

## Original Research Article

# Examining maternal influences on low birth weight of baby: a study in Washim district

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### ABSTRACT

**Background:** This research investigated low birth weight (LBW) in Washim district, Maharashtra, India, recognizing its profound impact on infant health. With a prevalence of 13.3%, lower than state and national averages, the study focuses on maternal factors such as anemia, premature deliveries, and inadequate weight gain during pregnancy as contributors to LBW.

**Methods:** A cross-sectional study involving LBW infants and mothers was conducted in Washim district. The census approach (universal sampling) was employed in this study, encompassing the entire population of low birth weight babies born across all blocks in the Washim district and could be tracked by healthcare workers. This involved every eligible individual, eliminating the need for traditional sampling techniques. Data were collected from 6 Blocks, 153 Health sub-centers, and 25 primary health centers between April 1, 2022, and March 31, 2023, using a standardized questionnaire administered by healthcare workers. The study included 876 babies and mothers.

**Results:** Washim district reported a 13.3% LBW rate, lower than the state (20.1%) and national (17.8%) averages. High LBW incidence was noted among mothers with anemia (91.4%), premature deliveries (78.18%), and inadequate weight gain during pregnancy (average gain: 7.9 kg).

**Conclusions:** The study identified anemia during pregnancy, premature deliveries, and inadequate weight gain as primary contributors to LBW in the district.

**Keywords:** Anemia, Low birth weight, Maternal parameters, Premature birth

### INTRODUCTION

Birth weight is one of the key determinants of the newborn's health outcomes. Low birth weight babies are often prone to poor health outcomes and less chance of survival than their healthy counterparts. WHO defines low birth weight as the weight below 2500 grams at the time of birth regardless of gestational age.<sup>1</sup> Low birth weight babies have a high probability to become malnourished in later stages of life which leads to a higher proportion of SAM and MAM children in the community. Also, newborns with low birth weight are more prone for SNCU admission and consequent poor

outcomes. Low birth weight (LBW) is considered one of the significant public health challenges as it is a risk factor for early neonatal mortality and morbidity, particularly in developing countries.<sup>2</sup>

Washim is one of the aspirational districts in India who is competing with other districts in becoming best in state as per Aspirational district programme as launched by NITI Ayog. In 2021-22, 11.2% of the live births were reported as low birth weight babies as per data collected by district health office Washim. District administration had envisaged that reducing the burden of low-birth-weight babies in the district will lead to improvement in overall

health outcomes and to improve child health indicators in the district. Addressing the maternal factors responsible for low birth weight was considered essential to reduce the proportion of low-birth-weight babies.

LBW poses challenges not only in immediate health outcomes but extends its impact into cognitive development, educational attainment, and future productivity.<sup>3</sup> LBW is potential cost burden on the health system and households in the developed and developing countries.<sup>4</sup>

Therefore, this study aims to unravel the specific maternal determinants of LBW in Washim, employing a comprehensive cross-sectional approach. By identifying these factors, the research seeks to pave the way for targeted interventions to enhance maternal and child health in the region and beyond.

### **Aim**

The aim of this study was to identify maternal factors during pregnancy that are linked to the occurrence of low birth weight babies, with the intention of pinpointing areas for intervention to enhance pregnancy outcomes.

### **Objectives**

The objectives of this study were to investigate the maternal factors that contribute to the likelihood of low birth weight in infants and to assess the health outcomes associated with low birth weight babies

## **METHODS**

A cross-sectional study design was employed for this research with the primary objective of investigating the factors contributing to low birth weight in infants. A census approach was employed in this study, encompassing the entire population of low birth weight babies born across all 6 blocks in Washim district. This involved the inclusion of every eligible individual, eliminating the need for traditional sampling techniques. The decision to conduct a census was driven by the aim of achieving a comprehensive understanding of the factors contributing to low birth weight within the specified context.

The study included all reported cases of low birth weight babies born between April 2022 and March 2023 within the district. Auxiliary nurse midwives (ANMs) compiled lists of low birth weight babies from their respective sub-centers. Mothers of these identified low birth weight babies served as respondents for the study.

A comprehensive questionnaire was developed to gather information related to several key factors, including the socio-economic status of the mothers, their nutritional status during pregnancy, and indicators pertaining to antenatal care (ANC) and postnatal care (PNC). Google

Forms were utilized as the primary data collection tool and were distributed to all health facilities, streamlining and expediting data collection.

ANMs and community health officers (CHOs) received one-day training on the use of Google Forms and the tracking of low birth weight babies. This training equipped them with the necessary skills to effectively manage data collection and monitor low birth weight babies for up to six months after birth. ASHAs (accredited social health activists) were subsequently trained at the block level by ANMs to assist with data entry and management. The data collected from 876 mothers who had delivered low birth weight infants between April 2022 and March 2023 was exported into Microsoft Excel spreadsheets for further analysis.

The collected data underwent rigorous analysis to derive meaningful insights. Quantitative data was subjected to statistical examination using tools like Excel, enabling computations of descriptive statistics, correlations, and inferential tests where applicable. Power BI was employed for visual representation, providing clear graphical interpretations of trends and patterns. Qualitative data was analyzed through thematic coding, identifying recurring themes and nuanced perspectives.

This comprehensive methodology ensured the systematic collection, organization, and analysis of data, enabling the research team to achieve the objectives of the study and gain a deeper understanding of the factors influencing low birth weight in the district.

## **RESULTS**

34.2% of mothers belong to scheduled castes and scheduled tribes communities, while 47% come from other backward classes and VJ/NT communities. This data underscores the significant representation of marginalized and disadvantaged groups among mothers of low birth weight infants. A similar study conducted by Singh et al named prevalence and correlates of low birth weight in India: findings from national family health survey states Scheduled caste (18.66%) and scheduled tribe (17.81%) women were considered to be vulnerable to LBW infants.<sup>3,5</sup>

**Table 1: Distribution of mothers by caste category.**

Caste category	No. of mothers	Percentage
SC/ST	265	34.2
OBC	279	36.0
Open	139	17.9
VJ/NT	92	11.9

A mere 5.9% of mothers have attained education beyond the 12<sup>th</sup> standard, highlighting the significance of low education among mothers of low birth weight babies. Conversely, a majority, comprising 60.9%, have

completed education below the 10<sup>th</sup> standard. A similar cause was found in a study done by Sarika et al on the study of low birth weight babies and their association with maternal risk factors which showed the prevalence of low birth weight was higher in illiterate mothers (40.54%) when compared to literate mothers (18.28%).<sup>6</sup>

**Table 2: Mothers classification by education.**

Education of mother	Number	Percentage
Below 10 <sup>th</sup> standard	483	60.9
Below 12 <sup>th</sup> standard	263	33.2
Above 12 <sup>th</sup> standard	47	5.9

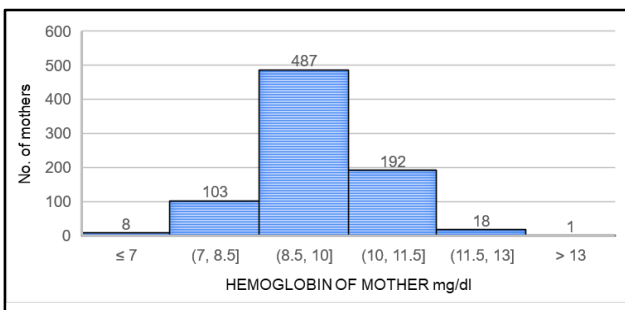
Only 14% of the heads of households are on salaried jobs while the remaining 86% are either manual laborers or farmers. It indicates that mothers from poor socio-economic sections are more prone to have LBW babies. A study conducted by Elaabsi et al named socio-economic and cultural determinants of mothers and fathers for low birth weight newborns in the region of Marrakech (Morocco) shows father's professional activity contributing to baby's weight support the similar.<sup>7</sup>

**Table 3: Occupation of fathers.**

Occupation of father	Number	Percentage
Manual labor	375	47
Farmer	302	38
Salaried employee/business	110	14

**Hemoglobin of mother**

Among the 809 participants, merely 69 mothers displayed hemoglobin levels above 11 mg/dl (91.5% mothers were anemic) hemoglobin levels of less than 11 gm/dl at any time during pregnancy are considered abnormal. During pregnancy, there is a correlation between iron deficiency anemia and adverse perinatal outcomes, which include premature labor, intrauterine growth retardation, low birth weight, birth asphyxia, and neonatal anemia.



**Figure 1: Mother's hemoglobin at first ANC visit.**

This finding highlights a significant prevalence of low hemoglobin concentrations among the studied mothers of low birth weight, suggesting potential health implications and the need for targeted interventions. In similar study

conducted by Agarwal et al named maternal risk factors associated with low birth weight neonates in a tertiary care hospital, northern India similarly showed Prevalence was seen (47.61%) of LBW was inversely proportional to the 6.0-8.0 gm Hemoglobin level.<sup>8</sup>

**Premature pregnancy**

Prematurity emerged as the leading factor for low birth weight, with around 73% of infants born underweight being delivered before completing 36 weeks of gestation. This finding underscores the critical role of gestational age in determining birth weight and highlights the significance of ensuring full-term pregnancies to mitigate the risk of low birth weight-related complications. A study by Anil et al named low birth weight and its associated risk factors states preterm birth was the risk factors associated with low birth weight.<sup>9</sup>

**Table 4: Gestation week and premature baby.**

Week of birth (weeks)	No. of mothers	Percentage
Very preterm (<32)	224	24.56
Moderately preterm (32-34)	132	14.47
Late preterm (34-36)	357	39.14
Above 36	199	21.82

**Poor weight gain of mother during pregnancy**

Poor weight gain during pregnancy is found to be one of the key determinants of low birth as 90.3% of mothers had weight gain less than 11.5 kg. Not gaining enough weight over the course of pregnancy can put the woman and her baby at greater risk of complications. A study done by Abubakari et al showed similar result inadequate weight gain during pregnancy were a significant determinant of low birth weight baby.<sup>10</sup>

**Table 5: Mother's weight gain from 1<sup>st</sup> visit to last.**

Mother's weight gain from 1 <sup>st</sup> visit to last (kg)	No. of mothers	Percentage
Below 11.5	656	90.7
Above 11.5	67	9.3
Average weight gain	7.9	-

**DISCUSSION**

The present study delves into the intricate relationship between maternal factors and the prevalence of low birth weight (LBW) infants in the Washim district. The significance of this research lies in the context of India's alarming neonatal mortality rate attributed to complications arising from LBW. The repercussions of LBW extend beyond infancy, affecting cognitive development, educational attainment, and future productivity.

The study findings resonate with global health concerns, highlighting the multifaceted nature of factors influencing LBW. Notably, the observed LBW rate of 13.3% in Washim district is lower than both the state (20.1%) and national (17.8%) averages, suggesting a potential impact of local interventions. This result is promising, yet challenges persist in understanding the contributing elements to these variations.

Anemia during pregnancy emerged as a significant correlate of LBW, with a substantial proportion of mothers (91.4%) exhibiting hemoglobin levels below the recommended threshold. This aligns with existing knowledge linking maternal iron deficiency to adverse perinatal outcomes. The direct correlation between low hemoglobin levels and premature labor, intrauterine growth retardation, and neonatal anemia underscores the critical importance of addressing anemia during pregnancy.

Another noteworthy finding is the prevalence of premature births as a major contributor to LBW, with 73% of infants born underweight delivered before the completion of 36 weeks of gestation. This underscores the urgency of promoting full-term pregnancies to mitigate the risk of LBW-related complications.

Poor weight gain during pregnancy further compounds the issue, with 90.3% of mothers not achieving the recommended weight gain of 11.5 kg. This signifies the imperative of comprehensive maternal care, emphasizing adequate nutrition and regular prenatal monitoring.

The study's findings emphasize the intricate interplay of various maternal factors contributing to LBW. The socioeconomic context plays a pivotal role, with a majority of LBW babies born to mothers from socially disadvantaged backgrounds. The implications of these findings call for tailored interventions that address the unique challenges faced by different segments of the population.

This study has some limitations. Limited time frame: the study's data collection period was confined to one year (April 2022 to March 2023), potentially limiting the ability to capture seasonal variations or long-term trends. Data collection reliance: the study heavily relies on the accuracy of the data collected through questionnaires. Human error or biases in responses could impact the reliability of the results. Census approach: while the census approach was used to include the entire population of low birth weight babies that could be tracked by government health care workers, this might introduce selection bias as it excludes babies that couldn't be tracked. Social desirability bias: respondents may provide answers they believe are socially acceptable or desirable, potentially leading to an overestimation of healthcare utilization. Context specificity: the findings of this study are specific to Washim district in Maharashtra, India, and may not be directly applicable to other regions with

different healthcare infrastructure, cultural norms, or demographic characteristics.

## CONCLUSION

In conclusion, this cross-sectional study, conducted in Washim district, offers crucial insights into the maternal factors contributing to low birth weight (LBW) among infants born at government facilities. Anemia during pregnancy, premature deliveries, and inadequate weight gain emerged as primary determinants of LBW in the district. The study's unique census approach, encompassing all LBW infants born at government facilities across blocks, provided a comprehensive understanding without relying on traditional sampling techniques.

The observed prevalence of LBW, at 13.3%, signifies the importance of tailored interventions. These findings highlight the significance of addressing specific maternal health aspects to improve birth outcomes, reinforcing the need for targeted strategies in this geographical context. This research advances the field's understanding by identifying locally relevant factors influencing LBW and provides a foundation for evidence-based interventions to enhance maternal and child health in Washim district.

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