International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 21s, 2025
https://theaspd.com/index.php

Assessing The Prevalence of Low Birth Weight & Its Associated Factors Among Neonates in Balianta Block, Odisha

SR Chandan Kumar[1], Dr Uttara Patnaik[2], Prof. Pradeep Kumar Panda[3]

[1]M.P.H. Student,
[2]Assistant Professor AIPH University upatnaik@aiph.ac.in
[3]Dean School of Public Health AIPH University pradeepkpanda@aiph.ac.in

Abstract

Globally, low birth weight (LBW) among neonates is a significant public health problem. An estimated 20 million infants are born with LBW annually. LBW contributes to over 80% of all neonatal deaths globally. In addition to neonatal mortality, LBW is also responsible for delayed growth, impaired cognitive development, and increased risk of chronic diseases in adulthood. Since India contributes to over 40% of global LBW births, this makes the issue of LBW not only a national health concern but also a global priority. According to National Family Health Survey (NFHS) data, although there has been a decline in the prevalence of LBW in India from 21.5% in NFHS-3 (2005-06) to 17.4% in NFHS-5 (2019-21), the pace of decline is slow, and the figures remain significantly higher than the global average. Disparities also exist between urban and rural areas, and among different socio-economic groups and states, with states like Uttar Pradesh, Bihar, Madhya Pradesh, and Odisha reporting higher prevalence rates compared to southern states. This study aimed to assess the prevalence and associated factors of low birth weight among neonates in Balianta block in the state of Odisha, India.

The study population included 227 neonates, randomly selected from the Balianta block of Odisha. The results showed a high prevalence rate (31.7%) of LBW among the neonates. In order to find the factors associated with low birth weight among neonates, Chi-square tests were used. The present study identified several significant maternal and perinatal factors associated with low birth weight (LBW) among neonates. A statistically significant association was found between mother's age and LBW ($p = 0.008$), with the highest proportion of LBW observed in the 18–23 years age group. The history of previous low birth weight babies was also significantly associated with LBW ($p = 0.006$), suggesting a recurring pattern. The number of antenatal care (ANC) visits had a notable impact, as mothers with fewer ANC visits (0–3) showed a higher incidence of LBW ($p = 0.005$). Preeclampsia emerged as a significant maternal complication linked to LBW ($p = 0.004$). Nutritional practices during pregnancy, specifically the frequency of consuming protein-rich foods and vegetables, were also significantly associated with LBW ($p = 0.004$). Tobacco consumption during pregnancy was found to be another significant risk factor ($p = 0.006$). Furthermore, the type of delivery was significantly related to LBW outcomes, with higher rates reported among instrumental deliveries ($p = 0.008$). Other variables such as monthly income, anemia, hypertension, iron and folic acid consumption, and gestational diabetes did not show significant associations with LBW in this study.

Based on the findings of this study, it is recommended to strengthen antenatal care services to ensure that all pregnant women attend a minimum of four ANC visits for early identification and management of risk factors associated with low birth weight. Special attention should be given to adolescent and young mothers through targeted educational programs focusing on reproductive health and proper nutrition to reduce LBW risk in this vulnerable group. Promoting adequate maternal nutrition, particularly regular consumption of protein-rich foods and vegetables, is essential and can be achieved through nutrition counseling and supplementation initiatives. Effective screening and management of pregnancy-related complications such as preeclampsia should be prioritized to minimize adverse birth outcomes. Additionally, community-based interventions aimed at tobacco cessation during pregnancy are necessary to reduce LBW incidence related to harmful habits. Improving delivery care through training of healthcare providers in managing complicated deliveries, especially instrumental births, is also important. Finally, ongoing research and monitoring are needed to further understand and address

other determinants of low birth weight, alongside raising community awareness about the importance of prenatal care, maternal nutrition, and avoidance of harmful behaviors during pregnancy.

INTRODUCTION

Background

Low birth weight (LBW), defined as a birth weight of less than 2,500 grams (2.5 kilograms), remains a significant public health concern in India. (1) India accounts for one of the highest rates of LBW globally, contributing significantly to neonatal morbidity, mortality, and long-term developmental challenge. (2) According to national health surveys, a substantial proportion of Indian newborns are born with low birth weight, particularly in rural areas and among marginalized communities. According to WHO (World Health Organization) LBW is a major contributor to neonatal deaths, which account for a significant portion of under-five mortality in India. (3) Birth weight of an infant is dependent on amount of growth during pregnancy and the gestational age and these factors are also related to the genetic makeup of the infant and the mother, her lifestyle and status of health. Globally, neonatal mortality is 20 times more likely for LBW newborns when compared to normal weight newborns (2,500 gm-4,000 gm) and it increases sharply as birth weight decreases. (4) Newborns with low birth weight are more likely to have a health problem and slower development from immediately after birth to later life and suffer from an extremely high rate of mortality and morbidity from infectious disease and underweight, stunting, or wasting beginning in the neonatal period through childhood .(5) According to the National Family Health Survey (NFHS-5) conducted between 2019 and 2021, the prevalence of LBW in India was reported to be 18% of all live births .(6) In the first place, perinatal morbidity and mortality are more frequent in LBW infants than in normal infants; LBW has become the second cause of death in this period, after premature birth. (7) A variety of factors influence foetal growth, although they can be grouped into several general categories: factors originating from the foetus itself, maternal factors, placental factors and, finally, factors produced from the interaction of these factors. (8) Factors with well- established direct causal impacts on intrauterine growth include infant sex, racial/ethnic origin, maternal height, pre-pregnancy weight, paternal weight and height, maternal birth weight, parity, history of prior low-birth-weight infants, gestational weight gain and caloric intake, general morbidity and episodic illness, malaria, cigarette smoking, alcohol consumption, and tobacco chewing. (9)Poor maternal nutrition, anemia, and inadequate weight gain during pregnancy are prevalent among Indian women, especially in rural areas, and contribute significantly to LBW. Inadequate antenatal care (ANC), delayed initiation of ANC visits, and low utilization of healthcare services further exacerbate the risk. (10) Maternal age is another key factor, with adolescent mothers and women over 35 years being at higher risk of delivering LBW infants. Socioeconomic conditions, including poverty, low educational levels, and limited healthcare access, also contribute significantly to the high prevalence of LBW in vulnerable populations.

(11) Furthermore, fetal factors such as intrauterine growth restriction (IUGR) and preterm birth are recognized as primary contributors to LBW. Despite extensive research on low birth weight (LBW) and its associated factors, significant gaps remain in understanding the multifactorial determinants contributing to LBW, particularly in low-resource settings. (4) Many previous studies have focused primarily on maternal factors such as age, parity, and antenatal care (ANC) attendance, while less attention has been given to environmental, genetic, and socioeconomic influences.(12) Additionally, limited research has explored the combined effects of maternal nutrition, infections, and mental health on neonatal birth weight .(13) Most studies have relied on cross-sectional designs with retrospective data, leading to potential recall bias and incomplete information. Furthermore, there is a lack of comprehensive data on the impact of quality and timing of ANC, birth spacing, and paternal factors in determining neonatal birth outcome.(6)Another critical gap is the underrepresentation of rural and marginalized populations, which limits the generalizability of findings .(8) Understanding the prevalence and associated factors of LBW in a community setting is essential for designing and implementing targeted interventions aimed at improving maternal and neonatal outcomes . Community-based studies provide valuable insights into the local determinants of LBW and highlight gaps in healthcare delivery that need to be addressed. This study aims to assess the prevalence of LBW and identify the factors associated with its occurrence among neonates.

1.2 LITERATURE REVIEW

Global Prevalence of Low Birth Weight

Globally, an estimated 15–20% of all births are low birth weight, representing more than 20 million births a year. (3) The burden is disproportionately high in South Asia, where nearly one in four newborns has a low birth weight. (14)LBW contributes to almost 60–80% of all neonatal deaths globally.(12)

National Scenario in India

According to the National Family Health Survey-5 (NFHS-5), about 18.2% of newborns in India are of low birth weight, showing a slight improvement from NFHS-4 (2015–16), which reported 18.5% .(15) However, state-wise variability exists, with Odisha reporting approximately 19.5% LBW births, higher than the national average (NFHS-5, 2021). (16)

Associated Factors of Low Birth Weight

Numerous interrelated maternal, socio-economic, environmental, and healthcare-related factors contribute to LBW. (8)

Maternal Factors

- Maternal Age: Adolescent mothers (<20 years) and older mothers (>35 years) are at higher risk of delivering LBW babies due to biological immaturity or age-related complications. (16)
- Parity and Birth Spacing: Primiparous women or those with short birth intervals (<24 months) have a greater risk of LBW. (15)
- Nutrition and BMI: Maternal malnutrition, low pre-pregnancy Body Mass Index (BMI), and inadequate gestational weight gain are strongly associated with LBW .(17)
- Anemia During Pregnancy: A prevalent condition in India, maternal anemia leads to poor oxygenation and placental function, increasing the risk of LBW .(18) **Socioeconomic Factors**
- Education: Maternal education influences nutritional status, health-seeking behavior, and utilization of antenatal care (ANC) services .(19)
- Income and Living Standards: Low socioeconomic status often results in poor access to quality healthcare and nutrition, thereby increasing LBW risk .(17)

Antenatal and Healthcare Access

- ANC Visits: Inadequate antenatal visits (<4 visits) are associated with missed opportunities for nutritional counseling, supplementation, and early detection of complications .(11)
- Iron-Folic Acid (IFA) Supplementation: Non-compliance with IFA intake during pregnancy contributes to maternal anemia and LBW outcomes .(20)

Environmental and Behavioral Factors

- Tobacco and Alcohol Use: Maternal smoking and passive exposure to tobacco smoke are established risk factors for LBW .(12)
- Domestic Violence and Stress: Psychosocial stress during pregnancy is linked to adverse birth outcomes including LBW.(12)

Previous Studies in Odisha and Similar Settings

A study conducted in rural Odisha found that 21.8% of neonates were of low birth weight, and associated factors included maternal undernutrition, inadequate ANC visits, and maternal anemia .(11) Another study from a community health center in Balasore district of Odisha identified poor maternal BMI and low hemoglobin levels as the leading predictors of LBW.(14) **Conceptual Framework**

The determinants of LBW are best understood through the WHO's Conceptual Framework for Maternal and Child Health, which highlights the interplay of immediate, underlying, and basic causes such as maternal health status, nutrition, socioeconomic conditions, and health services .(21)

Research Gap

Despite a high burden, region-specific data in blocks like Balianta (Odisha) are limited. Existing studies are largely hospital-based or retrospective, with limited community-level assessment of multiple risk factors .(21) This necessitates localized research to tailor interventions effectively.

Rationale

Low Birth Weight (LBW) continues to be a major public health challenge worldwide, especially in developing countries like India .(22) Defined as a birth weight of less than 2500 grams, LBW is a significant predictor of neonatal morbidity and mortality, impaired immune function, developmental delays, and long-term health complications such as chronic diseases in adulthood .(5) Despite various national programs targeting maternal and child health, the prevalence of LBW in India remains unacceptably high .(23)

Odisha, a state with substantial rural and socioeconomically disadvantaged populations, reports a LBW rate that exceeds the national average .(24) While numerous studies have assessed LBW prevalence at the national and state levels, there is a lack of recent, community-based data that reflects the local burden and determinants of LBW, especially in semi-urban and rural blocks like **Balianta**. Given the unique demographic and health service characteristics of this block, it is important to generate context-specific evidence. This study is necessary to identify the magnitude of LBW and to examine associated maternal, socioeconomic, nutritional, and healthcare-related factors in the study area. Findings from this research can help inform local health authorities, primary healthcare providers, and maternal-child health programs to design targeted interventions, enhance service delivery, and improve maternal and newborn outcomes in Balianta Block. This research aims to bridge the information gap by providing localized evidence on LBW prevalence and its determinants, thereby contributing to the national goal of reducing LBW rates in alignment with the National Health Mission (NHM). Objectives

General Objective: To assess the prevalence and associated factors of low birth weight among neonates in Balianta block, Odisha.

Specific Objectives:

1. To determine the prevalence of low birth weight among newborns in Balianta block, Odisha.
2. To identify maternal factors associated with low birth weight.
3. To analyze socioeconomic and environmental factors that influence low birth weight, including maternal education, household income, and access to healthcare.

METHODS

Type of study

A community based cross sectional survey was conducted between the period of April 2025 to July 2025.

Study setting

The study participants were recruited from all the sub centres of Balianta block of Odisha.

Study participants

The study population included all neonates born in the selected community during the study period.

Sampling frame

List of new mother & infant pairs during the study period. List of mothers were taken from the ANM & ASHAs for the selected Sub centres.

Sample size

Sample size is calculated from the expression: $N= z^2 *p*(1-p) /e^2$

- Prevalence rate (P) is 18%
- Z is a standard normal deviate usually set at 1.96.
- The confidence level was specified as 95% and the tolerable margin error (e) was 5%.
- Sample Size= $(1.96)^2*0.18(1- 0.18)/ (0.05)^2 = 227$

Sampling strategy

The study population was consists of all neonates born within Balianta block during the study period, along with their mothers. Simple Random Sampling (SRS) was used to select participants from the population to ensure that every eligible neonate has an equal chance of being included in the study. List of all live births in the block during the specified study period was obtained from hospital birth records, community health workers (e.g., ASHAs), or birth registers maintained by the local health authorities. A unique identification number was given to each eligible neonate in the list. This numbering served as the basis for random selection. The required sample size was 227 neonates which was collected from all the subcentres of Balianta block, Odisha.

Selection criteria

Inclusion Criteria:

1. Neonates born within the study period.
2. Mothers who have consented to participate in the study.

Exclusion Criteria:

1. Stillbirths or infants who died before birth during the study period.
2. Mothers who decline to participate.
3. Mother or infant, with severe health issues.

Data collection technique

Permission was obtained from the Chief District Medical Officer, Khordha, Odisha to obtain data on newborns, birth weight & complications, and maternal health factors. For this community-based cross-sectional study, primary data collection was carried out using a structured, pre-tested questionnaire and review of Maternal and Child Health (MCH) records. Data were collected through face-to-face interviews with mothers of neonates (0–28 days old) residing in the Balianta Block of Khordha District, Odisha. The interview was conducted using a semi-structured questionnaire, which was developed based on relevant literature and validated tools used in similar studies. The questionnaire included sections on: Socio-demographic details (age, education, occupation, income, etc.) Obstetric history (gravida, parity, birth interval, ANC visits, etc.) Maternal health and nutrition (anemia status, IFA supplementation, weight gain) Lifestyle and behavioural factors (tobacco/alcohol use, stress, domestic violence) Birth weight and gestational age data were obtained from: MCH Cards, Delivery registers at sub-centres and PHC, Discharge summaries from nearby health facilities. These records were cross-verified with the mother's responses to ensure data accuracy. Eligible participants were selected using systematic random sampling from the population register maintained by ASHA workers. The data's quality, integrity and confidentiality were ensured. Verbal and written informed consent was obtained from each participant prior to the interview. Confidentiality and anonymity were strictly maintained. The study was explained to the participant and informed consent was obtained. The questionnaire was in English and Odia. The participants were explained about the questions. It took approximately 20-25 minutes to collect data for each participant to complete the questionnaire and there were no incentives for completing the study.

Operational definition for outcome variables

To ensure clarity and consistency in measurement, the following operational definitions are used for the outcome and key variables in this study:

1. Low Birth Weight (LBW)

- **Definition**: A neonate is considered to have Low Birth Weight if their weight at birth is less than 2500 grams (2.5 kilograms), regardless of gestational age.
- **Measurement**: Recorded birth weight is obtained from MCH cards, health facility discharge summaries, or direct maternal report confirmed by ANM/ASHA records.

2. Neonate

- **Definition**: A neonate is defined as a newborn infant aged 0 to 28 completed days from birth.
- **Inclusion Criteria**: All live-born infants during the study period within this age range are included.

3. Preterm Birth

- **Definition**: Delivery of a neonate before 37 completed weeks of gestation.
- **Measurement**: Based on maternal recall of last menstrual period (LMP) or ANC records.

4. Maternal Anemia

- **Definition**: A pregnant woman is considered anemic if her hemoglobin level during pregnancy is less than 11 g/dL, according to WHO criteria.
- **Measurement**: Self-reported history or recorded in ANC cards.

5. Antenatal Care (ANC) Visits

- **Adequate ANC**: Defined as 4 or more ANC visits during the pregnancy.
- **Inadequate ANC**: Fewer than 4 visits.
- **Measurement**: Verified from maternal recall and ANC records.

6. Iron and Folic Acid (IFA) Supplementation

- **Definition**: Regular intake of iron and folic acid tablets during pregnancy as prescribed.
- **Measurement**: Self-reported compliance with supplementation.

7. Maternal Body Mass Index (BMI)

Definition: Calculated using the formula

BMI = Weight in Kg at delivery/ (Height in meters)^2 **Categories**:

o Underweight: <18.5 kg/m2 o Normal: 18.5–24.9 kg/m2 o Overweight/Obese: ≥25 kg/m2

Measurement: Based on reported weight at delivery and height measured in cm.

8. Birth Interval

- **Definition**: The time interval between the birth of the previous child and the current child.
- **Short Birth Interval**: Less than 24 months.
- **Measurement**: Based on maternal recall and parity history.

9. Socioeconomic Status (SES)

- **Definition**: Measured based on self-reported monthly family income, education level of mother and husband, and occupation.
- **Categorization**: As per pre-decided income brackets and educational strata.

10. Substance Use During Pregnancy

- **Definition**: Use of tobacco (smoked or smokeless), alcohol, or other substances (e.g., betel nut) by the mother during pregnancy.
- **Measurement**: Self-reported during structured interviews.

Interview tool

Data was collected through a structured interview schedule using Kobo Toolbox. The structured questionnaire was developed in both English and Odia language. The duration of the interview for participants was 20-30 minutes per participant.

The interview schedule had questions covering the following domains:

1. Sociodemographic and economic characteristics
2. Maternal medical & Obstetrics characteristics
3. Nutritional status of mother
4. General maternal behaviour
5. Newborn characteristics

Data quality assurance

The quality of interview schedule was checked out before actual data collection. The questionnaires were analyzed, and appropriate changes were made before asking the study questionnaire to study participants.

Data collection: Data was collected by using Kobo Toolbox.

Data analysis

The data analysis was done by using SPSS-20 softwareand Microsoft office excel.

Ethical consideration

Ethical clearance was obtained from the Institutional Ethical Review Committee of the Asian Institute of Public Health University. The participants were asked to sign the consent form if they agreed to participate in the study. The confidentiality, privacy, and anonymity were maintained throughout the study. The identification of the participants was kept confidential. The place of data collection where privacy was maximal. Respondent was given the right to participate in the study or discontinue at any time.

Informed consent was obtained from all the participants involved in the study.

3 RESULTS

3.1 Sociodemographic and economic characteristics

Demographic Variables	Options	Frequency	Percentage
Age	18-23	67	29.5
	23-28	55	24.2
	28-33	48	21.1
	33-38	48	21.1
	38-43	9	4.0
Highest education attended	No formal education	42	18.5
	Primary level	36	15.9
	Upper primary level	33	14.5
	High school level	39	17.2
	Higher Secondary	35	15.4
	Graduate	42	18.5
Occupation	Housewife	44	19.4
	Agriculture	44	19.4
	Daily laborer	35	15.4

	Salaried employee	51	22.5
	Other	53	23.3
Husband's occupation	Housewife	47	20.7
	Agriculture	41	18.1
	Daily laborer	49	21.6
	Salaried employee	45	19.8
	Other	45	19.8
Monthly Income	1000- 20,000	209	92.1
	20,000- 40,000	15	6.6
	40,000- 60,000	3	1.3

Type of family	Nuclear family	125	55.1
	Joint family	102	44.9
Independent Variables	**Options**	**Frequency**	**Percentage**
Maternal Medical & Obstetric History			
Pregnancy count	Once	99	43.6
	Two times	120	52.9
	Three times	8	3.5
	Never	0	0
No. of live births	Once	99	43.6
	Two times	118	52.0
	Three times	10	4.4
	Never	0	0
No. of abortions or miscarriages	Once	7	3.1
	Two times	3	1.3
	Three times	0	0
	Never	217	95.6
No. of Stillbirths	Once	2	.9
	Two times	0	0
	Three times	0	0
	Never	225	99.1
No. of previous Low birth weight babies	Once	75	33.0
	Two times	70	30.8
	Three times	0	0
	Never	82	36.1
No. of ANC visits	0-3	89	39.2
	3-6	71	31.3
	6-9	67	29.5
Consumption of Iron & Folic acid	Yes	102	44.9

	No	125	55.1
Gestational Diabetes	Yes	111	48.9
	No	116	51.1
Hypertension	Yes	122	53.7
	No	105	46.3
Placental abnormalities	Yes	1	0.4
	No	226	99.5
Maternal Infections	Yes	20	8.8
	No	207	91.2
Preeclampsia	Yes	23	10.1
	No	204	89.9
Anemia	Yes	63	27.8
	No	164	72.2

Lifestyle & Nutritional factors			
Weight during Delivery	25- 50	64	28.2
	50- 75	163	71.8
	75- 100	0	0
Consumption of protein rich foods & vegetables during pregnancy	Daily	31	13.7
	Few times per week	44	19.4
	Weekly	54	23.8
	Few times per month	48	21.1
	Never	50	22.0
Smoking during pregnancy	Yes	2	.9
	No	225	99.1
Alcohol Consumption during pregnancy	Yes	1	.4
	No	226	99.6
Tobacco Consumption	Yes	106	46.7
	No	121	53.3
Access to clean water	Yes	216	95.2
	No	11	53.3
Neonatal Information			
Birth weight of the baby	Low birth weight (Less then 2.5 kg)	72	31.7
	Normal birth weight (92.5- 4.0 kg)	155	68.3
	High birth weight (more than 4.0 kg)	0	0
Type of delivery	Normal vaginal delivery	67	29.5
	Cesarean section	82	36.1

	Instrumental delivery (forceps or vaccums)	78	34.4
Gestational age	Preterm (less then 37 weeks)	65	28.6
	Term(37- 42 weeks)	150	66.1
	Post term (more than 42 weeks)	12	5
Did your baby experience any immediate complications after birth?	Yes	30	13.2
	No	197	86.8

The study included 227 mothers, and detailed information was collected regarding their socio-demographic profile, obstetric history, lifestyle practices, and neonatal outcomes.

Socio-Demographic Characteristics

The distribution of maternal age indicated that a significant proportion of participants were young mothers, with **29.5% in the 18–23 years age group** and **24.2% between 23–28 years**. This suggests that early childbearing is common in the study area. Educational attainment showed that **18.5%** of the women had no formal education, whereas another **18.5% were graduates**, reflecting a wide range in educational background. Nearly **one-third of mothers** were involved in either household work or agriculture. The most common occupational status of the husbands was daily labourer (**21.6%**) and housework (**20.7%**), highlighting the predominantly low-income, labour-oriented background of the study population. Income distribution revealed that **92.1%** of families earned between **INR 1,000–20,000 per month**, indicating a lower socioeconomic profile. More than half (**55.1%**) of the participants belonged to nuclear families, which may influence childcare practices and support during pregnancy.

Maternal Medical and Obstetric History

In terms of obstetric history, **52.9%** of women were pregnant for the second time, and **52.0%** had two live births. A high proportion of mothers (**95.6%**) reported no history of abortion or miscarriage, and **99.1%** reported no stillbirths, indicating relatively favourable pregnancy outcomes. However, **63.8%** of the participants had a history of delivering low birth weight babies at least once, suggesting a potential risk of recurrence. Antenatal care (ANC) utilization appeared suboptimal, with **39.2%** of mothers attending only 0–3 ANC visits. Additionally, **55.1%** of women did not consume iron and folic acid (IFA) supplements during pregnancy, highlighting gaps in essential prenatal care. High prevalence rates of **gestational diabetes (48.9%)**, **hypertension (53.7%)**, and **anemia (27.8%)** were reported, all of which are known risk factors for adverse pregnancy outcomes, including low birth weight.

Lifestyle and Nutritional Factors

Maternal weight at the time of delivery was found to be below optimal in nearly **28.2%** of participants (25–50 kg), which could contribute to intrauterine growth restriction. Nutritional intake was found to be inconsistent, with only **13.7%** consuming protein-rich foods and vegetables daily. Notably, **22%** reported never consuming such foods during pregnancy, indicating poor dietary practices.

Substance use was reported at varying levels. While **smoking (0.9%)** and alcohol consumption (0.4%) were minimal, **tobacco consumption was reported by 46.7%** of participants, which could significantly impact fetal growth. Most respondents (**95.2%**) had access to clean water, reducing the likelihood of waterborne infections during pregnancy.

Neonatal Outcomes

Low birth weight (defined as <2.5 kg) was observed in **31.7%** of the neonates. Preterm births (<37 weeks gestation) accounted for **28.6%**, indicating a high prevalence of early deliveries. The mode of delivery varied, with **36.1% undergoing cesarean section**, **34.4% assisted through instrumental delivery**, and **29.5% having normal vaginal delivery**. Immediate complications after birth were reported in **13.2%** of the neonates, further highlighting neonatal vulnerability in this population.

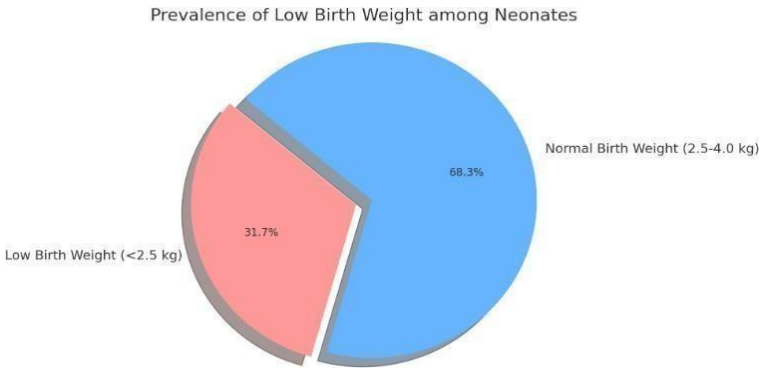
Prevalence of Low Birth Weight:

Prevalence refers to the proportion of individuals in a population who have a particular condition at a specific point in time.

In the present study, the birth weights of 227 neonates were recorded and categorized into three groups: low birth weight (<2.5 kg), normal birth weight (2.5–4.0 kg), and high birth weight (>4.0 kg). The findings revealed that:

- **72** neonates were classified as low birth weight.
- **155** neonates had normal birth weight.
- No cases of high birth weight were observed.

Prevalence of Low Birth Weight = Number of LBW babies/ Total number of babies ×100
Calculation:
Prevalence of LBW= 72/ 227*100 = 31.72%



The **prevalence of low birth weight** among the neonates in this study was **31.7%**. This indicates that nearly one-third of the newborns weighed less than 2.5 kg at birth, which is considered below the standard threshold for normal birth weight. This high prevalence suggests a significant public health concern and calls for targeted interventions to address maternal and neonatal risk factors.

Significant association between Variables and outcomes

Outcome	Risk factors	Frequency	Percentage	p- value
BIRTH	**Mother's Age**			
	18- 23	**20**	**8.8**	
	23- 28	**17**	**7.4**	**.008**
	28- 33	**19**	**8.3**	
	33-38	**13**	**5.7**	
	38-43	**3**	**1.3**	
LOW WEIGHT	**Monthly Income**			
	1000- 20,000	**67**	**29.5**	**.909**
	20,000- 40,000	**4**	**1.7**	
	40,000- 60,000	**1**	**0.4**	
	Pregnancy count			
	Once	**28**	**12.3**	
	Two times	**43**	**18.9**	**.241**
	Three times	**1**	**0.4**	
	Never	**0**	**0**	
	Weight duri Delivery			
	25- 50	**20**	**8.8**	**.924**
	50- 75	**52**	**22.9**	
	75- 100	**0**	**0**	

	No. of live births			
	Once	**29**	**12.7**	**.195**
	Two times	**42**	**18.5**	
	Three times	**1**	**0.4**	
	Never	**0**	**0**	
	No. of abortions or miscarriages			
BIRTH	Once	**2**	**0.8**	
	Two times	**1**	**0.4**	**.982**
	Three times	**0**	**0**	
	Never	**69**	**30.3**	
	No. of Stillbirths			
	Once	**1**	**0.4**	
	Two times	**0**	**0**	**.333**
	Three times	**0**	**0**	
	Never	**72**	**31.7**	
	No. of previous Low birth weight babies			
	Once	**30**	**13.2**	**.006**
	Two times	**28**	**12.3**	
	Three times	**0**	**0**	
LOW WEIGHT	Never	**22**	**9.6**	
	No. of ANC visits			
	0-3	**25**	**11.0**	**.005**
	3-6	**29**	**12.7**	
	6-9	**18**	**7.9**	
	Consumption of Iron & Folic acid			
	Yes	**33**	**14.5**	**.853**
	No	**39**	**17.1**	
	Gestational Diabetes			
	Yes	**36**	**15.8**	**.821**
	No	**36**	**15.8**	
	Hypertension			
	Yes	**37**	**16.2**	**.628**
	No	**35**	**15.4**	
	Placental abnormalities			
	Yes	**0**	**0**	**.495**
	No	**72**	**31.7**	

	Maternal Infections			
BIRTH	Yes	**6**	**2.6**	**.863**
	No	**66**	**29.0**	
	Preeclampsia			
	Yes	**11**	**4.8**	**.004**

	No	**61**	**26.8**	
	Anemia			
	Yes	**19**	**8.3**	**.754**
	No	**53**	**23.3**	
	Consumption of protein rich foods & vegetables during pregnancy			**.004**
	Daily	**14**	**6.1**	
LOW WEIGHT	Few times per week	**12**	**5.2**	
	Weekly	**24**	**10.5**	
	Few times per month	**10**	**4.4**	
	Never	**22**	**9.6**	
	Smoking dur pregnancy			
	Yes	**1**	**0.4**	**.577**
	No	**71**	**31.2**	
	Alcohol Consumption during pregnancy			**.683**
	Yes	**0**	**0**	
	No	**72**	**31.7**	
	Tobacco Consumption			
	Yes	**49**	**21.5**	**.006**
	No	**36**	**15.8**	
	Access to clean water			
	Yes	**69**	**30.3**	**.745**
	No	**3**	**1.3**	
	Type of delivery			
	Normal vag delivery	**14**	**6.1**	**.008**
	Cesarean section	**31**	**13.6**	
	Instrumental delivery (forceps or vaccums)	**27**	**11.8**	
	Gestational age			
	Preterm (less than 37 weeks)	**19**	**8.3**	**.691**
BIRTH LOW WEIGHT	Term (37- 42 weeks)	**48**	**21.1**	
	Post term (more than 42 weeks)	**5**	**2.2**	
	If the baby faced any			

Complications during Birth			**.828**
Yes	**9**	**3.9**	
No	**63**	**27.7**	

*Significant at 0.05 level.

RESULT

The Chi-square table shows the statistical relationship between various maternal medical and obstetric factors and with lifestyle & nutritional factors (risk factors) and LBW outcomes. Each row lists a risk factor, an outcome, the frequency or percentage of its occurrence, and a corresponding p-value. A p-value less than 0.05 is typically considered 'statistically significant'. This means the association between the risk factor and the outcome is unlikely due to chance. A p-value greater than 0.05 suggests "no significant association", meaning any correlation between the factor and outcome could be due to random chance. The p-value helps determine if the association between the risk factor and the outcome is statistically significant. Below is a detailed interpretation:

Among the variables analysed, the following factors showed a **statistically significant association** with LBW at the 0.05 level:

- **Maternal age** was significantly associated with LBW (p = 0.008). The highest proportion of LBW was observed in the age group 18–23 years (8.8%).
- **Number of previous low birth weight babies** was also found to be significantly associated (p = 0.006), with a higher occurrence in mothers who previously delivered one or two LBW babies.

Antenatal care (ANC) visits showed a significant association (p = 0.005). Mothers with fewer ANC visits (0–3) had a higher proportion of LBW babies compared to those with more visits.

- **Preeclampsia** during pregnancy was significantly associated with LBW (p = 0.004), indicating that mothers with preeclampsia were more likely to deliver LBW infants.
- **Consumption of protein-rich foods and vegetables** during pregnancy was also significantly associated (p = 0.004), with the lowest LBW rates found among mothers who consumed such foods daily. **Tobacco consumption** showed a strong association with LBW (p = 0.006), indicating higher risk among mothers who used tobacco during pregnancy.
- **Type of delivery** was significantly associated with LBW (p = 0.008), with a higher proportion of LBW cases among cesarean and instrumental deliveries compared to normal vaginal deliveries.

Other variables such as **monthly income, pregnancy count, maternal weight during delivery, number of live births, history of abortions or stillbirths, intake of iron and folic acid, presence of gestational diabetes, hypertension, placental abnormalities, maternal infections, anaemia, gestational age, and exposure to smoking, alcohol, or poor sanitation** did **not** showa statistically significant association with LBW (p > 0.05).

KEY FINDINGS:

The present study identified several significant maternal and perinatal factors associated with low birth weight (LBW) among neonates. A statistically significant association was found between mother's age and LBW (p = 0.008), with the highest proportion of LBW observed in the 18–23 years age group. The history of previous low birth weight babies was also significantly associated with LBW (p = 0.006), suggesting a recurring pattern. The number of antenatal care (ANC) visits had a notable impact, as mothers with fewer ANC visits (0–3) showed a higher incidence of LBW (p = 0.005). Preeclampsia emerged as a significant maternal complication linked to LBW (p = 0.004). Nutritional practices during pregnancy, specifically the frequency of consuming protein-rich foods and vegetables, were also significantly associated with LBW (p = 0.004). Tobacco consumption during pregnancy was found to be another significant risk factor (p = 0.006). Furthermore, the type of delivery was significantly related to LBW outcomes, with higher rates reported among instrumental deliveries (p = 0.008). Other variables such as monthly income, anaemia, hypertension, iron and folic acid consumption, and gestational diabetes did not show significant associations with LBW in this study.

DISCUSSION

The findings of this study highlight that low birth weight (LBW) continues to be a major public health concern in the Balianta block, with several maternal and perinatal factors significantly contributing to

its prevalence. Maternal age was found to be a critical determinant, with younger mothers (18–23 years) showing higher incidence of LBW. This aligns with existing literature that younger maternal age, often associated with physiological immaturity and limited antenatal care, can adversely affect fetal growth. A strong association was also observed between previous history of low-birth-weight deliveries and current LBW cases, indicating that maternal and environmental risk factors may persist across pregnancies if not addressed. Inadequate antenatal care (ANC), particularly fewer than four visits, was significantly associated with LBW, reinforcing the importance of early and regular ANC services in identifying and managing pregnancy-related risks. Preeclampsia, a known hypertensive disorder of pregnancy, was significantly linked to LBW, which is consistent with previous studies that report uteroplacental insufficiency as a mechanism leading to fetal growth restriction. Nutritional intake during pregnancy, especially the frequency of consumption of protein-rich foods and vegetables, was another significant predictor. Mothers who consumed such foods less frequently showed higher chances of delivering LBW babies, underscoring the role of maternal nutrition in fetal development. Tobacco uses during pregnancy emerged as a significant behavioural risk factor, reaffirming the adverse effects of nicotine and other harmful substances on placental blood flow and fetal growth. Additionally, the mode of delivery, particularly instrumental delivery, was significantly associated with LBW. This may reflect underlying fetal distress or complications during labor, which are often more common in growth-restricted fetuses. Interestingly, no significant associations were found between LBW and factors such as maternal anemia, gestational diabetes, hypertension, or iron and folic acid supplementation in this study. This could be attributed to possible variations in sample size, local health service utilization patterns, or effective management of these conditions during pregnancy. Overall, the study emphasizes the multifactorial etiology of LBW and the need for targeted interventions focusing on adolescent reproductive health, improved nutritional support, tobacco cessation, and enhanced antenatal care coverage to reduce the burden of LBW in rural communities.

OBSERVATIONS:
The study observed that low birth weight was more common among younger mothers (18–23 years) and those with a history of previous LBW babies. Inadequate antenatal care, especially fewer than four visits, and the presence of preeclampsia were significantly linked to LBW. Poor dietary intake during pregnancy and tobacco use also showed strong associations with LBW. Instrumental deliveries were more frequently associated with low birth weight, possibly due to underlying complications. Other factors such as income, anaemia, hypertension, and iron or folic acid intake did not show significant associations. Overall, the findings highlight the importance of maternal age, nutrition, antenatal care, and lifestyle in preventing low birth weight.

CONCLUSION
This study highlights that low birth weight (LBW) remains a significant public health issue in the Balianta block, with multiple contributing factors. The findings revealed that younger maternal age, especially between 18 to 23 years, is associated with a higher risk of delivering LBW babies. A previous history of low-birth-weight deliveries was also strongly linked to recurrence in subsequent births. Inadequate antenatal care, particularly fewer than four ANC visits, emerged as a critical risk factor, along with medical conditions like preeclampsia. Maternal nutrition played a key role, as infrequent consumption of protein- rich foods and vegetables was associated with higher LBW incidence. Additionally, tobacco use during pregnancy significantly increased the risk. The type of delivery, especially instrumental methods, showed a notable association with LBW, likely reflecting underlying complications. On the other hand, factors like income level, anemia, hypertension, and iron-folic acid supplementation did not show significant associations in this study. These findings underscore the importance of strengthening maternal health services, promoting adequate nutrition, ensuring regular ANC visits, and addressing lifestyle risk factors to reduce the burden of low birth weight and improve newborn outcomes.

RECOMMENDATIONS
Based on the findings of this study, it is recommended to strengthen antenatal care services to ensure that all pregnant women attend a minimum of four ANC visits for early identification and management of risk factors associated with low birth weight. Special attention should be given to adolescent and young mothers through targeted educational programs focusing on reproductive health and proper nutrition to reduce LBW risk in this vulnerable group. Promoting adequate maternal nutrition,

particularly regular consumption of protein-rich foods and vegetables, is essential and can be achieved through nutrition counselling and supplementation initiatives. Effective screening and management of pregnancy-related complications such as preeclampsia should be prioritized to minimize adverse birth outcomes.

Additionally, community-based interventions aimed at tobacco cessation during pregnancy are necessary to reduce LBW incidence related to harmful habits. Improving delivery care through training of healthcare providers in managing complicated deliveries, especially instrumental births, is also important. Finally, ongoing research and monitoring are needed to further understand and address other determinants of low birth weight, alongside raising community awareness about the importance of prenatal care, maternal nutrition, and avoidance of harmful behaviors during pregnancy.

STRENGTHS OF THE STUDY

- The study provides valuable data on low-birth-weight determinants specific to the rural Balianta block, Odisha, addressing a regional research gap.
- It comprehensively examines a wide range of factors, including maternal age, nutrition, antenatal care, medical conditions, and lifestyle behaviors.
- Inclusion of both clinical and behavioral risk factors, such as preeclampsia and tobacco use, allows a holistic understanding of LBW causes.
- The focus on modifiable risk factors offers practical insights for designing targeted public health interventions.
- The adequate sample size and systematic data collection enhance the study's reliability and validity.
- Findings are relevant and generalizable to similar rural populations in India.

LIMITATIONS OF THE STUDY

- The study was conducted in a specific rural area (Balianta block), which may limit the generalizability of the findings to urban or other diverse settings.
- Cross-sectional design restricts the ability to establish causal relationships between risk factors and low birth weight.
- Data on some variables, such as dietary intake and tobacco use, relied on self-reporting, which may be subject to recall or reporting bias.
- Limited availability of detailed clinical data or laboratory investigations could have affected the assessment of maternal medical conditions.
- Potential confounding factors might not have been fully controlled or explored due to resource constraints.
- The sample size, while adequate, may not be sufficient to detect associations with less common risk factors.

REFERENCES

1. Low birth weight and its associated factors in Ethiopia: a systematic review and meta-analysis | Italian Journal of Pediatrics [Internet]. [cited 2025 Mar 18]. Available from: https://link.springer.com/article/10.1186/s13052-018-0586-6
2. Epidemiology of low birth weight in Iran: A systematic review and meta-analysis: Heliyon
3. [Internet]. [cited 2025 Mar 18]. Available from: https://www.cell.com/heliyon/fulltext/S24058440(20)30632-0
4. UNICEF-WHO Low birthweight estimates: Levels and trends 2000–2015 | UNICEF [Internet]. 2019 [cited 2025 Jun 30]. Available from: https://www.unicef.org/reports/UNICEF-WHO-lowbirthweight-estimates-2019
5. Mahumud RA, Sultana M, Sarker AR. Distribution and Determinants of Low Birth Weight in Developing Countries. J Prev Med Pub Health. 2017 Jan 31;50(1):18–28.
6. Davoudi N, Khezri M, Asgharpour M, Khatami SM, Hoseinpour M, Azarian AA. Prevalence and Related Factors of Low Birth Weight in Mashhad, Iran. Iran J Neonatol. 2012 Aug 1;3(2):69–76.
7. Tessema ZT, Tamirat KS, Teshale AB, Tesema GA. Prevalence of low birth weight and its associated factor at birth in Sub- Saharan Africa: A generalized linear mixed model. Petry CJ, editor. PLOS ONE. 2021 Mar 11;16(3):e0248417.
8. The World Health Report 2005. Make every mother and child count [Internet]. [cited 2025 Jun
9. 30]. Available from: https://www.who.int/publications/i/item/9241562900

10. Sema A, Tesfaye F, Belay Y, Amsalu B, Bekele D, Desalew A. Associated Factors with Low Birth Weight in Dire Dawa City, Eastern Ethiopia: A Cross-Sectional Study. BioMed Res Int.
11. 2019;2019:2965094.
12. Determinants of low birth weight: methodological assessment and meta-analysis - PMC [Internet].
13. [cited 2025 Mar 18]. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC2491072/
14. Khan N, Mozumdar A, Kaur S. Determinants of low birth weight in India: An investigation from the National Family Health Survey. Am J Hum Biol. 2020 May;32(3):e23355.
15. Risk factors for low birth weight: a review - ScienceDirect [Internet]. [cited 2025 Mar 18]. Available from: https://www.sciencedirect.com/science/article/abs/pii/S0301211504001654
16. Toru T, Anmut W. Assessment of Low Birth Weight and Associated Factors Among Neonates in Butajira General Hospital, South Ethiopia, Cross Sectional Study, 2019. Int J Pediatr. 2020 Aug 1;2020:1–6.
17. Dilnessa T, Belete E, Tefera M. Prevalence of Low Birth Weight and Associated Factors among New Born Babies in Ataye Primary Hospital, North Shoa, Ethiopia, 2018. Asian J Med Health. 2020 Apr 30;1–11.
18. Yadav DK, Shukla GS, Gupta N, Shrestha N, Singh A, Kaphle HP. Maternal and Obstetric Factors Associated with Low Birth Weight. J Nepal Health Res Counc. 2020 Jan 21;17(4):443–50.
19. Titaley CR, Dibley MJ, Agho K, Roberts CL, Hall J. Determinants of neonatal mortality in Indonesia. BMC Public Health. 2008 Jul 9;8(1):232.
20. The Outcomes of Very Low Birth Weight Infants: Are We Asking the Right Questions? | Pediatrics | American Academy of Pediatrics [Internet]. [cited 2025 Mar 18]. Available from: https://publications.aap.org/pediatrics/article - abstract/99/6/869/75394/The-Outcomes-of-Very-LowBirth-Weight-Infants-Are
21. Assessing the relationship between maternal and neonatal factors and low birth weight in Iran; a systematic review and meta- analysis - PMC [Internet]. [cited 2025 Mar 18]. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC5319292/
22. Debi S, Basu G, Mondal R, Chakrabarti S, Roy S, Ghosh S. Compliance to iron-folic-acid supplementation and associated factors among pregnant women: A cross-sectional survey in a district of West Bengal, India. J Fam Med Prim Care. 2020;9(7):3613.
23. Sharifi N, Dolatian M, Fathnezhad A, Pakzad R, Mahmoodi Z, Mohammadi Nasrabadi F. Prevalence of Low Birth Weight in Iranian Newborns: A Systematic Review and Meta-analysis. Int J Womens Health Reprod Sci. 2017 Jul 5;6(3):233–9.
24. Hack M, Klein NK, Taylor HG. Long-Term Developmental Outcomes of Low Birth Weight Infants. Future Child. 1995;5(1):176–96.
25. Mishra PS, Sinha D, Kumar P, Srivastava S, Bawankule R. Newborn low birth weight: do socioeconomic inequality still persist in India? BMC Pediatr. 2021 Nov 19;21(1):518.
26. Belachew A, Tewabe T. Neonatal sepsis and its association with birth weight and gestational age among admitted neonates in Ethiopia: systematic review and meta-analysis. BMC Pediatr. 2020 Feb 5;20(1):55.
27. Frontiers | Effect of antenatal care on low birth weight: a systematic review and meta-analysis in
28. Africa, 2022 [Internet]. [cited 2025 Mar 18]. Available from:
29. https://www.frontiersin.org/journals/public- health/articles/10.3389/fpubh.2023.1158809/full 24. Prevalence of Low Birth Weight and Associated Factors among Neonates in Public Hospitals of Addis Ababa, Ethiopia in 2022. | Research Square [Internet]. [cited 2025 Mar 18]. Available from:
30. https://www.researchsquare.com/article/rs- 3469559/v1