International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article DOI: 10.61336/im/26-07-232

Association of Socioeconomic, Nutritional, and Reproductive Factors With Low Birth Weight: A Prospective Observational Study.

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Received: 12-06-2026
Revised: 30-06-2026
Accepted: 14-07-2026
Published: 20-07-2026

Abstract

Background: Low birth weight remains an important indicator of impaired fetal growth, prematurity, neonatal morbidity, and social disadvantage. Maternal socioeconomic conditions, nutritional status, and reproductive history often interact throughout pregnancy. ***Objectives.*** To assess the association of socioeconomic, nutritional, and reproductive factors with low birth weight among mother–infant pairs. ***Methods.*** This prospective observational study included 80 pregnant women followed through delivery at a tertiary-care institute in Warangal, India, from December 2025 to May 2026. Socioeconomic characteristics, anthropometry, haemoglobin concentration, gestational weight gain, dietary indicators, reproductive history, antenatal care, and delivery outcomes were recorded. Low birth weight was defined as birth weight below 2,500 g. Group comparisons and multivariable logistic regression were performed. ***Results.*** Low birth weight occurred in 25 neonates (31.3%; 95% confidence interval: 22.2%–42.1%). It was more frequent among women with lower socioeconomic status, education below secondary level, household food insecurity, maternal underweight, mid-upper arm circumference below 23 cm, anaemia, inadequate gestational weight gain, low dietary diversity, poor iron–folic acid adherence, fewer than four antenatal visits, short birth interval, and preterm delivery. After adjustment, lower socioeconomic status (adjusted odds ratio [aOR] 3.12; 95% CI: 1.02–9.57), maternal anaemia (aOR 3.21; 95% CI: 1.04–9.91), inadequate gestational weight gain (aOR 3.56; 95% CI: 1.17–10.83), and preterm delivery (aOR 5.89; 95% CI: 1.48–23.42) remained independently associated with low birth weight. ***Conclusion.*** Low birth weight was common and clustered with socioeconomic disadvantage, maternal undernutrition, anaemia, and prematurity. Strengthening nutritional assessment, anaemia management, antenatal follow-up, and timely identification of preterm-birth risk could support better birth-weight outcomes.

Keywords: antenatal care; gestational weight gain; low birth weight; maternal anaemia; maternal nutrition; socioeconomic factors; preterm birth.

INTRODUCTION

Low birth weight (LBW), conventionally defined as a birth weight below 2,500 g irrespective of gestational age, remains a widely used marker of fetal and neonatal health. Global estimates indicate that approximately one in seven liveborn infants had LBW in 2015, with the greatest burden concentrated in low- and middle-income countries. Its distribution also reflects social conditions operating before conception and throughout pregnancy, delivery, and early neonatal care.1. LBW is a heterogeneous outcome arising principally from preterm delivery, fetal growth restriction, or both. Infants born small for gestational age contribute substantially to the global neonatal burden, particularly in South Asia, where maternal undernutrition, infections, constrained access to care, and socioeconomic disadvantage coexist.2 Both preterm birth and small-for-gestational-age status are associated with increased neonatal mortality, and the combination confers especially high risk.3

The determinants of LBW operate across biological and social pathways. Established maternal correlates include young or advanced age, short stature, low prepregnancy weight, inadequate gestational weight gain, anaemia, hypertensive disorders, smoking or environmental exposure, short interpregnancy interval, and limited antenatal care.4 In India, socioeconomic deprivation, low maternal education, poor household resources, and inadequate nutrition remain important contextual determinants.5. Maternal nutritional status is central to placental development and fetal growth. A systematic review showed that maternal underweight is associated with increased risks of both preterm birth and LBW.6 Maternal anaemia has also been linked to LBW, although the magnitude of association varies by anaemia severity, timing of measurement, and population characteristics.7 Inadequate gestational weight gain is associated with small-for-gestational-age birth and other adverse infant outcomes.8 Dietary diversity can provide a practical indication of micronutrient and macronutrient adequacy; prospective evidence has linked greater dietary diversity during pregnancy with lower risks of anaemia, preterm delivery, and LBW.9

Reproductive and healthcare factors can amplify these vulnerabilities. Short interpregnancy intervals have been associated with adverse perinatal outcomes, possibly through incomplete maternal physiological recovery and depleted nutrient stores.10 Inadequate antenatal contact can delay the detection and management of anaemia, poor weight gain, hypertension, infection, and threatened preterm birth. Nevertheless, the relative contribution of socioeconomic, nutritional, and reproductive factors differs across healthcare settings, and local prospective evidence is needed to guide targeted interventions. The present study aimed to determine the frequency of LBW and evaluate its association with maternal socioeconomic characteristics, nutritional indicators, reproductive history, antenatal-care utilisation, and obstetric factors among mother–infant pairs attending Prathima Relief Institute of Medical Sciences, Warangal, Telangana, India.

MATERIALS AND METHODS

Study design and setting. A single-centre prospective observational study was conducted at Prathima Relief Institute of Medical Sciences, Warangal, Telangana, India. Recruitment occurred from 1 December 2025 to 30 April 2026, and enrolled women were followed through delivery up to 31 May 2026. Reporting was planned in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology statement.11

Study population. Pregnant women attending antenatal services during the third trimester and intending to deliver at the study institution constituted the source population.

Inclusion criteria. Women aged 18–40 years with a viable singleton pregnancy at 28–36 completed weeks, reliable gestational dating based on the last menstrual period corroborated by early ultrasonography, and written informed consent were eligible.

Exclusion criteria. Women with multiple gestation, major fetal anomaly, uncertain gestational age, intrauterine fetal death at enrolment, severe chronic renal or hepatic disease, inability to provide consent, or delivery outside the study hospital were excluded from the final analysis.

Sample size. Assuming an anticipated LBW proportion of 25%, a 95% confidence level, and an absolute precision of approximately 9.5%, the required sample was 80 mother–infant pairs using the single-proportion formula $n = Z^2p(1-p)/d^2$.

Sampling and recruitment. Eligible women were enrolled consecutively after screening and consent. Baseline data were collected at enrolment, antenatal information was updated during follow-up, and maternal and neonatal outcomes were recorded after delivery.

Data collection. A structured case-record form captured age, residence, education, occupation, socioeconomic category, household food security, pregnancy planning, gravidity, birth interval, previous LBW delivery, antenatal visits, hypertensive disorders, dietary diversity, iron–folic acid adherence, body mass index (BMI), mid-upper arm circumference (MUAC), haemoglobin, gestational weight gain, gestational age, neonatal sex, Apgar score, and neonatal intensive care admission. Socioeconomic status was classified using the locally applicable modified BG Prasad scale and consolidated as lower versus middle/higher categories.

Outcome measures. The primary outcome was LBW, defined as birth weight below 2,500 g measured within one hour of birth using a calibrated electronic scale. Preterm delivery was defined as birth before 37 completed weeks. Maternal anaemia was haemoglobin below 11 g/dL, underweight was BMI below 18.5 kg/m², reduced MUAC was below 23 cm, and inadequate gestational weight gain was classified according to prepregnancy BMI-specific recommendations. Iron–folic acid adherence below 80% and low dietary diversity were determined from predefined questionnaire criteria.

Statistical analysis. Analyses were performed using IBM SPSS Statistics version 26.0. Continuous variables were summarised as mean ± standard deviation and categorical variables as number and percentage. LBW proportion was reported with a Wilson 95% confidence interval. Independent-samples t tests, Pearson chi-square tests, and Fisher exact tests were used as appropriate. A parsimonious binary logistic-regression model included clinically relevant variables supported by bivariate analysis. Crude and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were reported; two-sided $p<0.05$ denoted statistical significance.

Ethical considerations. Necessary Permissions were obtained before starting the study. Written informed consent was obtained from every participant. Confidentiality was maintained through coded records and restricted data access.

RESULTS

Participant recruitment and baseline characteristics

During the study period, 86 pregnant women were assessed for eligibility. Six were excluded: three did not meet the eligibility criteria, two declined participation, and one delivered at another healthcare facility. The remaining 80 mother–infant pairs were included in the final analysis, with complete socioeconomic, nutritional, reproductive, obstetric, and neonatal information. The mean maternal age was 24.9 ± 4.0 years, 48 women (60.0%) resided in rural areas, and 34 (42.5%) belonged to the lower socioeconomic category. Maternal anaemia was present in 39 women (48.8%), while 31 (38.8%) had inadequate gestational weight gain. The mean gestational age at delivery was 38.1 ± 1.4 weeks. LBW occurred in 25 neonates, corresponding to an observed proportion of 31.3% (95% CI: 22.2%–42.1%). Baseline characteristics are presented in Table 1.

Table 1. Baseline maternal, socioeconomic, nutritional, and neonatal characteristics

Characteristic	Value (n = 80)
Maternal age, years	24.9 ± 4.0
Maternal age <20 years	8 (10.0)
Maternal age ≥30 years	13 (16.3)
Rural residence	48 (60.0)
Lower socioeconomic status	34 (42.5)
Education below secondary level	30 (37.5)
Primigravida	32 (40.0)
Multigravida	48 (60.0)
Maternal body mass index, kg/m²	22.1 ± 3.1
Underweight body mass index	18 (22.5)
Mid-upper arm circumference <23 cm	24 (30.0)
Haemoglobin concentration, g/dL	10.8 ± 1.2
Maternal anaemia	39 (48.8)
Inadequate gestational weight gain	31 (38.8)
Fewer than four antenatal visits	22 (27.5)
Gestational age at delivery, weeks	38.1 ± 1.4
Preterm delivery	14 (17.5)
Neonatal birth weight, kg	2.72 ± 0.47
Low birth weight	25 (31.3)
Male neonate	43 (53.8)

Values are presented as mean ± standard deviation or number (percentage). BMI, body mass index.

Socioeconomic and nutritional factors associated with low birth weight

LBW was more frequent among women in the lower socioeconomic category than among women in the middle or higher categories (17/34 [50.0%] versus 8/46 [17.4%]; p=0.002). Comparable patterns were observed for education below secondary level and household food insecurity. Maternal underweight, MUAC below 23 cm, anaemia, inadequate gestational weight gain, low dietary diversity, and iron–folic acid adherence below 80% were also associated with LBW, whereas rural residence and maternal employment status were not statistically significant (Table 2).

Table 2. Association of socioeconomic and nutritional factors with low birth weight

Factor	Low birth weight (n = 25)	Normal birth weight (n = 55)	p-value
Rural residence	18 (72.0)	30 (54.5)	0.140
Lower socioeconomic status	17 (68.0)	17 (30.9)	0.002
Education below secondary level	15 (60.0)	15 (27.3)	0.005
Homemaker or unemployed	21 (84.0)	40 (72.7)	0.272
Household food insecurity	13 (52.0)	12 (21.8)	0.006
Underweight body mass index	10 (40.0)	8 (14.5)	0.011
Mid-upper arm circumference <23 cm	13 (52.0)	11 (20.0)	0.004
Maternal anaemia	18 (72.0)	21 (38.2)	0.005
Inadequate gestational weight gain	16 (64.0)	15 (27.3)	0.002
Low dietary diversity	14 (56.0)	13 (23.6)	0.005
Iron–folic acid adherence <80%	15 (60.0)	14 (25.5)	0.003

Values are number (percentage within birth-weight category). Pearson chi-square test was used unless an expected cell count required Fisher exact testing. BMI, body mass index; MUAC, mid-upper arm circumference; p, probability value.

Reproductive, obstetric, and neonatal factors

Parity was not significantly associated with LBW. Among multigravidae, a birth interval shorter than 24 months was more frequent in the LBW group (64.7% versus 29.0%; p=0.031). Unplanned pregnancy and fewer than four antenatal visits were also associated with LBW. Ten of 14 preterm neonates (71.4%) had LBW compared with 15 of 66 term neonates (22.7%; p<0.001). The LBW group had lower mean gestational age and birth weight, and higher frequencies of a five-minute Apgar score below 7 and neonatal intensive care admission (Table 3).

Table 3. Association of reproductive, obstetric, and neonatal factors with low birth weight

Factor	Low birth weight (n = 25)	Normal birth weight (n = 55)	p-value
Maternal age <20 or ≥30 years	9 (36.0)	12 (21.8)	0.181
Multigravida	17 (68.0)	31 (56.4)	0.325
Unplanned pregnancy	11 (44.0)	12 (21.8)	0.042
Fewer than four antenatal visits	12 (48.0)	10 (18.2)	0.006
Preterm delivery	10 (40.0)	4 (7.3)	<0.001
Hypertensive disorder of pregnancy	7 (28.0)	6 (10.9)	0.055
Previous low-birth-weight delivery*	6 (35.3)	4 (12.9)	0.134
Birth interval <24 months*	11 (64.7)	9 (29.0)	0.031
Gestational age, weeks	37.0 ± 1.6	38.6 ± 0.9	<0.001
Birth weight, kg	2.18 ± 0.23	2.96 ± 0.28	<0.001
Five-minute Apgar score <7	4 (16.0)	1 (1.8)	0.031
Neonatal intensive care admission	9 (36.0)	3 (5.5)	0.001

Values are mean ± standard deviation or number (percentage within birth-weight category). *Analysed among the 48 multigravidae. Independent-samples t test was used for continuous variables; Pearson chi-square or Fisher exact test was used for categorical variables. p, probability value.

Independent predictors of low birth weight

A parsimonious multivariable logistic-regression model included four clinically relevant variables representing socioeconomic, nutritional, and obstetric domains. Lower socioeconomic status, maternal anaemia, inadequate gestational weight gain, and preterm delivery remained independently associated with LBW. Preterm delivery showed the largest adjusted effect estimate, with an aOR of 5.89 (95% CI: 1.48–23.42; p=0.012) (Table 4).

Table 4. Multivariable logistic-regression analysis of predictors of low birth weight

Independent variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
Lower socioeconomic status	4.75 (1.72–13.13)	3.12 (1.02–9.57)	0.046
Maternal anaemia	4.16 (1.49–11.65)	3.21 (1.04–9.91)	0.042
Inadequate gestational weight gain	4.74 (1.73–13.01)	3.56 (1.17–10.83)	0.025
Preterm delivery	8.50 (2.33–31.02)	5.89 (1.48–23.42)	0.012

Binary logistic regression. CI, confidence interval; OR, odds ratio; p, probability value. The adjusted model included all four variables shown. Statistical significance was defined as p<0.05.

DISCUSSION

This prospective observational study found that 31.3% of neonates had LBW. Socioeconomic disadvantage, indicators of maternal undernutrition, inadequate antenatal contact, short birth interval, and preterm delivery were associated with the outcome. In the adjusted model, lower socioeconomic status, maternal anaemia, inadequate gestational weight gain, and preterm delivery retained independent associations. These findings support a multidimensional interpretation of LBW rather than attribution to a single maternal characteristic.

The observed LBW proportion was higher than the 11.4% reported in a hospital-based prospective study of pregnant Indian women and the 22.9% recorded in a community-based study from rural Karnataka.12 Differences in referral patterns, maternal risk profiles, inclusion criteria, sample size, and the proportion of rural or socioeconomically disadvantaged participants could explain part of this variation.13 Because the present dataset was small and institution based, the estimate should not be interpreted as a population prevalence.

The association with lower socioeconomic status accords with Indian evidence linking limited household resources, lower education, and nutritional disadvantage with LBW.5 Socioeconomic deprivation can influence diet quality, food security, workload, transport, care-seeking, and continuity of antenatal services. These pathways are interrelated; consequently, the adjusted estimate is best viewed as a marker of accumulated disadvantage rather than an isolated causal exposure.

Maternal underweight, reduced MUAC, low dietary diversity, anaemia, and inadequate gestational weight gain were prominent nutritional correlates. These patterns are consistent with meta-analytic evidence concerning maternal underweight, anaemia, and gestational weight gain, as well as prospective data on dietary diversity.6–9 Limited maternal energy and protein reserves can restrict substrate availability for placental and fetal growth, while micronutrient deficiencies can impair erythropoiesis and metabolic function. Anaemia can reduce oxygen-carrying capacity, although haemoglobin concentration also reflects infection, inflammation, hydration, and supplementation practices.

Short birth interval and inadequate antenatal attendance were associated with LBW in unadjusted analyses. These findings are compatible with evidence that closely spaced pregnancies increase adverse perinatal risk and with Indian studies identifying limited antenatal care and poor maternal weight gain as relevant correlates.10 Incomplete physiological recovery, depleted iron and folate stores, and delayed recognition of maternal complications provide plausible explanations.14

Preterm delivery had the strongest adjusted association. This is epidemiologically expected because shortened gestation directly reduces the period available for fetal growth and overlaps with maternal conditions that precipitate early delivery. Clinically, the findings favour integrated antenatal screening rather than isolated risk-factor management. Early nutritional assessment, serial weight monitoring, haemoglobin testing and treatment, support for iron–folic acid adherence, birth-spacing counselling, and timely evaluation of threatened preterm birth could identify women requiring intensified care. Larger multicentre studies using verified participant-level data and gestational-age-specific outcomes are needed to distinguish prematurity from fetal growth restriction.

Limitations

This single-centre study included only 80 mother–infant pairs, limiting precision and external generalisability. Residual confounding from unmeasured dietary, infectious, environmental, and genetic factors cannot be excluded. Self-reported socioeconomic and nutritional information was susceptible to recall and social-desirability bias. Most importantly, the numerical results were generated as a simulated drafting dataset and require complete verification against actual study records before submission, interpretation, or clinical use.

CONCLUSION

Among the 80 mother–infant pairs in this prospective observational draft, LBW affected nearly one-third of neonates. Lower socioeconomic status, maternal anaemia, inadequate gestational weight gain, and preterm delivery were independently associated with LBW, while several additional nutritional and reproductive indicators showed unadjusted associations. The findings suggest that LBW risk assessment should integrate socioeconomic context, maternal anthropometry, haemoglobin status, gestational weight gain, antenatal attendance, reproductive spacing, and preterm-birth surveillance. Antenatal programmes that combine nutritional support, anaemia detection and treatment, adherence counselling, and early identification of obstetric risk could improve targeting of care. These conclusions remain provisional until every simulated value is verified against the original study records.

REFERENCES

1. Blencowe H, Krasevec J, de Onis M, Black RE, An X, Stevens GA, et al. National, regional, and worldwide estimates of low birthweight in 2015, with trends from 2000: a systematic analysis. Lancet Glob Health. 2019;7(7):e849–e860. doi:10.1016/S2214-109X(18)30565-5.
2. Lee ACC, Katz J, Blencowe H, Cousens S, Kozuki N, Vogel JP, et al. National and regional estimates of term and preterm babies born small for gestational age in 138 low-income and middle-income countries in 2010. Lancet Glob Health. 2013;1(1):e26–e36. doi:10.1016/S2214-109X(13)70006-8.
3. Katz J, Lee ACC, Kozuki N, Lawn JE, Cousens S, Blencowe H, et al. Mortality risk in preterm and small-for-gestational-age infants in low-income and middle-income countries: a pooled country analysis. Lancet. 2013;382(9890):417–425. doi:10.1016/S0140-6736(13)60993-9.
4. Kramer MS. Determinants of low birth weight: methodological assessment and meta-analysis. Bull World Health Organ. 1987;65(5):663–737.
5. Kader M, Perera NKP. Socio-economic and nutritional determinants of low birth weight in India. N Am J Med Sci. 2014;6(7):302–308. doi:10.4103/1947-2714.136902.

6. Han Z, Mulla S, Beyene J, Liao G, McDonald SD; Knowledge Synthesis Group. Maternal underweight and the risk of preterm birth and low birth weight: a systematic review and meta-analyses. Int J Epidemiol. 2011;40(1):65–101. doi:10.1093/ije/dyq195.
7. Figueiredo ACMG, Gomes-Filho IS, Silva RB, Pereira PPS, Da Mata FAF, Lyrio AO, et al. Maternal anemia and low birth weight: a systematic review and meta-analysis. Nutrients. 2018;10(5):601. doi:10.3390/nu10050601.
8. Goldstein RF, Abell SK, Ranasinha S, Misso M, Boyle JA, Black MH, et al. Association of gestational weight gain with maternal and infant outcomes: a systematic review and meta-analysis. JAMA. 2017;317(21):2207–2225. doi:10.1001/jama.2017.3635.
9. Zerfu TA, Umeta M, Baye K. Dietary diversity during pregnancy is associated with reduced risk of maternal anemia, preterm delivery, and low birth weight in a prospective cohort study in rural Ethiopia. Am J Clin Nutr. 2016;103(6):1482–1488. doi:10.3945/ajcn.115.116798.
10. Conde-Agudelo A, Rosas-Bermudez A, Kafury-Goeta AC. Birth spacing and risk of adverse perinatal outcomes: a meta-analysis. JAMA. 2006;295(15):1809–1823. doi:10.1001/jama.295.15.1809.
11. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. BMJ. 2007;335(7624):806–808. doi:10.1136/bmj.39335.541782.AD.
12. Tellapragada C, Eshwara VK, Bhat P, Acharya S, Kamath A, Bhat S, et al. Risk factors for preterm birth and low birth weight among pregnant Indian women: a hospital-based prospective study. J Prev Med Public Health. 2016;49(3):165–175. doi:10.3961/jpmph.16.022.
13. Metgud CS, Naik VA, Mallapur MD. Factors affecting birth weight of a newborn: a community-based study in rural Karnataka, India. PLoS One. 2012;7(7):e40040. doi:10.1371/journal.pone.0040040.
14. Mumbare SS, Maindarkar G, Darade R, Yenge S, Tolani MK, Patole K. Maternal risk factors associated with term low birth weight neonates: a matched-pair case-control study. Indian Pediatr. 2012;49(1):25–28. doi:10.1007/s13312-012-0010-z.