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## **Assessment of maternal factors associated with low birth weight at a tertiary care hospital of South India - an exploratory study.**

### **Cover Page Footnote**

The authors acknowledge the support and guidance provided by Yenepoya University. We also thank the study participants for their cooperation.

# Assessment of maternal factors associated with low birth weight at a tertiary care hospital of South India - an exploratory study.

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## Abstract

**Introduction:** Low birth weight is a major public health problem in many developing countries. Though the causes are multiple, maternal factors of low birth weight are significant. A large number of infant deaths can be prevented if these factors are identified early, and prompt management of low-birth-weight babies will save a life. The objective of this study is to identify the maternal factors associated with low birth weight in newborns among postnatal mothers. **Method:** An exploratory research design was adopted to assess the maternal factors associated with low birth weight in newborns. Non-probability convenience sampling technique was used to recruit 79 mothers of babies whose birth weight is less than 2,500 gm at 37 weeks' gestation admitted to a tertiary care hospital. A checklist was used to identify maternal factors contributing to low birth weight and data analysis was done by descriptive statistics. **Result:** The maternal factors associated with low birth weight in this study were found to be mothers' weight < 45 kg (64.6%), height < 146 cm (53.2%), psychological stress during pregnancy (84.8%), consumption of excess junk food during pregnancy (64.6%), family history of low-birth-weight babies (50.6%) and haemoglobin level less than 12 gm/dL during pregnancy period (68.4%). **Conclusion:** There are significant preventable maternal factors associated with low birth weight in newborns. Health professionals should create awareness among pregnant women so that these factors could be addressed at the earliest.

*Keywords:* exploratory study, Low Birth Weight (LBW), maternal factors, newborn, South India.

## Introduction

Birth weight is an important determinant of survival, growth, and development in children (Wilcox, 2001). According to World Health Organization (WHO), if the infant's weight is less than 2,500 gm at birth then it is considered a Low Birth Weight (LBW). Around 15% to 20% of all births worldwide are LBW (WHO, 2012). LBW is an important indicator of reproductive health and the general health status of the population. It may

lead to impaired growth of the infant and is associated with increased mortality, morbidity, impaired mental development, and chronic adult disease. Infants who weigh less than 2,499 gm at birth are twenty times more at risk of neonatal death than those who weigh more than 2,500 gm (Choudhary et al., 2013).

In 2015, it was reported that there are around 20.5 million LBW live births worldwide, out of which nearly three quarters are seen in Southern Asia and Sub-Saharan Africa (Blencowe et al., 2019). LBW accounts for a high load of morbidity and mortality among children in India. The main causes are preterm births and intrauterine growth retardation. Yearly, India sees the birth of almost 8 million LBW babies and 2.7 million preterm babies (Deshpande et al., 2011).

There are various factors contributing to LBW, including maternal and foetal, where the maternal

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factors are biologically and socially interrelated. Studies have shown that the gestational age of the newborn, maternal age and socioeconomic status are the main causes of LBW. Other factors like maternal height, weight, and paternal height also influence low birth weight. Nutritional factors like food consumption as well as weight gain during pregnancy, and psychosocial factors like the psychological make-up of the mother during pregnancy can also lead to LBW. Physical activity, the health status of the mother, previous obstetric history, the details of previous pregnancies as well as any previous adverse outcomes, smoking as well as passive smoking, maternal morbidity during pregnancy, complications during pregnancy, and inadequate antenatal care are the other leading causes for LBW (WHO, 2012).

The study indicates that the education level of the mother, place of residence, occupation, income, maternal age, antenatal visit, maternal weight and stature, preterm birth and parity, obstetric and medical disorders during pregnancy [hypertensive disorders of pregnancy, anaemia, and malaria] could also lead to LBW (Bililign et al., 2018). Yet another study reported that LBW is also associated with other socioeconomic factors such as residence [urban/rural areas], mother's age, occupation, birth order of the child, family income and many maternal conditions such as nutritional status, mother's educational and health status (Siza, 2008). Low maternal food intake and illness, especially infections were found to be the factors leading to preterm delivery and foetal growth retardation associated with LBW. The short maternal stature, very young age, high parity, and close birth spacing were also reported to be the associated factors (Rajaeefard et al., 2012).

Maternal anaemia has also been found to have an impact on the risk of LBW, preterm birth and perinatal or neonatal mortality in low and middle-income countries. In low-income countries, maternal anaemia during pregnancy contributes to 25% of LBW (Rahman et al., 2014). Early teenage marriages, inadequate spacing between pregnancies, malnutrition during the antenatal period, fewer antenatal visits, bad obstetrics history, and complications in pregnancy due to various medical

diseases, maternal infections are the leading factors contributing to LBW (Johnson et al., 2016).

### **Objective**

The objective of this study was to assess the maternal factors associated with low birth weight.

### **Materials and methods**

It was a cross-sectional exploratory study that was approved by the institutional ethics committee (Protocol No YEC 2/139). The study was conducted in a 1,050 bedded multi-speciality, tertiary care hospital where around 3,000 deliveries take place annually, which include approximately 2,000 to 2,100 normal deliveries and the rest of the caesarean section. Among these, around 120 to 130 babies born were LBW. The study population consisted of postnatal mothers. Using the non-probability convenience sampling technique, 79 mothers who delivered at 37 weeks of gestation and had a birth weight of a baby less than 2.5 kg were selected for the study. Mothers who were sick requiring emergency/intensive care, mentally ill and with twin/multiple gestations were excluded. The variables under study were the demographic characteristics of mothers and maternal factors associated with LBW.

Investigators developed a structured questionnaire for the study after a thorough literature survey. The demographic proforma and structured checklist were prepared. The structured checklist had closed-ended questions requiring binomial scale responses. The demographic proforma consisted of 10 items and the structured checklist included 27 items consisting of the maternal factors contributing to LBW among newborns. The questionnaire was peer-reviewed and pretested. Participants did not express difficulty in understanding the items. The tools were found to be reliable.

Written permission was obtained from the concerned authority to conduct the study. Informed consent was taken from the study participants prior to data collection. The investigators ensured that the collected data were complete. Anonymity and confidentiality were maintained. Data analyses were performed using SPSS statistical software.

## Results

The study result showed that 30.4% of mothers were more than 35 years old, 49.4% had no formal education, 74.7% were belonging to BPL (Below Poverty Line) families, 50.6% were from a nuclear family, 82.3% were homemakers, 64.6% were primi mothers, 69.6% delivered by caesarean section, 77.2% had a birth interval of  $\leq 3$  years.

Figure 1 shows the maternal factors identified that were associated with low birth weight. It is seen maternal age  $> 35$  years, the weight of mother  $< 45$  kg, height of mother  $< 146$  cm, experience of psychological stress during pregnancy, consumption of junk food in excess during pregnancy, family history of low birth weight babies, and haemoglobin (Hb) level less than 12 gm/dL during pregnancy period are the maternal factors associated with LBW.

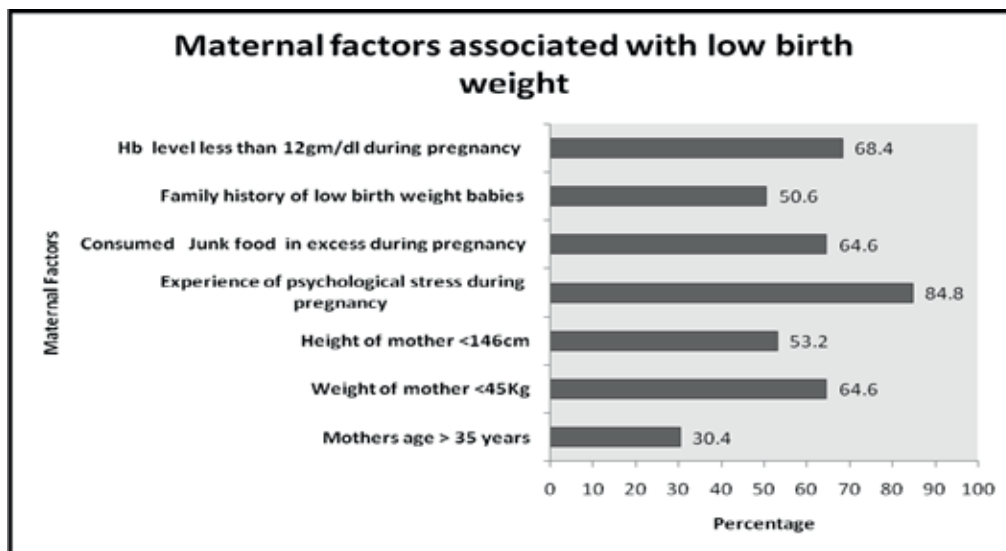


Figure 1. Maternal factors associated with low birth weight

## Discussion

Globally, over the past years, the standard of living has been improved as well as the government has allocated increased funds for healthcare. This has led to a decrease in the incidence of LBW in the world. But in India, there is not much change in this scenario. The reasons for this could be socio-demographic factors, maternal obstetric factors, foetal, genetic, and idiopathic factors as well. In India, one of the factors could be economic constraints.

The various factors which had a significant impact on LBW babies in the current study were mothers age  $> 35$  years, the weight of mother  $< 45$  kg, height of mother  $< 146$  cm, experience of psychological stress during pregnancy, consuming junk food in excess during pregnancy, family history of LBW babies and Hb level  $< 12$  gm/dL during pregnancy period.

These findings were supported by many studies. It was reported in studies that mothers  $< 20$  years and  $> 35$

years of age were having more risk to deliver babies with LBW (Dickute et al., 2002; Gebremedhin et al., 2015). Yet another study reported that the incidence of low birth weight is more in mothers with  $< 20$  years of age (Johnson et al., 2004).

Mothers' height and weight are the other common maternal factors leading to LBW. The present study has shown that mothers with weight  $< 45$  kg and height  $< 146$  cm are at risk for LBW babies. To support this, a study has revealed that maternal weight  $< 50$  kg is associated with LBW (Gebremedhin et al., 2015). It was also reported that a mother weighing  $< 45$  kg is more prone to delivering LBW babies (Johnson et al., 2004).

More prevalence of LBW has been seen among anaemic mothers. Anaemia affects maternal oxygen uptake, decreases oxygen delivery to the foetus (Hutter et al., 2010) and consequently leads to foetal growth restriction (Ream et al., 2008; Mahajan et al., 2004). The

present study says mothers who did not maintain their haemoglobin > 12 gm/dL have LBW babies. Literature (Fosu et al., 2013; Pawar et al., 2017; Prudhivi et al., 2015; Sharma et al., 2015) has supported these findings and hence it is proven that low haemoglobin in mothers is a risk factor for LBW babies.

Maternal nutritional status has been demonstrated to be an important determinant of birth weight (Sharma et al., 2015; Deshpande et al., 2011). Among the participants of the present study majority (64.6%) had consumed junk food in excess during pregnancy, which could be a diet of low nutrition. Previous research has reported that the consumption of a nutritious diet during pregnancy influences the birth weight of the baby (Gresham et al., 2014). Poor nutrition during pregnancy leads to foetal undernutrition and deficiency of several micronutrients which are necessary for the growth and development of the foetus (King, 2003; Fall et al., 2003).

Among the study participants, the majority had a family history of LBW babies. The present study has also identified that birth interval  $\leq 3$  years is also a risk factor for LBW. This finding has been also presented in previous studies where they found a cent per cent association between the birth interval and LBW, where the incidence of LBW was high when the birth interval was less than 2 years compared to the birth interval of more than 2 years. It is estimated that the mothers may take a minimum period of 2 to 3 years to gain back pre-pregnancy nutritional status and general health (Johnson et al., 2013).

Among the study participants, the majority were with no formal education (49.4%) and from BPL (74.7%). A study has reported that mothers living in low socioeconomic conditions lead to poor antenatal care and their area of residence has been identified as the maternal factor contributing to LBW (Fosu et al., 2013).

In the present study majority of the participants were primi mothers. A study (Johnson et al., 2000) has also shown that parity acts as a contributing factor for LBW and primipara mothers are more prone to deliver LBW babies.

## Conclusion

Nurses are the forefront members of the healthcare team. They play a key role in providing comprehensive nursing care to the patients admitted to the hospital, visiting the outpatient department and community settings as well. Nurse-midwives are the ones who provide comprehensive care to antenatal, intranatal, and postnatal mothers. They also play a major role in the prevention and management of LBW babies. The current study has elicited the maternal factors associated with LBW. One of the essential aspects in the prevention of LBW babies is early identification and management. Many of these maternal factors are modifiable. There comes the role of nurses to create awareness among the community regarding these aspects and conduct health education or health awareness among the people. It could be done with the help of audio-visual aids such as pamphlets, videos, written materials etc., based on the preference of mothers. In the present study, the researchers have developed an information pamphlet on maternal factors associated with LBW, validated the same and have distributed it to the public.

The use of a small sample size, a single postnatal unit of a rural-based tertiary care hospital, and specific urban and rural geographical areas and the assessment of only the maternal factors are the limitations for the generalization of the study results.

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