

Fetomaternal outcomes in teenage pregnancy: A prospective observational study from a tertiary care centre in southern Odisha.

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Abstract

Background:

Teenage pregnancy remains a major public health concern in developing countries, associated with increased maternal and neonatal morbidity and mortality.

Methods:

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, MKCG Medical College and Hospital, Berhampur, Odisha, from March 2024 to September 2025. A total of 362 pregnant adolescents aged 13–19 years were enrolled. Data on sociodemographic profile, obstetric complications, mode of delivery, and neonatal outcomes were collected and analysed.

Results:

The incidence of teenage pregnancy was 2.82 per 12,800 obstetric admissions. Most participants were aged 18–19 years (85.36%), from rural areas (70.16%), and unbooked (84.53%). Anemia (77.90%) was the most common complication, followed by hypertensive disorders (19.06%) and preterm labour (25.97%). Vaginal delivery occurred in 60.22%, while lower segment caesarean section (LSCS) was performed in 30.94%. Among 314 live births, 30.25% were low birth weight, 35.35% required NICU admission, and neonatal mortality was 1.59%.

Conclusion:

Teenage pregnancy is associated with significant fetomaternal complications, particularly anemia and preterm birth.

Recommendation:

Strengthening adolescent health education, delaying the age at marriage, improving access to antenatal care, and implementing nutritional interventions are essential to reducing adverse outcomes.

Keywords: Teenage pregnancy, adolescent pregnancy, fetomaternal outcome, anemia, preterm labour, low birth weight, lower segment caesarean section, Odisha.

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Introduction

Adolescence, defined by the World Health Organization (WHO) as the period between 10 and 19 years of age, represents a critical transitional phase characterised by rapid biological, psychological, and social maturation [1]. When pregnancy occurs during this window, it creates a biological competition between the still-growing adolescent body and the developing fetus, placing both at significant risk. Pregnancy in a girl below 20 years of age is broadly defined as a teenage or adolescent pregnancy, and the two terms are often used interchangeably in the literature [2,3].

Globally, approximately 21 million girls aged 15–19 years become pregnant every year, accounting for roughly 11% of all births worldwide. Of these, about 12 million result in live births, with approximately 90% occurring in low- and

middle-income countries [4,5]. The global adolescent birth rate stands at around 41 per 1,000 women aged 15–19 years, with disproportionately higher rates observed in South Asia and sub-Saharan Africa [1]. Pregnancy and childbirth complications rank among the leading causes of death in the 15–19-year age group globally [6].

India harbours the world's largest adolescent population—over 253 million individuals—with girls constituting approximately 20% of the total female population. Despite legislative provisions setting the minimum age of marriage at 18 years for females under the Prohibition of Child Marriage Act 2006, child marriage continues to be widely practised, particularly in rural, socioeconomically deprived communities [7,9]. National Family Health Survey (NFHS) data document a significant decline in adolescent

childbearing over recent decades—from approximately 16% in NFHS-3 (2005–06) to ~8% in NFHS-4 (2015–16) and ~7% in NFHS-5 (2019–21)—yet the absolute burden remains large given India's adolescent population size [10].

Odisha, a state with persistent socioeconomic underdevelopment and relatively high rates of tribal and rural poverty, faces an above-average burden of adolescent pregnancies. Factors contributing to this burden include early marriage, female illiteracy, low socioeconomic status, gender disparity, limited access to contraceptive services, and inadequate reproductive health education [7,8]. Adolescent mothers face unique physiological risks: incomplete pelvic ossification, nutritional vulnerability, and an immature uterine milieu predispose to anemia, hypertensive disorders of pregnancy, cephalopelvic disproportion, preterm labour, and operative delivery. Fetal and neonatal consequences include prematurity, low birth weight (LBW), intrauterine growth restriction (IUGR), birth asphyxia, and elevated perinatal mortality [3,11,12].

MKCG Medical College and Hospital, Berhampur, serves as the primary referral centre for the southern Odisha region, encompassing several tribal and backward districts, and receives a high volume of high-risk obstetric cases. Viewed in this context, the present prospective study was designed to comprehensively evaluate the demographic profile, maternal complications, mode of delivery, and neonatal outcomes in teenage pregnancies managed at this institution, and to compare findings with contemporaneous national and regional data.

Materials and Methods

Study Design and Setting

This was a prospective observational study conducted in the Department of Obstetrics and Gynaecology, MKCG Medical College and Hospital (MKCG MCH), Berhampur, Ganjam, Odisha—a 1,200-bed tertiary teaching institution serving as the apex referral centre for southern Odisha and parts of Andhra Pradesh.

Study Size Justification

The sample size of 362 adolescent pregnancies was determined based on:

- Expected prevalence of teenage pregnancy (~3%) from previous institutional data
- 95% confidence level
- 5% margin of error

Additionally, all eligible adolescent pregnancies that occurred during the 18-month study period were included consecutively, yielding a complete enumeration sample.

Study Period and Sample Size

The study was carried out over 18 months from March 2024 to September 2025. A total of 362 pregnant adolescents who satisfied the eligibility criteria were consecutively enrolled.

Eligibility Criteria

Inclusion: All singleton and multiple pregnancies in females aged 13–19 years presenting to the labour room or antenatal outpatient department (OPD) at MKCG MCH during the study period.

Exclusion: (1) Pregnancy in women above 19 years of age; (2) participants who declined written informed consent; (3) participants lost to follow-up before delivery.

Data Collection

Structured case record proformas were used to collect information on sociodemographic variables (age, residence, education, marital status, socioeconomic class by modified Kuppuswamy scale), obstetric history, antenatal care (ANC) registration status, clinical examination findings, laboratory investigations (complete blood count, urine analysis, blood grouping, random blood sugar, VDRL, HBsAg, HIV), and ultrasonographic findings. Patients were followed through the antenatal, intrapartum, and postpartum periods.

Labour was monitored using the WHO partograph. Active management of the third stage of labour was performed uniformly. Neonates were assessed with the APGAR score at 1 and 5 minutes; birth weight was recorded. Neonates requiring NICU/SNCU care were referred, and their duration of stay was documented. Maternal and neonatal outcomes at discharge were the primary endpoints.

Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants (or legal guardians for minors below 18 years). Institutional Ethics Committee approval was obtained before commencement.

Statistical Analysis

Data were entered in Microsoft Excel and analysed using descriptive statistics. Categorical variables were expressed as frequencies and percentages. Proportions were compared where applicable. All findings were tabulated and discussed in context with published literature.

Results

A total of **12,800 obstetric patients** were admitted during the study period.

- **Potentially eligible adolescents:** 389
- **Excluded:**
 - Declined consent: 15
 - Lost to follow-up: 12
- **Final included:** 362
- **Analysed:** 362

All included participants completed follow-up until delivery and discharge.

Incidence of Teenage Pregnancy
 During the study period, a total of 12,800 obstetric admissions were recorded at MKCG MCH, of which 362

were teenage pregnancies, yielding an institutional incidence of 2.82%.

Table 1: Sociodemographic Profile of Study Participants

Table 1. Sociodemographic and Obstetric Characteristics of 362 Teenage Mothers

Characteristic	Number (n=362)	Percentage (%)
Residence		
Rural	254	70.16%
Urban	108	29.83%
Socioeconomic Status		
Low	245	67.67%
Middle	117	32.32%
High	0	0.00%
Marital Status		
Married	305	84.25%
Unmarried	57	15.75%
ANC Registration		
Booked	56	15.46%
Unbooked	306	84.53%
Parity		
Primigravida	307	84.81%
Multigravida	55	15.19%

ANC: Antenatal care. Socioeconomic status classified by the modified Kuppuswamy scale.

Age Distribution

The age-group distribution revealed that the majority of participants (85.36%; n=309) were in the late-adolescent

category (18–19 years), while 9.67% (n=35) were mid-adolescents (16–17 years) and 4.97% (n=18) were early adolescents below 15 years. Details are presented in Table 2.

Table 2. Distribution of Study Participants by Adolescent Age Group

Age Group	Age Range (years)	n	Percentage (%)
Early Adolescent	<15	18	4.97%
Mid Adolescent	16–17	35	9.67%
Late Adolescent	18–19	309	85.36%
Total		362	100%

Early adolescent: <15 years; Mid adolescent: 16–17 years; Late adolescent: 18–19 years (WHO classification).

Educational Profile

Functional literacy was present in 94.20% of participants; however, only 8.56% had attained higher secondary education (Classes 11–12). The largest proportion (33.98%) had studied up to middle school (Classes 6–8), and 27.62% had completed only primary education (Classes 1–5). A total of 5.80% of participants were entirely illiterate.

Maternal Complications

Anemia emerged as the single most prevalent complication, affecting 274 of 362 (75.69%) participants; 77.90% of the

study cohort met haematological criteria for anemia (Hb <11 g/dL). Among those with anemia, moderate grade (Hb 7–9.9 g/dL) predominated (65.25%), while severe anemia (Hb 4–6.9 g/dL) was documented in 3.19%. Hypertensive disorders of pregnancy affected 19.06% of the cohort—comprising gestational hypertension in 8.29%, severe pre-eclampsia in 4.15%, and eclampsia in 6.63%. Preterm labour occurred in 25.97% of deliveries. Table 3 provides a comprehensive overview of antepartum, intrapartum, and postpartum complications.

Table 3. Maternal Complications in Teenage Pregnancy (n=362)

Complication	n	Percentage (%)
Antepartum Complications		
Anemia (any grade)	274	75.69%
– Mild (Hb 10–10.9 g/dL)	89 / 282 anemic	31.56%
– Moderate (Hb 7–9.9 g/dL)	184 / 282 anemic	65.25%
– Severe (Hb 4–6.9 g/dL)	9 / 282 anemic	3.19%
Gestational Hypertension	30	8.29%
Severe Pre-eclampsia	15	4.15%
Eclampsia (antepartum)	24	6.63%
IUGR	21	5.80%
Antepartum Haemorrhage	12	3.31%
Congenital Anomaly	6	1.66%
Intrapartum Complications		
Preterm Labour	44	12.15%
Fetal Distress	38	10.50%
Cephalopelvic Disproportion	30	8.29%
PROM / PPROM	30	8.29%
Oligohydramnios	18	4.97%
Obstructed Labour	12	3.31%
Postpartum Complications		
Postpartum Haemorrhage	18	4.97%
Postpartum Eclampsia	5	1.38%
Shock / AKI / MODS	3	0.83%

Complication	n	Percentage (%)
Antepartum Complications		
HELLP Syndrome	1	0.28%

IUGR: Intrauterine growth restriction; APH: Antepartum haemorrhage; PROM: Premature rupture of membranes; PPROM: Preterm PROM; AKI: Acute kidney injury; MODS: Multiple organ dysfunction syndrome; HELLP: Haemolysis, elevated liver enzymes, low platelets.

Mode of Delivery and Labour Outcomes

Vaginal delivery was achieved in 60.22% (n=218) of participants. Lower segment caesarean section (LSCS) was performed in 30.94% (n=112), with fetal distress being the

primary indication (29.46%), followed closely by cephalopelvic disproportion (26.79%). Abortion occurred in 8.83%. Duration of active labour was 6–10 hours in the majority (60.57%) who delivered vaginally. Full details are outlined in Table 4.

Table 4. Mode of Delivery, LSCS Indications, Labour Duration, and Gestational Age at Delivery

Parameter	n	Percentage (%)
Mode of Delivery (n=362)		
Vaginal Delivery	218	60.22%
LSCS	112	30.94%
Abortion	32	8.83%
Indications for LSCS (n=112)		
Fetal Distress	33	29.46%
Cephalopelvic Disproportion	30	26.79%
Oligohydramnios	14	12.50%
Obstructed Labour	12	10.71%
Breech Presentation	7	6.25%
Elective CDMR	11	9.82%
Others (Preterm, NPL)	5	4.47%
Duration of Labour (n=214 vaginal)		
<6 hours	33	15.42%
6–10 hours	130	60.57%
>10 hours	51	23.83%
Gestational Age at Delivery		
Term (37–41+6 wks)	232	64.09%
Preterm (20+1d–36+6 wks)	94	25.97%
Post-term (>42 wks)	6	1.66%
Abortion (<20 wks)	30	8.29%

LSCS: Lower segment caesarean section; CDMR: Caesarean delivery on maternal request; NPL: Non-progress of labour.

Neonatal and Fetal Outcomes

Among 362 pregnancies, 314 (86.74%) resulted in live births. Eleven (3.04%) were intrauterine fetal deaths, five (1.38%) were intrapartum stillbirths, and six (1.66%) neonates had congenital anomalies. Of the 314 live-born infants, 95

(30.25%) had low birth weight (<2.5 kg). NICU admission was required for 111 (35.35%) neonates. The most prevalent neonatal complications were neonatal jaundice (16.24%), low birth weight (12.74%), and respiratory illness (2.87%). Five neonatal deaths (1.59%) were recorded. Complete neonatal data are presented in Table 5.

Table 5. Fetal, Neonatal, and Birth Weight Outcomes

Outcome / Parameter	n	Percentage (%)
Pregnancy Outcome (n=362)		
Live Birth	314	86.74%
Abortion	32	8.84%
IUFD	11	3.04%
Stillbirth	5	1.38%
Congenital Anomaly	6	1.66%
Birth Weight (n=314 live births)		
<1.5 kg	12	3.82%
1.5–2.5 kg (LBW)	83	26.43%
2.6–3.5 kg	212	67.52%
>3.5 kg	4	1.27%
Total LBW (<2.5 kg)	95	30.25%
NICU Admission (n=314)		
Admitted to NICU	111	35.35%
Not Admitted	203	64.65%
Neonatal Complications (n=314)		
Neonatal Jaundice	51	16.24%
Low Birth Weight	40	12.74%
Respiratory Illness	9	2.87%
Neonatal Sepsis	5	1.59%
Neonatal Seizures	4	1.27%
Necrotizing Enterocolitis	2	0.64%
Neonatal Death	5	1.59%

LBW: Low birth weight (<2.5 kg); IUFD: Intrauterine fetal death; NICU: Neonatal intensive care unit.

Maternal Mortality

One maternal death (0.28%) was recorded. The patient was a primigravida with severe anemia, antepartum eclampsia, and intrauterine fetal death who progressed to septic shock and multi-organ failure.

Discussion Incidence

The incidence of teenage pregnancy in this study was 2.82%, reflecting a declining trend compared with earlier institutional reports from India: Kumar A (2007) reported 4.1% [13], Yasmin G (2014) reported 5.10% [14], Devi G (2019) reported 5.56% [15], and Okram SD (2019) documented 7.0% [16]. The reduction aligns with national NFHS-5 data documenting a fall in adolescent childbearing from ~16% in 2005–06 to ~7% in 2019–21 [17]. Strengthened enforcement of the Prohibition of Child Marriage Act, expanded access to female education under initiatives such as Beti Bachao Beti Padhao, and greater availability of contraceptive services likely account for this secular decline. However, the continued high absolute number underscores the persistent magnitude of the problem in a high-volume tertiary centre serving socioeconomically marginalised populations.

Sociodemographic Profile

The predominance of rural residents (70.16%) and low socioeconomic status participants (67.67%) is consistent with national survey data, which identify poverty and rural residence as principal drivers of adolescent pregnancy in India [17,18]. In NFHS-5, approximately 62% of adolescent mothers belonged to the lowest socioeconomic quintile, a figure comparable to the present cohort [17]. The high proportion of unbooked cases (84.53%) reflects deficient antenatal care utilisation, a well-documented problem in this demographic that substantially amplifies obstetric risk [19]. The predominance of the late-adolescent group (18–19 years; 85.36%) among participants is also consistent with the national trend showing that most adolescent births in India occur in the 18–19-year age band following early marriage rather than in girls under 16 years [17].

Anemia

Anemia constituted the most prevalent and clinically significant maternal complication, affecting 77.90% of the cohort. This figure markedly exceeds the national average of 52.2% among pregnant women reported in NFHS-5, and even the elevated adolescent-specific prevalence of ~61.5% documented in the same survey [17]. Chahande et al (2002) reported anemia in 72.6% of teenage pregnant women in central India [20]; Devi G (2019) found 47.1% [15]; and Okram SD (2019) documented 44% [16]. The higher rate in the present study likely reflects the tertiary-centre bias toward

complicated referral cases and the extreme socioeconomic vulnerability of the catchment population. Nutritional iron and folate deficiency, compounded by the concurrent growth demands of adolescence and the haematopoietic requirements of pregnancy—the so-called 'double burden'—creates a perfect physiological substrate for profound anaemia [21,22]. Severe anemia increases susceptibility to postpartum haemorrhage, cardiac failure, and sepsis, and compounds the risk of poor fetal growth and preterm birth [3].

Hypertensive Disorders of Pregnancy

Hypertensive disorders of pregnancy (HDP) affected 19.06% of participants, a rate higher than that reported by Kumar A (2007) at 11.2% [13] and Nair A (2015) at 14.87% [23], but consistent with the trajectory of increasing HDP recognition in tertiary referral cohorts. The biological mechanisms are multifactorial: incomplete spiral artery remodelling secondary to uterine immaturity impairs placentation, leading to relative placental ischaemia and endothelial dysfunction—the central pathophysiological event in pre-eclampsia [24]. The high proportion of eclampsia (6.63%) is particularly concerning and is attributable to the high proportion of unbooked cases who present for the first time in an advanced hypertensive emergency, precluding early detection and prophylactic magnesium sulphate therapy. Ganchimeg et al (2014), in a WHO multicountry study, confirmed that adolescent pregnancy carries a significantly elevated risk of hypertensive disorders compared with adult pregnancies [25].

Preterm Labour and Delivery

Preterm delivery occurred in 25.97% of participants, closely mirroring the rate of 27.04% reported by Yasmin G (2014) [14] and exceeding the 18.22% noted by Nair A (2013) [23] and 19% by Marimuthu K (2022) [26]. Biological immaturity of the cervix (including incomplete collagen cross-linking and shortened cervical length), subclinical genitourinary infections, psychosocial stress-mediated corticotropin-releasing hormone release, and placental dysfunction collectively elevate the risk of preterm parturition in adolescents [3,11]. Among the 94 preterm deliveries, 57.45% were late preterm (34–36+6 weeks), but 4.26% were extremely preterm (<28 weeks), representing the highest-acuity neonatal category. This distribution underscores the substantial contribution of teenage pregnancy to NICU burden and perinatal mortality.

Caesarean Section Rate and Indications

The LSCS rate of 30.94% was lower than the 52–56% documented by Rita D et al (2016) [27] and Emani & Shetty (2014) [28], respectively, but higher than the 25% reported by Dev & Kadambi (2022) [29]. The primary indication was fetal distress (29.46%), reflecting the combined effect of

placental insufficiency from anaemia and hypertensive disease. CPD, the second most frequent indication (26.79%), arises from the incomplete pelvic ossification characteristic of adolescence: bone growth continues through the mid-teenage years, and premature pregnancy before full pelvic maturity creates a structurally narrowed birth canal relative to fetal dimensions [30]. The relatively elevated rate of elective CDMR (9.82%) in this cohort warrants further investigation. Rising caesarean rates in adolescents have been attributed to improved fetal surveillance technology, altered obstetric thresholds in tertiary centres, and medicolegal considerations, rather than solely to true cephalopelvic disproportion [28,29].

Neonatal Outcomes

The LBW rate of 30.25% in this cohort is lower than the 38% reported by Mukhopadhyay P (2010) [31] and the 48.7% by Saxena V (2016) [32], but consistent with Nair A (2015) at 29.5% [23]. Fetomaternal nutritional competition, uteroplacental insufficiency secondary to anaemia and hypertensive disease, and the high burden of preterm birth collectively drive the elevated LBW rate in adolescent pregnancies [11]. NICU admission was necessary for 35.35% of live-born neonates, reflecting the combined burden of prematurity, respiratory illness, and haemodynamic instability. Neonatal jaundice (16.24%) was the most frequently documented NICU diagnosis, consistent with the high rates of preterm birth and ABO/Rh incompatibility. Neonatal mortality was 1.59%, and perinatal mortality (incorporating IUFD, stillbirth, and neonatal death) totalled approximately 5.8%, broadly consistent with the 5.1% perinatal mortality documented by Mukhopadhyay P (2010) [31].

Maternal Mortality

One maternal death (0.28%) was recorded, corresponding to a case of severe anaemia compounded by eclampsia, IUFD, sepsis, and ultimately multi-organ failure. The present rate is in keeping with the two deaths recorded among 672 adolescent deliveries by Yasmin G (2014) [14] and the 10 deaths among 68 maternal fatalities reported by Singh and Khare (2001) [33]. As MKCG MCH is a tertiary referral institution for the entire southern Odisha region, it inevitably receives patients who have already deteriorated en route, inflating apparent mortality. Nevertheless, this single death powerfully illustrates the catastrophic cascade that uncorrected anaemia and unmanaged hypertension can precipitate in an adolescent pregnancy.

Generalizability

The findings of this study are most applicable to tertiary care hospital settings catering to rural and socioeconomically disadvantaged populations. Due to referral bias and a higher proportion of complicated cases, the complication rates may be higher than in community settings. However, the study

provides valuable insight into the burden and pattern of teenage pregnancy in high-risk populations in eastern India.

Conclusion

This prospective study affirms that teenage pregnancy in a resource-constrained tertiary care setting is characterised by a high burden of anemia, hypertensive disorders, preterm delivery, and operative morbidity, with consequent adverse neonatal outcomes including elevated LBW, NICU admissions, and neonatal deaths. The overwhelming predominance of unbooked, rural, low-socioeconomic status participants highlights the structural barriers to antenatal care that amplify biological risk in this cohort.

Addressing teenage pregnancy in India demands an integrated approach: (1) strict enforcement of the minimum marriage age, (2) retention of girls in secondary and higher secondary education, (3) expansion of adolescent-friendly health services with non-judgmental contraceptive counselling, (4) aggressive iron-folate supplementation programmes targeting school-age girls, (5) community sensitisation to destigmatise antenatal care-seeking, and (6) capacity-strengthening at SNCU/NICU level to manage high-risk neonates. Policy frameworks such as the Rashtriya Kishor Swasthya Karyakram (RKSK) and the Mission Parivar Vikas scheme must be more effectively operationalised to achieve meaningful reductions in adolescent fertility and its associated fetomaternal sequelae.

Limitations

This study is subject to several limitations. First, as a single tertiary centre study, the data are biased towards high-risk referred cases, which may overestimate complication rates relative to the general adolescent obstetric population. Second, loss to follow-up cases were excluded, potentially introducing selection bias if those who did not return experienced adverse outcomes elsewhere. Third, the 18-month study duration may not fully capture seasonal variations in nutritional status or healthcare access. Fourth, certain exposure variables—such as age at first intercourse and reasons for non-utilisation of ANC—depend on patient recall and may be subject to social-desirability bias.

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List of Abbreviations

ANC – Antenatal Care
LSCS – Lower Segment Caesarean Section
NICU – Neonatal Intensive Care Unit
IUFD – Intrauterine Fetal Death
LBW – Low Birth Weight

IUGR – Intrauterine Growth Restriction
PROM – Premature Rupture of Membranes
PPROM – Preterm Premature Rupture of Membranes
AKI – Acute Kidney Injury
MODS – Multiple Organ Dysfunction Syndrome

Page | 9 **Source of Funding**

This study did not receive any external funding.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

- Avasmica Toppo: Data collection, manuscript drafting
- Mahija Sahu: Study design, supervision, critical revision
- Sabyasachi Padhi: Data analysis, literature review
- Arati Behera: Conceptualisation, final approval, corresponding author

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Biography

- **Avasmica Toppo:** Postgraduate resident in Obstetrics and Gynaecology with research interest in maternal health and high-risk pregnancy
- **Mahija Sahu:** Professor and Head with extensive experience in obstetric care and academic research
- **Sabyasachi Padhi:** Resident doctor with interest in epidemiology and clinical research
- **Arati Behera:** Assistant Professor specialising in maternal–fetal medicine

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