Performance of midwives in provision of care during labor, childbirth and immediate postpartum period in Amhara Region, Ethiopia

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ABSTRACT

Background
Regional, national and global goals for improving maternal and newborn health outcomes focus on skilled care during labor and childbirth. The purpose of this study was to assess competence of midwives in providing care during labor, childbirth and immediate postpartum period in public hospitals and health centers located in Amhara Region, Ethiopia

Methodology
We conducted a cross-sectional study covering 56 public health facilities (19 hospitals and 37 health centers) in Amhara Regional State in 2015. Twelve proficient midwives observed the performance of midwives as they provided care to laboring mothers from admission to six hours after birth using a 9 point Likert scale where scores 1-3 denotes unsatisfactory, 4-6 satisfactory, and 7-9 outstanding performance. After the observation, they conducted interviews and inventory of basic equipments, drugs and supplies. Percentages of midwives who had unsatisfactory, satisfactory and superior performance were determined using composite score and global rating.

Results
A total of 150 midwives were observed providing labor, delivery and immediate postpartum care, giving a response rate of 100%. Overall 19.3%, 75.3% and 5.3% of midwives had unsatisfactory, competent and superior composite scores, respectively. Global rating of the performance also revealed that 15.3%, 78% and 6.7% of midwives gave unsatisfactory, competent and superior performance, respectively. The percentage mean performance score was 54% and 53% for composite score and global rating respectively. Midwives performed relatively well on communication, teamwork and professionalism but a higher percentage (20.1 %-29.3 %) of midwives performed poorly in rapid initial evaluation, history
taking, infection prevention, partograph use, and immediate postpartum care. A total of 51 obstetric complications were also observed and 48 (94%) of them were managed satisfactorily.

**Conclusions**

Most midwives were competent in providing intrapartum care including management of complications. However, a significant number of midwives lack the competencies to provide satisfactory care.

**Key words**: competence, labor and delivery, immediate postpartum period, complication management, midwives, Amhara Region
Knowledge of Direct Obstetric Causes of Maternal Mortality and Associated Factors among Reproductive Age Women in Aneded District, Northwest Ethiopia

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Abstract

Background: In Ethiopia, 20,000 women die each year from complications related to pregnancy and child birth with much more maternal morbidity occurring for each maternal death. Good knowledge of women related with direct causes of maternal mortality is important in reducing maternal morbidity and mortality. So, the aim of this study was to assess knowledge of direct obstetric causes of maternal mortality and associated factors among reproductive age of women in Aneded worda, Northwest Ethiopia, 2014.

Methodology: A community based cross sectional study was conducted using multi stage sampling followed by simple random sampling technique to get 844 samples of reproductive age women in Aneded district. Data was collected from 8 March 2014 to 4 April 2014. Pre-tested semi-structured questionnaire was used to collect the data. Data was collected through face-to-face interviews by 12 data collectors. Data was cleaned, coded and entered into Epi-data version 3.1, then exported and analyzed using SPSS version 20. Bivariate and multivariable analysis were used to identify factors related to knowledge about obstetric causes of maternal mortality. The crude and adjusted odds ratios together with their corresponding 95% confidence intervals were computed. A P-value < 0.05 was considered to declare a result as statistically significant in this study.

Result: This study found that almost half (49.6%) of respondents have good knowledge level towards obstetric causes of maternal mortality. Significant variables associated with knowledge towards obstetric causes of maternal mortality were: occupation type in which government workers (AOR=3.6, 95%CI(1.4-8.9), respondents who had additional monthly income from family members (AOR=1.54, 95%CI(1.04-2.27), respondents who attended primary school and above(AOR=1.6, 95%CI(1.13-2.249), distance of health facility in which the time it took less than 20 minutes (AOR=2.25,CI(1.24-4.09), 20-39minutes (AOR=3.06,CI(1.66-5.64), 40-60 minutes (AOR=2.38,95%CI (1.52-5.26), and respondents who had previous history of prolonged labor (AOR=1.4,9(1.04 -2.03) were the most significant variables.

Conclusion: This study indicated that the reproductive age women of the study area had poor knowledge towards about obstetric causes of maternal mortality. Therefore to improve maternal knowledge and thereby reduce maternal death, the identified significant factors should be addressed through maternal and child health services by designing an appropriate strategies including provision of targeted information, education and communication.

Key words: Maternal mortality, knowledge, obstetric causes, reproductive women, Ethiopia.

Introduction

World Health Organization (WHO) estimates that about 300 million women in the developing countries suffer from short and long-term illnesses due to pregnancy and childbirth related complications. Childbirth is the time of greatest lifetime risk of mortality for a mother and her baby (1).
Since the inception of safe motherhood in 1987, countries throughout the world have made several progress to improve the maternal health and reduce maternal morbidity and mortality. Even if the global rate of maternal mortality ratio have dropped from time to time, the rate of decline is still slow and not satisfactory especially in developing countries, like the Sub Saharan Africa (2, 3).

Maternal mortality due to direct and indirect obstetric causes is one of the main factors which results in low life expectancy for women. Most of maternal deaths occur within 24 hours of child birth, followed by during pregnancy, within seven days of delivery and from two to six weeks after child birth each accounting for 50%, 25%, 20% and 5% of Maternal mortality (4). In Ethiopia, 20,000 women die each year from pregnancy and child birth complications with much more maternal morbidity (5).

Among the different strategies which can increase the use of skilled birth attendants during pregnancy, labor and delivery and post-partum period is improving the knowledge level of reproductive age women towards the obstetric danger signs (6-8).

Women and their families should have knowledge of direct obstetric causes during pregnancy, delivery and the postpartum period because the fact that every pregnancy faces risks (9). The knowledge will ultimately empower them and their families to make prompt decisions to seek care from skilled birth attendants (10). Knowledge of obstetric causes are strategies aimed at enhancing the utilization of skilled care during low-risk births and emergency obstetric care in complicated cases in low income countries(11). Women and families are more likely to seek care in the event of an emergency if they are aware of obstetric complications (12-14).

A community based study conducted on knowledge about obstetric danger signs among mothers in Tsegdie district showed that the most commonly mentioned danger sign during pregnancy and child birth vaginal bleeding, 49.1%) and 52.8% respectively. In addition the study also found that 35.1% and 31.8% of respondents didn’t know any danger signs of pregnancy and child birth (15).

Awareness of obstetric causes of maternal mortality of women in reproductive age is bottleneck to reduce maternal mortality and to achieve MDG goals. Therefore this study tried to assess the knowledge score of reproductive age women and associated factors in the district.

**Materials and Methods**

**Study design and area**

A community-based cross sectional study design was conducted. The study was conducted in Aneded woreda which was found 283 km north of BahirDar and 282 Northwest of Addis Ababa, in Amhara Regional state. The woreda has 20 kebeles. According to population projection of the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), there was an estimated population of 101,734 of whom 50,664 are men and
51,070 women of which 20,693 are reproductive age women. There are four health centers and 20 health posts in the woreda.

**Study period and population**
The study was conducted from 21 February to March 18/2014. The study population of this study were reproductive age women who were living in the randomly selected kebeles in the woreda. Reproductive age group women, who were critically ill, couldn’t talk or listen were excluded from the study.

**Sample Size determination and sampling procedures**
The required sample size was determined using single population proportion formula by considering proportion (p) as 50% and a margin error of 5%, design effect of 2 and none response rate of 10%. Accordingly, the sample size was:

\[
n = \frac{(1.96)^2 \times 0.5 (1-0.5)}{(0.05)^2}
\]

\[
n = 384, \text{ and by considering 10% non-response rate and design effect of 2 the total sample size was 844.}
\]

A multistage sampling technique was used. First, all the kebeles in the district was stratified in to urban and rural. Then one urban kebele and 5 out of 19 rural kebeles were randomly selected by simple random sampling. List of reproductive age women were extracted from community-based intervention for action (CBIA) data in the selected kebeles which was collected by health extension workers. The calculated sample size was proportionally allocated to urban \((n=75)\) and rural \((n=769)\) areas respectively.

**Variables of the study**
The dependent variable of this study was knowledge of obstetric causes of maternal mortality. The independent variables were: Socio-demographic factors (age of mother, religion, residence, marital status, occupation, level of education, monthly income), Obstetric history (gravidity and parity), Health- system factors (distance, transportation, transport cost, availability health facilities and health professionals), Previous self-exposure / history to Obstetric causes of maternal mortality: Hemorrhage, abortion, sepsis, hypertensive disorder of pregnancy and obstructed labor.

**Data processing and analysis**
The collected data was cleaned, coded and entered in EPI data computer programs. Prior to the analysis, the whole data were cleaned and the data was doubly entered. The completeness of the data was checked. Errors related to inconsistency were verified using cross tabulation and other data exploration methods. The data was exported to Statistical Package for Social Sciences (SPSS) version 20. Then recoded, categorized and sorted for further analysis.
Descriptive analysis was used to describe the percentages and number distributions of the respondents by socio-demographic characteristics and other relevant variables in the study. Furthermore, logistic regression, specifically Bivariate and multivariable analysis were used to identify factors related to knowledge about obstetric causes of maternal mortality. In bivariate analysis all variables were interred to the model and variables which had p-value <0.25 were used in multivariate analysis. The crude and adjusted odds ratios together with their corresponding 95% confidence intervals were computed. A P-value < 0.05 was considered to declare a result as statistically significant in this study.

Ethical consideration

Ethical clearance was obtained from the Institutional review board (IRB) of Debre Markos University (DMU), College of Medicine and Health science (CMHS). Then officials at different levels in the study area were communicated through letters from DMU, CMHS. Letter of permission was obtained from Aneded worda health office. Data was collected after informed consent was obtained from each respondent prior to the interview after explaining the purpose of the study, the procedure of data collection, benefits and risks, and confidentiality issues. Prior to the data collection, respondents gave their consent, and they have signed for the participation voluntarily in the consent form of the data collection tool. For respondents who were below 18 years old, informed consent was obtained from parents/guardians on their behalf. This was approved by the IRB of DMU, CMHS. Confidentiality of the information was assured and privacy of the respondents was maintained.

Results

Socio demographic characters

The respondent rate was 92% out of 844 samples. The mean ages of the respondents were 28.93 years (±6.6SD). Most of the respondents 643(82.9%) were married and 759(92.9%) were orthodox in religion. More than half participants 642 (59.5%) couldn’t read and write, 168(21.6%) could read and write, 68(21.6%) attended primary school, 40(5.2%) attended secondary school and 38(4.9%) attended college diploma and above. Majority of the respondents were farmers in occupation accounting 617(79.5%)(Table 1).

Participants past history of exposure to obstetric causes of maternal mortality

Around 631(81.3%) participants had prior history of pregnancy. Out of this, 156(20.1%) participant’s had earlier history of vaginal bleeding during their pregnancy, delivery and post-partum period. Only 30(13.3%) had gone to health facility though a good number of participants experienced vaginal bleeding. Out of 631 women who were pregnant 241(31.1%), 93(12%), 38(4.9%), 28(3.6%) of the respondents had prior history of prolonged/obstructed labor, abortion, hypertension and sepsis, of which 143(18.4%), 37(4.8%), 26(3.4%), 20(2.6%) had gone to a health facility respectively.
Knowledge towards obstetric causes of maternal mortality

More than half 602(77.6%) knew about obstetric causes of maternal mortality, of which majority 524(67.5%) mentioned obstetric hemorrhage as a main cause. Participants mentioned other obstetric causes of maternal death, 482(62.1%) as prolonged/obstructed labor, 359(46.3%) as pregnancy induced hypertension, 361(46.5), as abortion and 250(32.2%) as sepsis. Participants were familiar with the above mentioned causes from their family members (Table 2).

There were eleven questions related with knowledge towards obstetric causes of maternal mortality and the mean value was 5.3. The minimum knowledge score was 0 and the maximum knowledge score was 11. From total knowledge score, respondents who answered 5.3-11 questions were labeled as to have good knowledge and those who scored 0-5.3 were leveled as insufficient knowledge. Accordingly, respondents who had good knowledge were 383(49.6%) and 393(50.4%) had insufficient knowledge.

Factors associated with knowledge towards obstetric causes of maternal mortality

Bivariate and multivariate analyses were computed to identify factors associated with knowledge towards obstetric causes of maternal mortality. Accordingly, variables found to be associated with the dependent variable on bivariate analysis were; age, educational status, occupation type, additional source of family income, family educational status, source of information (radio), distance to health facility, previous contact to health facility, respondents who knew the importance of medical follow up during antenatal care, delivery and post natal care, previous exposure of obstetric complications like; hypertension, prolonged labor (Table 3).

In order to identify independent factors of knowledge of obstetric causes of maternal mortality, multivariate analysis were performed. Accordingly, variables significant during bivariate analysis were fitted to the model. As presented in table 3, the significant variables were; occupation type in which government workers were 3.6 times more knowledgeable than merchant with(AOR=3.6,95%CI(1.4-8.9), respondents who had additional monthly income were 1.54 times more knowledgably than who had not with (AOR=1.54,95%CI(1.04-2.27), from family members who attend primary school and above(AOR=1.6, 95%CI(1.13-2.249) distance of health facility in which the time it took less than 20 minutes (AOR=2.25,CI(1.24-4.09), 20-39 minutes (AOR=3.06,CI (1.66-5.64), 40-60minutes (AOR=2.38,95%CI (1.52-5.26). Respondents who had previous history of prolonged labor 1.4 times more knowledgeable than who had not with (AOR=1.4, CI (1.04 -2.03) were the most significant variables.

Discussion

Knowledge of obstetric causes of maternal mortality is the first essential step to decrease the highest level of maternal mortality associated with obstetric causes. The findings of this study have provided insight information on reproductive age women’s knowledge about obstetric causes in the study area. This study found that good knowledge score of obstetric causes of maternal mortality were 49.6%, which was relatively low because it is expected that every reproductive age women must know about obstetric causes of maternal mortality. This finding
is lower than a study conducted in Nigeria (69.1%) (16), this difference could be due to a difference in sociocultural and health system factors.

Three hundred ninety three (50.6%) of respondents who lived in urban area had good knowledge about obstetric causes of maternal mortality which is higher than their counterparts in rural areas (49.3%). When compared with other findings, the current study finding is lower than the study done in urban areas of southern Nigeria 90% (16) and Urban Slum Area of South India 95.5%(17), this may be due to access to information and health seeking behavior of the community. Similar finding was also observed in a study conducted in Aleta Wondo district, southern Ethiopia showing that pregnant women who reside in urban areas have higher level of knowledge towards obstetric danger signs than their counter parts in the rural areas (13).

Most of the respondents (77.6%) knew maternal death occurs due to obstetric causes which was lower than (95.5%) the study done in India and (96.3%) the study conducted in delta of Nigeria (16, 17).The difference could be attributed to difference in socio demographic characteristics, access to information and place of residence, rural areas in this case.

This study also found that (67.5%) of the respondents mentioned that maternal mortality occurred due to vaginal bleeding which was lower than (85.4%) with the study done in delta of Nigeria (16) and the study done in Varanasi, India (73.81%)(18), but which was a higher than the study done in Aletawondo district, Ethiopia (45.9%) (13) and (39.4%) Burkina Faso and (31%) Guatemala (19, 20). This may be due to the role of health extension workers (HEWs), and one to five health development army (HDAs) in each kebeles, and the community mobilization in the study area.

Most of the respondents (62.1%) knew prolonged labor as a cause of maternal mortality which was higher than the study done in Aletawondo, Ethiopia (43.2%) and also higher than (4%) the study done in delta of Nigeria (8, 10) this may be due to the reason that respondents may get information from health extension workers, one to five HDAs, community mobilization and mass media.

More than half of the respondents (46.3%) had mentioned maternal death occurs due to pregnancy induced hypertension which is higher than the study done in Aletawondo, Ethiopia (19.5%) and (32.2%) had mentioned that maternal death occurred due to sepsis which is higher than the study done in delta of Nigeria (4%) (13, 16). Respondents who had good knowledge about obstetric causes of maternal mortality said that they heard about such information from health facilities(56.8%), from mass media (18.9%), and 0.9% said they heard from printed papers.

In multivariate analysis occupational status, additional monthly income from family members, respondents family members who attended primary school and above, distance of health facility and respondents who knew
importance of following medical follow up during antenatal care, delivery and post natal care and previous history of exposure to prolonged labor were identified significant variables

Respondents who were government workers were 3.6 times more knowledgeable than merchants with (AOR=3.6, 95%CI (1.4-8.9), and those who had additional monthly income from their family members were 1.54 times more knowledgeable than those who had not (AOR=1.54, 95%CI (1.04-2.2). A study conducted among pregnant women in public health institutions in Mekele city, Ethiopia also showed that government employees were more knowledgeable towards obstetric danger signs than farmers (21).

Respondents who had attended primary school and above from their family members were 1.7 times more knowledge than who hadn’t attended, (AOR=1.7, 95%CI (1.2-2.3)), this may be due to they could get information about obstetric causes of maternal mortality from family members. This finding is comparable with a study conducted in Tsegede district, Tigray region, which showed that mothers who have a formal education were more likely to have higher knowledge towards obstetric danger signs than their counter parts (15). Similar findings were also observed in studies conducted in Arba Minch town, Tanzania and Egypt also showed similar findings (22-24).

Respondents who lived at the distance of less than 20 minutes to reach health facility were 2.25 times more knowledgeable than who lived greater than 60 minutes with AOR= 2.25,95%CI(1.242-4.05). Respondents who lived 20-39 minutes to reach health facility 2.7 times more knowledgeable than it took 60 minutes (AOR=2.7, 95%CI (1.5-5.07)) and they lived 40-60 minutes to reach health facility 2.59 times more knowledgeable than health facility that took 60 minutes (AOR=2.59, 95%CI (1.40-4.7).This may be due to respondents who lived near health facilities had got more information and they can get health professionals easily. Respondents who had previous history of prolonged labor 1.4 times more knowledgeable than who had not with AOR=1.4, (1.04-2.03). This may be due to a reason that they could get more information from health professionals and from health facility due to their previous exposure at health center/hospitals.

Conclusion

The total knowledge score of study subjects towards obstetric causes of maternal mortality in Aneded woreda were comparatively low (49.6%).Occupational type, educational status and additional income from family members, distance of health facility and history of prolonged labor were the predictor variables that affect knowledge of reproductive age women towards obstetric causes of maternal mortality.

Recommendation

Based on the above findings, the following recommendations are forwarded:

To healthcare institutions:
Information regarding obstetric causes of maternal mortality should be provided to the public through available channels such as print and electronic media, billboards and posters, and opinion/religious leaders and health education.

Promotion messages focusing on obstetric causes of maternal mortality and the preventive mechanisms of maternal mortality should be scaled up into the community.

Health professionals should give strong counseling about direct causes of maternal mortality when they provide medical service.

Private and public health institutions should be expanded to the community.

Further comprehensive research should be done on knowledge towards direct obstetric causes of maternal mortality in different settings.

Competing interests
The authors declare that they have no competing interests.

Authors' contribution
FG participated in the design, data collection, and participated in data analysis and interpretation of data. GM, MA and EA participated in the analysis, interpretation, and drafting of the manuscript. All authors read and approved the final manuscript.

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References


Prevalence and associated factors of low birth weight among new borns in Debre Markos Referral Hospital, North west Ethiopia, 2014

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Abstract

Background: Low birth weight and preterm birth are major determinants of prenatal survival, infant morbidity and mortality as well as risk of developmental disabilities and illnesses throughout future lives. Low birth weight is responsible for 60% of the infant mortality in the first year of life and it carries a 40-fold increase in the risk of neonatal mortality during the first month. So, the main objective of this study is to assess the prevalence and associated factors of low birth weight in Debre Markos referral hospital northwest Ethiopia.

Methods

Institution based a cross-sectional study was conducted in Debre Markos referral hospital. Information on independent variables was collected from the mothers just before discharge using a structured interview questionnaire. Neonatal weight was measured using standard beam balance. Both interviews and weight measurements was done by three trained nurse. Gestational age was determined by last menstrual period, and ultrasound examinations. Data was entered by using Epi data version 3.1 and the relevant analysis including binary and multiple logistic regressions were performed by using SPSS version 16 statistical software. Data was presented with frequency, percentage, and tables.

Results

A total of 237 neonates/mother pairs were involved in this study with a response rate of 99.6%. The overall prevalence of low birth weight was 18.6%. Gestational age less than 37 weeks (AOR 3.6(95% CI 1.5-9.4)), MUAC (AOR 4(95%CI 1.8-8.9), illness during current pregnancy (AOR 2.9(95%CI 1.1-7.7)) were found to be significantly associated with low birth weight of new born. The factors associated with low birth weight were closely related to socio demographic status and obstetric care utilization.

Conclusion

There was a high prevalence of low birth weight in the study area. Gestational age less than 37 weeks, MUAC, illness during current pregnancy were found to be associated factors of the LBW in the studied area. Special attention should be given to health seeking behaviour and prevention of illness, malnutrition and preterm birth could reduce low birth weight.
Background
An estimated 18 million babies worldwide are born each year with low birth weight of which, about 3.1 million are in sub-Saharan Africa. World Health Organization (WHO) definition of low birth weight (LBW) as having a weight of less than 2500 grams at birth (1).

One of the goals of the 1990 World Summit for Children was to reduce the incidence of LBW to less than 10% by the year 2000. Despite of this, LBW continues to remain a major public health problem in many sub-Saharan African countries where the incidence of LBW was estimated around 13% to 15% (2). LBW and preterm birth are major determinants of prenatal survival, infant morbidity and mortality as well as risk of developmental disabilities and illnesses throughout future lives (2, 3).

Birth weight has emerged as the leading indicator of infant health and welfare and the central focus of infant health policy (4). This is because low birth weight (LBW) infants experience severe health problems and developmental difficulties that can impose enormous costs on families in particular and societies in general (5). About 70% of all LBW babies are born preterm, the remaining 30% at full term (6).

LBW is associated with many socio-economic factors such as residence (urban-rural difference), mother’s age and occupation, birth order, the family’s income and many maternal conditions such as nutritional status, tobacco use, mother’s education, Women, who have three or more children, who are not living with the father of the new born, who have multiple gestations, who have unintended pregnancy and who have a history of delivering LBW previous, history of miscarriage younger and older age of mother and health status of mother have an increased risk of delivering LBW baby(7-11).

LBW might constitute the single most important factor affecting neonatal mortality and morbidity, as evidenced by the fact that LBW babies are 40 times greater contributors to neonatal mortality and morbidity (12).

Even if an LBW baby survives, it likely to suffer a high incidence of malnutrition, diarrhoea, acute respiratory infection, infectious disease, neurodevelopment problems such as cerebral palsy, and physical defects. In addition, LBW also determines the postnatal mental, physical, and neurological development of children (13). Lifelong problems include adult-onset diabetes, coronary heart disease, high blood pressure intellectual, physical and sensory disabilities, and psychological and emotional distress (14).
LBW babies usually need extra hospital care, and there is a constant concern and uncertainty over future health outcomes however, little attention is paid to birth weight improvement as a means of reducing child mortality (15).

On the other hand, even though in Ethiopia infant mortality rate of 59/1000 live birth and neonatal mortality rate decreased from 49 deaths per 1,000 live births in 2000 to 39 deaths per 1,000 live births in 2005, still One in every 17 Ethiopian children dies before the first birthday, and one in every 11 children dies before the fifth birthday it has since remained stable at 37 deaths per 1,000, Prevalence of low birth weight 11% as reported in the 2011 EDHS (16).

Despite of limited data on birth weight estimates as most deliveries take place at home leading to a highly biased maternal subjective inclusion of a “very small baby” in the reports (17). Hence, this study aims to objectively assess the prevalence and associated factors of LBW among neonates delivered at Debremarkos referral hospital.

**Methods**

**Study design, area and period**

Institution based cross sectional study was carried out. The study was conducted in Debre Markos referral Hospital (DMRH), situated at Debre Markos town in East Gojjam Zone, Amhara National Regional State. The town is located 300 km far from the capital city of Ethiopia, Addis Ababa and 265 km from Bahirdar, a city of regional state. The Hospital provides health service to more than 3.5 million populations. This cross sectional study design was conducted in Debre Markos referral hospital from March 10 to April 30, 2014.

**Source and study population**

All live births in Debre Markos referral hospital during study period were the source population, and the study population was all live births at 28 weeks of gestational age during the study period.

**Sample size and sampling procedure**

Sample size was calculated using single proportion formula assuming a 17.1% proportion of LBW (from previous study in Ethiopia (18) at a 95% confidence limit, 5% margin of error and adding 10% as contingency for non-response. The following formula was used to calculate the sample size.
Where $z = \text{confidence interval (with 95\% level of certainty)}$

$w = \text{margin of error (5\%)}$

$p = \text{assuming 17.1\% proportion of low birth weight (from previous study in Ethiopia (18)}}$

\[ n = \frac{Z^2 \cdot \bar{p} \cdot (1 - \bar{p})}{\frac{w^2}{2}} \]

All mother who delivered a live birth in Debre Markos referral hospital during data collection period were invited for interview. Participants were selected from mothers who have live birth after 28 weeks of gestation at the hospital during the study period by using systematic random sampling methods from 480 neonates after calculating and getting intervals ($k^{th} = 2$).

**Inclusion and Exclusion criteria**

All alive births after 28 weeks of gestation at DMRH during the study period were included in the study. Mothers who were seriously ill and neonates with congenital malformation were excluded from the study.

**Variables of the study**

The dependent variable of this study was low birth weight of new born babies, and the independent variables were; socio-demographic factors, like; education, age, residence religion, marital status, income, distance, ethnicity, family size, occupation, educational status. Nutritional status, health service (ANC follow up, family planning), present obstetric history: parity, gravidity, birth spacing, gestational age, past obstetric history: abortion, multiple pregnancy, maternal clinical factors; like hypertension, HIV, and hepatitis.

**Data collection techniques**

The data was collected by using a structured questionnaire prepared to address all the important variables. The questionnaire was adopted from different literatures which were developed for similar purpose done by different authors.

Data was collected by three nurses in the obstetric ward of Debre Markos referral Hospital. Training on the standard procedures of weight measurement and interview was provided to data collectors. Each
new born recruited was weighed only once, soon after delivery. Maternal information was collected just before discharge. Birth weights and their codes were recorded together so as to provide a link to the maternal interview results. Pre-test was done on 5% (12) of sample size for accuracy of assessment of tools. Data collection process was supervised by one midwife and by principal investigator. Furthermore, each questionnaire was reviewed daily by supervisors and the principal investigator to check for completeness and consistency of the collected data.

**Data analysis**

Each questionnaire was given a unique code by the principal investigator and the principal investigator prepared the template and entered data using Epi-data version 3.1 and exported to SPSS version 16 statistical package for windows software for analysis. Data was cleaned for inconsistencies, and missing value. Frequency, mean and proportions were computed for description of the study population in relation to socio-demographic and other relevant variables. Significance was determined using crude and adjusted odds ratio with 95% confidence intervals. To assess the association between the different predictor variables of low birth weight with the dependent variables, binary relationships were investigated using a binary logistic regression. Factors with a p-value < 0.25 in the bivariate analysis were further entered into the multivariate analysis to control for potential confounders. Odds Ratio (OR) was used as a measure of association and p-values < 0.05 were taken as statistically significant. The results were presented in the form of tables, percentage and frequency.

**Ethical considerations**

Ethical clearance for this study was obtained from Debre Markos University, research review committee and supporting letter was written to DMRH. After telling the purpose and objective of study informed, verbal consent was obtained from each study participant. Participation was based on voluntary basis and they can withdraw from the study at any time if they were not comfortable about the interview. In order to keep confidentiality of any information provided by study subjects, the data collection procedure was anonymous. Mother who has low birth weight was obtained health education about new born care and possible intra referral to neonatology ward.

**Results**

A total of 237 neonates and mother pairs were involved in this study with a response rate of 99.6%. Majority of respondents age, 192(81%) were between 20-34 years of age, 28 (11.8%) were greater than 35, and 17 (7.2%) were less than 20 years of age. The range between 17 - 40 years with a mean of
26.7±5 years. More of them were urban dwellers 135(57%) remaining of them were 102(43%) were rural dwellers (Table 1). 

Majority, 235(99.2%), of respondents were Amhara ethnics the remaining were Oromo 2(0.8). Among women who gave birth 214 (90.3%) were married, while 12(5.1%) were married but separately exist, while 11(4.6%) were single. Majority, 217(91.6%), were Orthodox Christian followers. Analysis of educational status of mothers showed that the majority of women’s, 88(37.1%) were secondary school and above, 73(30.8%) were cannot and write, 39(16.5%) were primary school completed, the rest 37(15.6%) can read and write. And majority, 86(36.3%) were farmers, 71(30%) were merchant, followed by government employees which accounts 31(13.1%) (Table 1).

Medical and obstetric profile of study participants

Among mothers, 110(46.4%) were primigravida and 11(4.6%) of women were grand multiparous (number of pregnancy five and more). Regarding to parity, 56(32.6%) of women gave 2-4 birth, 60(25.3%) gave one birth before the actual data collection period.

The mean of gravidity and parity were 2.3 ± 1.6 and 2.1 ± 0.8 respectively. The mean gestational age was 38.5 weeks ± 2.1 weeks whereas the mean weight of new born was 2920 ± 545.2 gram. More than three quarters of women`s gestational age were 195(82.3%) greater than or equal to 37 weeks (term or post pregnancy), 42(17.7%) women’s gestational age were less than 37 weeks (preterm pregnancy) (Table 2).

Among weighted new born, 44(18.6%) were low birth weight. satisfactory number of participants 210(88.6%) had history of ANC follow up, of which 131(55.3%) had at least 2-4 visits during the current pregnancy, 60(25.3) had at least five times while the remaining 22(9.3%) of them had only once ANC follow up. And above half, 165(69.9%) of women said they were obtained dietary counselling during this current pregnancy. Among participants the mid arm circumference (MUAC) of 162 (68.4%) were greater than or equal to 23 centimetre and 75 (31.6%) of women had MUAC less than 23 centimetre. Among the participants, 175(73.8%) women said they used contraceptive before this pregnancy, but the remaining 72 (30.4%) of them didn’t use any contraceptive before this pregnancy (Table 2).
Factors associated with Low Birth Weight

By using binary logistic regression gestational age, history of antenatal follow up during this pregnancy, illness during current pregnancy, mid upper arm circumference of mother, haemoglobin of mother, educational status and dietary counselling during pregnancy were found to be associated with low birth weight.

However, history of antenatal care follow up, haemoglobin of mother, educational status and dietary counselling during current pregnancy through multiple logistic regressions were not associated with low birth weight.

The results of multiple logistic regression analysis (Table 3) also showed that a significant association of low birth weights with gestational age, those mothers who had illness during current pregnancy and mothers who had mid upper arm circumference less than 23 had high proportion of LBW babies or more likely to deliver low birth weight babies and the difference were statistically significant at (p –value < 0.006, <0.038 and <0.001) respectively.

Gestational age less than 37 weeks were 3.6 times (AOR=3.6, 95%CI 1.5, 9) more likely to be delivered low birth weight than those new born greater than or equal to 37 weeks of gestation. Those women who had illness during current pregnancy (PIH, PROM, APH) were 2.9 times (AOR=2.9, 95%CI= 1.1, 7.7) more likely to deliver low birth weight baby as compared with those women’s who had no illness during current pregnancy. Mothers who had mid upper arm circumference less than 23 centimetre were 4 times(AOR =4,95%CI= 1.8,8.9) more likely to deliver LBW babies as compared as with those mothers who had mid upper arm circumference greater than 23 centimetre (Table 3).

Discussion

The finding of this study revealed that the prevalence of LBW was 18.6%. This is higher than the research done in the national 2005 and 2011 EDHS values of LBW by measurement (14.6%, 11%) respectively (16). The finding is almost similar when comparing with research done in Gondar referral hospital southwest Ethiopia (17.1%) (19), but it is lower than the research done in Jimma and Ashanti Region of Ghana (22.5%, 21.1%) respectively (20, 21). The prevalence of LBW varies from 3% in countries such as Iran to 40% in some country like India (22, 23). This difference may be explained by the difference in socio demographic characteristics and the time gap between these studies.
However, this study found out a higher prevalence of LBW compared to other hospital based studies in other countries which reported a LBW prevalence ranging between 6.3% and 12.6% like Iran, Vientiane Japan, Tehran, Niger, Turkey, Gambia, and Malaysia (24-30). The difference might be due to the fact that, mothers in these countries may have better disease screening and prevention practice and also there might be difference in nutritional status before, after, or/and during pregnancy between these countries and mothers in the current study area.

This study also assessed factors associated with low birth weight among the study participants. Accordingly the study found that; gestational age less than 37 weeks, illness during the current pregnancy and mid upper arm circumference of the mother were independently and significantly associated with LBW.

The odds ratio of the women’s who had gestational age less than 37 weeks, had 3.6 times more likely to deliver a low birth weight baby as compared with those who delivered at gestational age greater than or equal to 37 weeks. This result was in line with other studies conducted in Jimma, Malaysia and India (20, 27, 30).

This study didn’t show association between family income and LBW, which is different from previous study findings (23, 31). This may be related to the sampling method used in this study or difference in the socio economic characteristics, which need further investigation. In this study the delivering of LBW babies was found to be significantly higher in mothers who had illness during current pregnancy than those who had no illness. This could be due to the effect of maternal ill health condition on the growth and development of the foetus, which results in LBW. This finding was in line with other studies done in Gondar hospital, Gambia, Teharn, Niger and Malaysia (21, 26, 27, 29, 30).

Mothers with MUAC less than 23 centimetres were 4 times more likely to delivery low birth weight as Compared with those women with MUAC greater than 23 centimetres. Similar finding was also reported from the study done on an observational cohort study on pregnant women on determinants for Low Birth Weight in Kersa, Ethiopia (32).

**Conclusion**

The prevalence of LBW in this study was relatively higher. Gestational age less than 37 weeks, MUAC, illness during current pregnancy were found to be associated factors of the LBW in the studied area.
The factors associated with low birth weight were closely related to socio demographic status and obstetric care utilization; which include gestational age less than 37 weeks, illness during the current pregnancy and mid upper arm circumference of the mother. Improving the nutritional status of women particularly pregnant women would reduce the occurrence of LBW.

**Recommendations**

Low birth weight is still a public health problem. Based on the above findings, the following recommendations are forwarded.

- Improving health care of pregnant women should be considered.
- Population based studies covering a larger area and population should be conducted in order to obtain more information regarding Low birth weights and its determinants.
- Nutritional counselling should be provided for non-pregnant and pregnant reproductive age women.
- Mothers should be encouraged to start and continue antenatal care visits, and early detection and treatment of pregnancy related diseases should strengthened during each visit.
- Prevention of malnutrition and improving the nutritional status of women particularly pregnant women should be considered.

**Competing interests**

The authors declare that they have no competing interests.

**Authors' contributions**

AA, MA, and GT participated in the design, data collection, and participated in data analysis and interpretation. GM and GT participated in the interpretation of data, and drafting of the manuscript. All authors read and approved the final manuscript.
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