The study done on the Prevalence and Associated Factors of Adverse Birth Outcomes among Women Attended Maternity Ward at Negest Elene Mohammed Memorial General Hospital in Hosanna Town, SNNPR, Ethiopia, shows a lack of antenatal care (AOR = 3.2, 95% CI (1.27,8.06) was associated with low birth weight (25).

A cross sectional study design was done on the Prevalence and Associated Factors of Low Birth Weight among Term Newborns in Dilla Town, Southern Ethiopia, Mothers with a lack of ANC follow up during pregnancy had 6.83 times as low birth weight as those mothers who had ANC follow up (34).

2.2.3 Nutritional Factors

According to a cross sectional study done on Risk factors and adverse perinatal outcomes associated with low birth weight in Northern Tanzania, Multivariate logistic regression showed mothers who had not counseled during pregnancy (RR 1.3; 95% CI 1.2–1.6) were significantly associated with delivery of low birth weight (29). A study done in Kenya on the Determinants of

Low Birth Weight in the Context of Maternal Nutrition Education in Urban Informal Settlements in 2019 shows nutritional counseling and additional diet during the current pregnancy had a strong association with low birth weight (35). Another study conducted on the Associated Factors with Low Birth Weight in Dire Dawa City, Eastern Ethiopia, shows the mothers who did not receive nutritional counseling during ANC follow up were twice (AOR = 2.03, 95% CI: 1.01, 4.06) more likely to give LBW babies compared with their counterparts (36).

Maternal associated factors of low birth-weight A hospital based cross sectional mixed study in Tigray, Northern Ethiopia, also shows that mothers who did not get dietary counseling during pregnancy had a 3.5-fold higher risk of low birth weight (24).

2.2.4 Maternal Behavioral Factors

According to a study done on Risk factors and adverse perinatal outcome associated with low birth weight in Northern Tanzania, Multivariate logistic regression showed smoking during pregnancy (RR 1.9; 95% CI 1.0–3.5) was significantly associated with the delivery of low birth weight infants (29). Another study done in Negest Elene Mohammed Memorial General Hospital in Hosanna Town on the prevalence and associated factors of adverse birth outcomes among women attending the maternity ward in 2016 shows that tobacco smoking has a significant association with low birth weight (25).

Determinants of Low Birth Weight among Newborns at Debre Tabor Referral Hospital, Northwest Ethiopia: A cross-sectional study shows the association between smoking cigarettes and low birth weight. The odds of LBW were 1.19 (AOR = 1.19; 95% CI 1.07, 1.33) times higher in newborns from mothers who smoked compared to newborns from mothers who did not smoke (37). Another study was conducted on Low Birth Weight and Its Associated Factors among Newborns Delivered at Wolaita Sodo University Teaching and Referral Hospital, Southern Ethiopia, it shows that a newborn born to a mother who drinks alcohol during her current pregnancy is eight times more likely to have a low birth weight compared to a mother who did not drink alcohol during her current pregnancy (11, 32).

2.2.5 Fetal Factors

Determinants of low birth weight in a Block of Hooghly, West Bengal: A multivariate analysis A study showed that low birth rates were significantly higher among females than males (61.6% vs.

38.4%) (20). Female neonates had about 32% increased odds of being born with low birth weights compared to their male colleagues (OR = 1.32, 95% CI [1.14, 1.52]; $p < 0.0001$) (16).

A study conducted on the determinants and adverse perinatal outcomes of low birth-weight newborns delivered in Hawassa University Comprehensive Specialized Hospital, Ethiopia, shows LBW newborns are associated with an increased risk of a low Apgar score and early neonatal death (38).

A cross sectional analytic study conducted on Factors associated with low birth weight among neonates born at Olkalou District Hospital, Central Region, Kenya, on 346 mothers and their respective newborn babies shows that female infants (AOR = 3.37, 95% C.I.= 1.14-10.00) were independently associated with LBW, and ten (3.1%) of the newborns had visible birth defects (18). Another study was also done on the Prevalence of Low Birth Weight and Associated Factors among Neonates in Public Hospitals, Addis Ababa, Ethiopia, Among the three hundred sixty-nine newborns, 213 (57.7%) were females and 156 (42.3%) were male newborns. 19 (5.1%) of the newborn babies had visible birth defects (2).

A study done on the Prevalence and associated Factors of Adverse Birth Outcomes among Women Attended Maternity Ward at Negest Elene Mohammed Memorial General Hospital in Hosanna Town, SNNPR, Ethiopia, shows that of 327 pregnant mothers, 6 (1.8%) had a visible severe defect (25).

2.3 Conceptual Framework

The conceptual framework developed based on the literature. The details of the framework are displayed in Figure 1 below. The arrow in the diagram shows the relationship between the variables. As depicted in the diagram, there is a relationship between low birth weight and socio-demographic factors, maternal factors, nutritional factors, and fetal factors (2, 5, 18, 37, 39).

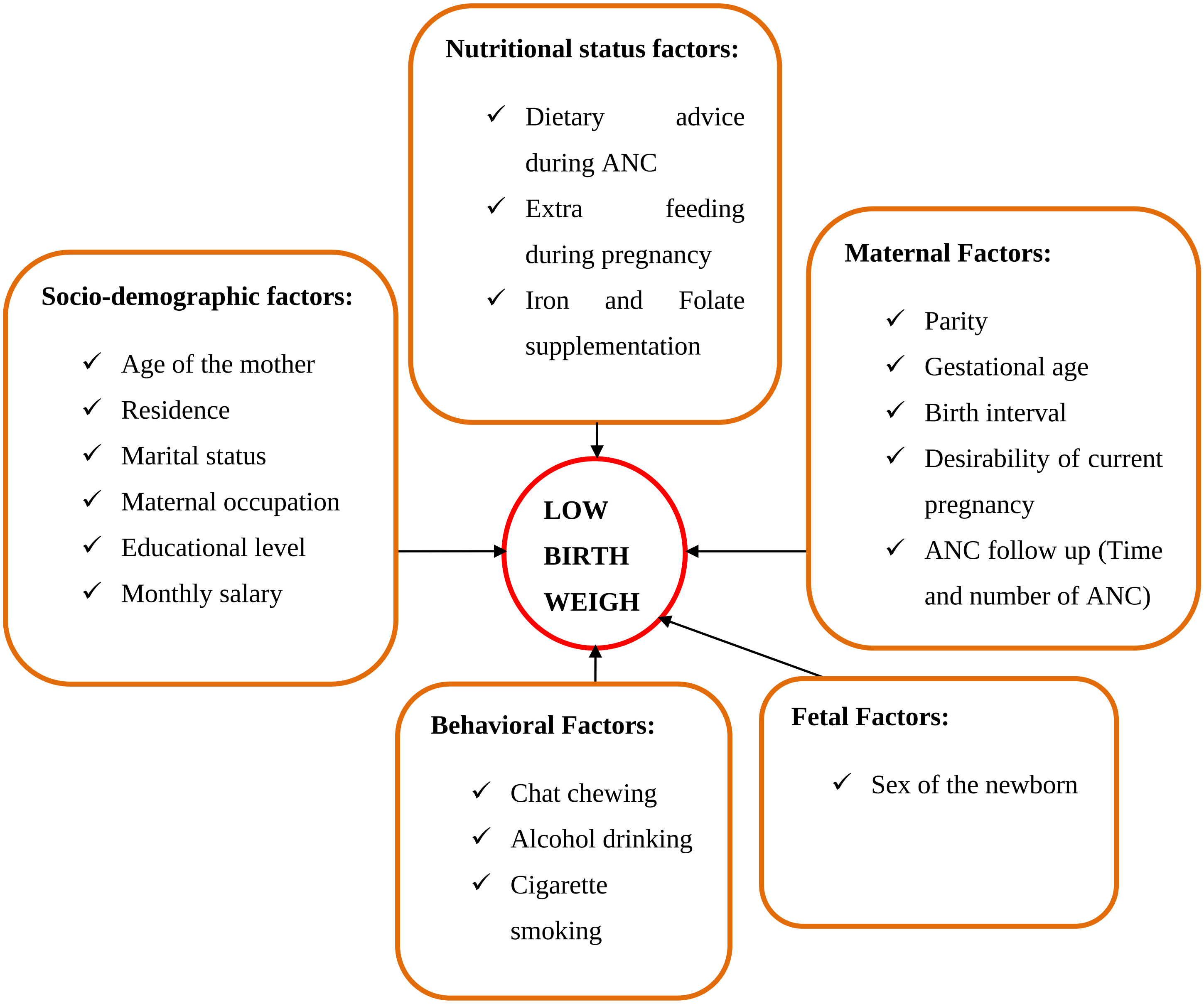

Figure 1: Conceptual Framework Illustrating the Determinants of Low Birth Weight (Developed Based on Reviewed Literature)

3. OBJECTIVE

3.1 General objective

- To assess the Magnitude and Determinant factors of Low Birth Weight (LBW) Among Newborn Babies in Public Hospitals in Mekelle City, Tigray, Ethiopia, in 2024.

3.2 Specific objectives

- To Determine the magnitude of Low Birth Weight (LBW) Among Newborn Babies.
- To identify Determinant Factors of Low Birth Weight (LBW) Among Newborn.

4. METHODOLOGY

4.1 Study Area

The study was carried out in Mekelle public hospitals in Mekelle city, Tigray, Ethiopia. Mekelle is the capital city of Tigray regional state and one of the administrative towns. The city is located in the northern part of Ethiopia, at a distance of 783 km from Addis Ababa, the capital city of Ethiopia. Its astronomical location is 13° 32′ North latitude and 39° 28′ East longitude. Administratively, Mekelle is considered a special zone that is divided into seven sub-cities. Namely: Hawelti, AdiHaki, Kedamay Weyane, Hadnet, Ayder, Semien, and Quiha. Based on the 2013 household survey, the Tigray Bureau of Urban Development estimated that the population growth rate in Mekelle would be 5.5% per year (40).

Within Mekelle city, there are about nine public health centers, two primary hospitals, two general hospitals (Mekelle general hospital and Quiha general hospital), and one comprehensive specialized referral hospital. The health institutions in the city provide maternal and child health services.

4.2 Study Design and period

A facility based cross sectional study design was conducted from March 25, 2024, to May 26, 2024.

4.4 Source population and Sampling Population

4.3.1 Source Population

The source of population were all mothers who give birth and their respective newborns in public hospitals in Mekelle City, Tigray, Ethiopia, from March 25, 2024, to May 26, 2024.

4.3.2 Study Population

All randomly selected mothers and their respective newborns available in the public hospitals of Mekelle City during the data collection time were the study participants.

4.3.3 Study Unit

The study unit was both the mothers and their respective newborns available in the public hospitals of Mekelle City during the data collection period.

4.4 Eligibility Criteria

4.4.1 Inclusion Criteria

All singleton term and preterm newborn babies and their mothers who have given birth live in Mekelle City, public hospitals, and only those mothers with known gestational age, Date of delivery, and weight of the newborn were included in this study.

4.4.2 Exclusion Criteria

Newborn babies whose mothers are suffering from severe medical or surgical conditions, twin deliveries, and newborns with congenital anomalies and stillbirth were excluded from this study.

4.5 Sample size and Sampling procedure

4.5.1 Sample Size Calculation

To estimate the sample size, a 95% confidence level, 80% power, and 10% non-response rate assumptions was used. The sample size was determined by using Epi Info version 7.2.6.0. Moreover, to estimate the sample size, all significantly different determinants in a previous similar study conducted in Ethiopia were compared to get a larger sample size using nutritional counseling during antenatal care (36). Accordingly, the total sample size using Fleiss w/cc method was **383.**

Table 1: Sample size calculation by using Determinants Variables from previous study

Significant Determinants	CI (%)	Power	AOR	Final Samples size including 10% non-response
Nutritional Counseling During ANC	95	80%	2.03	**383**
Smoking During Pregnancy	95	80%	3.97	99
Gestational age	95	80%	18.48	26

4.5.2 Sampling Procedure

There are five public hospitals in Mekelle City. These are Yekatit 11 Primary Hospital, HEWO Hospital, Ayder Comprehensive Specialized Hospital, Mekelle General Hospital, and Quiha General Hospital that are providing delivery services. Total sample sizes of 383 newborn babies were selected from the five public hospitals.

All newborn babies from the five public hospitals that delivered day and night during the study period were considered for the study. The numbers of newborn babies surveyed from each public hospital are allocated proportionally to the total average number of deliveries for the study period from all public hospitals. Data obtained from the last one-month average number of deliveries in each public hospitals and sampling frame of delivery flow. Then participants were selected for every K interval newborn baby by using systematic random sampling techniques until the required sample size is obtained, and the starting newborn babies was selected by a simple random sampling method.

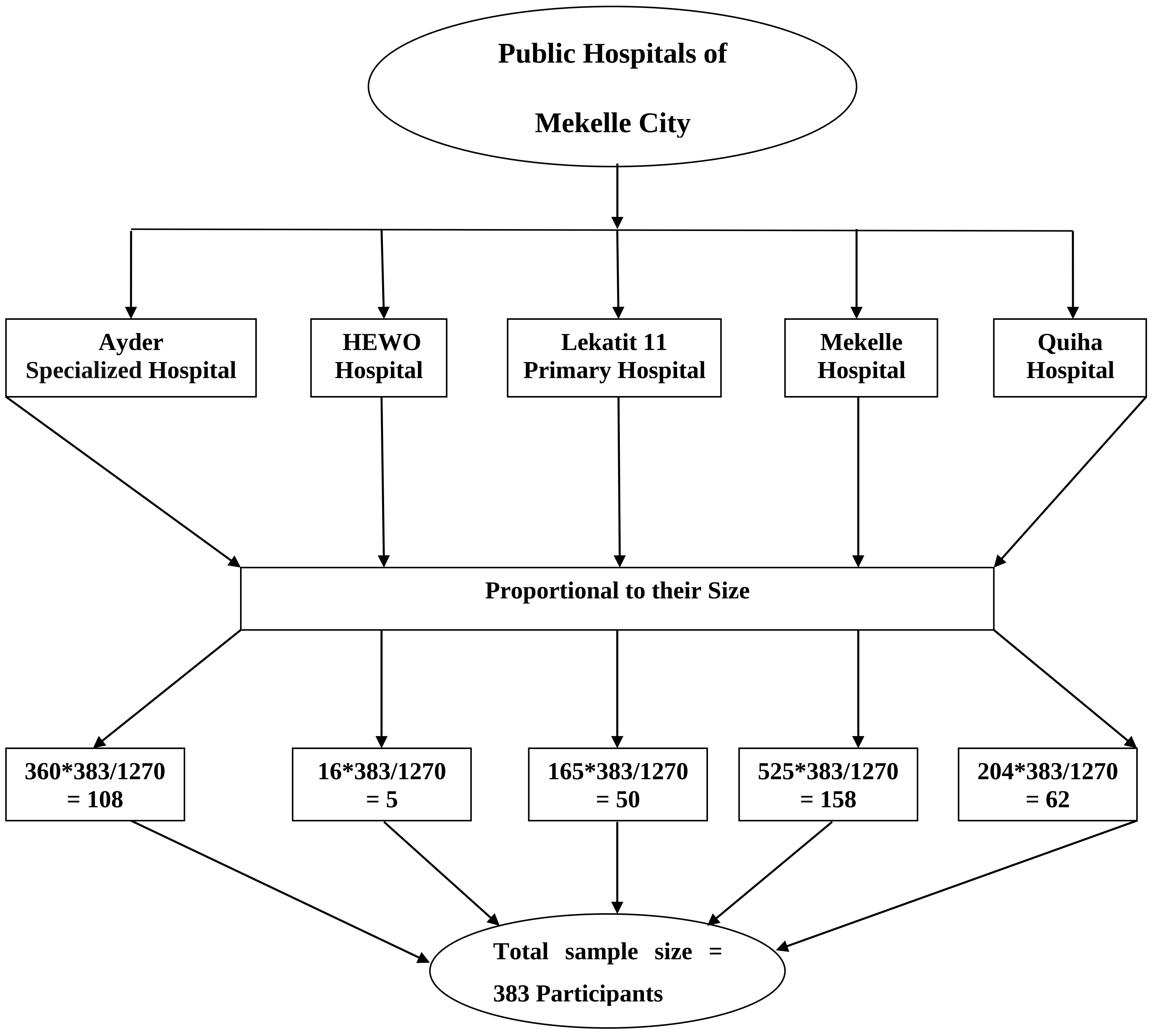

Figure 2: Schematic Representation of Sampling Procedures.

4.6 Study Variables

4.6.1 Dependent Variables

Low Birth Weight

4.6.2 Independent Variables

Socio-Demographic Characteristics of Respondents:

- ✓ Age of the mother
- ✓ Residence
- ✓ Religion
- ✓ Ethnicity
- ✓ Marital status
- ✓ Maternal occupation
- ✓ Maternal educational level
- ✓ Monthly salary

Maternal Factors of the Respondent:

- ✓ Parity
- ✓ Pregnancy interval of previous birth
- ✓ Malaria during pregnancy
- ✓ Pregnancy complications
- ✓ Desirability of current pregnancy
- ✓ Anemia during pregnancy
- ✓ STI during current pregnancy
- ✓ History of low birth weight
- ✓ ANC follow up
- ✓ Time of initiation of ANC
- ✓ Number of ANC
- ✓ Gestational age

Nutritional Status & Behavioral Factors:

- ✓ Dietary advice during ANC
- ✓ Extra-meal during pregnancy
- ✓ Iron and folic acid supplementation
- ✓ Alcohol drinking
- ✓ Cigarette smoking
- ✓ Chat chewing

Newborn Factors:

- ✓ Sex of the Newborn

4.7 Operational Definitions/Definition of terms

Newborn: The newborns age from birth to 24 hours postpartum (3, 41).

Normal Birth Weight: The newborn infant weight greater than 2500 grams and less than 4000 grams (41).

Low Birth Weight: The newborn birth weight less than 2,500 grams (up to and including 2,499 grams) (3).

Maternal anemia: refers to a condition in which a pregnant woman has a hemoglobin level of less than 11.0 g/dL, as defined by the World Health Organization (WHO). It is assessed through antenatal clinical records or laboratory results (42).

Chronic Medical Condition: the presence of one or more long term, non-communicable diseases diagnosed prior to or during pregnancy, such as hypertension, diabetes mellitus, asthma, cardiac disorders, epilepsy, or renal disease. These conditions are identified through medical history or documented diagnosis in the mother's clinical records (43).

4.8 Data collection tool and procedure

The data was collected using a semi-structured, pre-tested interviewer guided questionnaire after reviewing similar literature and the Ethiopian Mini Demographic and Health Survey 2019. Medical records were cross checked to confirm important variables such as patients' obstetric history and antenatal history. Three data collectors who are diploma midwives and one BSC midwife supervisor was recruited based on their fluency in speaking, reading, writing, and listening to Tigrigna. One data collector was assigned to each health facility. The data collectors and supervisor were trained for one day by the principal investigator on the objectives of the study, relevance of the study, procedures during interviewing, confidentiality of client information, eligibility criteria, respondents' rights, informed consent, and ways of approaching during the interview.

4.9 Data quality assurance

In order to assure the quality of the data, the following measures was taken: The questionnaire was initially prepared in English, translated into the local language (Tigrigna), and back translated to English by two language experts to check for consistency of the questionnaire. The validity of the questionnaire was maintained by using questionnaires adapted from different literatures that were used by other researchers.

A calibrated weight scale that has measurement accuracy for the weight of the newborn was used, and the reliability of the bean balance was checked before using the instrument for data collection. Both supervisors and data collectors are closely followed for the data collection process. Before the actual data collection, a pretest was conducted by 5% of the study population at Wukro General Hospital to evaluate the clarity of the questions, the validity of the instrument, and the reactions of respondents to the questions. The maintenance of privacy and confidentiality of the respondents, as well as good communication skills between respondents and interviewers that was gained through training sessions for both data collectors and supervisors, was contribute to the quality of the study. Every day, all questionnaires was reviewed and checked at the end of the data collection period, and any errors was corrected by the principal investigator accordingly with the supervisor and data collector. The completed questionnaire was cross-checked daily for inconsistencies, and the data was kept in the form of a file in a secure place where no one can access it except the principal investigator.

4.10 Data processing and analysis

All filled-out questionnaires were checked for completeness, consistency, and accuracy and entered into Epi Info Data (7.2), then exported to SPSS software version 27 for data analysis. Frequency, proportion, and summary statistics (table, pie chart, and bar graph) was used to describe the study population in relation to the relevant variables. Bivariate logistic regression was used to check variables that have an association with the dependent variables. Then those variables found to have a P value less than 0.2 was fit into multiple logistic regressions for controlling the effect of confounders. The odds ratio with their 95% CI was computed, and variables having a P value less than 0.05 in the multivariable logistic regression models was considered as significantly associated with the dependent variable. Finally, the results were summarized and presented through texts, graphs, frequency tables, and other summary statistics.

4.11 Ethical consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) of Mekelle University, College of Health Science (Approval No. MU-IRB 2282/2024). Support letters were obtained from the School of Nursing, and an official letter of permission was requested from Tigray regional health bureau and Sub city Director Office of the health facilities. The leaders of the site and all participants was informed about the purpose, advantages, and disadvantages of the study, including anonymity and the right to refuse at any stage of the interview. Confidentiality and beneficence of the respondents was assured by not recording names or any personal identifiers, and informed consent was obtained prior to each interview.

4.12 Dissemination of findings

The findings will be submitted and presented to Mekelle University, College of Health Science, and School of Nursing. It was also be submitted to Tigray Regional Health Bureau, Yekatit 11 Primary Hospital, HEWO Hospital, Ayder Comprehensive Specialized Hospital, Quiha General Hospital, and Mekelle General Hospital. The result of this study was presented in different scientific forums, and lastly, efforts was made to publish it in peer-to-peer reputable journals.

5. Results

5.1. Socio-demographic characteristics of participants

The study included 383 participants mothers & their newborns making it a 100% response rate. The age distribution revealed that 259(67,6%) of participants fell within the 20-34 years age group. Younger participants under 20 years accounted for 58 cases (15.1%), while those aged 35 years and above comprised 66 participants (17.2%).

Religious affiliation showed Orthodox Christians dominating the sample 362 (94.5%). Muslim participants constituted a small minority, 21(5.5%). Marital status distribution demonstrated that nearly all participants were married (363, 94.8%), with only a small proportion being single (7, 1.8%).

Residential patterns showed a significant urban predominance, with 287 participants (74.9%) residing in urban. Nearly half (190, 49.6%) had achieved secondary education or higher, while 123 (32.1%) had primary education. A smaller proportion (41, 10.7%) were able to read and write only, and 29 (7.6%) had no formal education. Homemakers constituted the largest group (152, 39.7%), followed by government employees (96, 25.1%) and merchants (78, 20.4%). Agricultural workers accounted for 29 participants (7.6%), while other occupations comprised 28 cases (7.3%) (**Table 2**).

Table 2: Sociodemographic characteristics of women who gave birth at public health hospitals of Mekelle, Tigray, Ethiopia, 2024(n=383)

Variable	Categories	Frequency	Percentage
Maternal age	Under 20 Years	58	15.1
	20-34 Years	259	67.6
	35 years and more	66	17.2
Religion	Orthodox	362	94.5
	Muslim	21	5.5
Marital status	Single	7	1.8
	Married	363	94.8
	Divorced	4	1
	Widowed	4	1
	Separated	5	1.3
Residence	Urban	287	74.9
	Rural	96	25.1
Educational status	Not read and write	29	7.6
	Read and write	41	10.7
	Primary	123	32.1
	Secondary and above	190	49.6
Occupation	Farmer	29	7.6
	Merchant	78	20.4
	House wife	152	39.7
	Government employed	96	25.1
	Others	28	7.3

5.2. Magnitude of LBW

The distribution of birth weight among the study population is presented in Figure 3. The findings indicate that the 86.9% of infants were born with a normal birth weight, while a 13.1% (95% CI: 10, 16%) proportion had low birth weight.

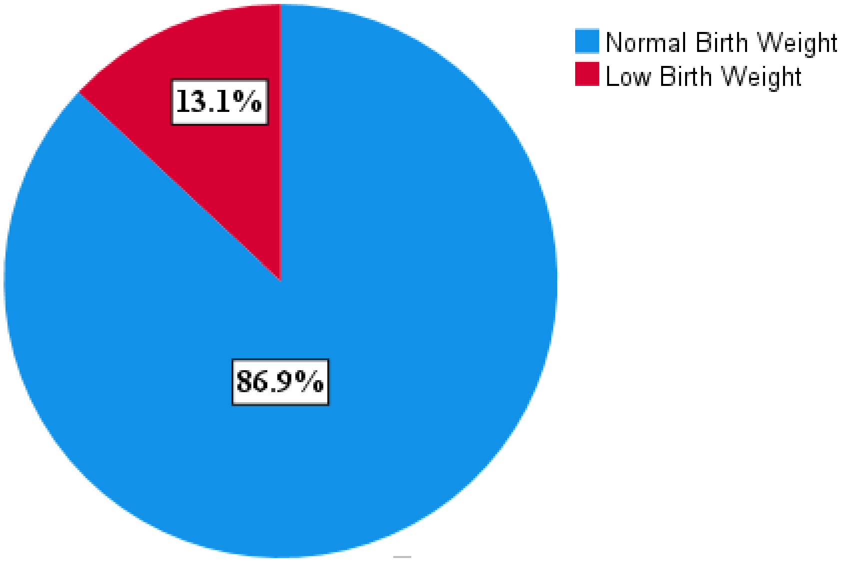

Figure 3: Prevalence of low-birth weight among newborn babies in public hospitals of Mekelle city, Tigray region, Ethiopia, 2024

5.3. Obstetric Factors

Gravidity data showed that 278 women (72.6%) were multigravida. Parity distribution demonstrated that 194 women (50.7%) had given birth 2-4 times, followed by 51 (13.3%) with five or more births, and 33 (8.6%) with one birth. Birth interval analysis showed that 191 women (49.9%) had optimal spacing of ≥24 months between pregnancies, while 91 (23.8%) had shorter intervals of <24 months. Regarding gestational age at delivery, 297 pregnancies (77.5%) reached term (≥37 weeks), compared to 86 (22.5%) preterm deliveries (<37 weeks). Antenatal care utilization patterns revealed that 230 women (60.1%) achieved the recommended ≥4 ANC visits, while 153 (39.9%) had fewer than 4 visits.

Neonatal characteristics showed a nearly equal sex distribution, with 201 female newborns (52.5%) and 182 males (47.5%). A history of low birth weight was reported in 39 cases (10.2%), while 344 women (89.8%) had no such history. Pregnancy planning data indicated that 346 pregnancies (90.3%) were planned, compared to 37 unplanned pregnancies (9.7%).

Table 3: Obstetric factors of women who gave birth at public health hospitals of Mekelle, Tigray, Ethiopia, 2024(n=383)

Variable	Categories	Frequency	Percentage
Gravidity	Primigravida	105	27.4
	Multigravida	278	72.6
Parity	1 Birth	33	8.6
	2-4 Births	194	50.7
	5 and more Births	51	13.3
Birth Interval	< 24 months	91	23.8
	>= 24 months	191	49.9
Gestational age	<37 Weeks	86	22.5
	>= 37 Weeks	297	77.5
Number of ANC visits	< 4 visits	153	39.9
	>= 4 visits	230	60.1
Sex of newborn	Female	201	52.5
	Male	182	47.5
History of low birth weight	Yes	39	10.2
	No	344	89.8
Planned pregnancy	Yes	346	90.3
	No	37	9.7

5.4. Maternal Factors

Chronic medical conditions were relatively uncommon, with only 20 women (5.2%) reporting such illnesses, while the vast majority (363, 94.8%) had no chronic medical conditions. Anemia prevalence data revealed that 67 participants (17.5%) were anemic, compared to 316 (82.5%) with normal hemoglobin levels. Sexually transmitted infection (STI) rates were remarkably low, with only 6 cases (1.6%) reported among participants, while 377 women (98.4%) had no STIs. Regarding pregnancy complications, 45 women (11.7%) experienced complications during their pregnancies, while 338 (88.3%) had uncomplicated pregnancies (**Table 4**).

Table 4: Maternal factors of women who gave birth at public health hospitals of Mekelle, Tigray, Ethiopia, 2024(n=383)

Variable	Categories	Frequency	Percentage
Chronic medical Illness	Yes	20	5.2
	No	363	94.8
Anemia	Yes	67	17.5
	No	316	82.5
STI	Yes	6	1.6
	No	377	98.4
Pregnancy complications	Yes	45	11.7
	No	338	88.3

5.5. Nutritional Factors

Majority (90.6%) of participants reported receiving dietary advice during antenatal care visits. Similarly, 89% of women consumed additional meals beyond their usual diet during pregnancy. Iron-folate supplementation uptake was particularly high, with 95% of women taking these essential supplements. Among supplement users, 68.8% consumed between 60-90 tablets while 31.2% took more than 90 tablets. However, the findings also identified gaps, as 9.4% of women did not receive dietary advice, 11% did not practice extra feeding, and 5% did not take iron-folate supplements (**Table 5**).

Table 5: Nutritional factors of women who gave birth at public health hospitals of Mekelle, Tigray, Ethiopia, 2024(n=383)

Variable	Categories	Frequency	Percentage
Dietary Advice	Yes	347	90.6
	No	36	9.4
Extra Feeding	Yes	341	89
	No	42	11
Iron-Folate Intake	Yes	364	95
	No	19	5
Number of Iron-Folate tablets taken	60-90 tablets	165	68.8
	>90 tablets	75	31.2

5.6. Factors associated with Low Birth Weight

Bivariate logistic regression analysis was first conducted to examine potential associations between independent variables and low birth weight (LBW). Variables showing associations at $p < 0.2$ in bivariate analysis included: maternal age, residence, income level, parity, birth interval, ANC visits, history of LBW, gestational age, newborn sex, and maternal anemia. These variables were subsequently entered into multivariable logistic regression for further analysis.

The final multivariable model revealed several statistically significant predictors of LBW at $p < 0.05$. Mothers aged 20-34 years had 79% lower odds of delivering low birth weight (LBW) infants compared to adolescent or older mothers (AOR = 0.21, 95% CI: 0.05, 0.77), indicating a protective effect of being in the optimal reproductive age range. In contrast, rural residence significantly increased the likelihood of LBW, with rural mothers having 4.17 times higher odds of delivering LBW infants compared to urban residents (AOR = 4.17, 95% CI: 1.19, 14.52). Similarly, a short birth interval of less than 24 months was associated with 5.3 times higher odds of LBW (AOR = 5.3, 95% CI: 1.73, 16.17), while mothers who attended fewer than four antenatal care (ANC) visits had 5.28 times increased odds of delivering LBW infants (AOR = 5.28, 95% CI: 1.68, 16.53).

Among all factors, maternal anemia demonstrated the strongest association, with anemic mothers having 9.31 times higher odds of delivering LBW infants compared to non-anemic counterparts (AOR = 9.31, 95% CI: 2.59, 33.42). Additionally, preterm birth (before 37 weeks gestation) remained a significant predictor, with affected mothers having 4.39 times higher odds of LBW delivery (AOR = 4.39, 95% CI: 1.38, 13.97) even after adjusting for potential confounders (Table 6).

Table 6: Bivariate and Multivariable logistic regression analysis of prevalence and determinants of low-birth weight among newborn babies in public hospitals of Mekelle city, Tigray region, Ethiopia, 2024 (n=383).

Variables	Categories	Outcome		COR (95% CI)	AOR (95% CI)	Sig.
		LBW (%)	NBW (%)			
Maternal age	Under 20 Years	27	31	3.23(1.47, 7.08)	3.7(0.94, 14.57)	0.61
	20-34 Years	9	250	0.13(0.05, 0.32)	0.21(0.05, 0.77)	0.01**
	35 and more years	14	52	1		
Residence	Rural	35	61	10.4(5.3, 20.2)	4.17(1.19, 14.52)	0.02*
	Urban	15	272	1		
Parity	5 and more births	15	36	4.16(1.1, 15.76)	0.52(0.16, 1.71)	0.28
	2-4 Births	31	163	1.9(0.54, 6.62)	0.33(0.01, 6)	0.45
	1 Birth	3	30	1		
Birth Interval	< 24 months	36	55	8.27(4.16, 16.45)	5.3(1.73, 16.17)	0.03*
	>= 24 months	14	177	1		
ANC visits	<4 visits	39	114	6.81(3.36, 13.8)	5.28(1.68, 16.53)	0.04*
	>= 4 visits	11	219	1		
History of low birth weight	Yes	22	17	14.6(6.95, 30.65)	2.56(0.62, 10.49)	0.18
	No	28	316	1		
Gestational age	< 37 Weeks	34	52	11.48(5.91, 22.3)	4.39(1.38, 13.97)	0.01**
	>= 37 Weeks	16	281	1		
Sex of newborn	Female	39	162	3.74(1.85, 7.55)	2.96(0.92, 9.52)	0.06
	Male	11	171	1		
Anemia	Yes	19	48	3.63(1.9, 6.95)	9.31(2.59, 33.42)	0.001***
	No	31	285	1		

[1] References ^{COR} Crude Odds ratio ^{AOR} Adjusted Odds Ratio * Significant at α = 0.05 ** Significant at α = 0.01

This logistic regression model explains 72.8% of the variance in the dependent variable according to Nagelkerke R².

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	97.171	.441	.728

Since the p-value is 0.865 (which is greater than 0.05), we fail to reject the null hypothesis of the Hosmer and Lemeshow Test which says there is no significant difference between the predicted and observed values. This indicates that the model's predictions align well with the actual data, supporting the model's adequacy.

Hosmer and Lemeshow Test			
Step	Chi-square	df	Sig.
1	3.909	8	.865

6. Discussion

This study aimed to determine the magnitude of low birth weight (LBW) and its determinants among women who gave birth in public health facilities in Mekelle city. The current study found a prevalence of LBW to be 13.1% (95% CI: 10, 16).

Globally, the prevalence of LBW varies considerably, with South Asia having the greatest prevalence at 28%, followed by Sub-Saharan Africa at 13%, and Latin America at 9%. This result parallels Kenya's 12.3% (16), may be because there is similar socioeconomic status and healthcare facilities, and is lower than Uganda's 25.5% (22) and Northern Ethiopia's 14.6% (12), in which more severe LBW could reflect more widespread maternal malnourishment or inferior antenatal coverage.

Conversely, the prevalence in this study is higher than those reported in some parts of Nigeria (6.3%) (20), Eritrea (9.1%) (26), Axum (9.9%), and Laelay Maichew (6.3%) in North Ethiopia (13). These differences could be attributed to differences in sample size, nutrition status of the mothers, or timing of data collection. The substantially lower rates in this study compared to Indian research (28.8%) (19) possibly due to difference in risk stratfication or hemoglobin assessment protocol.

Rural residence was significantly associated with higher odds of LBW in multivariable analysis, as reported in Ethiopia (12), Uganda (22), and Pakistan (28). This concordance may be due to shared structural disadvantage in rural areas, like lower access to health care, poor transportation, and lower maternal education levels. The interaction between mother's age and LBW also conformed with international trends, whereby mothers between 20–34 years had a significantly lower probability of delivering LBW children as compared to mothers aged ≥35 years. This protective effect has also been seen in India (19) and Pakistan (27) and this might be due to optimal reproductive health and nutritional status during this age group. It is interesting to note that, unlike in some research where the risk factor for teen pregnancy remained even after adjustment, this study had the association attenuated. This may be accounted for by the mediating influence of variables such as ANC attendance or nutritional status controlled more strongly in this analysis.

The evidence that rural residence most significantly predicted LBW is consistent with previous research from Ethiopia, India (19), and Ghana (17) in which rural mothers had consistently 3–5 times the odds of LBW. These findings are likely due to sustained disparities in healthcare service use and maternal education. Similarly, short intervals between births (<24 months) were highly associated with LBW in accordance with Pakistani studies (<12 months) (27) and with Ethiopia, as they adhere to the biological knowledge that short intervals may not provide a sufficient amount of time for the restoration of maternal nutritional status.

The relationship of fewer than four ANC visits and LBW concurs with findings in Ethiopia and Kenya (16), where poor ANC is revealed to decrease opportunities for early identification and treatment of pregnancy complications. The association of preterm birth with LBW was also expected and consistent with prior studies. The magnitude of the adjusted odds ratio (AOR = 4.39), however, was intermediate between that reported in the New Mulago Hospital, Uganda (22) and that reported in Hawassa University Comprehensive Specialized Hospital, Ethiopia. This may result from variability in the gestational age or underlying condition for preterm delivery that vary by setting.

There was considerable divergence in the maternal anemia, which was very high in the adjusted odds ratio compared with research in Tanzania (28) and India (27). The difference can be explained through greater severity or severity of anemia among the study population, variation in hemoglobin threshold definitions applied, or by the impact of unmeasured confounders such as folate or other micronutrient deficiencies. Finally, the borderline association of female with LBW is as seen also in Ghana (17) and India (19), but it did not reach statistical significance within this study. The difference may be due to thin sample size in sex strata or regional variations in biological factors not as seen within this study.

7. Limitation of the study

7.1. Limitations of the study

The cross-sectional design precludes establishing causal relationships between identified factors and LBW outcomes. Furthermore, the study's focus on public hospitals in Mekelle City limits the generalizability of findings to other settings like rural health centers or private facilities.

8. Conclusion

Maternal age, rural residence, short birth intervals, inadequate antenatal care (ANC) visits, maternal anemia, and preterm birth were all strongly associated with an increased risk of delivering LBW infants.

9. Recommendation

Health authorities should work to improve ANC coverage and ensure that all pregnant women attend at least eight ANC visits as recommended by the World Health Organization. Health education and follow-up mechanisms should be strengthened to promote early and regular ANC attendance, especially among rural and underserved populations.

Given the strong association between maternal anemia and LBW, routine screening and treatment of anemia during pregnancy should be prioritized. Health programs should encourage adequate birth spacing of at least 24 months through accessible and culturally appropriate family planning services. Rural residence was significantly associated with LBW. Therefore, targeted interventions aimed at improving maternal health services, transportation to health facilities, and education in rural areas are essential to address geographic disparities in birth outcomes.

Efforts should be made to identify women at risk of preterm labor and provide timely interventions. Strengthening maternal and neonatal care services, including preterm labor management protocols and skilled birth attendance, is critical to reduce LBW resulting from premature deliveries.

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11. ANNEXES

11.1 Information Sheet

Participant Information Questionnaire Code No: ________

Dear Participants, My name is ____________. I am working with Desta Fitsum, who is doing research for the partial fulfillment of his Master's Degree in Pediatrics and Child Health Nursing at Mekelle University. This letter serves to ask for consent from you to take part in this research. The purpose of this study is to assess the prevalence and determinant factors of low birth weight among newborn babies in public hospitals in Mekelle City, Tigray, Ethiopia. This was critical input for policymakers and organizations involved in care and support for child health interventions. Your participation in this research is voluntary. The participants are selected by chance. The interview period was taking about 30 minutes. If you decide not to participate, there was no negative consequences for you. If you do decide to participate, there was no benefits for you. However, your participation in this study is very important for the achievement of the study. Giving your correct answer can play a great role in the success of the study, and it was providing great input to bring about a change in the quality of health services for under-five children. All the responses given by you and the results obtained was kept confidential, using a coding system whereby no one was having access to your response. You are not expected to give your name or phone number. You have the full right to refuse or withdraw from participating in this study if you don't wish. If you are willing to participate in this study, you need to understand and sign the agreement form.

Name of investigator**:** Desta Fitsum

Name of advisors: Tsige - Araya (BSc,MSc,Asst.prof.)

Mekuria - Kassa (RN,MSc,Asst.prof.)

Are you voluntary to participate in the interview? __________

INSTRUCTION: The questionnaire has four parts. It was taking about 30 minutes to complete the interview. Please try to respond to all questions and mark the box (□√) in front of your answers for each question. Thank you very much for your patience.

Part I- Demographic & Socio-economic Characteristics of the Mother

S., No	**Item of questions**	**Participant Response**
101	Age of the mother?	____________ in years
102	What is your religion?	☐ Orthodox ☐ Muslim ☐ Protestant ☐ Catholic ☐ Other (specify)-------------
103	Ethnicity?	☐ Tigray ☐ Amhara ☐ Oromo ☐ Other (specify)-------------
104	What is your current marital status?	☐ Single ☐ Married ☐ Divorced ☐ Widowed ☐ Separated
105	Where are you living?	☐ Urban ☐ Rural
106	What is your current Maternal Educational Status?	☐ Not read and write ☐ Read and write ☐ Primary education ☐ Secondary education and above
107	What is your occupation?	☐ Farmer ☐ Merchant ☐ Housewife ☐ Government employed ☐ If Other specify------------------
108	What is your monthly salary?	-----------------in Ethiopian birr

Part II – Maternal Factors

S. No.	**Item of questions**	**Participant Response**	**Skip Questions**
201	Number of previous births (including term and premature deliveries)	☐ 1 ☐ 2-3 ☐ 4-5 ☐ >=6	
202	What is the pregnancy interval since the previous birth?	--------------------in Months	
203	Did you want to become pregnant?	☐ Yes ☐ No	
204	Do you have a previous history of Low Birth Weight?	☐ Yes ☐ No	If No for question No. 204, Skip to question No. 206
205	If yes for question No. 204, what type of Low Birth Weight?	☐ < 2500 g or LBW ☐ < 1500 g or VLBW ☐ < 1000 g or ELBW	
206	Did you have pregnancy complication during your current pregnancy?	☐ Yes ☐ No	If No for question No. 206, Skip to question No. 208
207	If yes for question No.206, what type of pregnancy complication?	☐ APH ☐ PROM ☐ PIH ☐ Mention if any-------	
208	Did you have Chronic Medical Illness during pregnancy?	☐ Yes ☐ No	If No for question No. 208, Skip to question No. 210
209	If yes for question No. 208, what type of illness?	☐ TB ☐ HIV ☐ DM ☐ Mention if any-----	
210	Did you have Malaria infection during the current pregnancy?	☐ Yes ☐ No	
211	Did you have STI during the current pregnancy which is confirmed?	☐ Yes ☐ No	If No for question No. 211, Skip to question No. 213
212	If yes for question No.211, what type of infection?	☐ Syphilis ☐ Gonorrhea ☐ LAP ☐ Mention if any-----	

213	Did you have Anemia for the current pregnancy that is confirmed with health care personnel?	☐ Yes ☐ No	
214	Gestational age of current pregnancy at delivery?	--------------------in Weeks	
215	Did you have ANC visits for the current pregnancy?	☐ Yes ☐ No	If No for question No. 215, Skip to question No. 218
216	Which month of pregnancy did you start Antenatal visits?	--------------------in Weeks	
217	Number of ANC visits attended?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ >=5	
218	Iron/folate intake during pregnancy?	☐ Yes ☐ No	If No for question No. 218, Skip to question No. 301
219	If yes for question No. 218, how many tablets have you ever taken?	☐ <60 tablets ☐ 60-90 tablets ☐ >90 tablets (44)	

Part- III- Maternal Behavior & Nutritional Factors

S. No.	**Item of questions**	**Participant Response**
301	Have you ever advised about dietary intake during ANC follow up?	☐ Yes ☐ No
302	Did you take extra feeding during pregnancy?	☐ Yes ☐ No
303	Did you smoke cigarettes during the current pregnancy?	☐ Yes ☐ No
304	Did you take alcohol during the current pregnancy?	☐ Yes ☐ No
305	Did you chew chat during the current pregnancy?	☐ Yes ☐ No

Part- IV- Newborn Factors

S. No.	Item of questions	Participant Response
401	Birth weight of live birth baby?	--------------------in Gram
402	Sex of the newborn?	☐ Female ☐ Male

Thank you for your time!!

ብትግርኛ መሕትት

ናይ ስምምዕነት ቅጥዒ

ናይ ተሳታፊ ሓበሬታ መሕተቲ ምሽጥር ቁፅሪ: __________

ዝኸበርክን ተሳተፍቲ ስመይ _______________ ይበሃል። ኣብ ዩኒቨርስቲ መቐለ ብሕክምና ሕፃናትን ጥዕና ህፃናትን ነርሲግ ናይ ካሌኣይ ዲግሪኡ ንምፍፃም መፅናዕቲ ምስ ዝገብር ዘሎ ደስታ ፍፁም ይሰርሕ ኣለኹ። እዚ ደብዳቤ እዚ ኣብዚ መፅናዕቲ እዚ ንስክን ንክትሳተፉ ካባክን ፍቓድ ንምሕታት ይኸውን። ዕላማ እዚ መፅናዕቲ ድማ፣ ኣብ ሓደሽቲ ዝተወልዱ ናፅላታት፣ ትሑት ክብደት መጠን ሰዉነት ናፅላታትን ዝርግሐን፣ ወሰንቲ ረቛሒታቶምን ንምግምጋም እዩ። ኣብ ትግራይ፣ ከተማ መቐለ፣ ኣብ መንግስታዊ ሆስፒታላት እዩ ክካየድ። እዚ ድማ ንሓንፀፅቲ ፖሊሲን፣ ኣብ ክንክንን ደገፍን ምትእትታው ጥዕና ህፃናት ንዝነጥፉ ትካላት ወሳኒ እታው ክኸውን እዩ። ኣብዚ መፅናዕቲ እዚ ናትክን ተሳትፎ ብሰናይ ድልየትክን እዩ ዝኸውን። እተን ተሳተፍቲ ብዕድል ወይ ከዓ ብዕፃ እየን ዝምረፃ። እቲ ናይ ቃለ መሕትት ግዜ ንኣስታት ሰላሳ ደቓይቕ፣ ክወስድ ይክእል እዩ። ከይትሳተፉ እንተ ወሲንክን፡ ንዓክን ዘስዕቦ ኣሉታዊ ሳዕቤን የብሉን። ክትሳተፉ እንተ ወሲንክን፡ ከዓ ፉሉይ ዝበለ ንዉልቃዊ ረብሓክን ዝውዕል ነገር የብሉን። ይኹን እምበር ኣብዚ መፅናዕቲ እዚ ተሳትፎክን ንዕውትነት እዚ መፅናዕቲ ኣዝዩ ኣገዳሲ እዩ። ቁኑዕን ሙሉእ መልሲ ብምሃብ ኣብ ዕዉትነት እዚ መፅናዕቲ ዝለዓለ እጃም ከም ዝትፃወታ ተስፋ ብምግባር እዩ። ብተወሳኪ እዉን ኣብ ዕርየት ኣገልግሎት ጥዕና ትሕቲ ሓሙሽተ ዓመት ህፃናት ለውጢ ንምምፃእ ድማ ዓቢ እታው ክህብ እዩ። ኩሉ እቲ ብኣክን ዝወሃብ መልስታትን ዝተረኽበ ውፂኢትን ምስጢራዊነቱ ሕሉው ክኸውን እዩ። ብተወሳኺ እዉን መልስክን ዝኾነ ሰብ ዘይረኽበሉ ናይ ሚስጢር ስርዓትን ኣሰራርሓን ክንጥቀም ኢና። ስምክን ወይ ቁፅሪ ቴሌፎንክን ክትህባ ትፅቢት ኣይግበርን። እንተዘይደሊክን ኣብ'ዚ መፅናዕቲ'ዚ ካብ ምክፋል ክትኣብያ ወይ ክትስሕባ ሙሉእ መሰል ኣለክን። ኣብዚ መፅናዕቲ እዚ ክትሳተፍ ፍቓደኛ እንተኮይንክን ግን ነቲ ናይ ስምምዕነት ቅጥዒ ክትርድኦኦን ክትፍርሞኦን ኣለክን።

ሽም ፅንዓት መካየዲ፡ ደስታ ፍፁም

ሽም ኣማኸርቲ፡ ፅጌ - ኣርኣያ (ሓጋዚ ፕሮፌሰር)

መኩርያ - ካሳ (ሓጋዚ ፕሮፌሰር)

ኣብዚ ቃለ መሕትት እዚ ክትሳተፉ ብፍቃድክን ድዩ? __________

መምርሒ፡- እዚ ቃለ መሕተቲ እዚ ኣርባዕተ ክፋላት ኣለውዎ። ነቲ ቃለ መሕትት ንምዝዛም ኣስታት ሰላሳ ደቓይቕ ክወስድ ይክእል እዩ። በጃኽን ንኹሉ ሕቶታት መልሲ ክትህባ ፈትና፡ ንነፍሲ ወከፍ ሕቶ ድማ ኣብ ቅድሚ መልስኽን ኣብ ዘሎ ሳጡን (□√) ምልክት ግበራ። ስለቲ ትዕግስትኽን ብጣዕሚ ነመስግን።

ቀዳማይ ክፋል - ከባብያውን ማሕበረ-ቁጠባውን ባህርያት ኣደ

ተ.ቁ	ሕቶታት	መልሲ ተሳታፊት
101	ዕድመ ኣደ?	_____________ ብዓመታት
102	ሃይማኖትክን እንታይ እዩ?	☐ ኦርቶዶክስ ☐ ሙስሊም ☐ ፕሮቴስታንት ☐ ካቶሊክ ☐ ካልእ እንተኮይኑ (ይግለፃ)-------------
103	ብሄርክን እንታይ እዩ?	☐ ትግራወይቲ ☐ ኣምሓረይቲ ☐ ኦሮሞይቲ ☐ ካልእ እንተኮይኑ (ይግለፃ)-------------
104	ህሉው ኩነታት ሓዳርክን እንታይ እዩ?	☐ ዘይ ተመርዐወት ☐ በዓልቲ ሓዳር ☐ ዝተፋተሐት ☐ በዓል ገዛኣ ዝሞታ ☐ ተፈላልዮም ዝነብሩ
105	ኣበይ ኢኽን ትነብራ ዘለኽን?	☐ ኣብ ከተማ ☐ ኣብ ገጠር
106	ህሉው ኩነታት ትምህርቲ ደረጃኽን እንታይ እዩ?	☐ ምንባብን ምፅሓፍን ዘይክእላ ☐ ምንባብን ምፅሓፍን ዝክእላ ☐ መባእታዊ ትምህርቲ ☐ ካልኣይ ደረጃ ትምህርትን ልዕሊኡን
107	ስራሕክን እንታይ እዩ?	☐ ሓረስታይ ☐ ነጋዳይ ☐ ሙሉእ እዋን ኣብ ገዛ ዘሕልፋ ☐ መንግስታዊ ቁፃር ☐ ካልእ እንተኮይኑ (ይግለፃ)-------------
108	ወርሓዊ መሃያክን ክንደይ እዩ?	------------------ ብናይ ኢትዮጵያ ቅርሺ

ካልኣይ ክፋል - ረቛሒታት ኣዴታት

ተ.ቁ	ሕቶታት	መልሲ ተሳታፊት	
201	ብዝሐ ቅድሚ ሐዚ ዝተወልዱ ናዕላታት (ብግዜን ቅድሚ ግዜኦምን ዝተወልዱ ሓዊሱ)	☐ 1 ☐ 2-3 ☐ 4-5 ☐ 6 ተን ልዕሊኡን	
202	ካብቲ ቅድሚ ሐዚ ዝነበረ ጥንሲ ምስቲ ሐዚ ዘሎ ናይ ጥንሲ ፍልልይ ግዜኡ ክንደይ ይኸውን?	-----------------ብ ኣዋርሕ	
203	ናይ ምጥናስ ድልየት ነይርወን ዶ?	☐ እወ ☐ ኣይፋሉን	
204	ቅድሚ ሐዚ ናይ ትሑት ክብደት ውልደት ታሪኽ ኣለወን ድዩ?	☐ እወ ☐ ኣይፋሉን	መልስክን ኣይፋሉን እንተኮይኑ ናብ ተ.ቁ 206 ይሕለፉ
205	ንሕቶ ቁፅሪ 204 እወ እንተኾይኑ እንታይ ዓይነት ትሑት ክብደት ውልደት?	☐ ትሕቲ 2500 ግራም ☐ ትሕቲ 1500 ግራም ☐ ትሕቲ 1000 ግራም	
206	ኣብዚ ሐዚ ዘሎ ጥንሲ፤ ናይ ጥንሲ ምትሕልላክ ወይ ከዓ ፀገም ኣጋጢምወን ድዩ?	☐ እወ ☐ ኣይፋሉን	መልስክን ኣይፋሉን እንተኮይኑ ናብ ተ.ቁ 208 ይሕለፉ
207	ንሕቶ ቁፅሪ 206 እወ እንተኾይኑ እንታይ ዓይነት ናይ ጥንሲ ምትሕልላክ ወይ ከዓ ፀገም?	☐ ቅድመ ወሊድ ምፍሳስ ደም ☐ ኣቐዲሙ ምፍሳስ ቃስታ ኣንስቶ ☐ ምስ ጥንሲ ዘንቀለ ፀቕጢ ደም ☐ ካልእ እንተኮይኑ (ይግለፃ)-------------	
208	ኣብ እዋን ጥንሲ ሕዱር ሕክምናዊ ሕማም ነይሪወን ዶ?	☐ እወ ☐ ኣይፋሉን	መልስክን ኣይፋሉን እንተኮይኑ ናብ ተ.ቁ 210 ይሕለፉ
209	ንሕቶ ቁፅሪ 208 እወ እንተኾይኑ እንታይ ዓይነት ሕማም?	☐ ሕማም ዓባይ ሰዓል (ቲቢ) ☐ ሕማም ኤችኣይቪ ☐ ሕማም ሽኮር ☐ ካልእ እንተኮይኑ (ይግለፃ)-----------	
210	ኣብዚ ሐዚ እዋን ምስ ዘሎ ጥንስክን ረኽሲ ሕማም ዓሶ ነይርወን ዶ?	☐ እወ ☐ ኣይፋሉን	
211	ኣብዚ ሐዚ እዋን ምስ ዘሎ ጥንስክን ብጾወታዊ ረክቢ ካብ ዝመሓላለፉ ሕማማት ብበዓል ሞያ ዝተረጋገፀ ረክሲ ነይርወን ዶ?	☐ እወ ☐ ኣይፋሉን	መልስክን ኣይፋሉን እንተኮይኑ ናብ ተ.ቁ 213 ይሕለፉ
212	ንሕቶ ቁፅሪ 211 እወ እንተኾይኑ እንታይ ዓይነት ረኽሲ?	☐ ሕማም ፍንጣጣ ☐ ሕማም ጆግል ☐ ቃንዛ ታሕተዋይ ክፋል ከብዲ ☐ ካልእ እንተኮይኑ (ይግለፃ)-----------	
213	ኣብዚ ሐዚ እዋን ምስ ዘሎ ጥንስክን ብበዓል ሞያ ዝተረጋገፀ ዋሕዲ ቀይሕ ደም ነይሩወን ድዩ?	☐ እወ ☐ ኣይፋሉን	
214	ዕድመ ጥንሲ፣ ምስቲ ናይ ሐዚ ጥንስክን ኣብ እዋን ሕርሲ ወይ እዉን እቲ ናዕላ ኣብ ክንደይ ሰሙኑ ተወሊዱ?	-------------------- ብ ሰሙናት	

215	ናይቲ ሐዚ እዋን ጥንስክን ክትትል ቅድመ ወሊድ ነይርወን ዶ?	☐ እወ ☐ ኣይፋሉን	መልስክን ኣይፋሉን እንተኮይኑ ናብ ተ.ቑ 218 ይሕለፋ
216	ኣበየናይ ወርሒ ጥንስክን ኢክን ክትትል ቅድመ ወሊድ ጀሚርክን?	------------------- ብ ሰሙናት	
217	ክንደይ ግዜ ክትትል ቅድመ ወሊድ ገይረን?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5ተን ልዕሊኡን	
218	ኣብ እዋን ጥንሲ ዝዉሰድ ሓፂን/ፎሌት (Iron folate) ኪኒን ወሲደን ዶ?	☐ እወ ☐ ኣይፋሉን	መልስክን ኣይፋሉን እንተኮይኑ ናብ ተ.ቑ 301 ይሕለፋ
219	ንሕቶ ቁፅሪ 218 እወ እንተኾይኑ ክንደይ ኪኒን ወሲድክን?	☐ ትሕቲ 60 ኪኒን ☐ ካብ 60-90 ኪኒን ☐ 90 ልዕሊ ኪኒን	

ሳልሳይ ክፋል- ባህርያት ኣዴታትን ረቛሒታተንን ስነ ስርዓተ - ኣመጋግበአንን

ተ.ቑ	ሕቶታት	መልሲ ተሳታፊት
301	ኣብ እዋን ምክትታል ቅድመ ወሊድ ብዛዕባ ኣመጋግባ ምግቢ ሰብ ሞያ ኣመኺሮምወን ይፈልጡ ዶ?	☐ እወ ☐ ኣይፋሉን
302	ኣብዚ እዋን እዚ ምስ ዘሎ ጥንስክን ተወሳኺ ምግቢ ትምገባ ዶ?	☐ እወ ☐ ኣይፋሉን
303	ኣብዚ እዋን እዚ ምስ ዘሎ ጥንስክን ሽጋራ ተትክካ ዶ?	☐ እወ ☐ ኣይፋሉን
304	ኣብዚ እዋን እዚ ምስ ዘሎ ጥንስክን ኣልኮላዊ መስተ ትሰትያ ዶ?	☐ እወ ☐ ኣይፋሉን
305	ኣብዚ እዋን እዚ ምስ ዘሎ ጥንስክን ጫት ትሓይካ ዶ?	☐ እወ ☐ ኣይፋሉን

ራብዓይ ክፋል - ሓደሽቲ ዝተወልዱ ናፅላታትን ረቛሒታቶምን

ተ.ቑ	ሕቶታት	መልሲ ተሳታፊት
401	ክብደት ልደት ብህይወት ዝተወልደ ናፅላ?	------------------- ብግራም
402	ፆታ ናይቲ ሓድሽ ዝተወልደ ናፅላ?	☐ ጓል ኣንስተይቲ ☐ ተባዕታይ

ሰለቲ ግዜክን የቐንየልና!!