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"PREVALENCE AND DETERMINANTS OF LOW BIRTH WEIGHT IN THE RURAL PRIMARY HEALTH FACILITY OF JEWAR BLOCK, OF DISTRICT GAUTAM BUDDHA NAGAR: INSIGHTS FOR MATERNAL HEALTH STRATEGIES"

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ABSTRACT **Introduction:** Low birth weight (LBW), defined as a birth weight of less than 2500 grams, is a global public health concern linked to various health issues. The World Health Assembly's 2012 resolution aimed for a 30% reduction in LBW by 2025. In India, the prevalence of LBW remains high with regional disparities. This study examines the prevalence and determinants of LBW at Jewar Primary Health Centre (PHC) in Gautam Buddha Nagar district, Uttar Pradesh. **Material and Methods:** A cross-sectional descriptive study was conducted at Jewar PHC, the Rural Health & Training Centre (RHTC) for the Noida International Institute of Medical Sciences (NIIMS). The study included all live births from January 1 to December 31, 2023. Secondary data from medical records on socio-demographic characteristics, maternal health, prenatal care, and birth weight were analyzed using SPSS software. **Result:** Among 1548 live births, 117 neonates (8%) were classified as LBW. Significant predictors of LBW included maternal age under 20 years (OR = 10.5, $p < 0.0001$), maternal height ≤ 150 cm (OR = 2.47, $p < 0.0001$), fewer than four antenatal care visits (OR = 1.7, $p = 0.005$), and maternal education below the 10th standard (OR = 1.63, $p = 0.01$). Factors such as paternal education, gravida status, deworming status, haemoglobin levels, religion, and iron and folic acid intake were not significantly associated with LBW. Discussion: The LBW prevalence in Jewar (8%) is lower than the national average (18%), but the significant predictors align with global and national findings. **Conclusion:** This study highlights the importance of improving maternal health education, nutritional support, and prenatal care access in rural areas to reduce LBW incidence.

KEYWORDS : Low birth weight, Maternal health, Antenatal care, Rural India, Birth weight determinants

Low birth weight, as defined by the World Health Organization (WHO), is a birth weight of less than 2500 grams (5.5 pounds).[1] This condition remains a major global public health issue, linked to various short- and long-term health consequences. In 2012, the World Health Assembly adopted Resolution 65.6, which endorsed a Comprehensive Implementation Plan on Maternal, Infant, and Young Child Nutrition. [2] This plan outlined six global nutrition targets to be achieved by 2025.[3] It is estimated that 15% to 20% of all births worldwide fall into this category, amounting to over 20 million infants each year. The target is to achieve a 30% reduction in the number of babies born with a weight under 2500 grams by 2025.[2] This objective entails an annual relative reduction of 3% from 2012 to 2025, decreasing the number of low birth weight infants from approximately 20 million to around 14 million. Preterm birth is the leading direct cause of neonatal mortality. Each year, 1.1 million infants die due to complications related to preterm birth. Low birth weight significantly predicts prenatal mortality and morbidity, and recent research has shown that it also elevates the risk of developing noncommunicable diseases like diabetes and cardiovascular disease in later life .[4,5]

In India, the prevalence of LBW remains alarmingly high with significant regional disparities. According to the National Family Health Survey 5 (NFHS), around 18% of infants in India are born with LBW.[6] This high prevalence presents substantial challenges to the healthcare system, already struggling with high neonatal mortality rates. Addressing LBW is essential for improving maternal and child health outcomes and achieving national and global health objectives, such as the Sustainable Development Goals (SDGs).

Multiple socio-economic, biological, and environmental factors contribute to LBW. Maternal nutrition is a key factor; inadequate nutritional status before and during pregnancy can hinder fetal growth. Insufficient prenatal care is another critical determinant, as it often results in missed opportunities for detecting and managing potential complications during pregnancy. Socio-economic factors, including low income, limited educational opportunities, and restricted access to healthcare services, further exacerbate the risk of LBW. These factors often intersect, creating a complex web of influences that negatively impact pregnancy outcomes. Environmental factors, such as exposure to pollutants and maternal stress, also play a significant role in the incidence of LBW.

Understanding the rate and causes of low birth weight (LBW) in specific areas is crucial for creating effective interventions and policies. These measures can help lower the occurrence of LBW and enhance newborn health outcomes. This research seeks to identify the prevalence of LBW in births at Jewar Primary Health Centre (PHC), which serves as the Rural Health & Training Centre (RHTC) for Noida International Institute of Medical Sciences (NIIMS) in Gautam Buddha Nagar district, Uttar Pradesh. Additionally, it seeks to identify the determinants influencing LBW in this rural setting, providing valuable insights for local healthcare providers and policymakers.

Importance of the Study

Conducting this study in a rural setting such as Jewar, Gautam Buddha Nagar, Uttar Pradesh, proved particularly important. Rural areas often face unique challenges, including limited healthcare infrastructure, lower educational levels, and higher rates of poverty. By examining the prevalence and determinants of low birth weight (LBW) in this specific context, the study provided valuable insights for developing targeted interventions that address the unique needs of rural populations. The findings highlighted critical areas for improvement in maternal and child healthcare services, enabling the formulation of effective strategies to reduce the incidence of LBW and improve neonatal health outcomes in rural settings

Objectives of the study

The primary aim of this study is ;

- To determine the Prevalence of Low Birth Weight (LBW)
- To identify Determinants of LBW
- To utilize findings to shape local healthcare strategies and policies aimed at reducing LBW incidence and improving neonatal health outcomes in rural India.

MATERIALS AND METHODS

Study Design

This study employed a cross-sectional descriptive design to assess the prevalence and determinants of low birth weight (LBW) in a rural setting of Jewar block of district Gautam Budh Nagar.

Study Setting

The research was conducted at the Rural Health & Training Centre (RHTC) in Jewar, block of district Gautam Buddha Nagar, of state Uttar Pradesh. This center serves as a primary healthcare facility catering to the local rural population and is associated as RHTC with the Department of Community Medicine at NIIMS (Noida International Institute of Medical Sciences).

Study Population

The study population comprised all live births recorded at the RHTC from Jan 1st to Dec 31st 2023.

- **Inclusion criteria**

Live Births: Only live births were included in the study.

Births at RHTC: Neonates born at the Rural Health & Training Centre (RHTC) in Jewar during 2023 were included.

- **Exclusion criteria**

Stillbirths: Cases where the neonate was stillborn were excluded from the analysis.

Births with Missing Data: Cases where essential data on birth weight or maternal health factors were incomplete or missing.

Data Collection

Secondary data were obtained from medical records maintained at the Jewar PHC (RHTC of the Department of Community Medicine, NIIMS). These records included information on socio-demographic characteristics, maternal health, prenatal care, and neonatal birth weight. Data accuracy and completeness were ensured through a thorough review of the medical records.

Variables

The primary outcome variable was birth weight, classified as LBW (<2,500 grams) and normal birth weight (≥2,500 grams). Independent variables included maternal age, education, socio-economic status, nutritional status, antenatal care visits, and pregnancy complications.

Sample Size

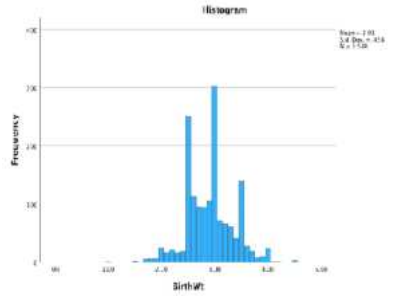
The study included 1548 live births recorded at the Rural Health & Training Centre (RHTC) in Jewar over a one-year period from Jan 1st to Dec 31st 2023. Given the comprehensive nature of the available data, the entire population of live births during this period was included in the analysis.

Statistical Analysis

Data were entered and analysed using SPSS (Statistical Package for the Social Sciences) software. Descriptive statistics were employed to summarize the prevalence of low birth weight (LBW) among the 1548 live births recorded at the Rural Health & Training Centre (RHTC) in Jewar over the year 2023. Bivariate analyses were conducted to identify determinants significantly associated with LBW. Adjusted odds ratios (AOR) and 95% confidence intervals (CI) were calculated to assess the strength and significance of these associations. This methodological approach enabled the study to effectively leverage existing data, providing comprehensive insights into the prevalence and determinants of LBW in the rural setting of Jewar. These findings establish a robust foundation for developing targeted healthcare interventions aimed at improving maternal and neonatal health outcomes in similar rural contexts.

Results

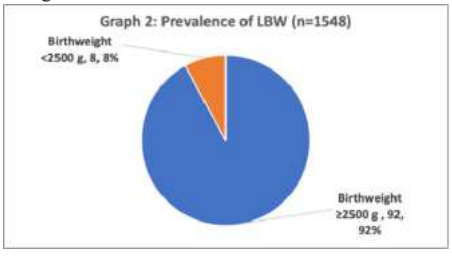
The study included a total of 1548 live births recorded at the Rural Health & Training Centre (RHTC) in Jewar over the one-year period in 2023. Among the 1548 infants included in the birth weight analysis, mean birth weight was 2.91 ± 0.43 kg.(Graph 1). The study also identified the prevalence of LBW which is as mentioned below



Graph 1: Distribution of birthweight for 1548 infants enrolled in the study

- Birthweight ≥2500 g: Out of the total live births, 1431 neonates (92%) had a birth weight of 2500 grams or more.
- Birthweight <2500 g: A total of 117 neonates (8%) were classified as having low birth weight (LBW), defined as a birth weight less than 2500 grams.

The pie chart (graph 2) visually represents the proportion of neonates with birth weights of 2500 grams or more compared to those with low birth weight. The overwhelming majority of neonates (92%) had normal birth weights, while a smaller percentage (8%) were born with low birth weights.



The sociodemographic characteristics of the study population reveals that most mothers (96%) were aged 20 years or older, with only 4% being under 20 years. Regarding maternal height, 63% of the mothers were taller than 150 cm, and 37% were 150 cm or shorter (table 1).

In terms of education, 69% of the mothers and 69% of the fathers had education levels of 10th standard or higher, leaving 31% of the mothers and 31% of the fathers with less than 10th standard education. Multigravida mothers made up 72% of the study population, while primigravida mothers accounted for 28%.(table 1)

Antenatal care (ANC) visits showed that 62% of the mothers had four or more visits, whereas 38% had fewer than four visits. Deworming during pregnancy was reported by 80% of the mothers, while 20% did not undergo deworming. Haemoglobin estimation indicated that 67% of the mothers had HB levels below 11%, suggesting a high prevalence of anaemia among the participants, with the remaining 33% having HB levels of 11% or higher.

Regarding religion, the majority of the population (80%) practiced Hinduism, while 20% were Muslims. Additionally, a significant majority (83%) of the mothers took iron and folic acid (IFA) tablets during pregnancy, compared to 17% who did not.

Table 1: Sociodemographic variables (n=1548)		
Maternal Age		
<20 yrs	61	4%
≥20 yrs	1487	96%
Maternal height		
≤ 150 cm	569	37%
>150 cm	979	63%
Education of Mother		
<10th Standard	487	31%
≥10th Standard	1061	69%
Education of Father		
<10th Standard	477	31%
≥10th Standard	1071	69%
Gravida		

Multigravida	1107	72%
Primigravida	441	28%
ANC visits		
<4	581	38%
≥4	967	62%
Deworming Status		
No	311	20%
Yes	1237	80%
HB estimation		
<11%	1032	67%
≥11%	516	33%
Total	1548	
Religion		
Hinduism	1246	80%
Islam	302	20%
IFA Tablets		
No	262	17%
Yes	1286	83%

This study explored various maternal and household predictors associated with low birthweight (LBW) outcomes, defined as birthweight less than 2500 grams. The following predictors were examined: maternal age, maternal height, education of mother, education of father, gravida status, antenatal care (ANC) visits, deworming status, haemoglobin (HB) estimation, religion, and intake of iron and folic acid (IFA) tablets. Table 2 presents the crude odds ratios (OR) and p-values for each predictor in relation to LBW. 52% of the infant included in the study are males followed by 49% females. Among the 1548 infants included in the birth weight analysis, mean birth weight was 2.91 ± 0.4 kg, and 8% were classified as LBW (<2500 g). Maternal age was a strong predictor of low birth weight (LBW). Mothers aged ≥20 years had significantly lower odds of having a LBW baby compared to those aged <20 years (OR = 10.5, 95% CI: 5.88, 18.77; p < 0.0001). Similarly, maternal height was significantly associated with LBW, with mothers taller than 150 cm having lower odds of delivering a LBW baby compared to those 150 cm or shorter (OR = 2.47, 95% CI: 1.66, 3.68; p < 0.0001). Antenatal care (ANC) visits were also significant; mothers with ≥4 ANC visits had lower odds of having a LBW baby compared to those with fewer than 4 visits (OR = 1.7, 95% CI: 1.18, 2.45; p = 0.005). Additionally, the mother's education level showed a significant association with LBW (OR = 1.63, 95% CI: 1.13, 2.34; p = 0.01).

Conversely, other factors were not significantly associated with LBW. The father's education level did not show a significant association (OR = 1.13, 95% CI: 0.74, 1.73; p = 0.53), nor did gravida status, where multigravida status compared to primigravida was not significant (OR = 0.88, 95% CI: 0.58, 1.34; p = 0.56). Deworming treatment was not significantly associated with LBW (OR = 0.8, 95% CI: 0.47, 1.36; p = 0.4), and higher haemoglobin levels (≥11) did not significantly reduce the odds of LBW (OR = 0.95, 95% CI: 0.62, 1.46; p = 0.83). Religious affiliation, specifically practicing Islam compared to Hinduism, was not a significant factor (OR = 0.88, 95% CI: 0.54, 1.42; p = 0.59), nor was the intake of iron and folic acid (IFA) tablets (OR = 1.29, 95% CI: 0.81, 2.04; p = 0.28).

Table 2: Predictors and Their Association with Low Birthweight (LBW)

Variable	Category	Birthweight <2500 g	Birthweight ≥2500 g	Crude OR (95% CI)	p-value
Maternal Age	< 20 years	25	36	1.00 (Reference)	0.0001
	≥ 20 years	92	1395	10.5 (5.88, 18.77)	
Maternal Height	≤ 150 cm	67	502	1.00 (Reference)	0.0001
	> 150 cm	50	929	2.47 (1.66, 3.68)	
Education of Mother	< 10 years	49	438	1.00 (Reference)	0.01
	≥ 10 years	68	1 993	1.63 (1.13, 2.34)	
Education of Father	< 10 years	39	438	1.00 (Reference)	0.53
	≥ 10 years	78	993	1.13 (0.74, 1.73)	
Gravida	Multigravida	81	1026	1.00 (Reference)	0.56
	Primigravida	36	405	0.88 (0.58, 1.34)	
ANC Visits	< 4 visits	58	523	1.00 (Reference)	0.005
	≥ 4 visits	59	908	1.7 (1.18, 2.45)	
Deworming Status	No	20	291	1.00 (Reference)	0.4
	Yes	97	1140	0.8 (0.47, 1.36)	
HB Estimation	< 11	77	955	1.00 (Reference)	0.83
	≥ 11	40	476	0.95 (0.62, 1.46)	
Religion	Hinduism	92	1154	1.00 (Reference)	0.59
	Islam	25	277	0.88 (0.54, 1.42)	
IFA Tablets	No	24	238	1.00 (Reference)	0.28
	Yes	93	1193	1.29 (0.81, 2.04)	

These findings highlight significant predictors of low birthweight, including, maternal age, maternal height, and ANC visits, and education of mother emphasizing the need for targeted interventions to address these factors in order to reduce the incidence of low birthweight.

DISCUSSION

The present study investigated the prevalence and determinants of low birth weight (LBW) among live births at the Rural Health & Training Centre (RHTC) in Jewar, Gautam Buddha Nagar, over a one-year period (2023). The findings revealed that 8% of the neonates had a birth weight less than 2500 grams, which is less than the global estimates reported by the World Health Organization (WHO) that 15% to 20% of all births worldwide are LBW.[1] The mean birth weight observed in this study was 2.91 ± 0.43 kg, indicating that the majority of neonates in this rural setting had normal birth weights.

Several sociodemographic and maternal factors were examined to identify their association with LBW. Notably, household head education, maternal age, maternal height, and the number of antenatal care (ANC) visits were significantly associated with LBW. Maternal age was another strong predictor of LBW. Mothers aged 20 years or older had significantly lower odds of having a LBW baby compared to those aged less than 20 years (OR = 10.5, 95% CI: 5.88, 18.77; p < 0.0001). This supports the findings of studies conducted in Ethiopia and India, which have shown that teenage pregnancies are associated with a higher risk of adverse birth outcomes, including LBW, due to biological immaturity and inadequate prenatal care. [7,8,9] Maternal height was also significantly associated with LBW. Mothers with a height greater than 150 cm had lower odds of having a LBW baby compared to those with a height of 150 cm or less (OR = 2.47, 95% CI: 1.66, 3.68; p < 0.0001). Similar results were found, where shorter maternal stature was linked to a higher prevalence of LBW, possibly due to intergenerational nutritional deficiencies and poor health.[10] The number of ANC visits was significantly associated with LBW. Mothers who had four or more ANC visits had lower odds of having a LBW baby compared to those with fewer than four visits (OR = 1.7, 95% CI: 1.18, 2.45; p = 0.005). This is in line with WHO recommendations and other studies emphasizing the importance of adequate ANC visits in monitoring and promoting maternal and fetal health, thus reducing the risk of LBW.[11,12,13,14,15,16,17] Interestingly, other factors such as maternal education, paternal education, gravida status, deworming status, haemoglobin levels, religion, and intake of iron and folic acid (IFA) tablets were not significantly associated with LBW in this study. This contrasts with some studies where maternal anaemia and IFA supplementation have shown significant impacts on birth weight outcomes. The lack of association in this study might be due to the high coverage of IFA supplementation (83%) and deworming (80%) among the participants, possibly masking any potential differences.

Comparison with Other Studies

The prevalence of LBW (8%) in this study is lower compared to the national average reported in India, which is around 18%.[6] This discrepancy might be due to differences in study settings, sample sizes, and regional healthcare practices. Additionally, the significant predictors identified in this study highlight the multifaceted nature of LBW, where both sociodemographic and healthcare factors play crucial roles.

Limitation

One significant limitation of this study is the reliance on secondary data, which inherently comes with several challenges. The data quality and completeness are beyond the control of the researchers, potentially leading to inaccuracies or biases in the findings. The secondary data may lack specific variables or detailed contextual information that could be crucial for a comprehensive analysis. This limitation restricts the ability to perform nuanced analyses or control for all potential confounding factors, thereby possibly affecting the study's overall validity and generalizability. Despite these challenges, secondary data

analysis remains a valuable approach, especially in resource-limited settings, offering insights that can inform policy and practice

CONCLUSION

In conclusion, this study provides valuable insights into the prevalence and determinants of low birth weight (LBW) in a rural setting of Jewar, Gautam Buddha Nagar, Uttar Pradesh. The findings highlight that 8% of the infants were classified as having LBW, with significant predictors including household head education, maternal age, maternal height, and the number of antenatal care visits. These results underscore the importance of targeted interventions to improve maternal health education, enhance nutritional support, and ensure adequate prenatal care, particularly in rural areas. Addressing these key factors can help reduce the incidence of LBW, ultimately contributing to better neonatal health outcomes and advancing public health goals. The study's limitations, such as reliance on secondary data, must be acknowledged, yet the insights gained are crucial for informing effective local healthcare strategies and policies.

Recommendation

Based on the findings of the study on low birth weight (LBW) in Jewar, Gautam Buddha Nagar, Uttar Pradesh, several recommendations can be proposed to address the identified determinants and improve maternal and neonatal health outcomes:

1. **Enhance Maternal Health Education**: Implement programs to educate mothers and families about the importance of nutrition during pregnancy, optimal maternal age for childbirth, and the benefits of adequate prenatal care. This could involve community workshops, counseling sessions at healthcare facilities, and outreach programs.

2. **Strengthen Nutritional Support**: Provide targeted nutritional support for pregnant women, especially those from households with lower education levels. This may include access to fortified foods, prenatal supplements, and nutritional counseling to ensure adequate maternal nutrition throughout pregnancy.

3. **Increase Access to Antenatal Care (ANC)**: Encourage early and regular attendance at ANC visits by promoting the benefits of prenatal screenings and health checks. Ensure that healthcare facilities in rural areas are adequately equipped and staffed to provide comprehensive ANC services.

4. **Empower Household Heads**: Promote education and awareness among household heads, as their education level was found to be a significant predictor of LBW. Initiatives could include adult education programs, vocational training, and awareness campaigns on maternal and child health.

5. **Community-Based Interventions**: Implement community-based interventions that involve local health workers, community leaders, and volunteers to raise awareness about LBW and its determinants. Engage community members in identifying and addressing barriers to accessing maternal healthcare services.

6. **Monitor and Evaluate Interventions**: Establish monitoring and evaluation mechanisms to track the effectiveness of interventions aimed at reducing LBW rates. Regular assessments can help identify gaps and refine strategies to achieve better outcomes.

7. **Policy Support**: Advocate for policies that prioritize maternal and child health, particularly in rural areas. This includes allocation of resources for healthcare infrastructure, training of healthcare professionals, and implementation of evidence-based interventions.

8. **Collaboration and Partnerships**: Foster collaboration between government agencies, non-governmental organizations, healthcare providers, and community stakeholders to create a unified approach towards reducing LBW prevalence. Pooling resources and expertise can enhance the impact of interventions.

By implementing these recommendations, stakeholders can work towards reducing the incidence of LBW in Jewar and similar rural settings, ultimately improving neonatal health outcomes and advancing public health goals.

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