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Maternal and Neonatal Health in Conflict-Affected Areas of West Gojjam Zone, Northwest Ethiopia.

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Abstract

Background: Maternal and neonatal mortality remain major global public health challenges, particularly in low- and middle-income countries. Progress in reducing these deaths has slowed, while armed conflict further worsens outcomes by disrupting healthcare services and access to essential maternal care. Therefore, this study assessed maternal and neonatal health outcomes and associated factors in conflict-affected areas of West Gojjam Zone, Northwest Ethiopia.

Objective: To Assess Maternal and Neonatal Health in Conflict-Affected Areas of West Gojjam Zone, Northwest Ethiopia.

Methods: A facility-based cross-sectional study was conducted among 418 pregnant women attending antenatal care services from October 1 to May 12, 2025. Participants were selected using a systematic sampling technique. Data were collected using interviewer-administered, semi-structured questionnaires, entered into EpiData version 3.1, and analyzed using Stata version 17. Variables with a p-value ≤ 0.25 in the bivariable analysis were included in the multivariable logistic regression model, and statistical significance was determined at $p < 0.05$.

Results: Assisted vaginal delivery (AOR: 0.19, 95% CI: 0.12–0.28) and cesarean section (AOR: 0.29, 95% CI: 0.16–0.51) were protective against low birth weight compared to spontaneous vaginal delivery. Severe maternal anemia (Hb <7 g/dl) (AOR: 2.17, 95% CI: 1.51–3.10), vaginal bleeding during pregnancy (AOR: 2.44, 95% CI: 1.69–3.51), ICU admission (AOR: 2.28, 95% CI: 1.58–3.29), and personal safety problems (AOR: 2.14, 95% CI: 1.13–4.08) significantly increased the risk of low birth weight. Experiencing family member death reduced the odds of low birth weight (AOR: 0.46, 95% CI: 0.24–0.90).

Conclusion and Recommendations: Adverse neonatal outcomes were high in the study area, driven by obstetric, nutritional, medical, and conflict-related psychosocial factors. Strengthening emergency obstetric and neonatal care, improving maternal nutrition, enhancing antenatal services, and integrating psychosocial support are essential to improve outcomes in conflict-affected setting

Keywords: *Maternal and neonatal health outcomes; West Gojjam Zone public health facilities; Northwest,Ethiopia.*

Contributions to the literature

Provides rare and context-specific evidence on low birth weight and adverse neonatal outcomes among mothers living in conflict-affected areas of West Gojjam Zone, Northwest Ethiopia, where empirical data remain scarce.

Examines maternal and neonatal health using a comprehensive framework that integrates obstetric, nutritional, medical, and conflict-related psychosocial factors.

Identifies key predictors of adverse neonatal outcomes, including severe maternal anemia, vaginal bleeding during pregnancy, ICU admission, and conflict-related personal safety concerns.

Demonstrates the substantial burden of low birth weight in humanitarian settings, highlighting the impact of armed conflict on maternal and newborn health.

Generates evidence to inform policymakers, humanitarian agencies, and health professionals in designing integrated maternal and newborn health interventions, including emergency obstetric care, nutrition support, antenatal care continuity, and psychosocial services.

1. Introduction

1.1. Background

Maternal and neonatal mortality continue to be major global public health challenges. In 2023, an estimated 260,000 women died from pregnancy-related complications, while about 2.3 million newborns died within their first 28 days of life. The overwhelming majority of these preventable deaths occurred in low- and lower-middle-income countries, highlighting persistent inequities in access to quality maternal and newborn healthcare services. [1]. Progress in reducing maternal and neonatal deaths has been uneven and has slowed in recent years, such that achieving the Goals for Sustainable Development targets for maternal and newborn survival will require substantially accelerated action [2].

Armed conflict is a powerful accelerator of maternal and neonatal risks because it disrupts food systems, health-care delivery, the supply chain for essential medicines and the functioning of maternal and neonatal services [3]. Evidence from conflict-affected settings shows rises in obstetric complications, reductions in antenatal care and facility births, and worsening newborn outcomes when health systems are compromised and humanitarian access is limited [4].

Among the regions with the highest neonatal and maternal mortality rates worldwide, Africa's sub-Saharan region continues to carry a the majority of the global burden [1].

Despite over the past few decades, Ethiopia has made significant progress in maternal and child survival, national indicators still show substantial challenges: Ethiopia's maternal and neonatal mortality rates are among the highest in the world, according to recent national evaluations and modeling, and there is a large within-country variation by region and district [5]. According to the 2019 Ethiopia Mini Demographic and Health Survey, many women receive at least one antenatal visit, but fewer do the recommended four or more visits, and facility delivery, skilled birth attendance, and coverage of basic maternal interventions remain gaps [6]. Maternal under nutrition, anaemia and suboptimal care practices remain prevalent in many Ethiopian communities and are recognized drivers of poor maternal and neonatal outcomes [6]. Within Amhara Region and West Gojjam Zone, community studies before the recent conflict documented low dietary diversity in pregnancy, inadequate antenatal nutrition counseling and socioeconomic barriers that contribute to maternal nutritional vulnerability [7]. These pre-

existing vulnerabilities leave pregnant women especially exposed when conflict interrupts food access, income and routine health-service provision [8]. Since the onset and expansion of conflict in northern Ethiopia, multiple humanitarian and surveillance reports have highlighted worsening food security, constrained humanitarian access and elevated malnutrition levels in parts of Amhara conditions that plausibly increase mortality and morbidity among mothers and newborns in affected zones [8]. Field research from other conflict settings corroborates these links, showing higher rates of low birth weight, preterm birth and neonatal death where services collapse and food insecurity is severe [9]. Timely, zone-level evidence on maternal and neonatal health in conflict-affected West Gojjam is limited, yet such localized data are essential to design feasible, prioritized interventions (for example, emergency obstetric care, targeted nutrition support and continuity of antenatal services) appropriate for crisis contexts [8].

Identifying the prevalence of adverse The relative contribution of household, nutritional, and health factors to maternal and neonatal outcomes service-delivery and conflict-related determinants will help humanitarian actors and the health system target scarce resources to the highest-impact interventions [10].

Despite these converging lines of evidence, there remains limited, up-to-date zone-level data quantifying maternal and neonatal health outcomes and the relative contribution of household, nutritional, service-delivery and conflict-related determinants in conflict-affected parts of West Gojjam [11].Generating timely, localized evidence is essential to design feasible and prioritized interventions for example, targeted nutrition support for pregnant women, measures to maintain antenatal and delivery services, and strategies to safeguard supply chains and humanitarian corridors that can reduce maternal and neonatal risk in crisis conditions [1].

The Contribution of the Study makes several important contributions to the growing body of literature on maternal and neonatal health in conflict-affected settings. First, it provides valuable and timely evidence from the conflict-affected areas of West Gojjam Zone, Northwest Ethiopia, where research on maternal and neonatal outcomes remains limited despite the significant disruption of healthcare services caused by armed conflict. While most previous studies in Ethiopia have been conducted in relatively stable environments and have focused primarily on traditional determinants of maternal and neonatal health, this study specifically examines these outcomes within a humanitarian crisis context.

Second, the study employs a comprehensive analytical approach by investigating obstetric, nutritional, medical, and conflict-related psychosocial factors associated with low birth weight and adverse neonatal outcomes. Unlike many earlier studies that concentrated mainly on clinical and socio-demographic determinants, this research incorporates conflict-specific experiences such as personal safety concerns, forced displacement, traumatic events, and family loss. By doing so, it offers a broader and more contextualized understanding of the pathways through which armed conflict influences maternal and neonatal health.

Third, the study reveals an exceptionally high prevalence of low birth weight (52.99%), substantially exceeding estimates reported in most non-conflict settings in Ethiopia and other low- and middle-income countries. This finding highlights the severe public health burden faced by populations living in conflict-affected areas and underscores the urgent need for targeted maternal and newborn health interventions. In addition, the study identifies severe maternal anemia, vaginal bleeding during pregnancy, intensive care unit (ICU) admission, and conflict-related personal safety concerns as significant predictors of adverse neonatal outcomes. These findings contribute to existing evidence by demonstrating how clinical complications and conflict-related stressors interact to influence neonatal health, emphasizing the multidimensional nature of risk in humanitarian settings.

Finally, this study generates context-specific evidence that can inform policymakers, humanitarian organizations, and healthcare providers in the development of integrated maternal and newborn health programs in fragile and conflict-affected environments. The findings highlight the importance of strengthening emergency obstetric and neonatal care services, improving maternal nutrition interventions, ensuring continuity of antenatal care, and incorporating psychosocial support into maternal healthcare programs. By addressing a critical evidence gap, this study contributes meaningful insights to the limited literature on maternal and neonatal health in humanitarian and conflict settings and provides practical guidance for improving health outcomes among vulnerable populations.

2. Methods

2.1. Study Design, areas and Period

This cross-sectional study was conducted to assess the status of maternal and neonatal health and its associated factors in conflict-affected areas of West Gojjam Zone, Northwest Ethiopia. West Gojjam Zone, located in the Amhara Region, is largely rural and has experienced varying levels of armed conflict, population displacement, and disruption of health services in recent years. These challenges have significantly affected the delivery of routine maternal and child healthcare.At the time of data collection, the zone was functionally divided due to the ongoing conflict. The presence of government military forces separated certain areas, while the Amhara National Force (Fano) controlled many rural parts surrounding the town centers. Movement between the northern districts (North Achefer and Jabi Tehnan) and the central and southern districts (Bahir Dar Zuria, Merawi, and Sekela) was highly restricted.As a result, access to healthcare facilities became severely limited, with some communities completely cut off due to insecurity and active military operations. This situation also led to large-scale internal displacement of the population within the zone. [12]. In the conflict-affected northern districts, only two major obstetric centers were fully functional during the study period: Bure General Hospital and Finote Selam Primary Hospital. Bure General Hospital offered free maternal and obstetric services and managed most institutional deliveries. In contrast, Finote Selam Primary Hospital provided services with partial user fees and handled a smaller number of cases [13]. In the relatively safer central and southern districts, three main obstetric centers were providing services during the study period: Merawi Primary Hospital, Adet Primary Hospital, and Feresbet Primary Hospital. Merawi and Adet, both government-run facilities, were the only centers equipped with Neonatal Intensive Care Units (NICUs) and managed the majority of births within their catchment areas. Feresbet Primary Hospital, supported by the government and partner organizations, served as an additional obstetric care center, helping to accommodate overflow cases from surrounding districts [14].

The study was carried out in three major health facilities in West Gojjam Zone: Bure Primary Hospital, Finote Selam General Hospital, and Debrecha Primary Hospital. Owing to logistical and administrative limitations, it was not possible to include other health centers within the zone. All mothers who delivered singleton births during the study period were considered eligible for

inclusion. However, mothers with multiple pregnancies, those with preterm premature rupture of membranes (PPROM), and newborns with congenital or chromosomal abnormalities were excluded from the study to ensure data consistency and reduce potential confounding factors. Data were collected by senior medical students using both direct patient interviews and medical record reviews [15].

2.2. Sample Size Determination and Procedure

The sample size was determined using the single population proportion formula, since the primary outcome of interest was the prevalence of adverse maternal and neonatal health outcomes.

Formula $$n = \frac{(Za/2)^2 * p\,(1-p)}{d^2}$$

Where:

n = required sample size

Zα/2 = standard normal value at 95% confidence level (1.96)

p = estimated prevalence of the outcome

d = margin of error

Assumptions

Confidence level: 95%

Margin of error (d): 5% (0.05)

Estimated prevalence (p): Since no recent study was available in conflict-affected areas of West Go jam, a conservative estimate of 50% (0.5) was used to obtain the maximum sample size.

Design effect: 1.5 (to account for multistage sampling)

Non-response rate: 10%

$$n = \frac{(Za/2)2 * p\,(1-p)}{d^2}$$

$$n = \frac{(1.96)^2 x 0.5\,(1-0.5)}{(0.05)^2} = n = \frac{3.84 \times 0.25}{0.0025} = 384 = 384 \times 1.5 = 576$$

After adding 10% non-response rate: = 576+ (576×0.10) =634

2.3. Study variables and instruments

A structured data sheet was used for data collection, consisting of five sections. The first section captured maternal and neonatal variables, including maternal age, residence, educational status, household income, maternal weight and height, hemoglobin level (Hb), and blood pressure at delivery, as well as obstetric history such as previous pregnancies and abortions or stillbirths. It also recorded neonatal characteristics, including sex, birth weight, gestational age, and maternal exposure to substances such as cigarette smoke.

The second section collected information related to the current pregnancy, including the mode of delivery, any history of vaginal bleeding, existing maternal comorbidities, the timing and frequency of antenatal care (ANC) visits, and the reasons for not attending ANC where applicable. The third section evaluated maternal nutritional status by assessing household food availability, dietary adequacy and diversity, access to animal-source foods, drinking water conditions, and the use of iron and folic acid supplementation during pregnancy.

The fourth section documented neonatal clinical outcomes, such as Apgar scores at one and five minutes after birth, the requirement for neonatal resuscitation, and admission to the neonatal intensive care unit (NICU). These practices reflect the standard routine monitoring and care procedures implemented in health facilities across the West Gojjam Zone. The fifth section assessed the direct effects of conflict on maternal physical and psychological well-being, including experiences of injury, loss of close family members, self-reported stress levels, and other related psychosocial factors. Data items with more than 10% missing responses were excluded from the final analysis to maintain data quality and reliability. Gestational age was calculated based on the last menstrual period (LMP). Newborns delivered at 37 completed weeks of gestation or later were classified as full-term (FT), while preterm (PT) births were defined as those occurring before 37 weeks. Preterm births were further categorized as late preterm (34–36 weeks), moderate preterm (32–33 weeks), very preterm (28–31 weeks), and extremely preterm (less than 28 weeks of gestation). Although the small for gestational age (SGA) classification is widely recognized as a more precise indicator of fetal growth because it accounts for gestational age and sex-specific percentiles, it was not applied in this study due to the absence of routine early ultrasound dating, which may introduce measurement bias and inconsistencies in gestational age estimation. Birth weight was classified as high birth weight (>4000 g), normal

birth weight (2500–4000 g), and low birth weight (<2500 g). Very low birth weight (VLBW) was defined as 1000–1499 g, while extremely low birth weight (ELBW) referred to infants weighing less than 1000 g at birth [16] . Normal blood pressure at the time of delivery was defined as systolic and diastolic measurements below 140 mmHg and 90 mmHg, respectively. This threshold aligns with standard clinical guidelines used to distinguish norm tension from hypertensive conditions during the per partum period [17]

2.4. Operational definition

Conflict-affected area: Geographic areas experiencing civil unrest and documented interruption of public services for ≥3 months [18].

Neonatal mortality: Death of a live-born infant within 28 days of birth. [19]

Low birth weight: Neonate weighing <2,500 grams at birth [20].

2.5. Data Collection Tool and Procedure

2.6.1. Data Collection Tool

The data were collected through face-to-face interviews using pretested, structured, and semi-structured questionnaires that were adapted from relevant literature. This approach ensured clarity, consistency, and completeness of the information obtained, while allowing flexibility to capture context-specific details.[21]. Data were collected by trained midwife nurse professionals to ensure accuracy and consistency throughout the process. The questionnaire was structured into four main sections: maternal socio-demographic characteristics and obstetric history; past and current obstetric history; current maternal nutritional status and overall well-being; and the effects of conflict on maternal physical and psychological health. The tool was adapted from standardized questionnaires developed by the World Health Organization (WHO), ensuring its validity and relevance for assessing maternal health outcomes in the study setting [12].

2.6.2. Data Collection Procedure

The data for this study were collected from four public health facilities providing maternal and neonatal care services. A multistage sampling technique was applied to select study participants. First, four districts were randomly chosen from the conflict-affected areas of West Gojjam Zone

using a simple lottery method. Within each selected district, public health facilities offering delivery and neonatal services were identified and then stratified into primary hospitals and general hospitals. Health facilities were subsequently selected proportionally based on the availability of delivery services. The overall sample size was allocated to each selected facility according to their average monthly delivery caseload, calculated from records of the three months preceding data collection. At the facility level, eligible mother–neonate pairs were finally selected using a systematic random sampling technique from delivery registration records, ensuring an unbiased and representative selection of participants. The sampling interval (K) was calculated by dividing the total number of deliveries recorded in each health facility during the study period by the respective allocated sample size. The initial participant was selected randomly using a lottery method, after which every Kth individual was systematically chosen until the desired sample size was fully attained.

Ethical Consideration

Ethical approval for the study was secured from the Institutional Review Board of Debre Markos University, College of Medicine and Health Sciences. In addition, formal permission was obtained from public health facilities in West Gojjam Zone. Prior to data collection, participants were clearly informed about the study's objectives and assured that their involvement was entirely voluntary, with the option to decline participation or withdraw at any point without any negative consequences. Written informed consent was obtained from each participant before enrolling them in the study. Throughout the research process, strict measures were taken to ensure the confidentiality and privacy of all information provided by respondents.

2.7. Data Quality Assurance

A pre-test was carried out on 5% of the total sample size at Bure Yohannes Hospital, which is outside the actual study area, specifically within the maternal and neonatal health clinic of Bure District public health facility. This process allowed the questionnaire to be evaluated in terms of clarity, length, content relevance, and wording. Based on the findings, necessary modifications were made, including the addition of relevant maternal and neonatal health variables that were initially missing but important for the study context. To ensure data quality, one MSc midwife and two BSc midwives were recruited and trained as data collectors, along with a supervisor. A

comprehensive two-day training was provided prior to data collection, covering the study objectives, data collection procedures, ethical considerations, and proper interviewing techniques. In addition, a detailed data collection manual was prepared and distributed to all data collectors and the supervisor to standardize the process.During the data collection period, the principal investigator and the supervisor closely monitored the process by reviewing completed questionnaires on a daily basis to ensure completeness and consistency. Furthermore, before data entry, each questionnaire was assigned a unique identification code by the principal investigator to facilitate proper organization and tracking of the data.

2.8. Statistical analysis

After data collection, the completed questionnaires were carefully checked, cleaned, and coded before being entered into Epi-Data version 3.1. The dataset was then exported to Stata version 17 for further statistical analysis. To ensure data quality, terminal digit analysis was performed for key continuous variables, including birth weight, gestational age (converted into decimal weeks), maternal age, hemoglobin level, and maternal weight. In addition, histograms were used to detect any clustering or heaping at clinically meaningful thresholds, particularly at 2500 g for birth weight and 37 weeks for gestational age. The assessment revealed evidence of digit preference and heaping in both birth weight and gestational age, suggesting some degree of systematic rounding and clustering around 37 and 40 weeks. However, no unusual distribution patterns were observed for the remaining variables, indicating that overall data quality across the three hospitals was acceptable and suitable for analysis.[22]. Descriptive statistics such as means, frequencies, and percentages were first computed to summarize the characteristics of all study variables. To examine factors associated with maternal and neonatal health outcomes, logistic regression analysis was applied. The overall fitness of the model was assessed using the Hosmer–Lemeshow goodness-of-fit test. Initially, bivariate logistic regression analysis was conducted, and variables with a p-value of less than 0.25 were selected as candidates for further analysis. These variables were then included in the multivariable logistic regression model to control for potential confounding effects. The magnitude of associations between maternal and neonatal health outcomes and independent variables was expressed using adjusted odds ratios (AORs) with corresponding 95% confidence intervals (CIs). In the final model, variables with a p-value of less than 0.05 were considered statistically significant

3. Results

3.1.Maternal socio-demographic information and obstetric history

A total of 408/418 pregnant women participated in this study with a response rate of 98%. Most of the participants were Unable to read and write 364 (57.96%).About 154 (24.52%) of the respondents had completed primary or secondary education (Grades 1–12). In addition, (9.24%) had a diploma, while (5.57%) held a degree. Only (2.71%) had attained a master's degree or higher. In terms of average family income during the war, more than half of the respondents, (54.30%), earned less than 1500 per month, while (45.75%) earned more than 1500. (Table 1)

Table 1 Maternal Socio-Demographic and Obstetric Characteristics in Conflict-Affected Areas of West Gojjam Zone, Northwest Ethiopia, (N=628)

Variable	Category	Frequency	Percent
Mother age	23-28	136	21.66
	29–33	249	39.65
	>=40	243	38.69
Education	Unable to read and write	364	57.96
	Primary& Secondary(1-12)	154	24.52
	Diploma	58	9.24
	Degree	35	5.57
	Masters and above	17	2.71
Average family income during the war	<1500	341	54.30
	≥1500	287	45.70

3.2.Past and current obstetric history

Regarding previous abortion history, more than half of the respondents, (54.30%), had a history of previous abortions, while (45.70%) had no such history of abortions, In terms of the mode of delivery, more than half of the mothers, (51.59%), delivered through assisted vaginal delivery. Normal vaginal delivery was reported among (35.99%) mothers, while (12.42%) gave birth by caesarean section. Regarding maternal hemoglobin level, (52.23%) of mothers had hemoglobin levels below 7 g/dl, while (47.77%) had hemoglobin levels of 11 g/dl or above. With respect to blood pressure at delivery, (55.73%) mothers had normal blood pressure, while (19.29%) had high blood pressure. For more than half of the respondents, (25.00%), blood pressure status was not documented. (Table 2)

Table 2 Past and Current Obstetric History in Conflict-Affected Areas of West Gojjam Zone, Northwest Ethiopia, (N=628)

Variable	Category	Frequency	Percent
Previous abortions	Yes	341	54.30
	No	287	45.70
Delivery mode	Normal vaginal delivery	226	35.99
	Assist vaginal delivery	324	51.59
	Caesarean sections	78	12.42
Maternal Hb (g/dl)	≥ 11 g/dl	300	47.77
	< 7 g/dl	328	52.23
Blood pressure at delivery	Normal blood pressure	350	55.73
	High blood pressure	121	19.27
	Not documented	157	25.00
Vaginal bleeding	Yes	330	52.55
	No	298	47.45
Timing of the first antenatal care visit	First trimester	188	29.94
	Second trimester	325	51.75
	Third trimester	115	18.31
Number of ANC visits	<4	355	56.53
	>=8	273	43.47
ANC setting(s)	Hospitals	166	26.43
	Primary healthcare	206	32.80
	Private clinic	256	40.76

3.3.Current status of maternal nutrition and overall well-being

More than half of the respondents (60.67%) experienced a poor appetite during pregnancy, while the remaining (39.33%) reported having a good appetite. With regard to dietary intake, a large proportion of mothers (70.54%) reported insufficient food quantity during pregnancy, whereas only (29.46%) had adequate food intake. A similar situation was observed in dietary diversity, where (70.54%) of respondents reported insufficient food variety, compared to just (29.46%) who had a sufficiently diverse diet. Regarding access to safe drinking water, the majority of mothers (70.54%) reported that they did not have sufficient access, while only 29.46% indicated that they had adequate access to clean water. Regarding iron and folic acid supplementation, more than half of the respondents (52.07%) reported taking the supplements at least once per week, though not on a daily basis. Additionally, (24.52%) took them less frequently than once per week, while only (23.41%) adhered to daily supplementation for at least 12 weeks. (Table 3)

Table 3 Maternal Nutrition during Pregnancy in Conflict-Affected Areas of West Gojjam Zone, Northwest Ethiopia (N=628)

Variable	Category	Frequency	Percent
Appetite during pregnancy	Good	247	39.33
	Poor	381	60.67
Food quantity during pregnancy	Sufficient	183	29.46
	Insufficient	443	70.54
Food diversity during pregnancy	Sufficient	188	29.46
	Insufficient	448	70.54
Accessibility to clean drinking water	Sufficient	185	29.46
	Insufficient	443	70.54
Iron and folic acid supplementation	less than once/week	154	24.52
	At least once/week but not daily	327	52.07
	Daily for at least 12 weeks	147	23.41

3.4.Impact of war on maternal physical and psychological well-being

The study assessed respondents' living conditions, exposure to conflict-related experiences, and pregnancy-related concerns. Regarding current residence, more than one-third of the mothers (34.28%) were living in separate houses. This was followed by (29.09%) who were staying in shelters, while (21.38%) lived in tents and (15.25%) resided in shared houses.

Regarding in relation to exposure to violence, a substantial proportion of respondents (62.58%) reported that a family member had been killed, while (37.42%) had not experienced such a loss. Likewise, more than half (57.55%) had witnessed dead bodies, whereas (42.45%) had not.

During the current pregnancy, mothers reported several key concerns. Forced displacement was the most common issue, affecting (67.92%) of respondents. Additionally, (52.36%) were worried about losing family members, while (54.56%) expressed concern about the possibility of abortion. Just over half (53.14%) feared death. Furthermore, (43.55%) were concerned about their baby's health, and (43.40%) worried about securing food. Personal safety was also a significant concern for (42.61%) of the mothers. (Table 4)

Table 4 Impact of War on Maternal Physical and Psychological Well-Being in Conflict-Affected Areas of West Gojjam Zone, Northwest Ethiopia, (N=628)

Variable	Category	Frequency	Percent
Current residence	Separate house	229	36.46
	Shared house	72	11.46
	Shelter	191	30.41
	Tent	136	21.66
A family member was killed	Yes	341	54.30
	No	287	45.70
Saw dead bodies	Yes	324	51.59
	No	304	48.41
Personal safety	Yes	276	43.40
	No	360	56.60
Forced displacement	Yes	277	43.55
	No	359	56.45
Death family members	Yes	284	44.65
	No	352	55.35
Having an abortion	Yes	337	52.99
	No	299	47.01
The health of my fetus	Yes	277	43.55
	No	359	56.45
Death	Yes	277	43.55
	No	359	56.45

3.5.Current status of birth weight and neonatal health

The study also examined newborn characteristics and immediate postnatal outcomes of regarding based on sex of the newborns, the majority were female, accounting for (74.84%), while male newborns represented (25.16%) of the total births. In terms of immediate newborn care, (47.96%) of the babies required resuscitation at birth, whereas the remaining (52.04%) did not need resuscitation. Concerning admission to the neonatal intensive care unit (NICU), nearly half of the newborns, (44.34%), were admitted for specialized care, while a slightly higher proportion, (60.85%), were not admitted. (Table 5)

Table 5 Current Status of Birth Weight and Neonatal Health Outcomes in Conflict-Affected Areas of West Gojjam Zone, Northwest Ethiopia (N=628)

Variable	Category	Frequency	Percent
Newborn's sex	Male	160	25.16
	Female	476	74.84
Resuscitation was needed	Yes	305	47.96
	No	331	52.04
Admission to NICU	Yes	282	44.34
	No	387	60.85

3.6.The prevalence of neonatal birth weight

The overall magnitude of neonatal birth Weight was 52.96% (95% CI: 43.16, 50.9)

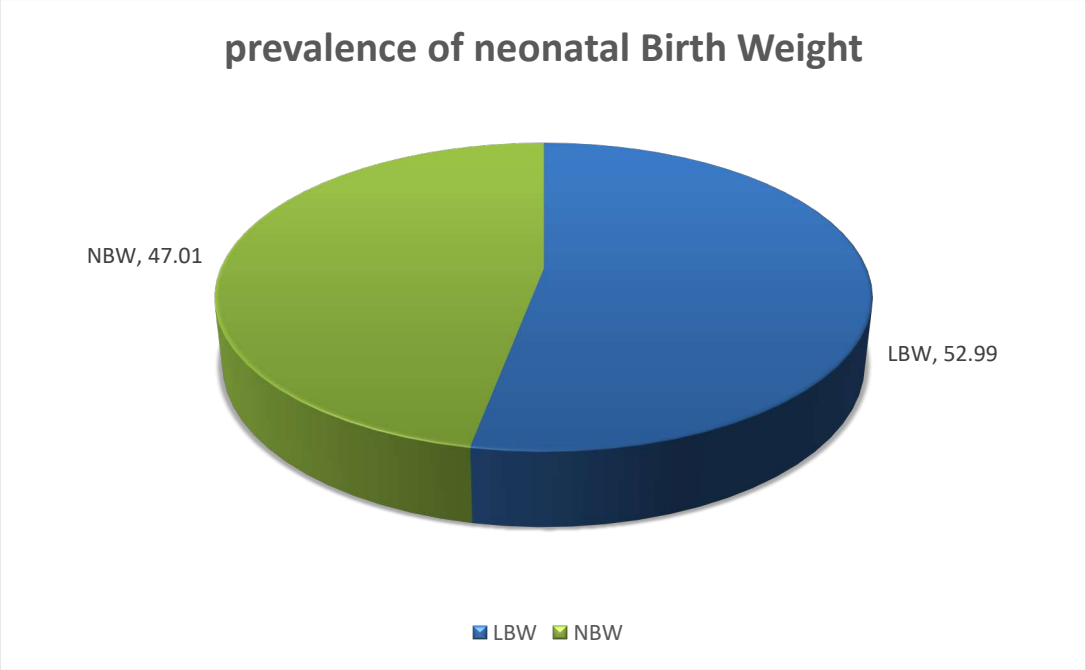


Figure 1the prevalence of neonatal birth weight among in conflict-affected areas in West Gojjam Zone.

Factors associated with maternal and neonatal health in conflict-affected areas of West Gojjam Zone.

In bi-variable logistic regression analysis, the variables; Mode of delivery, Maternal Hb, Vaginal bleeding, Injury during pregnancy, Death family members, Previous abortions, Personal safety and ICU were significantly associated (P-value less than 0.25) maternal and neonatal health in a conflict-affected areas score. Subsequently, in a multivariable binary logistic regression analysis,

Mode of delivery, Maternal Hb, Vaginal bleeding, Death family members, Personal safety and ICU were significantly associated with maternal and neonatal health in a conflict-affected areas score. At a p-value of <0.05, mode of delivery was significantly associated with birth weight. Mothers who had assisted vaginal delivery were 81% less likely to deliver a low birth weight infant (AOR: 0.19, 95% CI: 0.12, 0.28) compared to those who had spontaneous vaginal delivery. Similarly, mothers who delivered by cesarean section were 71% less likely to have a low birth weight infant (AOR: 0.29, 95% CI: 0.16, 0.51) compared to those who had spontaneous vaginal delivery.

Maternal hemoglobin level showed a significant association with birth weight. Mothers with hemoglobin level <7 g/dl were 2.17 times more likely to deliver a low birth weight infant (AOR: 2.17, 95% CI: 1.51, 3.10) compared to those with hemoglobin level ≥11 g/dl. Vaginal bleeding during pregnancy was also significantly associated with birth weight. Mothers who experienced vaginal bleeding were 2.44 times more likely to deliver a low birth weight infant (AOR: 2.44, 95% CI: 1.69, 3.51) compared to those who did not.

Injury during pregnancy was not significantly associated with birth weight in the adjusted analysis (AOR: 1.56, 95% CI: 0.82, 2.97).Death of a family member was significantly associated with birth weight. Mothers who experienced death of a family member were 54% less likely to deliver a low birth weight infant (AOR: 0.46, 95% CI: 0.24, 0.90) compared to those who did not. Previous abortion was not significantly associated with birth weight after adjustment (AOR: 1.54, 95% CI: 0.82, 2.87).ICU admission was significantly associated with birth weight. Mothers who were admitted to ICU were 2.28 times more likely to deliver a low birth weight infant (AOR: 2.28, 95% CI: 1.58, 3.29) compared to those who were not admitted.

Personal safety problems during pregnancy were also significantly associated with birth weight. Mothers who reported personal safety problems were 2.14 times more likely to deliver a low birth weight infant (AOR: 2.14, 95% CI: 1.13, 4.08) compared to those who did not report such problems.

Table 6 Multivariable logistic regression of factors associated maternal and neonatal health in a conflict-affected areas in West Gojjam Zone, Northwest Ethiopia,(N=628)

Variables	Category	Birth weight		COR 95%CI	AOR, 95%CI
		NBW	LBW		
Mode of delivery	vaginal delivery	157	71	1	1
	Assist vaginal delivery	107	222	0.22 (0.15, 0.31)*	0.19 (0.12, 0.28)**
	Cesarean section	35	44	0.36 (0.21, 0.61)*	0.29 (0.16, 0.51)**
Maternal Hb	≥ 11 g/dl	114	192	1	1
	< 7 g/dl	185	145	2.15 (1.56, 2.95)*	2.17 (1.51, 3.10)**
Vaginal bleeding	No	186	151	1	1
	Yes	113	186	2.03 (1.48, 2.78)*	2.44 (1.69, 3.51)**
Injury during pregnancy	No	164	126	1	1
	Yes	135	211	2.03 (1.48, 2.79)*	1.56 (0.82, 2.97)
Death family members	No	165	138	1	1
	Yes	134	199	1.78 (1.30, 2.43)*	0.46 (0.24, 0.90)**
Previous abortions	No	213	124	1	1
	Yes	134	165	2.12 (1.54, 2.91)*	1.54 (0.82, 2.87)
ICU	No	216	121	1	1
	Yes	146	153	1.87 (1.36, 2.57)*	2.28 (1.58, 3.29)**
Personal safety	No	218	119	1	1
	Yes	136	163	2.20 (1.60, 3.02)*	2.14 (1.13, 4.08)**

Key: *Significant at p-value < 0.25 in unadjusted logistic regression analysis

**Significant at p < 0.05 in adjusted logistic regression analysis

4. DISCUSSION

The current study prevalence of LBW observed in the current study is higher than studies conducted in Ethiopia, including Debre Tabor, Addis Ababa, and Eastern Ethiopia, where LBW prevalence ranged from 11% to 32% [23-25]. The lower prevalence in these Ethiopian studies may be due to relatively stable healthcare services, improved maternal nutritional support, and better antenatal care utilization compared with conflict-affected West Gojjam Zone. Similarly, studies conducted in Kenya, Uganda, Tanzania, and Rwanda reported LBW prevalence ranging from 10% to 18%, which is substantially lower than the current finding [26, 27]. These countries have shown gradual improvements in maternal-child health services and community nutrition programs, which may contribute to better neonatal outcomes.

According to this study finding is also greater than studies conducted in Asian countries such as India, Bangladesh, Nepal, and Pakistan, where LBW prevalence ranged from 15% to 28% [28].The relatively lower prevalence in these countries may be related to improved institutional delivery services, stronger maternal supplementation programs, and better maternal education coverage. Furthermore, the studies conducted in developed countries such as the United States, Canada, the United Kingdom, and European countries documented LBW prevalence below 10%[29]. The lower burden in developed nations may be explained by advanced maternal healthcare systems, early obstetric interventions, improved maternal nutrition, and strong neonatal intensive care services.

We suggested that the prevalence reported in the current study is similar to findings from conflict-affected countries such as Somalia, South Sudan, Syria, Afghanistan, Gaza Strip, and Northern Nigeria, where LBW prevalence exceeded 50%[27, 30]. Studies from Somalia and South Sudan showed that prolonged armed conflict, food insecurity, displacement, and collapse of healthcare systems significantly increased maternal and neonatal complications [30]. Likewise, research conducted in Gaza Strip and Syria reported high rates of LBW because conflict severely disrupted maternal healthcare access and increased maternal psychological stress [15]. Therefore, the current study shares similarities with findings from humanitarian crisis settings, suggesting that conflict-related disruptions substantially worsen neonatal health outcomes.

According to this study line with the research done in Ethiopia, Kenya, India, and Nigeria, where prompt obstetric interventions increased neonatal survival and decreased birth complications, this study found that assisted vaginal delivery and cesarean section significantly decreased the risk of LBW compared with spontaneous vaginal delivery [25, 31, 32]. Emergency obstetric interventions are crucial for preventing fetal distress and unfavorable neonatal outcomes, according to WHO guidelines [31]. Similar results were found in studies from Tanzania and Uganda, where high-risk pregnancies had better birth outcomes after surgical delivery [26]. owever, because emergency surgical services were scarce and referral systems were disrupted during conflict, studies carried out in fragile health systems like South Sudan and Somalia revealed weaker protective effects [30]. According to the current study, despite the ongoing conflict, some emergency obstetric services were still available in West Gojjam.

We found that mothers with normal hemoglobin levels, we discovered that mothers with hemoglobin levels below 7 g/dl were more than twice as likely to give birth to LBW infants. Our results are consistent with research from Bangladesh, Ethiopia, India, Nepal, and Pakistan that found a strong correlation between fetal growth restriction and severe maternal anemia [29, 33]. Maternal anemia increased the risk of LBW by more than two times, according to Ethiopian studies [33]. In a similar vein, research from South Asia revealed that insufficient iron supplementation and poor maternal nutrition were significant causes of neonatal morbidity [28]. Studies carried out in developed nations like Canada, Germany, and the UK, however, found weaker correlations because early anemia treatment and efficient maternal nutrition programs reduced pregnancy-related complications [34]. Food insecurity, interrupted nutritional support services, and limited dietary diversity brought on by armed conflict may be the causes of the stronger association found in this study.

We discovered that the risk of LBW was considerably elevated by vaginal bleeding during pregnancy. Antenatal hemorrhage was found to be strongly associated with neonatal morbidity and mortality in studies conducted in Ethiopia, Sudan, India, Pakistan, and Nigeria [32, 34]. Placental bleeding reduces fetal growth and placental blood circulation, according to research from Pakistan and India [34]. However, compared to developed nations, where early obstetric diagnosis and timely emergency management help reduce complications related to antepartum hemorrhage, the strength of association found in this study was higher. Therefore, the higher

burden noted in the current study may be explained by delayed access to healthcare services and disruptions in healthcare delivery caused by conflicts.

According to personal safety LBW babies were more likely to be born due to personal safety concerns. This result is consistent with research from Syria, Afghanistan, the Gaza Strip, Northern Nigeria, and South Sudan that found maternal psychological stress greatly increased the risk of preterm birth and low birth weight [27, 30, 35]. Chronic stress raises maternal cortisol levels, which have a detrimental effect on placental function and fetal growth, according to studies done in conflict environments [35]. In contrast, studies carried out in peaceful environments in Ethiopia, Kenya, and Rwanda revealed weaker correlations between psychosocial stress and LBW because women had better access to healthcare and relatively stable social environments [23, 27]. The current study thus confirms that poor neonatal outcomes are significantly influenced by psychological trauma related to conflict.

In this study, we discovered a significant correlation between low birth weight and intensive care unit (ICU) admission during pregnancy. Severe maternal complications, such as hemorrhage, hypertensive disorders, and sepsis, were found to be associated with higher neonatal morbidity and mortality in studies carried out in Ethiopia, Kenya, Uganda, India, and Nigeria [36]. Studies conducted in sub-Saharan Africa have shown that maternal critical illness has a detrimental effect on the fetus. growth and raises the possibility of complications for newborns [26, 36]. Therefore, the current result is consistent with local and international research showing that neonatal outcomes are significantly impacted by severe maternal morbidity.

5. Strengths and Limitations

This study provides important evidence on maternal and neonatal health in the conflict-affected West Gojjam Zone, where data are relatively limited. It incorporates both clinical and psychosocial factors, including conflict-related stressors, to offer a more comprehensive understanding of low birth weight and related outcomes. The use of multivariable logistic regression further strengthens the reliability of the findings by controlling for potential confounding variables. Overall, the study generates context-specific and policy-relevant evidence that can inform targeted maternal health interventions in fragile and resource-limited settings. However, the cross-sectional design limits the ability to establish causal relationships between the identified predictors and outcomes. Some variables, particularly psychosocial and conflict-related exposures, may also be subject to recall or reporting bias. In addition, there is a possibility of residual confounding due to unmeasured factors such as dietary intake, infections, and quality of care. Challenges in accessing conflict-affected areas may have influenced sample representativeness, while the reliance on facility-based data may exclude home births, potentially underestimating the true burden of adverse outcomes in the community.

6. Conclusion And Recommendations

6.1. Conclusion

This study examined maternal and neonatal health outcomes in a conflict-affected area of West Gojjam Zone, focusing on determinants of low birth weight (LBW) and related adverse outcomes. The findings revealed a high prevalence of adverse neonatal outcomes (52.99%), indicating a substantial public health burden driven by obstetric, medical, and conflict-related psychosocial factors. Mode of delivery was protective, with assisted vaginal delivery and cesarean section reducing the risk of LBW. Severe maternal anemia (Hb <7 g/dl) and antepartum hemorrhage were strong predictors of LBW, emphasizing the role of maternal nutrition and pregnancy complications. Conflict-related stressors, including insecurity and exposure to traumatic events, significantly contributed to adverse neonatal outcomes. Overall, the study concludes that maternal and neonatal outcomes are influenced by interacting clinical, nutritional, obstetric, and conflict-related factors, resulting in a moderately high burden in the study area.

6.2.Recommendation

This study assessed maternal and neonatal health outcomes in a conflict-affected area of West Gojjam Zone, with a particular focus on the determinants of low birth weight (LBW) and related adverse outcomes. The findings revealed a high prevalence of adverse neonatal outcomes (52.99%), indicating a considerable public health burden driven by a combination of obstetric, medical, and conflict-related psychosocial factors. The mode of delivery showed a protective effect, as both assisted vaginal delivery and cesarean section were associated with a reduced risk of LBW. Severe maternal anemia (hemoglobin <7 g/dl) and antepartum hemorrhage emerged as strong predictors of LBW, highlighting the critical importance of maternal nutrition and the management of pregnancy complications. In addition, conflict-related stressors such as insecurity and exposure to traumatic events were found to significantly contribute to adverse neonatal outcomes. Overall, the study concludes that maternal and neonatal health outcomes in the area are shaped by the interaction of clinical, nutritional, obstetric, and conflict-related factors, resulting in a moderately high burden of adverse outcomes in the study setting.

Abbreviations and Acronyms

ANC	Antenatal care
Hb	Hemoglobin level
LMP	Last menstrual period
LBM	Low birth weight
NICU	Neonatal Intensive Care Units
PT	Preterm
PPROM	Preterm premature rupture of membranes
SGA	Small for gestational age
ELBW	Extremely low birth weight
FT	Full-term
VLBW	Very low birth weight

Declarations

Ethics approval and consent to participate

This study involved human data, and all research procedures were carried out in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethical Review Board of Debre Markos University. In addition, a formal permission letter was secured from the West Gojjam Zone Health Department, followed by the necessary approvals from each respective office to facilitate the implementation of the study.After clearly explaining the purpose of the study, written informed consent was obtained from all study participants by the data collectors. Participants were informed that their participation was voluntary and that they had the right to withdraw from the study at any time without any consequence. To ensure confidentiality, no personal identifiers were collected, and participant privacy was strictly maintained throughout the study.

Consent for publication

NA

Availability of data and materials

The data used for this study are available from the corresponding author upon request

Competing interests

The authors declare that they have no competing interests

Funding

This research received no specific funding

Authors' contributions

Haimanot Degu : Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization and Writing – original draft.

Abraham Degu: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Supervision, Validation, Visualization and Writing – review & editing.

Agumas Degu: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Supervision, Validation, Visualization and Writing – review & editing.

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7. Reference

1. Ronsmans C, Graham WJ: **Maternal mortality: who, when, where, and why**. *The lancet* 2006, **368**(9542):1189-1200.
2. AXIONS: **Report: Progress on reducing maternal mortality stalls around the world**. *Advances in medicine* 2025.
3. Abetie TA, Bante SA, Atnafu DD: **Health impacts of armed conflict in Ethiopia: a scoping review of evidence from 2018 to 2023**. *BMC public health* 2025, **25**(1):3947.
4. Teka H, Ebrahim MM, Nardos R, Legesse AY, Berhe Y, Berhe H, Gebregziabher M, Kiros G-E: **The impact of armed conflict on maternal morbidity and mortality at a teaching hospital in the Tigray region of Ethiopia: a pre-war and wartime comparative analysis**. *BMC Pregnancy and Childbirth* 2025, **25**(1):389.
5. Legesse W, Hussien M: **Benchmarking Best Global Practices in Ethiopian Leather Sector**. In: *Emerging Trends in Leather Science and Technology.* edn.: Springer; 2024: 387-400.
6. Alemu TG, Techane MA, Wubneh CA, Assimamaw NT, Belay GM, Tamir TT, Muhye AB, Kassie DG, Wondim A, Terefe B: **Spatial variation and determinates of dietary diversity among children aged 6–23 months in Ethiopia: spatial and multilevel analysis using Ethiopian Demography Health Survey (EDHS) 2019**. *Archives of Public Health* 2022, **80**(1):152.
7. Demilew YM, Alene GD, Belachew T: **Dietary practices and associated factors among pregnant women in West Gojjam Zone, Northwest Ethiopia**. *BMC Pregnancy and Childbirth* 2020, **20**(1):18.
8. OCHA: **https://www.unocha.org/publications/report/ethiopia/ethiopia-situation-report-10-jan-2024?utm_source=chatgpt.com**. 2024.
9. Aldabbour B, Elamassie S, Mahdi S, Abuzaid H, Abed T, Tannira Y, Skaik K, Zaydah YA, Elkolak A, Alhabashi M: **Impact of armed conflict on maternal and neonatal health and birth weight: a cross-sectional study in the Gaza-Strip**. 2025.
10. Guardian t: **Support the Guardian**. *Fund independent journalis* 2025.
11. Ruhmich C, Dijkzeul D: **Humanitarian management**. In: *An Introduction to Humanitarian Action.* edn.: Routledge; 2025: 219-255.
12. FMoH E: **Health Sector Transformation Plan II**. *Addis Ababa, Ethiopia* 2021.
13. Macro O: **Central Statistical Agency**. *Ethiopia demographic and health survey* 2005.
14. Tessema AM, Yalew AW: **Causes and Consequences of Farmland Conflicts in East Gojjam Zone: Insights from Gozamen Wereda, Northwestern Ethiopia**. *African and Asian Studies* 2025, **1**(aop):1-28.
15. Aldabbour B, Elamassie S, Mahdi S, Abuzaid H, Abed T, Tannira Y, Skaik K, Zaydah YA, Elkolak A, Alhabashi M: **Exploring maternal and neonatal health in a conflict-affected setting: cross-sectional findings from Gaza**. *Conflict and Health* 2025, **19**(1):45.
16. Shah S, Padhani ZA, Als D, Munyuzangabo M, Gaffey MF, Ahmed W, Siddiqui FJ, Meteke S, Kamali M, Jain RP: **Delivering nutrition interventions to women and children in conflict settings: a systematic review**. *BMJ Global Health* 2021, **6**(4).
17. Agrawal A, Wenger NK: **Hypertension during pregnancy**. *Current hypertension reports* 2020, **22**(9):64.
18. Gedfew M, Getie A, Ayenew T, Amlak BT, Meselu MA, Afenigus AD, Amha H: **Armed conflict and treatment interruptions: A systematic review and meta-analysis in Amhara, Ethiopia**. *Public Health* 2025, **241**:122-128.
19. Philip AG: **Neonatal mortality rate: is further improvement possible?** *The Journal of pediatrics* 1995, **126**(3):427-433.

20. Gruenwald P: **Infants of low birth weight among 5,000 deliveries**. *Pediatrics* 1964, **34**(2):157-162.
21. Barriball KL, While A: **Collecting data using a semi-structured interview: a discussion paper**. *Journal of Advanced Nursing-Institutional Subscription* 1994, **19**(2):328-335.
22. Boerma JT, Weinstein K, Rutstein SO, Sommerfelt AE: **Data on birth weight in developing countries: can surveys help?** *Bulletin of the World Health Organization* 1996, **74**(2):209.
23. Muluneh MW, Mulugeta SS, Belay AT, Moyehodie YA: **Determinants of low birth weight among newborns at debre tabor referral hospital, Northwest Ethiopia: a cross-sectional study**. *SAGE Open Nursing* 2023, **9**:23779608231167107.
24. Tiruneh GT, Demissie M, Worku A, Berhane Y: **Predictors of maternal and newborn health service utilization across the continuum of care in Ethiopia: A multilevel analysis**. *PloS one* 2022, **17**(2):e0264612.
25. Adugna M: **MAGNITUDE OF NEONATAL NEAR MISS AND ASSOCIATED FACTORS AMONG NEONATES BORN IN PUBLIC HOSPITALS IN HARARI REGION, EASTERN ETHIOPIA**. Haramaya university; 2021.
26. Mbonye MK: **Integrated Management of Infectious Diseases; Effect of Capacity Building Interventions on Malaria Case Management in Rural Uganda**: Universiteit Antwerpen (Belgium); 2015.
27. Alibhai KM, Ziegler BR, Meddings L, Batung E, Luginaah I: **Factors impacting antenatal care utilization: a systematic review of 37 fragile and conflict-affected situations**. *Conflict and health* 2022, **16**(1):33.
28. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, De Onis M, Ezzati M, Grantham-McGregor S, Katz J, Martorell R: **Maternal and child undernutrition and overweight in low-income and middle-income countries**. *The lancet* 2013, **382**(9890):427-451.
29. Organization WH: **Global anaemia reduction efforts among women of reproductive age: impact, achievement of targets and the way forward for optimizing efforts**: World Health Organization; 2020.
30. Galatsch M: **Enhancing Access to Healthcare for Displaced and Conflict-Affected Children**.
31. Health WHOR: **Managing complications in pregnancy and childbirth: a guide for midwives and doctors**: World Health Organization; 2003.
32. Yeshitila YG, Daniel B, Desta M, Kassa GM: **Obstructed labor and its effect on adverse maternal and fetal outcomes in Ethiopia: a systematic review and meta-analysis**. *PLoS One* 2022, **17**(9):e0275400.
33. Tesfay N, Hailu G, Begna D, Habtetsion M, Taye F, Woldeyohannes F, Jina R: **Prevalence, underlying causes, and determinants of maternal near miss in Ethiopia: a systematic review and meta-analysis**. *Frontiers in Medicine* 2024, **11**:1393118.
34. Cunningham FG, Leveno KJ, Bloom SL, Dashe JS, Hoffman BL, Casey BM, Spong CY: **Obstetrícia de Williams-25**: McGraw Hill Brasil; 2021.
35. Lobel M, Cannella DL, Graham JE, DeVincent C, Schneider J, Meyer BA: **Pregnancy-specific stress, prenatal health behaviors, and birth outcomes**. *Health psychology* 2008, **27**(5):604.
36. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller A-B, Daniels J, Gülmezoglu AM, Temmerman M, Alkema L: **Global causes of maternal death: a WHO systematic analysis**. *The Lancet global health* 2014, **2**(6):e323-e333.

Participant Information and Consent Form

Hello, my name is _____. I am working as a data collector with **Haimanot Degu,** who is conducting a research study entitled *"Maternal and Neonatal Health in Conflict-Affected Areas of West Gojjam Zone, Northwest Ethiopia."* The purpose of this study is to assess maternal and neonatal health conditions and associated factors among mothers living in conflict-affected areas of West Gojjam Zone.

During this interview, we will ask you questions related to your health, your newborn, and your household conditions. Your participation in this study is completely voluntary. You have the right to refuse to participate or to stop the interview at any time if you feel uncomfortable or tired. The interview will take approximately 30 minutes.

All information collected from you will be kept strictly confidential. Your responses will not be shared with anyone outside the research team and will be used only for the purpose of this study. Your name or any personal identifier will not appear in any report or publication resulting from

this research. We encourage you to answer all questions honestly and completely; however, you are free not to answer any question that you do not wish to answer. Your participation is very valuable because your views and experiences will contribute important information toward improving maternal and neonatal health services in conflict-affected communities.

Finally, I would like to assure you that there is no known risk or harm associated with participating in this study. Thank you for your willingness to participate.

. For detailed information, you can contact the investigator through cell phone: at

+251913360266 and e-mail haimanot_degu@dmu.edu.et .

•If you have any questions about the survey, I am ready to respond. Do you have any questions?

•Please let me know if anything I have stated is not clear, and I will be happy to explain it further to ensure you understand.

I have been informed about the purpose and use of this particular research. After all these, I understood and:

1. I agree to participate in this research voluntarily ☐

2. I didn't agree to participate in this research ☐

Interviewer's name Signature Date

Thank you in advance for your cooperation in the study

Appendix II: English Version Questionnaire

Name of the interviewer_____ Date of interview

_____Date of visit_____ CODE_____ DD |MM |YYYY

I. Assessment Socio-Demographic Interview Questionnaire			
No	**Questions**	**Responses**	**Code**
101	How old are you?	1. 23–28 years 2. 29–33 years 3. ≥40 years	
102	What is your highest level of education?	1. Unable to read and write 2. Primary & Secondary education (Grades 1–12)	

		3. Diploma 4. Degree 5. Master's degree and above	
103	What was your average monthly family income during the conflict period?	1. <1500 ETB 2. ≥1500 ETB	
II. Obstetric and Maternal Health History Interview Questionnaire			
104	Have you ever had a previous abortion?	1. Yes 2. No	
105	How did you give birth to your current baby?	1. Normal vaginal delivery 2. Assisted vaginal delivery 3. Caesarean section	
106	What was your hemoglobin level during pregnancy or delivery?	1. ≥11 g/dl 2. <7 g/dl	
107	What was your blood pressure status during delivery?	1. Normal blood pressure 2. High blood pressure 3. Not documented	
108	During this pregnancy, did you experience any vaginal bleeding?	1. Yes 2. No	
109	When did you first start antenatal care (ANC) follow-up for this pregnancy?	1. first trimester 2. second trimester 3. third trimester	
110	How many antenatal care (ANC) visits?	1. < 4 visits 2. ≥ 8 visits	
111	Where did you receive antenatal care services?	1. health center 2. Hospital	
III. Maternal Nutrition and Supplementation Interview Questionnaire			
112	How was your appetite during pregnancy?	1. Good 2. Poor	
113	Was the amount of food you consumed during pregnancy sufficient?	1. Sufficient 2. Insufficient	
114	Did you consume a diversified diet during pregnancy?	1. Sufficient 2. Insufficient	
115	Did you have sufficient access to clean drinking water during pregnancy?	1. Sufficient 2. Insufficient	

116	How often did you take iron and folic acid supplementation during pregnancy?	1. Less than once per week 2. At least once per week but not daily 3. Daily for at least 12 weeks	
IV. Conflict-Related and Living Condition Interview Questionnaire			
117	What is your current living arrangement?	1. Separate house 2. Shared house 3. Shelter 4. Tent	
118	Have any of your family members been killed due to the conflict?	1. Yes 2. No	
119	Have you ever seen dead bodies during the conflict?	1. Yes 2. No	
120	Have you been concerned about your personal safety during the conflict?	1. Yes 2. No	
121	Have you experienced forced displacement due to the conflict?	1. Yes 2. No	
122	Have you experienced the death of family members during the conflict?	1. Yes 2. No	
123	Have you been worried about experiencing an abortion during pregnancy?	1. Yes 2. No	
124	Have you been worried about the health of your fetus during pregnancy?	1. Yes 2. No	
125	Have you experienced fear of death during the conflict or pregnancy period?	1. Yes 2. No	
V. Assessment Neonatal Health Interview Questionnaire			
126	What is the sex of the newborn?	1. Male 2. Female	
127	Did the newborn require resuscitation immediately after birth?	1. Yes 2. No	
128	Was the newborn admitted to the Neonatal Intensive Care Unit (NICU)?	1. Yes 2. No	