

A Review of Low Birth Weight in Ethiopia: Socio-Demographic and Obstetric Risk Factors

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Abstract

Background: Neonatal morbidity and mortality, particularly relating to the low birth weight babies is still high in Africa, including Ethiopia. Most newborn deaths are among low birth weight babies. In 2013, birth asphyxia (34%) and prematurity (25%) were causes of neonatal mortality in Ethiopia, which are the most common causes for low birth weight. Therefore, this review aimed to document the main risk factors for low birth weight in Ethiopian studies.

Methods: The reviewed articles were accessed through web-based search from PubMed, MEDLINE, HINARI and Google Scholar.

Results: Socio-demographic (maternal education level, occupation, income and place of residence), maternal/obstetric (maternal age, antenatal care visit, maternal weight and stature, preterm birth and parity), obstetric and medical disorders during pregnancy (hypertensive disorders of pregnancy, anemia and malaria) and fetal factors (infant sex and congenital malformations) are the common risk factors for low birth weight in Ethiopia.

Conclusion: Health education and information on maternal nutrition, use of psychoactive substances and providing social support during pregnancy are important interventions to improve birth weight in Ethiopia.

Keywords: Socio-demographic factors; Maternal factors, Environmental factors, Ethiopia

Abbreviations: LBW: Low birth weight; USD: United States Dollar; ANC: Antenatal Care

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Introduction

The World Health Organization (WHO) defined low birth weight (LBW) as birth weight of less than 2500 grams at birth. Classifications of LBW babies include low birth weight (less than 2500 grams), very low birth weight (less than 1500 grams) and extremely low birth weight (less than 1000 grams) [1].

Globally an estimated 13 million babies are born before 37 completed weeks of gestation. This figure is high among middle and low income countries [2]. According to reports of WHO, 16 million adolescent girls gave birth each year. Babies born from these mothers accounting 11% worldwide; 95% in developing countries. The newborns of adolescent mothers are also more likely to have LBW, with the risk of long-term effects [3]. More than 20 million LBW infants are born each year in the developing world. Incidence of LBW ranged from 6% to 18% across the globe with sub-Saharan Africa accounting 13% to 15% [4].

LBW is the result of either intrauterine growth restriction or premature birth. LBW is the main cause of fetal/neonatal morbidity and mortality. Later in life, it can be highly associated with chronic diseases and inhibited growth and development including poor academic achievement [5].

Multiple gestation, mothers' body composition during conception, maternal short stature, residing at high altitudes, maternal nutrition during pregnancy including life style (substance or drug abuse) and medical disorders during pregnancy including hypertensive disorders were risk factors of LBW babies. Additionally, mothers with low socio-economic status are prone to infections from poor nutrition, thus birth weight will decrease [6].

The 2011 demographic health survey of Ethiopia (EDHS) showed that 29% of Ethiopian babies weigh low as perceived by their

mothers (not weighed) [7]. In 2013, birth asphyxia (34%) and Prematurity (25%) were causes of neonatal mortality in Ethiopia which are the most common causes for LBW [8].

Methods and Materials

Search strategy

A review of literature was conducted on risk factors of low birth weight in Ethiopia during March 2017. We searched electronic databases (PubMed, MEDLINE, HINARI and Google Scholar) using key words such as 'low birth weight', 'risk factors', 'predictors' and 'Ethiopia'. The Boolean logic (AND, OR) search technique was also used.

Selection of studies

All epidemiologic studies (cross-sectional, case-control, cohort) published between 2006 and 2016 were included in this review. Only published and English language literatures were included. Initially, titles and abstracts of the articles were assessed for relevance. Then the full papers of relevant articles were reviewed. Articles without full paper have been excluded from the review.

Results

Magnitude of low birth weight

Neonatal morbidity and mortality, particularly relating to the LBW babies is still unacceptably high in the Sub-Saharan including Ethiopia. LBW was associated with increased odds of perinatal mortality in some regions of Ethiopia [9].

In Ethiopia, 15% of babies were reported to be LBW in 2000 [4]. In 2011, the prevalence decreased to 11%. However only 5% of children were weighed at birth [7]. In Ethiopia, in 2014, there were 27,243 deaths due to low birth weight accounting 4.53% of the total deaths [10].

Descriptive studies conducted in Gondar, Tigray region and Jimma zone of Ethiopia reported 11.2%, 14.6% and 22.5% prevalence of low birth weight respectively [11-13]. Another cross-sectional studies conducted in University of Gondar referral hospital reported that the prevalence of low birth weight was 17.1%. [14] Cohort studies showed 18% and 28.3% prevalence of low birth weight in Ethiopia [15,16].

Risk factors of low birth weight

Different descriptive and analytical studies showed the common risk factors for low birth weight in Ethiopia are preventable causes. In this review, the risk factors for low birth weight are categorized as socio-demographic factors, maternal and other obstetrical factors, hypertensive disorders of pregnancy and other medical disorders during pregnancy, fetal factors and environmental factors. Each risk factor are described as follows (Table 1).

Socio-demographic risk factors

Some epidemiological studies conducted in Ethiopia showed association of socio-demographic factors with LBW. Deprived socio-economic status can increase the incidence of LBW. In-depth analysis of the 2011 EDHS revealed maternal literacy level,

paternal educational status and presence of radio/television in the household were predictors of LBW [17]. According to the 2011 EDHS, low birth weight was more common among children of the youngest mothers, age less than 20 (13%) and older mothers, age 35-49 (17%), and children of birth order six and above (16%). In Amhara region, 28% of babies reported to be small and the factors associated with LBW were place of residence, educational status and economic status [7].

Another case-control study in Oromia regional state of Ethiopia showed monthly income <26 United States Dollar (USD), lack of formal education and being merchant were associated with LBW [18]. Mothers residing in rural areas were also more likely to have small babies than their urban counterparts [12,18]. Observational cohort studies conducted in Southern, Oromia regions of Ethiopia highlighted maternal illiteracy, and poverty and longer time to walk to the nearest health facility were predictors of LBW infants [15,19].

Maternal and other obstetric risk factors

Different studies showed that, obstetric characteristics of mothers play a role on occurrence of LBW. Primiparity, short maternal stature and maternal thinness were found to be predictors of LBW [14,19]. A cohort study conducted in Kersa district showed maternal Mid Upper Arm Circumference (MUAC) less than 23 cm was associated with LBW [15].

Lack/infrequent of antenatal care follow-up was associated with LBW [14,15,18]. Other maternal factors including maternal body mass index <18 kg/m², maternal height <1.5 m and inter-pregnancy interval <2 years were predictors of LBW [18]. A prospective study done in southwest Ethiopia showed unwanted pregnancy as risk factor for LBW [16]. In a study conducted from Tigray region and Gondar University referral hospital History of preterm delivery, current preterm baby were factors associated with LBW [11,12]. Maternal age at delivery (less than 20 years) was also associated with LBW [17,18].

Obstetric and medical disorders as risk factors for low birth weight

LBW is highly associated with hypertensive disorders of pregnancy (HDP) because these multi organ disorders can cause intrauterine growth restriction (IUGR). Epidemiologic studies conducted in Mettu karl and University of Gondar referral hospitals showed association of HDP with LBW [11,16]. Additionally, LBW was significantly associated with anemia during pregnancy(17), presence of any medical illnesses [12,18], being HIV positive [14] and prenatal depression [16].

Fetal risk factors

A prospective cohort study conducted in Sidama zone of Ethiopia revealed female sex of a newborn as risk factor for LBW [19]. Cohort studies conducted in Mekelle and Mettu showed LBW was significantly associated with congenital malformations or other adverse fetal outcomes [20,21].

Environmental and life style risk factors

A case-control study conducted in Bale zone of Oromia regional

Table 1 Summary of risk factors for low birth weight, Ethiopia. 2006-2016.

Risk factors for LBW	Studies
Anemia, lack of ANC, maternal age, literacy level, paternal education, absence of radio/television	Alemu and Umeta. et al. [17]
Maternal age at delivery <20 years, monthly income <26 USD, lack of formal education, being, residing in rural area	
Occurrence of health problems during pregnancy, maternal body mass index <18 kg/m ² , maternal height <1.5m, inter-pregnancy interval <2 years, absence of antenatal care, history of khat ,	Demelash H. et al. [18]
Using firewood for cooking, using kerosene for cooking, wash hands with water only and not having separate kitchen room	
Rural place of residence, preterm birth, presence of any chronic medical illness, maternal weight	Gebremedhin M. et al. [12]
Poverty, maternal Mid Upper Arm Circumference (MUAC) less than 23, not attending ANC	Assefa N. et al. [15]
Mother's experience of physical violence during pregnancy, and longer time to walk to health facility	
Maternal illiteracy, female sex of the newborn, primiparity, short maternal stature and maternal thinness	Gebremedhin S. et al. [19]
First delivery, lack of antenatal care follow up or infrequent visits and being HIV positive	Zelege BM. et al. [14]
unwanted pregnancy	Wado YD. et al. [16]
history of delivering preterm or small baby, preterm birth and hypertension	Akilew AA. et al. [11]
Congenital anomalies	Mekonen HK. et al. [20]
Pregnancy related hypertensive disorders	Seyom E. et al. [21]
Intimate partner violence	Demelash H. et al. [22]

state revealed using firewood/ kerosene for cooking, wash hands with water only and not having separate kitchen room were risk factors for LBW [18]. Mother's experience of physical violence or intimate partner violence during pregnancy had LBW newborns [15,22]. Lack of social support during pregnancy was also associated with low birth weight [16]. History of khat chewing was associated with LBW in one study [18].

Discussion

According to the UNICEF and EDHS reports the prevalence of LBW in Ethiopia estimated to be 15% and 11% respectively [4,7]. Additionally, different epidemiological studies showed 11.2%, 14.6%, 17.1%, 18%, 28.3% and 22.5% prevalence's of LBW in different parts of the country [11-16]. Similar findings were reported in studies done in Kenya (12.3%), Tanzania (13.6% & 14%), Central Africa (9%-23%) and Chennai (25.8%) [23-27]. Higher prevalence of low birth weight was reported in a study conducted in Nigeria (45%) [28]. The difference is due to inclusion of only malaria patients in the Nigerian study.

Different Ethiopian studies and national reports showed deprived socio-economic status was associated with increased risks of LBW. Maternal literacy level, paternal educational status and presence of radio/television in the household, maternal age, birth order, place of residence, economic status and time required to the nearest health facility were some of the socioeconomic risk factors for LBW [7,12,18,19,29]. One Tanzanian study showed maternal educational status and marital were associated with LBW [27]. Additionally, different systematic reviews and meta-analyses revealed deprived socio-economic status (educational level, occupation, income, marital status and extremes of maternal age) as risk factors for LBW in developing countries [24,30-32]. Another review also noted socio-demographic deprivation was associated with adverse birth outcomes [33]. This might be an

indication of empowering women through education and work opportunities.

In Ethiopia, different studies showed that, obstetric characteristics of mothers play a role on occurrence of LBW. Primiparity, short maternal stature, Maternal thinness, history of preterm birth, maternal age during delivery, Maternal Mid Upper Arm Circumference (MUAC) and lack/infrequent of antenatal care follow-up were factors associated with LBW [11,12,14,15,18,19,29]. Other maternal factors including maternal body mass index <18 kg/m², maternal height <1.5 m and inter-pregnancy interval <2 years were predictors of LBW [18]. A prospective study done in southwest Ethiopia showed unwanted pregnancy as risk factor for LBW [16]. Cross-sectional studies in Kenya and Tanzania showed significant association of LBW with previous history of low birth weight infant, premature rupture of membrane, preterm delivery, BMI and ANC visit [26,27]. Other systematic reviews by Kramer [30] and Özaltın et al. [34] identified pre-pregnancy maternal weight, parity, gestational weight loss/deprived caloric intake and maternal short stature as risk factors for LBW. Micronutrient and folic acid supplementation and physical activity during pregnancy were associated with increased birth weight [31,35]. The total weight gain recommended for healthy pregnant women is 25 to 35 lb. Underweight women may gain up to 40 lb [36]. This indicates the need of prenatal care and nutritional supplementation during pregnancy.

Epidemiologic studies conducted in Mettu karl and University of Gondar referral hospitals of Ethiopia showed association of HDP with LBW [11,16]. Additionally, LBW was significantly associated with anemia during pregnancy [29], presence of any medical illnesses [12,18], being HIV positive [14] and prenatal depression [16]. One study conducted in Tanzania noted preeclampsia/eclampsia, thromboembolic diseases, antepartum hemorrhage

(placenta previa and abruption placenta) and tuberculosis were associated with increased odds of low birth weight [27]. Anemia [24,27,37-39] and malaria [27,28,30,40] during pregnancy were also highly associated with risk of LBW. Another systematic review revealed depression as risk factor for LBW [41]. Vasoconstriction resulted from activation of thromboxane A_2 is believed to decrease utero-placental perfusion and subsequent occurrence of IUGR during hypertensive disorders of pregnancy [42]. Early recognition and management of complications during prenatal period is important.

Fetal factors like female sex of newborn, congenital malformations and other adverse fetal outcomes as risk factors for LBW in Ethiopia [19-21]. Additionally, Systematic review of case-control studies showed association between periodontal diseases with low birth weight [43]. A cross-sectional study in Kenya [26] and one review [30] showed significant association of infant sex with LBW. This may be due to the effect of Y-chromosome on weight of male fetus. Genetic screening to detect heterozygotes in the non-pregnant and, if not already evaluated, in the pregnant population is appropriate [36].

Use of firewood/ kerosene for cooking, wash hands with water only and not having separate kitchen room were environmental risk factors for LBW in one Ethiopian study [18]. Moreover, mother's experience of physical violence or intimate partner violence during pregnancy increased odds of low birth weight newborns [15,22]. Lack of social support during pregnancy was also associated with LBW [16]. History of khat chewing was associated with low birth weight in one study [18]. A meta-

analysis of determinants of LBW highlighted cigarette smoking, alcohol consumption, tobacco chewing and in utero exposure to diethylstilbestrol as predictors of LBW in developing countries [30]. Use of psychoactive substances (i.e., smoking) during pregnancy is associated with increased small size for gestational age as well as increased prematurity rate. The higher perinatal mortality rate associated with use of these substances is attributable to intrauterine growth restriction [44]. This could be an indication for health education to pregnant mothers about the effects of substances to the fetus.

This review showed that the magnitude of low birth weight in Ethiopia is high. Therefore, health education and information on maternal nutrition, use of psychoactive substances and providing social support during pregnancy are important interventions to improve birth weight in Ethiopia.

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Author contributions

NBY: retrieved and synthesize literatures. MLL and MAM: assist in drafting the review. NBY: revised the paper critically. All authors read and approved the final manuscript.

Disclosure

Authors of this review declared that they have no any conflict of interests.

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