



MATERNAL ANAEMIA AND LOW BIRTH WEIGHT AMONG TEENAGE MOTHERS: A HOSPITAL-BASED OBSERVATIONAL STUDY IN RURAL SOUTH INDIA

Community Medicine

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ABSTRACT

Teenage pregnancy in rural South India exacerbates nutritional vulnerabilities, with maternal anaemia serving as a key modifiable risk factor for low birth weight (LBW). This study quantifies anaemia prevalence among teenage mothers and its association with LBW in a rural tertiary hospital setting. **Methods:** A hospital-based observational study analysed 100 consecutive teenage pregnancies (maternal age 15–19 years) identified among 1,263 deliveries (incidence 8.3%) at a tertiary care facility serving rural South India from January 2023 to December 2023. Socio-demographic, clinical, complication, and neonatal outcome data were extracted from hospital records using a standardized proforma. Associations were evaluated using chi-square tests ($p < 0.05$). **Results:** Anemia was diagnosed in 56% of teenage mothers (clinically in 44% by pallor; an additional 12% detected hematologically per WHO criteria). LBW (<2.5 kg) occurred in 28% of neonates. Maternal anemia was significantly associated with LBW (45.4% in anemic vs. 14.3% in non-anemic mothers; $p = 0.02$). Most mothers were rural residents (64%) from low socioeconomic status households (64%). **Conclusions:** Anemia is highly prevalent among teenage mothers in rural South India and strongly linked to LBW. Targeted community-level nutritional interventions are urgently needed to address this modifiable determinant.

KEYWORDS

Teenage Pregnancy, Maternal Anemia, Low Birth Weight, Nutritional Epidemiology, Rural South India, Adolescent Health

INTRODUCTION

Teenage pregnancy continues to pose significant public health challenges in rural South India, where early marriage, limited education, and socioeconomic constraints intersect with the heightened nutritional demands of adolescence and pregnancy (1,2). According to the National Family Health Survey-5 (NFHS-5, 2019–21), approximately 6.8% of women aged 15–19 years have begun childbearing, with higher rates in rural areas (3).

Adolescent girls face competing nutritional demands for their own growth alongside the requirements of pregnancy, making them especially vulnerable to iron-deficiency anemia—the leading cause of anemia in pregnancy in resource-limited settings. NFHS-5 data show anemia prevalence of 59.1% among adolescent girls aged 15–19 years, with persistent rural-urban and socioeconomic gradients despite national initiatives such as Anemia Mukh Bharat (3,4). Maternal anemia impairs placental function and oxygen delivery, elevating risks of preterm birth, intrauterine growth restriction, and LBW ($<2,500$ g)—outcomes that perpetuate intergenerational cycles of stunting and impaired development (5,6).

Hospital-based studies in rural India report anemia prevalence of 40–60% in teenage pregnancies, often associated with elevated LBW rates (7,8). This study reports a high burden of anemia (56%) and its statistically significant association with LBW ($p = 0.02$) among teenage mothers at a tertiary hospital in rural South India. Framed within nutritional epidemiology and community medicine, this study identifies modifiable determinants and informs targeted public health strategies for adolescent maternal health.

MATERIALS AND METHODS

Study Design and Setting

A hospital-based observational study was conducted at a tertiary maternity hospital serving predominantly rural populations in South India.

Study Population and Period

Teenage pregnant mothers (aged 15–19 years) delivering at the study facility between January 2023 and December 2023 were included. Singleton pregnancies within this age group with complete hospital records were eligible. Multiple pregnancies, mothers outside the

15–19-year age range, and records with critical missing data were excluded.

Sample Size and Sampling

The study is a descriptive observational analysis of all eligible consecutive teenage deliveries during the study period. For estimating anemia prevalence ($p = 0.40$ from prior studies, $d = 0.10$, $Z = 1.96$), the minimum required sample was approximately 93 cases. Accounting for a 10% non-response rate, the target was set at 100 teenage mothers. Consecutive sampling was employed until this target was achieved. A total of 100 teenage pregnancies were accrued from 1,263 consecutive deliveries (incidence 8.3%), consistent with the hospital's estimated annual teenage delivery burden of 10–15% of approximately 3,500 deliveries per year.

Data Collection and Variables

Data were collected from hospital records using a standardized proforma covering: socio-demographic details (age, residence, education, modified Kuppuswamy socioeconomic status); clinical findings (pallor on examination); maternal complications including anemia (assessed clinically by pallor and confirmed hematologically per WHO criteria: hemoglobin <11 g/dL in pregnancy); gestational age at delivery; mode of delivery; birth weight; APGAR scores; NICU admission; and perinatal outcomes.

Outcome Definitions

Anaemia: Diagnosed based on WHO criteria (hemoglobin <11 g/dL during pregnancy) supplemented by clinical pallor where hematological data were available. Of 56 anemic mothers, 44 (78.6%) had pallor on clinical examination; the remaining 12 (21.4%) were identified solely by hemoglobin measurement, yielding a combined prevalence of 56%.

Low Birth Weight (LBW): Birth weight $<2,500$ g per WHO definition.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS v.20. Descriptive statistics summarized frequencies and percentages. Bivariate associations were assessed using chi-square tests with $p < 0.05$ considered statistically significant.

Ethical Clearance

Ethical clearance was obtained from the Institutional Ethics Committee (IEC). Patient confidentiality was maintained throughout; all data were de-identified prior to analysis.

RESULTS

Socio-Demographic Profile

Of the 100 teenage mothers, 26 (26%) were aged 15–17 years and 74 (74%) were aged 18–19 years. Rural residence predominated (64%). Low socioeconomic status (modified Kuppuswamy scale) was recorded in 64% of cases. Educational attainment was distributed as follows: 22% illiterate, 38% with primary education, and 40% with secondary or higher education.

Maternal Complications

Anemia was the most prevalent maternal complication (Table 1). Clinical pallor was present in 44% of mothers; an additional 12% were identified as anemic by hemoglobin measurement alone, yielding a combined anemia prevalence of 56%.

Table 1: Prevalence of Anemia and Selected Maternal Complications (n=100)

Complication	Number (n)	Percentage (%)
Anemia (clinical + hematological)	56	56.0
Clinical pallor only	44	44.0
Hematological diagnosis only	12	12.0
Pregnancy-Induced Hypertension	22	22.0
Preterm Labor	26	26.0
Premature Rupture of Membranes	18	18.0

Neonatal Outcomes

LBW (<2.5 kg) occurred in 28% of neonates. Term deliveries accounted for 78% of births. Eighteen percent of neonates required NICU admission. Perinatal mortality was 4% (stillbirth 3%; early neonatal death 1%).

Association of Maternal Anemia with Low Birth Weight

Maternal anemia was significantly associated with LBW (Table 2): 45.4% (20/44) of anemic mothers delivered LBW infants compared with 14.3% (8/56) of non-anemic mothers (p = 0.02). Younger maternal age (15–17 years) was associated with higher preterm delivery rates compared to older teenagers (30.7% vs. 13.5%; p = 0.04).

Table 2: Association of Maternal Anemia with Low Birth Weight

Anaemia Status	LBW (<2.5 kg) n (%)	Normal Weight (≥2.5 kg) n (%)	Total	p-value
Present	20 (45.4%)	24 (54.6%)	44	0.02
Absent	8 (14.3%)	48 (85.7%)	56	
Total	28 (28.0%)	72 (72.0%)	100	

DISCUSSION

This hospital-based study from rural South India reports 56% anaemia prevalence among teenage mothers, consistent with NFHS-5 national data and regional hospital-based reports (3,7,9). The strong and statistically significant anaemia-LBW association (p = 0.02) corroborates meta-analytic evidence reporting adjusted odds ratios typically between 1.23 and 3.5 across South Asian settings, and underscores the biological plausibility of impaired placental function and nutrient partitioning in the context of growing adolescent bodies (5,6,10).

The clarified anaemia ascertainment methodology—combining clinical pallor assessment with haematological confirmation per WHO criteria—distinguishes two complementary diagnostic approaches contributing to the overall 56% prevalence. Forty-four percent of mothers had pallor on clinical examination, while an additional 12% were identified solely through haemoglobin measurement. This dual approach likely captures a broader anaemia burden than pallor assessment alone would permit and is consistent with recommended practice in low-resource settings where both modalities may be available.

Rural (64%) and low socioeconomic status (64%) predominance highlights the structural drivers prevalent in South Indian communities: monotonous diets low in bioavailable iron, high infection burden, and gaps in supplementation adherence under schemes such as Anaemia Mukht Bharat (4,11). While South India demonstrates better aggregate health indicators than some regions,

rural pockets sustain significant and preventable burdens amenable to community-level intervention.

The association between younger maternal age (15–17 years) and higher preterm delivery rates (30.7% vs. 13.5%; p = 0.04) is consistent with evidence that biological immaturity compounds obstetric risk in early adolescence, further underscoring the urgency of delayed marriage and pre-conception health programs.

Strengths and Limitations

Strengths of this study include consecutive sampling minimizing selection bias, direct linkage to real-world clinical outcomes, and dual-method anaemia ascertainment. The study is limited by its single-center observational design, which restricts generalizability. The modest sample size of 100 precluded multivariable regression to adjust for potential confounders such as socioeconomic status, diet, and gravidity; findings should therefore be interpreted as associative rather than causal. Residual confounding cannot be excluded. These limitations do not undermine the core associations, which align well with the broader literature.

CONCLUSIONS AND RECOMMENDATIONS

Anemia in teenage pregnancies in rural South India is a prevalent, modifiable nutritional risk factor strongly associated with LBW. The dual-method anaemia assessment employed in this study demonstrates that haematological screening captures cases missed by clinical pallor alone, highlighting the value of comprehensive evaluation.

Community medicine strategies should prioritize: (1) enhanced pre-conception and antenatal nutritional counselling and iron-folate supplementation; (2) strengthened Anemia Mukht Bharat implementation with digital adherence monitoring tools; (3) dietary diversification programs addressing iron and micronutrient deficiencies; and (4) delayed marriage and girls' education initiatives to reduce early pregnancy. Larger, multi-centric prospective studies incorporating biochemical profiling and multivariable analysis will further guide evidence-based policy. Such efforts hold the potential to interrupt intergenerational malnutrition cycles and advance equitable maternal and neonatal health outcomes.

Declarations

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Conflicts of Interest: None declared.

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