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Prevalence of Low Birth Weight among Normal Singleton Low Risk Pregnancies at a Tertiary Care Teaching Hospital in India

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ABSTRACT

Introduction: Birth weight is an accurate indicator of neonatal wellbeing alongside gestational age and congenital of newborn. Low birth weight (LBW) (< 2500gms) is associated with neonatal mortality and variety of morbidities such as cerebral palsy, motor delays, growth retardation, psychological problems and is becoming a significant global health crisis. The relationship between LBW and abnormalities of placenta/umbilical cord remains largely unexplored. Therefore, it is imperative need for multidimensional exploration to comprehend the LBW. The objective of the study was to determine the prevalence of LBW among neonates born to low risk singleton mothers and to analyze its association with selected maternal and neonatal factors.

Methodology: This cross-sectional study analyzed 300 antenatal records of low-risk singleton pregnancies. Maternal demographic and clinical variables, including age, gravidity, history of abortion, and hemoglobin levels, were collected. Neonatal data included birth weight, gestational age at delivery, and sex. Data was analyzed using SPSS 20.0 software. Continuous variables were presented as mean with standard deviation. Categorical variables were presented into proportions. Chi-square test was applied to find out the association between LBW and preterm births. *P* value<0.05 at 95% confidence interval was considered statistically significant.

Results: The mean maternal age was 24.19 ± 4 years, and the mean hemoglobin level was 10.86 ± 1.4 g/dL. Of the mothers, 35.7% were primigravida and 19.7% had a history of abortion. Among the neonates, 47% were male and 53% female, with a mean birth weight of 2801.6 ± 489.2 grams. Preterm births accounted for 16.3% of deliveries. The prevalence of LBW was 16.3% (n = 49), including 1.6% (n = 5) who were very low birth weight (<1500 grams). LBW was significantly associated with preterm birth ($\chi^2(1) = 65.414$, $p < 0.05$), while no significant association was found with prior abortion history (p = 0.353) or neonatal sex (p = 0.747).

Conclusion: The prevalence of low birth weight (LBW) in our study was remarkably higher at 16.3% considering the exclusive recruitment of low risk singleton pregnancies. Despite the higher incidence of LBW, the rate of very low birth weight (VLBW) was lower at 1.6%.

Key words: Low birth weight - Preterm - low risk singleton pregnancies.

INTRODUCTION

Birth weight (BW) is a pivotal indicator of wellbeing of the neonate alongside gestational age (GA) and congenital anomalies (CA). It is influenced by various factors such as maternal health, fetal health, environmental, genetical, placental and umbilical cord (UC) factors, as well as idiopathic reasons [1,2]. BW Less than 2,500gm is considered as low birth weight (LBW) irrespective of gestational age of the newborn [3]. It has been proven to be associated with infant's mortality (60 - 80% of child mortality) [4] and various morbidities like motor delays, cerebral palsy, behavior & psychological problems, growth retardation, neurological problems and impaired cognitive development [5,6]. The global prevalence of LBW ranges from 7.2 - 27.2% (around 20 million infants annually) [1]. This occurrence is twofold higher in developing countries such as India. India is burdened with the 10.35 - 19.65% [6] of LBW annually, becoming as major public health concern. Despite numerous legislations, the incidence of LBW is increasing in developing nations and continues to be a serious concern for health care practitioners, hospital administrators, policymakers and various stakeholders. An insight on the incidence, ambiguous etiology and various factors influencing LBW may help in prevention, better management and can effectively address the subsequent risk of chronic diseases and co-morbidities of LBW. In India there is paucity of literature on LBW among low risk pregnancies. Therefore, the present study aimed to assess the prevalence of LBW among low risk pregnancies.

MATERIAL AND METHODS

A retrospective record-based cross sectional study was executed in the Department of Obstetrics and Gynaecology, S V Medical College, Tirupati, Andhra Pradesh, India, from the period of October to December 2024. Target population was singleton low risk gestations and their newborn babies. Convenience sampling method was adopted.

Sample size calculation:

The required sample size was determined via the single population proportion formula:

$n = (Z\alpha/2)\ 2\ p\ (1- p)/d^2$

where p was set at 17.29% based on previous literature [7], with a margin of error of 5% and a confidence interval of 95% (z score = 1.96). On the basis of this calculation, the required sample size was 220, which was rounded to 300 participants.

Inclusion criteria: Low risk singleton pregnant women along with their newborn babies

Exclusion criteria: Pregnancies with gestational diabetes mellitus (GDM), pregnancy induced hypertension (PIH), pre-eclampsia, eclampsia, hypo/hyper thyroidism, IVF/IUI Pregnancies, TORCH infections, twin/triplet gestations, primi at high maternal age, neonates with congenital anomalies, still births and cases with incomplete or missing records.

Data Collection: Data were extracted from antenatal records, and included maternal characteristics such as age, LMP, EDD, hemoglobin levels, term of gestation and obstetric history (gravidity, parity and history of abortion). Neonatal details recorded were gender, birth weight (in grams) and gestational age (in days).

As per WHO classification, newborn's birth weight <2500gm has been considered as LBW [1] and <37 weeks of GA has been considered as preterm [7]. BW and GA was binned as per above criteria in to categorical data.

Statistical analysis: Data entered in to MS Excel sheet and analyzed using SPSS 20.0. Continuous variables like age, BW in grams and GA in days were presented as mean with standard deviation. Categorical variables were presented in percentages. Chi-square test was used to find out the association between LBW and pre term births. A *p* value <0.05 at 95% confidence interval was considered statistically significant.

Ethical consideration: This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethical Committee of Sri Venkateswara Medical College (SVMC), Tirupati, Andhra Pradesh, India (Approval No: 325/SRC/2025).

RESULTS

This study analyzed 300 antenatal records of low-risk singleton pregnancies to determine the prevalence of low birth weight (LBW) neonates. The mean maternal age was 24.19 ± 4 years. Of the total, 35.7% (n = 107) were primigravida and 64.3% (n = 193) were multigravida. A previous history of abortion was reported in 19.7% (n = 59) of mothers. The mean maternal hemoglobin concentration was 10.86 ± 1.4 g/dL (ranging between 7 and 15 g/dL).

Among the 300 neonates, 47% (n = 141) were male and 53% (n = 159) were female. The mean birth weight was 2801.6 ± 489.2 grams. The average gestational age at delivery was 267.8 ± 12.9 days. Preterm births (GA< 37 weeks) accounted for 16.3% (n = 49) of the total births. The mean birth weight among preterm neonates was 2316.3 ± 650.7 grams.

The prevalence of low birth weight among low-risk singleton mothers in this study was 16.3% (n = 49). Of these, 1.6% (n = 5) were categorized as very low birth weight neonates (<1500 grams). The mean birth weight in the LBW group was

2039.18 ± 407.7 grams, whereas the mean in the normal birth weight group was 2950.44 ± 343.7 grams. Male neonates constituted 55% of the LBW group, while females accounted for 45%.

A statistically significant association was observed between low birth weight and preterm birth ($\chi^2(1) = 65.414$, $p < 0.05$). However, no significant association was found between LBW and previous history of abortion ($\chi^2(1) = 0.862$, $p = 0.353$) or neonatal gender ($\chi^2(1) = 0.104$, $p = 0.747$).

DISCUSSION

In this present study we made an attempt to find out the prevalence of LBW among low risk singleton gestations as dearth of the studies (by excluding all high risk conditions) found in this aspect. This study found a 16.3% prevalence of low birth weight (LBW, <2,500 grams) among 300 low-risk singleton gestations at S V Medical College, Tirupati, Andhra Pradesh, India, during October and November 2024, with a statistically significant association between LBW and preterm delivery ($\chi^2(1)=65.414$, $p<0.001$). By focusing on low-risk pregnancies, this study addresses a critical gap in the literature, where high-risk conditions often inflate LBW estimates. The 16.3% prevalence and its link to preterm birth highlight persistent challenges to optimal fetal growth in semi-urban India, necessitating targeted clinical and public health interventions.

The 16.3% LBW prevalence aligns with regional estimates, such as Tamil Nadu's 16.4% [8], and is slightly below India's national average of 18.2% per the National Family Health Survey (NFHS-5, 2019–2021) [9]. Within India, it is comparable to Scaria et al.'s 16.1%[10] but lower than Mishra et al.'s 22.9% [11] and Raman et al.'s 32.7% [12]. Globally, our rate is lower than in Bangladesh (22%) [13] and Ethiopia (17.3%) [14] but higher than in high-income settings like China (7.2%) [15] and Turkey (6.7%) [16]. These disparities likely reflect India's socioeconomic challenges, including maternal undernutrition (19.7% of women with BMI <18.5 kg/m²) [9] and limited antenatal care access in semi-urban areas like Tirupati. The mean maternal hemoglobin level of 10.86 ± 1.4 g/dL, with some values as low as 7 g/dL, suggests subclinical anemia as a potential LBW contributor, consistent with studies linking anemia to impaired fetal growth [17]. In contrast, lower LBW rates in high-income countries are likely due to robust healthcare infrastructure and better maternal nutrition.

The significant association between LBW and preterm birth, observed in 16.3% of neonates (mean birth weight: 2316.3 ± 650.7 g), underscores gestational age as a primary driver of LBW, aligning with findings by Chen et al [15] and Thapa et al [18]. Preterm births role in LBW is particularly critical in low-risk pregnancies, where other risk factors (e.g., hypertension, diabetes) are absent. The lack of significant associations with neonatal gender ($\chi^2(1)=0.104$, $p=0.747$) or previous abortion history ($\chi^2(1)=0.862$, $p=0.353$) suggests these factors are less influential in this cohort, though the higher proportion of male LBW neonates (55%) may warrant further exploration. Maternal demographics, including a mean age of 24.19 ± 4.0 years and 64.3% of multigravida indicate a relatively young population, yet the elevated LBW rate suggests underlying nutritional or environmental factors.

These findings have significant implications. Clinically, routine screening for maternal anemia and nutritional deficiencies could mitigate LBW risk, particularly given the observed hemoglobin levels. Public health interventions, such as micronutrient supplementation and dietary counseling, are critical in semi-urban India, where cereal-based diets may lack protein and vitamins. Policymakers should strengthen antenatal care in regions like Andhra Pradesh to monitor maternal health indicators. This study's strengths include its focus on low-risk pregnancies and robust statistical analysis. However, limitations include the sample size (n=300), which limits generalizability, and the two-month data collection period, which may miss seasonal variations. The retrospective design precluded detailed maternal socioeconomic data, and the single-center setting may introduce selection bias.

Future research should prioritize multi-center prospective studies to explore LBW determinants, including maternal nutrition and anemia. Distinguishing preterm LBW from intrauterine growth restriction via gestational age data could clarify mechanisms. Qualitative studies on antenatal care barriers in semi-urban India could inform policy. In conclusion, the 16.3% LBW prevalence and its link to preterm birth highlight a public health challenge in low-risk pregnancies. Targeted interventions to address preterm birth and maternal health can reduce LBW, advancing India's maternal and child health goals.

CONCLUSION

The prevalence of low birth weight (LBW) in our study was remarkably higher at 16.3% considering the exclusive recruitment of low risk singleton pregnancies. In contrast, prior investigations have typically included a mix of low and high risk pregnancies. Despite the higher incidence of LBW, the rate of very low birth weight (VLBW) was lower at 1.6%. Consequently, it is imperative to recognize that low risk pregnancies still array a comparable risk of LBW, necessitating further exploration to comprehend the implications and management of this condition.

Conflicts of interest: Nil

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