Research Article

Low Birth Weight and associated maternal factors in Vellavely Medical Officer Of Health Area of Batticaloa district, Sri Lanka

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Background: Low Birth Weight (LBW) stands as a pivotal determinant in shaping not only prenatal survival but also exerting profound implications on infant morbidity, mortality, and the susceptibility to developmental disabilities and future-life illnesses. Against this backdrop, this study explores into the prevalence of LBW and the maternal factors associated with this phenomenon. The research is carried out within the Vellavely Medical Officer of Health (MOH) area of Batticaloa district of Sri Lanka.

Objective: This study aimed to systematically investigate two key aspects: first, to quantify the prevalence of low birth weight (LBW) within a specified population, and second, to identify and analyze the maternal factors associated with the occurrence of LBW.

Methods: A retrospective cross-sectional study was carried out among singleton pregnant women. A total of 319 birth details were randomly extracted from all birth records from January 2012 to December 2014 in all fifteen (15) public health midwife (PHM) areas in the Vellavely MOH division. The data such as maternal age, maternal hemoglobin level, maternal Body Mass Index (BMI), gestational weight gain, and birth weight of the newborns were collected from the maternal register book as secondary data.

Results: The prevalence of LBW was 27.3%. Mean birth weight of infants was 2.76 kg. Majority of LBW identified among the mothers who aged less than 24 years age group (46%), maternal haemoglobin of 11g/dl and above (59%), maternal BMI between 18.5-24.9 kgm-2 (51%), and gestational weight gain less than 10kg (79%).

Conclusion: LBW was associated with maternal hemoglobin (p=0.009), and gestational weight gain (p=0.004). Health education programs and supplementing with iron tablets may help to reduce the number of babies born with LBW.

Keywords: Low birth weight, maternal age, maternal body mass index, maternal haemoglobin, gestational weight gain

INTRODUCTION

Low Birth Weight (LBW), defined as a newborn weighing less than 2500 grams at birth, is a critical parameter influencing prenatal survival, infant health, and long-term developmental outcomes. LBW poses a substantial risk, contributing to heightened infant morbidity and mortality, as well as an increased susceptibility to developmental disabilities and future illnesses. Globally, LBW affects an estimated 15.5% of newborns, with over 95% of cases occurring in developing countries. Particularly in Asia, the incidence is pronounced, reaching 18.3% (1).

In the context of Sri Lanka, a developing nation, the prevalence of LBW was reported at 17.6 per 100 live births in 2008 and rose to 18.1% in 2010 (2). Despite the efforts over the past two decades, the prevalence of LBW has shown limited improvement in the country, maintaining a fluctuating range between 16% and 18%. Notably,

within the Eastern province of Sri Lanka, marked inter-district variations are observed, ranging from 12.1% in the Ampara district to 16.4% in the Batticaloa district, with the latter exhibiting a higher incidence of LBW (4).

LBW, being a risk factor for malnutrition, hypoglycemia, recurrent infections, neurodevelopmental delay, sepsis, and seizures, imposes a significant burden on affected infants, leading to higher mortality and morbidities (5). Various maternal factors have been identified as risk contributors to LBW, encompassing maternal age, gestational age, delivery interval, maternal height, hypertension, febrile illnesses during pregnancy, primiparity, oligohydramnios, preeclampsia, previous experiences of LBW, abruption of the placenta, maternal BMI, occupational factors, educational status, income levels, and maternal nutritional factors (6-9).

This study serves as a crucial initiative to raise awareness about LBW and elucidate the maternal factors intricately associated with this condition. By understanding these factors, we aim to foster regular follow-up and enhance compliance in complicated pregnancies, particularly among high-risk mothers. The insights gleaned from this research hold the potential to inform targeted interventions, ultimately contributing to improved maternal and neonatal outcomes in the face of the persistent challenge of LBW.

OBJECTIVE

This study aimed to systematically investigate two key aspects: first, to quantify the prevalence of low birth weight (LBW) within a specified population, and second, to identify and analyze the maternal factors associated with the occurrence of LBW.

The study aimed to comprehensively explore how maternal characteristics influence the prevalence of low birth weight (LBW), contributing valuable insights to perinatal health. It sought to identify potential risk factors related to LBW, with the ultimate goal of informing targeted interventions and strategies to enhance maternal and neonatal outcomes.

METHODS

Study Design and Sample

This retrospective cross-sectional study was conducted among singleton pregnant women to investigate the prevalence of Low Birth Weight (LBW) and associated maternal factors within the Vellavely Medical Officer of Health (MOH) area in the Batticaloa district of Sri Lanka. The study employed a proportion survey design, incorporating a finite population correction using the 'PENNSTATE (2014)' formula (10). This calculation determined a total sample size of 319.

Data Collection:

A systematic random sampling method was applied to select 319 birth details from the complete set of birth records spanning January 2012 to December 2014. These records were sourced from the pregnant mothers' registered books in all 15 Public Health Midwives (PHM) areas within the Vellavely MOH division. The pregnant mother's register book contained crucial information, including maternal age, maternal hemoglobin level, weight and height during the first antenatal check-up in the first trimester, weight before delivery, and the birth weight of the newborn. To maintain data integrity, samples with incomplete information, cases involving stillbirths, multiple births, and infants with congenital or neurological disorders at birth were excluded from the study.

Definitions and Classifications:

Low birth weight (LBW) and macrosomia were defined as birth weights below 2500g and above 4000g, respectively (11). Body Mass Index (BMI) groups were categorized into low, normal, overweight, and obesity with the following classifications: low BMI (<18.5), normal BMI (18.5-24.99), overweight (25-29.99), and obesity (>30 kg/m^2) (12).

Statistical Analysis:

The collected data underwent statistical analysis using the Statistical Package for the Social Sciences (SPSS-Version 16). The chi-square test was employed to determine the significance of associations between various maternal factors and the occurrence of LBW.

Ethical Considerations:

The study received ethical approval from the relevant authority, ensuring compliance with ethical standards and safeguarding the well-being and confidentiality of the participants. Ethical considerations were paramount throughout the research process, adhering to established guidelines and protocols.

RESULTS

The study analyzed a total of 319 alive infants born between January 2012 and December 2014, revealing a noteworthy prevalence of Low Birth Weight (LBW) at 27.3% (n=87). The mean birth weight of infants was recorded at 2.76 kg, and the mean maternal age among the participants was 26.8 (±5.9) years.

Maternal Age:

Low birth weight was recorded among 45.9% of the mothers aged less than 24 years. Contrastingly, lower rates of LBW were observed in older maternal age groups, with 22.9% for 25-29 years, 19.5% for 30-34 years, and the lowest prevalence observed for mothers aged 35 years and above. Although no statistical significance was found

between LBW and maternal age (p-value 0.681), the observed trends provide valuable insights into potential age-related patterns.

Table 1: ***Association between maternal factors and birth weight***

Maternal Variables		LBW	NBW	Chi squared (p-value)
Maternal Age				0.681
	<24	40 (12.5)	90 (28.3)	
	25-29	20 (6.3)	57 (17.8)	
	30-34	17 (5.4)	56 (17.5)	
	>35	10 (3.2)	29 (9.0)	
Hemoglobin levels				0.009
	<10	36 (11.4)	61 (19.1)	
	>10	51 (15.9)	171 (53.6)	
Maternal BMI				0.177
	<18.5	36 (11.3)	73 (22.9)	
	18.5-24.99	44 (13.8)	7 (2.2)	
	25-29.99	144 (45.1)	15 (4.7)	
Weight gain(kg)				0.004
	<10	69 (21.6)	141 (44.2)	
	11- 15	17 (5.3)	75 (23.6)	
	16-20	1 (0.3)	16 (5.0)	

Maternal Hemoglobin Levels:

Maternal hemoglobin levels played a crucial role, with 30.4% of mothers having hemoglobin levels below 10g/dl. Surprisingly, the LBW was recorded among 58.6% of the mothers with hemoglobin levels of 11g/dl and above. This association proved to be statistically significant (p-value 0.009), emphasizing the impact of maternal hemoglobin on birth weight outcomes.

Maternal BMI:

The distribution of maternal BMI revealed that 34.2% of mothers had a BMI less than 18.5 kg/m², and 58.9% fell within the 18.5-24.9 kg/m² range. Majority of LBW (50.5%) was observed among mothers with a BMI between 18.5-24.9 kg/m². Despite this, no statistically significant association was found between LBW and maternal BMI (p-value 0.177).

Maternal Weight Gain:

Maternal weight gain during pregnancy exhibited significant associations with LBW (p-value 0.004). The majority of LBW cases (79.3%) were observed among babies born to mothers who gained less than 10kg. In contrast, low number of LBW was recorded among mothers who gained 11-15kg and 16-20kg.

Association between maternal factors and birth weight:

The association between maternal variables and birth weight was analyzed using chi-square tests. Significant associations were found between LBW and maternal hemoglobin levels (p-value 0.009) and maternal weight gain (p-value 0.004). However, no significant associations were observed for maternal age (p-value 0.681) and

maternal BMI (p-value 0.177). The table (1) provides a detailed breakdown of LBW and Normal Birth Weight (NBW) cases across different maternal variables, offering a comprehensive view of the study findings.

DISCUSSION

Birth weight is universally acknowledged as a pivotal determinant influencing the future health, survival, and growth trajectory of infants. Low Birth Weight (LBW) holds significant importance as an indicator of newborn health. In our study, the mean birth weight of infants was within the normal range. This contrasts with a recent study in the Jaffna district of Sri Lanka, where the mean birth weight was reported as LBW, aligning with findings for preterm babies in other countries. Such variations emphasize the complex nature of birth weight dynamics (13-16).

The prevalence of LBW in our study was 27.3%, differing notably from the Jaffna district's higher prevalence of 59.7%. Both figures, however, surpass previous LBW rates in Sri Lanka (17.6% in 2008 and 18.1% in 2010). Moreover, our results indicate an increased prevalence compared to the Batticaloa district's 16.4%. These discrepancies may be attributed to diverse factors, including regional variations, time intervals, seasonal influences, and distinct study methodologies (2, 4, 13).

Maternal age did not exhibit a statistically significant association with LBW in our study, aligning with findings from other studies. The non-significant association suggests that factors such as study design, categorization of age groups, and cultural influences on marriage age may not substantially impact the link between maternal age and LBW prevalence (20-22).

Maternal Body Mass Index (BMI) did not significantly contribute to neonatal birth weight in our study, consistent with findings in India. This contrasts with some studies indicating an association between LBW and BMI. These variations may be attributed to differences in study design and the nutritional status of mothers across diverse populations (20, 23, 24).

Anemia was 30.4% aligns closely with Sri Lankan statistics (29.1%). Our results demonstrated a significant association between maternal hemoglobin levels and LBW, consistent with global studies. This underscores the importance of addressing maternal anemia as a potential mitigating factor for LBW (20-21, 25).

Our study identified a significant association between gestational weight gain and LBW. Although limited global studies explore this association, our findings emphasize the need for further investigation into the complex interplay between maternal weight gain during pregnancy and its impact on neonatal birth weight. This

association holds implications for maternal care practices and warrants additional research to inform targeted interventions.

This study provides nuanced insights into the prevalence of LBW and its associations with maternal factors. The observed variations underscore the multifaceted nature of birth weight dynamics, urging continued research to refine interventions and improve maternal and neonatal outcomes.

LIMITATIONS

While this study contributes valuable insights into the prevalence and associated maternal factors of Low Birth Weight (LBW), it is essential to acknowledge certain limitations inherent in its design. Being a cross-sectional study, it does not capture seasonal variations in LBW, limiting our understanding of how environmental factors may influence birth weight at different times of the year. Additionally, as the study was conducted within health facilities, it did not encompass certain potential risk factors for LBW, such as placental factors, congenital syndromes, and intrauterine infections. The absence of these factors in our analysis may underscore the need for future research exploring a broader spectrum of determinants for a more comprehensive understanding of LBW dynamics.

CONCLUSION

In conclusion, our study highlights significant associations between maternal hemoglobin levels and gestational weight gain with the occurrence of Low Birth Weight. These findings underscore the importance of maternal health during pregnancy in influencing neonatal outcomes. To mitigate the risk of LBW, there is a compelling need for targeted interventions. Health education programs aimed at raising awareness about the impact of maternal hemoglobin levels and promoting optimal gestational weight gain are crucial. Furthermore, enhancing the overall quality of healthcare provided to pregnant women, including the supplementation of iron and nutritional tablets, is recommended. By addressing these factors, there is potential to reduce the incidence of LBW and improve the overall health and well-being of newborns.This study clearly shares the limitations of cross-sectional studies and hence it does not show seasonal variations of LBW. Additionally, being conducted in health facilities, this study did not consider some potential risk factors for LBW such as placental factors, congenital syndromes and intra uterine infections.

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