

Original Research

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Teenage pregnancy; Adolescent pregnancy; Preeclampsia; Eclampsia; Fetomaternal outcome; Hypertensive disorders of pregnancy; Maternal morbidity; Neonatal outcome; Low birth weight; Preterm delivery.

Comparative Analysis of Feto Maternal Outcome Associated with Preeclampsia and Eclampsia in Teenage and Non-Teenage Pregnancy

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ABSTRACT:

Background: Preeclampsia and eclampsia are major causes of maternal and perinatal morbidity and mortality, particularly in resource-limited settings. Teenage pregnancy may further increase the risk of adverse fetomaternal outcomes because of biological, nutritional, socioeconomic, and healthcare-related vulnerabilities. This study was undertaken to compare fetomaternal outcomes among teenage and non-teenage pregnant women diagnosed with preeclampsia or eclampsia.

Methods: This hospital-based descriptive observational follow-up study was conducted in the Department of Obstetrics and Gynaecology at Deben Mahata Government Medical College and Hospital, Purulia, West Bengal, over a period of 12 months. A total of 120 pregnant women diagnosed clinically with preeclampsia or eclampsia were enrolled, comprising 60 teenage mothers aged 10–19 years and 60 non-teenage mothers aged 20–35 years. Participants were followed from admission through delivery and the postpartum period or hospital discharge. Maternal characteristics, blood pressure, proteinuria, gestational age, mode of delivery, maternal complications, birth weight, APGAR scores, live/stillbirth status, and neonatal complications were recorded. Statistical analysis was performed using independent t-test and chi-square test, with $p < 0.05$ considered statistically significant.

Results: Teenage mothers had significantly higher mean systolic blood pressure (157 ± 8.22 vs. 148 ± 8.62 mmHg; $p < 0.001$) and diastolic blood pressure (104 ± 7.95 vs. 97.3 ± 8.14 mmHg; $p < 0.001$) at admission compared with non-teenage mothers. Mean gestational age at delivery was significantly lower among teenagers (37.0 ± 2.06 vs. 38.0 ± 2.15 weeks; $p = 0.012$), with preterm delivery occurring in 36.7% and 23.3% of the respective groups. Mean neonatal birth weight was significantly lower among teenage mothers (2307.6 ± 375 vs. 2578.1 ± 654 g; $p = 0.006$), and low birth weight occurred in 75% compared with 40% of neonates born to non-teenage mothers. APGAR scores and overall neonatal complications showed a trend toward poorer outcomes among teenagers, although these differences were not statistically significant. Maternal complication rates were comparable between groups, and one maternal death occurred in the teenage group.

Conclusion: Among pregnant women with preeclampsia or eclampsia, teenage mothers demonstrated higher blood pressure at admission, earlier delivery, and significantly lower

neonatal birth weight compared with non-teenage mothers. The findings highlight the need for early antenatal registration, regular blood pressure surveillance, nutritional support, timely identification of severe disease, and appropriate obstetric and neonatal care for adolescent pregnancies complicated by hypertensive disorders.

INTRODUCTION

Preeclampsia and eclampsia continue to be major contributors to maternal and perinatal morbidity and mortality across the world, especially in low and middle income countries where limited access to antenatal care and obstetric services increases vulnerability. Preeclampsia is defined as the new onset of hypertension after 20 weeks of gestation with proteinuria or evidence of end organ dysfunction, while eclampsia is characterized by the occurrence of convulsions in a woman with preeclampsia in the absence of other neurological causes. These hypertensive disorders account for a significant proportion of maternal deaths globally and disproportionately affect young mothers in resource constrained settings because of biological and socioeconomic vulnerabilities shaped around adolescence and reproductive health access [1].

The clinical course of the disease increases the risk of complications such as placenta labruption, stroke, disseminated intravascular coagulation, pulmonary edema, acute kidney injury, and maternal mortality if not promptly detected and managed [2].

Adolescents represent a unique risk group because pregnancy during the teenage years is often accompanied by incomplete physiological maturity, nutritional deficiencies, inadequate antenatal supervision, low awareness of warning symptoms, and higher rates of anemia and infections. These factors collectively predispose the teenage population to hypertensive complications during pregnancy [3].

Multiple studies have reported a higher incidence of preeclampsia and eclampsia among teenage mothers compared to women in their twenties and thirties, indicating that adolescence itself may act as an independent risk factor beyond socioeconomic determinants [4].

Biological immaturity of the uteroplacental circulation, combined with adverse social determinants such as early marriage, poor education, and lack of financial autonomy, intensifies both maternal and fetal hazards in this group [5].

Teenage pregnancy remains culturally and socially prevalent in many developing countries, including India, where early marriage and poor access to contraceptive choices make adolescents more prone to unplanned and early conception. According to national health reports, more than a quarter of adolescent pregnancies in India occur without adequate antenatal care and many women first seek medical evaluation only after the onset of complications. This delay in care seeking often leads to rapid disease progression and elevates the chances of emergency interventions, including emergency caesarean section and intensive care admissions in cases of eclampsia [6].

Teenage mothers with preeclampsia or eclampsia present a higher likelihood of preterm birth, fetal growth restriction, low birth weight, low APGAR scores, and increased neonatal intensive care unit admissions. Perinatal mortality is also elevated in this population as a consequence of placental insufficiency, birth asphyxia, and complications related to prematurity [7].

The adult population, though relatively mature physiologically, is also significantly affected by hypertensive disorders of pregnancy. However, adult mothers usually display a more favourable outcome due to better nutritional reserves, awareness, and greater likelihood of receiving antenatal care at early stages. The differences in fetal and maternal outcomes between teenage and adult mothers with preeclampsia and eclampsia therefore remain an important area of scientific interest for evaluating how biological age interacts with pregnancy related complications and whether outcomes can be improved by targeted preventive and management strategies. Early recognition and treatment of adolescent pregnancies at risk of hypertensive disorders may be critical to reducing long term health burdens for both mothers and children [8].

Monitoring blood pressure trends, proteinuria, and warning symptoms during scheduled antenatal visits is the most effective approach for early detection of hypertensive disorders. However, when teenage mothers present late in pregnancy or during labor with severe features, the scope of preventive care becomes extremely restricted. This challenge underlines the need for

community based education programs and strengthening of adolescent reproductive health education to encourage early antenatal registration. Studies from South Asia have highlighted that improving antenatal attendance and nutritional supplementation among teenage mothers significantly reduces the severity of preeclampsia and improves both maternal and neonatal survival outcomes [9].

Despite global progress in maternal healthcare, disparities persist and preeclampsia and eclampsia remain among the most preventable yet deadly complications of pregnancy. Comparative evaluation between teenage and adult pregnancies affected by these disorders therefore holds substantial public health significance. Understanding differences in presentation, progression, maternal outcomes, and neonatal outcomes will support policymakers and clinicians in designing age specific obstetric strategies and improving the quality of perinatal care. Evidence generated through such studies can enhance hospital preparedness, guide resource allocation, and strengthen counseling and monitoring strategies specifically for the high risk teenage group to ensure safer motherhood and improved neonatal survival [10]

AMIS & OBJECTIVE:-

GENERAL:- To compare Fetomaternal outcome associated with Preeclampsia and Eclampsia in teenage and non-teenage pregnancy.

SPECIFIC:

1. To estimate proportion of teenage pregnancy diagnosed with preeclampsia and eclampsia admitting in our hospital.
2. To compare maternal & fetal outcome of preeclampsia & eclampsia, among teenage & non-teenage
3. To identify the risk factors associated with Preeclampsia & eclampsia in teenage & non-teenage pregnant women (adult pregnant women).

REVIEW OF LITERATURE

Global Epidemiology of Hypertensive Disorders of Pregnancy

Hypertensive disorders of pregnancy are recognized as one of the leading causes of maternal and perinatal mortality worldwide. The WHO estimates that preeclampsia and eclampsia account for approximately 14 percent of global maternal deaths, most of which occur in low-resource settings due to late diagnosis and limited emergency obstetric care [11]. The burden of disease varies considerably between regions, with the highest prevalence observed in sub-Saharan Africa and South Asia where diagnostic delays and reduced antenatal attendance continue to challenge maternal health programs [12]. Research has consistently demonstrated that early pregnancy in adolescents compounds this burden further, as physiological immaturity and nutritional insufficiency elevate the risk of developing hypertensive disorders [13].

Pathophysiology and Biological Mechanisms

The pathophysiology of preeclampsia is multifactorial and not fully understood, though the most widely accepted hypothesis attributes the condition to abnormal trophoblastic invasion leading to impaired placental perfusion. This is followed by oxidative stress, systemic endothelial dysfunction, release of antiangiogenic factors, and a cascade of inflammatory responses that trigger progressive multisystem disorder [14]. The severity of endothelial injury correlates with disease intensity and progression toward eclampsia, characterized by cerebral vasospasm, brain edema, and seizures. Adolescent pregnancies have been shown to display more pronounced vascular maladaptation to placental demands, possibly due to hormonal immaturity and under-developed cardiovascular reserves [15].

Pregnancy Among Adolescents and Physiological Vulnerability

Teenage pregnancy introduces unique biological vulnerabilities. The adolescent uterus and pelvic structures continue to mature beyond puberty, often resulting in reduced uteroplacental blood supply during early pregnancies. Studies have shown that girls under the age of 18 have significantly lower uterine artery compliance and higher resistance indices, both of which predispose them to placental dysfunction and preeclampsia [16]. Additionally many teenagers enter pregnancy with chronic anemia, micronutrient deficiencies, and a low body mass index, all of which contribute to increased oxidative stress and reduced physiological buffering against systemic inflammation [17].

Socioeconomic Determinants and Healthcare Inequities

Beyond biological factors teenage mothers frequently experience social marginalization, low education, poverty, cultural norms favouring early marriage, and minimal engagement with antenatal services. Lack of awareness regarding danger signs and minimal decision-making autonomy in health-related matters result in late presentation to hospitals and a higher rate of obstetric emergencies. A multi-country cohort study reported that adolescent mothers were twice as likely as adults to present with unbooked pregnancies and nearly four times more likely to first reach a health facility only during labour or seizure episodes [18]. The social and structural barriers that limit antenatal access have been identified as major contributing factors to disease severity and poor maternal–fetal outcomes in this age group [19].

Maternal Outcomes in Teenagers Non teenage Pregnancies

Several comparative studies across different regions have highlighted that maternal outcomes are significantly worse in teenage mothers suffering from preeclampsia and eclampsia. Increased rates of HELLP syndrome disseminated intravascular coagulation pulmonary edema acute kidney injury and postpartum hemorrhage have been reported among adolescents. Research from tertiary care centers in Pakistan and Brazil found that teenage mothers required emergency case are an sections and ICU admission at nearly double the rate of adults with similar disease severity [20]. Additionally seizure recurrence in postpartum period and magnesium sulfate resistance were found to be higher among adolescents indicating more aggressive disease progression [21].

Fetal and Neonatal Outcomes

Adverse perinatal outcomes remain a major concern in hypertensive pregnancies particularly among teenagers. Multiple studies have observed significantly higher rates of intrauterine growth restriction preterm delivery low APGAR scores low birth weight and intrapartum asphyxia among neonates born to adolescent mothers with preeclampsia or eclampsia. A study from Nigeria reported that nearly 45 percent of infants born to eclamptic adolescents required neonatal intensive care compared with 23 percent among adults [22]. Preterm birth driven by iatrogenic delivery for maternal stabilization combined with placental insufficiency is the leading explanation for elevated neonatal morbidity and mortality. A perinatal mortality rate up to five times higher has been documented in adolescent mothers compared with older mothers in similar clinical categories [23].

Implications for Public Health and Antenatal Strategies

The available literature strongly supports the necessity for targeted public health interventions addressing the unique vulnerabilities of adolescent mothers. Effective early antenatal care nutrition supplementation blood pressure surveillance and community education on early warning signs have shown significant benefit in reducing complications. A large Asian cluster-randomized trial demonstrated a substantial decline in both maternal and neonatal mortality when pregnant adolescents were enrolled in structured antenatal monitoring programs by the second trimester [24]. Strengthening adolescent-friendly health services especially in rural and underserved regions has been identified as a key component of reducing hypertensive complications. Preventive counseling in schools and community platforms has also been shown to delay early marriage and improve reproductive health literacy [25].

Gaps in Current Literature

Although numerous studies have explored hypertensive disorders of pregnancy limited research has specifically examined comparative fetal maternal outcomes between teenage and adult mothers within individual institutions using uniform diagnostic criteria. Significant variability exists in sample sizes disease definitions and follow-up duration across published works. Furthermore many studies do not stratify teenage pregnancies into early and late adolescence despite evidence that risk is highest among girls under 18. Therefore more institution-based comparative studies are needed to generate region-specific data that may guide clinical practice and inform public health policy [26].

RELEVANT LITERATURES

Macedoetal. Conducted one of the largest systematic reviews and meta-analyses to estimate the prevalence of preeclampsia and eclampsia among adolescent pregnancies worldwide, analysing data from 291,247 adolescents across 70 studies from

1969 onward. Their findings revealed an overall prevalence of 6.7 percent of hypertensive disorders in adolescent pregnancies, with striking geographical variation, especially showing higher burden in low- and middle-income countries. An important highlight of the review was the relationship between disease prevalence and socioeconomic context, demonstrating that adolescents in under-resourced regions are disproportionately affected. The study also observed a temporal trend indicating a mild decrease in preeclampsia prevalence globally, likely driven by improvements in antenatal surveillance. Nevertheless, the review concluded that adolescent pregnancies remain a major public health concern because their biological and social vulnerability increases the risk of adverse maternal and neonatal outcomes when hypertensive disorders develop [27].

Ahmad et al. carried out a cross-sectional study at Aziz Bhatti Shaheed Teaching Hospital to explore the prevalence of preeclampsia among adolescent pregnancies and reported an alarmingly high rate of 29.77 percent. The study highlighted illiteracy as the most significant factor associated with the development of preeclampsia among young mothers, reflecting the role of health literacy in pregnancy-related risk profiles. Many of the adolescents had little understanding of antenatal care, blood pressure monitoring, or danger signs, which contributed to late presentation and poorer outcomes. This study reinforced the need for community-level interventions to increase reproductive health awareness among teenage girls, encouraging early registration and routine antenatal visits. The findings further emphasized that adolescent pregnancies represent a particularly high-risk subgroup requiring targeted surveillance and timely intervention to prevent severe maternal and neonatal complications arising from hypertensive disorders [28].

Kooffreh et al. Examined the prevalence of preeclampsia among pregnant women at the University of Calabar Teaching Hospital over a three-year period and reported a prevalence rate of 1.2 percent. Although lower than some global estimates, the study brought attention to an upward trend in preeclampsia rates over the years covered in the review. A distinct observation in their analysis was the higher occurrence of preeclampsia among nulliparous women, many of whom belonged to younger age categories. The authors also identified strong association between preeclampsia and the requirement for caesarean delivery, underscoring the condition's contribution to emergency obstetric interventions. The study strongly recommended routine antenatal screening and early risk stratification for hypertensive disorders during pregnancy to improve maternal outcomes, emphasising that timely diagnosis and management can prevent progression to life-threatening complications such as eclampsia, disseminated intravascular coagulation, and acute organ dysfunction [29].

Pramesti and Hidayat investigated the incidence of preeclampsia in early pregnancy and found that more than two-thirds of adolescent mothers were diagnosed with preeclampsia. Alongside maternal morbidity, the study placed extensive focus on neonatal consequences, reporting that 14.5 percent of newborns had low birth weight and 26.1 percent experienced intrauterine fetal death. These results confirm the detrimental effect of hypertensive disorders on fetal well-being due to chronic placental insufficiency and intrauterine hypoxia. The researchers stressed that adolescent pregnancies amplify the severity of preeclampsia because of physiological immaturity, nutritional deficits, and inadequate health-seeking behaviour. Their findings highlighted the crucial need for structured antenatal monitoring and nutritional supplementation, especially in populations where early marriage and teenage pregnancy remain common. In their conclusion, the authors called for better public health strategies aimed at early screening and timely treatment to mitigate complications in adolescent pregnancies affected by hypertensive disorders [30].

Ngwenya performed a detailed analysis on severe preeclampsia and eclampsia at Mpilo Central Hospital in Zimbabwe and reported an incidence of 1.3 percent for severe cases. The study underscored the significant maternal complications associated with hypertensive disorders, particularly HELLP syndrome, which emerged as the most common. Maternal mortality was largely attributed to acute renal failure, highlighting the importance of prompt diagnosis and management of renal involvement in severe disease. This research also brought attention to adverse neonatal outcomes, reporting stillbirths and early neonatal deaths in almost half of the affected pregnancies. Limited accessibility to antenatal services and critical care facilities contributed to delayed treatment, which frequently resulted in irreversible maternal and fetal damage. The findings further reiterated that hypertensive disorders of pregnancy continue to pose serious challenges in resource-limited settings and that early detection through antenatal screening remains the key to preventing catastrophic maternal and neonatal consequences [31].

Usta et al. conducted a comparative study evaluating obstetric outcomes in teenage and adult pregnancies and demonstrated that teenagers were significantly more likely to experience adverse outcomes such as anemia, preeclampsia, preterm labour, and intrauterine growth restriction compared to their adult counterparts. Although teenage mothers showed faster cervical dilatation and shorter labour duration, the overall burden of complications outweighed this advantage. The authors highlighted that adolescent mothers often enter pregnancy with lower nutritional reserves, reduced medical awareness, and limited autonomy in accessing healthcare, which affects their ability to seek timely antenatal interventions. Their findings supported the classification of adolescent pregnancy as a high-risk condition requiring enhanced surveillance and counseling during antenatal visits. The study strongly advocated for public health policies that promote delaying early marriages, increasing contraceptive awareness, and ensuring that pregnant adolescents receive targeted medical interventions to reduce the disproportionately high risk of hypertensive and perinatal complications in this population [32].

Rajaei et al. conducted an extensive epidemiological assessment of preeclampsia across Hormozgan province and reported a prevalence of 5.8 percent, which was significantly higher than the global average. The study also revealed substantial geographical variation within the province, with certain districts recording almost triple the prevalence rate found in other areas. These variations were linked to disparities in socio-economic conditions, antenatal attendance, and access to emergency obstetric care. Importantly, their analysis demonstrated that inadequate nutritional status, low hemoglobin levels, and maternal age below 20 years were key predictors of disease occurrence. Another notable observation was that women with inadequate prenatal care were more likely to present with severe features or complications at the time of admission. The researchers concluded that early detection of hypertensive disorders, equitable distribution of healthcare resources, and improved reproductive health awareness are essential to reducing the maternal and fetal burden associated with preeclampsia [33].

Egbe et al. examined the prevalence and fetal outcomes of teenage pregnancies in the Buea Health District of Cameroon and found that 13.3 percent of hospital births were to teenage mothers, who displayed a significantly higher rate of adverse outcomes compared to adults. Among the teenage group, low birth weight, preterm delivery, and early neonatal complications were markedly higher, along with a greater frequency of perineal tears and labour-related morbidities. The study emphasized that delayed hospital presentation and incomplete antenatal care contributed directly to the burden of poor outcomes. The authors observed that early marriage, low socioeconomic status, and lack of reproductive health education were important drivers of early childbearing in the region. They recommended strengthening community-based awareness programs, adolescent-friendly reproductive health services, and universal antenatal enrollment to reduce the risk of complications and improve both maternal and neonatal survival among teenage mothers [34].

Uzunov et al. compared neonatal outcomes between adolescent and adult patients with preeclampsia and found that infants born to adolescent mothers had significantly lower birth weights, lower APGAR scores, and a higher need for neonatal intensive care unit admission. The study also noted that intrauterine growth restriction and preterm delivery were more common in the adolescent group, indicating compromised placental function likely intensified by young maternal age. Their findings supported the hypothesis that adolescent pregnancies complicated by preeclampsia progress more aggressively and impose a greater physiological burden on the fetus than in adults with similar disease severity. The authors stressed the importance of early ultrasonographic monitoring, Doppler evaluation of fetal circulation, and multidisciplinary care to improve neonatal survival rates in this vulnerable population. They concluded that tailored antenatal protocols for adolescent mothers are essential to mitigating fetal morbidity and mortality linked to hypertensive disorders of pregnancy [35].

METHODOLOGY

a. Study design:

The present study is a hospital-based descriptive and observational follow-up study designed to compare fetomaternal outcomes among pregnant women diagnosed with preeclampsia and eclampsia. The study included two cohorts of mothers—teenage mothers and non-teenage (adult) mothers—and each participant was followed from the time of admission until completion of the postpartum period or discharge from the hospital.

b. Study setting:

The study was conducted in the Department of Obstetrics and Gynaecology at Deben Mahata Government Medical College and Hospital, Purulia, West Bengal, India. This tertiary care teaching hospital receives referrals from district and peripheral health institutions and caters to a large rural population, allowing inclusion of cases across varied socioeconomic and demographic backgrounds.

c. Definition of population:

The study population consisted of pregnant women admitted in the inpatient obstetric wards, labour room, and emergency obstetric unit of the study centre with clinical diagnosis of preeclampsia or eclampsia.

Women aged 10–19 years at the time of pregnancy were categorised as teenage mothers as per WHO definition, and those aged 20–35 years were categorized as nonteenage (adult) mothers. Both groups were monitored clinically, obstetrically and neonatally until the end of hospital stay.

d. Study variables:

Independent variables included socio demographic characteristics (age, residence, education, socioeconomic status), obstetric profile (gravidity, parity, gestational age, antenatal check-up status, duration since diagnosis of preeclampsia/eclampsia), and maternal disease severity. Dependent variables included maternal outcomes (mode of delivery, need for ICU care, maternal morbidity, complications during puerperium and maternal mortality) and neonatal outcomes (birth weight, APGAR scores, live/still birth status and subsequent neonatal complications).

Inclusion criteria:

- All pregnant women diagnosed clinically with preeclampsia or eclampsia after 20 weeks of gestation.
- Participants willing to provide written informed consent for minors, guardian consent and assent were obtained.

Exclusion criteria:

- Pregnant women with gestational age < 20 weeks at time of diagnosis.
- Patients with seizure disorders unrelated to eclampsia.
- Women with pre-existing chronic hypertension, heart disease, renal disease or other major systemic illnesses prior to pregnancy.
- Participants who withdrew consent at any stage of the study.

e. Timeline:

- Data collection: After Institutional Ethics Committee approval, data collection was carried out over a period of 12 months.
- Data analysis and submission: In the subsequent six months, patient data were compiled from clinical history sheets and case records, entered in Excel sheets and analysed statistically.

f. Sample size/design:

Sample size was calculated using the formula:

$$N = (z\alpha + z\beta)^2 \times (p_1q_1 + p_2q_2) / (p_1 - p_2)^2$$

Where $z\alpha = 2.58$ at 99% CI and $z\beta = 1.28$ at 90% power. Based on Uzunov et al., 50% neonates were under weight in the adolescent group and 16.67% in the nonteenage group. After computation, the estimated sample size required was 52.61 per group. Considering 10% loss to follow-up, the final sample size was 60 in each group. Thus, a total of 120 participants (60 teenage and 60 non teenage mothers) were enrolled.

g. Controls:

Controls were not required since both the comparison groups (teenage and non-teenage mothers) were derived from the same target population and were observed under identical clinical conditions.

h. Experimental design:

Not applicable as the study followed across-sectional follow-up model based on clinical observation.

i. Methods of data collection:

Upon admission, a detailed patient information sheet was provided and the aim and objectives of the study were clearly explained. Written informed consent (and guardian consent for minors) was obtained. A structured case record form was used to collect relevant data, including socio demographic profile, medical and obstetric history, gestational age, duration of symptoms, blood pressure measurements, urine protein estimation and laboratory investigations. Patients were monitored throughout labour and delivery. Mode of delivery, duration of labour, need for induction or caesarean section, and maternal complications were recorded. Neonatal parameters including birth weight, APGAR scores at 1 and 5 minutes, live/still birth and complications such as respiratory distress syndrome, NICU admission and sepsis were documented.

Mothers and newborns were followed until discharge or death whichever occurred earlier.

j. Consent of patient:

Applicable. Written informed consent was obtained from all adult participants. For teenage mothers under 18 years, guardian consent and participant assent were obtained. Consent forms and information sheets are attached in annexures.

k. Definition of outcome:

The primary outcomes were maternal morbidity and mortality and neonatal status at birth (birth weight, APGAR, live/stillbirth). Secondary outcomes included post partum maternal complications and neonatal complications requiring NICU care.

l. Schedule of data collection:

Data were collected continuously over one year after ethical approval. After completion of data collection, detailed statistical analysis was carried out using appropriate statistical techniques.

m. Additional resources:

No external financial or human resources were required. All laboratory services, obstetric care and clinical investigations were carried out within the existing hospital infrastructure.

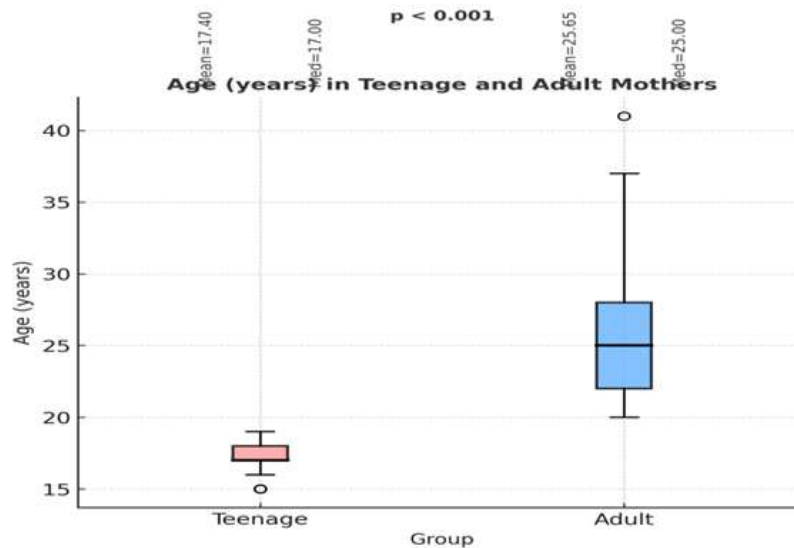
n. Statistical analysis:

Data were entered in Microsoft Excel and analysed using SPSS version 22 and Graph Pad Prism 10. Continuous variables were expressed as mean $\pm$ standard deviation, and categorical variables as frequency and percentage. Independent t-test was applied for comparison of means between the two groups, while chi-square test was used for comparison of proportions. p -value < 0.05 was considered statistically significant. Findings were represented through tables, box-plots and bar diagrams for clear interpretation.

RESULTS AND OBSERVATIONS

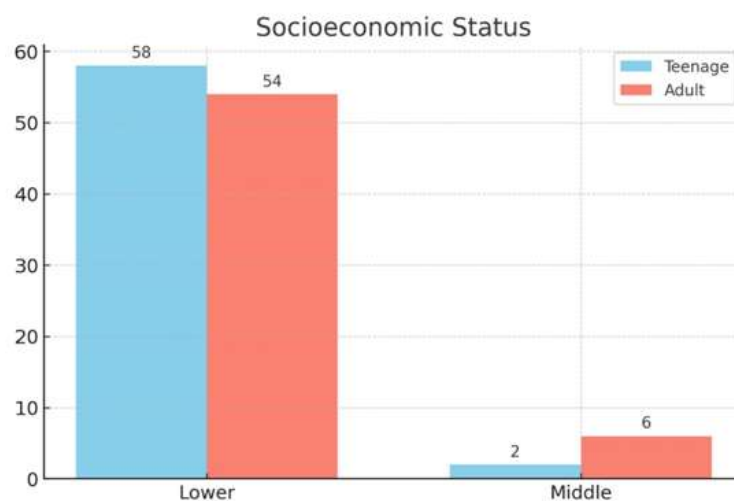
Comparison of Mean Age between Teenage and Non-teenage (Adult) Groups (n=120)

Inference: Non teenage mothers were significantly older than teenage mothers.



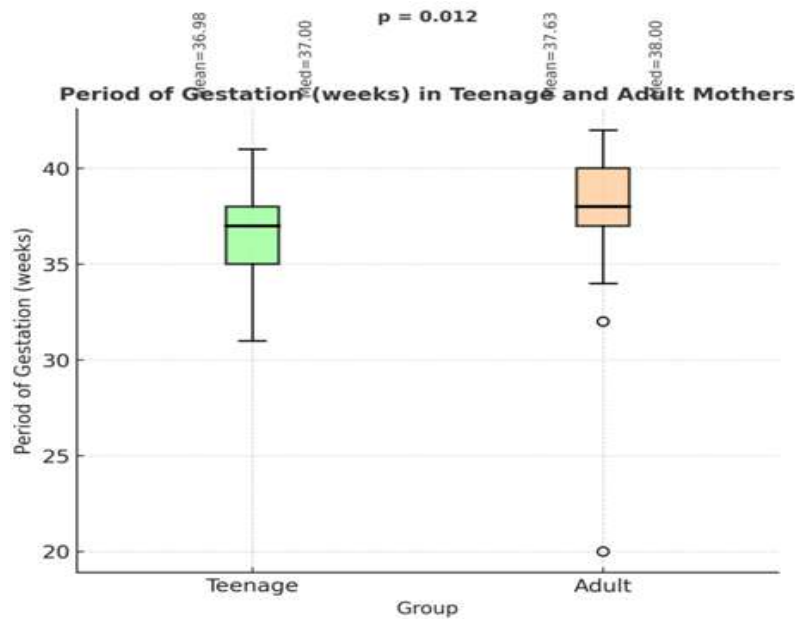
Comparison of Socioeconomic Status between Groups (n=120)

Inference: Lower socio-economic status was significantly more common among teenage mothers



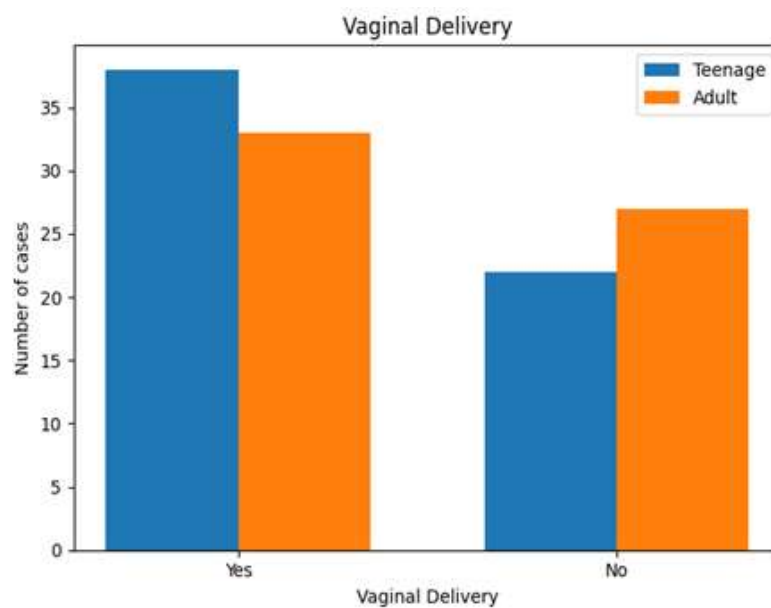
Comparison of Period of Gestation (Weeks) (n=120)

Inference: Teenage mothers delivered at significantly lower gestational age



Mode of Delivery – Vaginal Birth (n=120)

Inference: No insignificant difference invaginal delivery rates



Mode of Delivery–Instrumental Delivery (Forceps) (n=120)

Inference: Instrumental delivery (forceps) was significantly higher in teenage mothers.

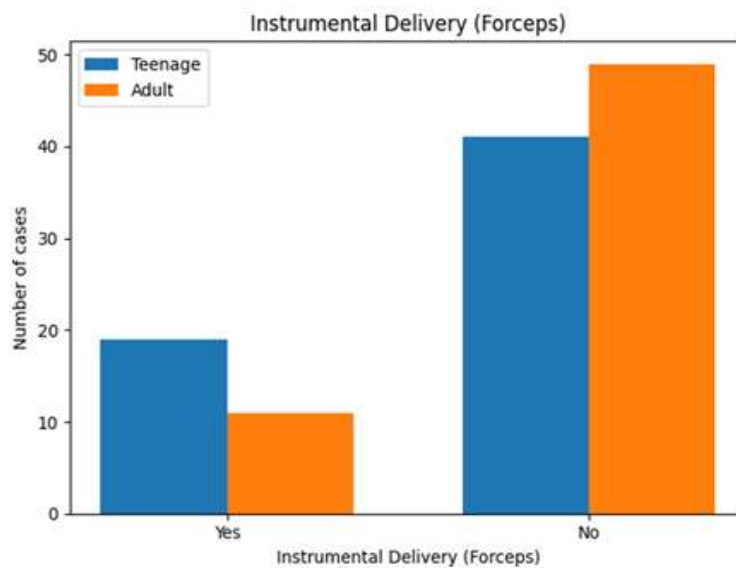
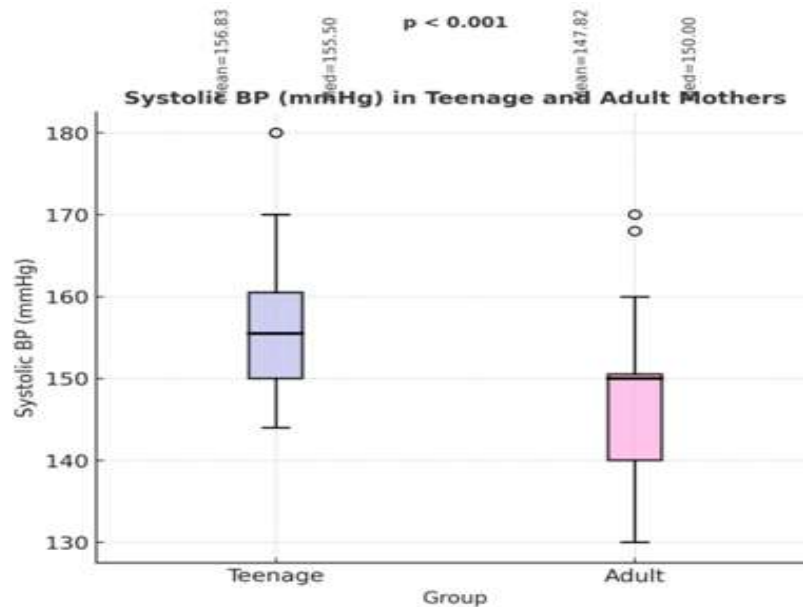


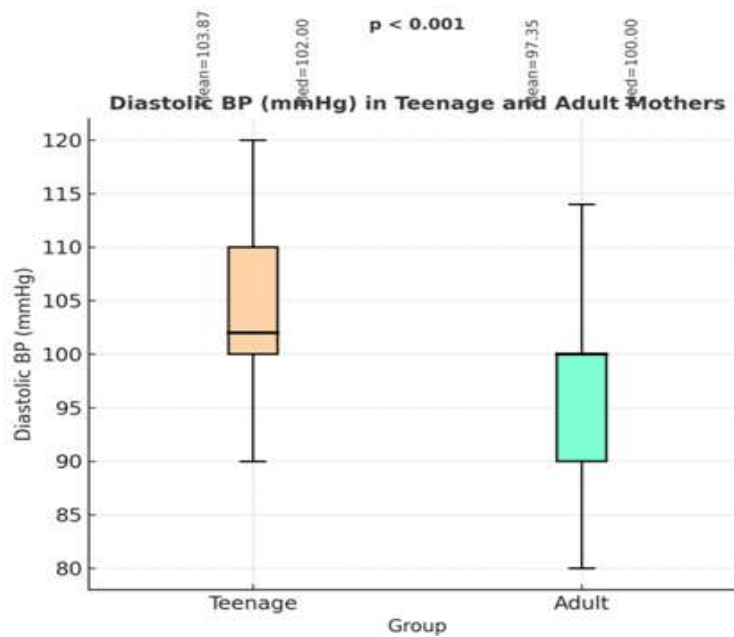
Table 6: Comparison of Mean Systolic Blood Pressure (SBP) (n=120)

Inference: SBP was significantly higher among teenage mothers



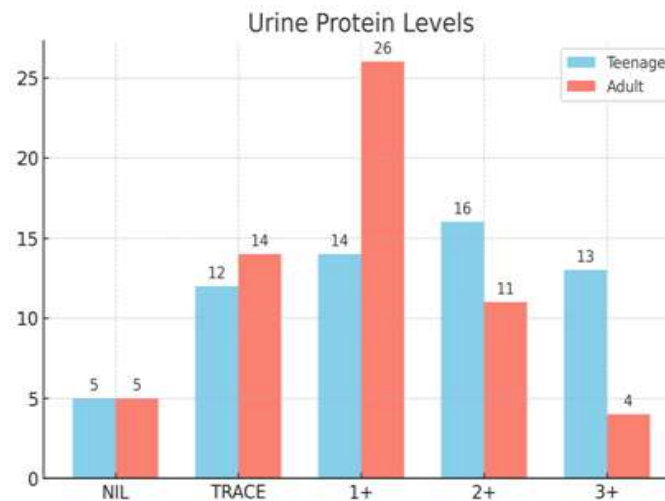
Comparison of Mean Diastolic Blood Pressure (DBP) (n=120)

Inference: DBP was significantly higher among teenage mothers



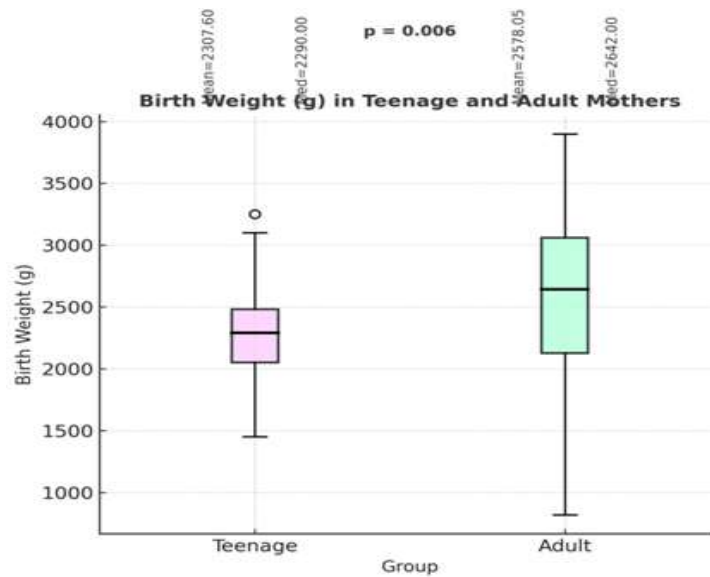
Distribution of Urine Protein Levels (n=120)

Inference: Difference approached significance; severe proteinuria (3+) was more frequent among teenage mothers



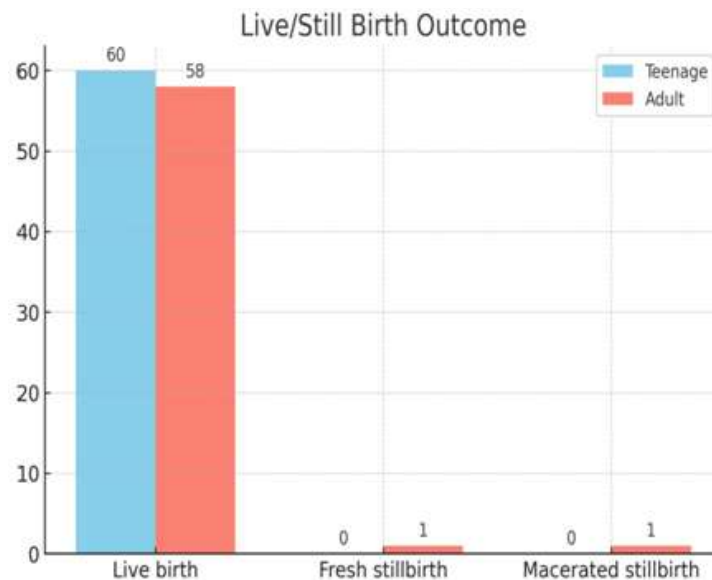
Comparison of Mean Birth Weight (grams) (n=120)

Inference: New born birth weight was significantly lower among teenage mothers



Live Birth/Still Birth Outcome (n=120)

Inference: No significant difference in live/still birth pattern



APGAR Score at 5 Minutes(n=120)

Inference: Slightly lower APGAR scores in teenage group, not statistically significant

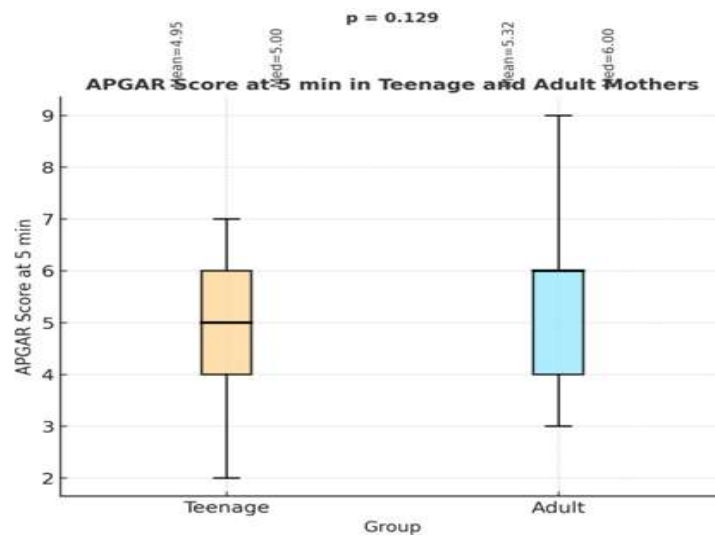
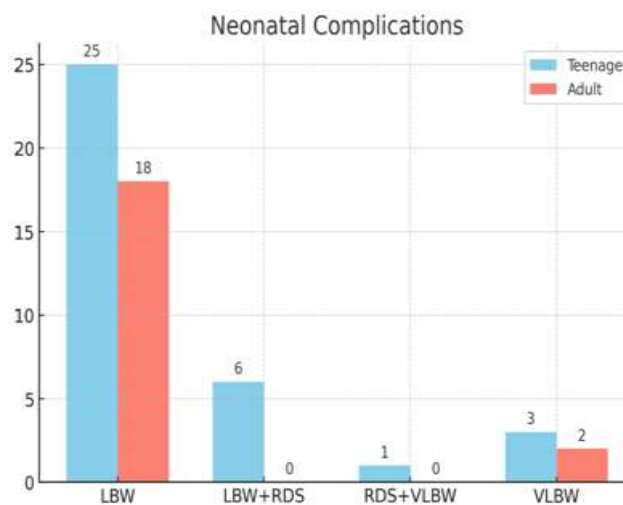
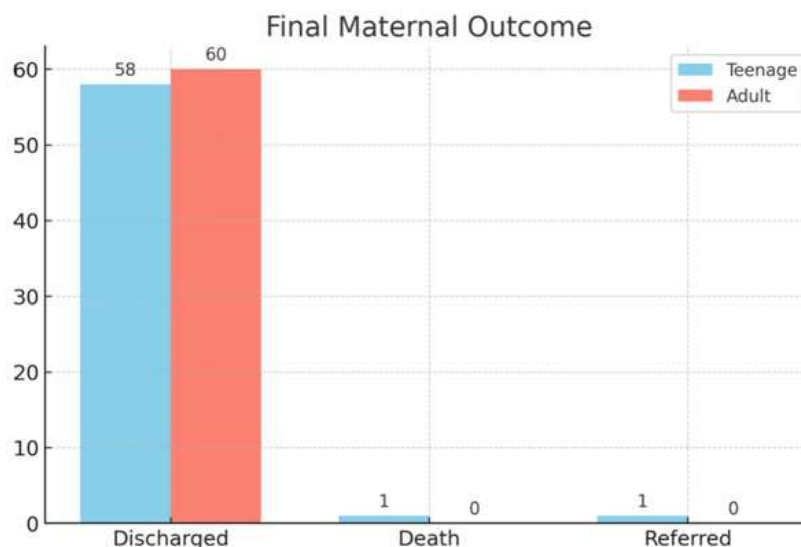


Table 13: Neonatal Complications (n=120)

Inference: Higher neonatal complications in teenage mothers, but not Statistically significant



Outcome	Teenage	Non teenage (Adult)	Total	$\chi^2(df)$	p
Discharged	58 (49.1%)	60 (50.9%)	118(100%)	1.01 (1)	0.315
Death	1 (100%)	-	1 (100%)		
Referred to higher centre	1 (100%)	-	1 (100%)		
Total	60 (50%)	60 (50%)	120 (100%)		



Inference: Maternal mortality was observed only in the teenage group, but the association was not statistically significant

DISCUSSION

The present study was conducted to compare fetal and maternal outcomes in preeclampsia and eclampsia among teenage and adult pregnant women admitted in a tertiary care hospital in Purulia. A total of 120 women were included, 60 in the teenage group and 60 in the non-teenage group, all with pre-eclampsia or eclampsia. In our study, the mean age of the teenage group was 17.4 ± 1.17 years, while the adult group had a mean age of 25.6 ± 4.52 years, and this difference was highly significant ($t = -13.7$, $p < 0.001$). This is expected as age group allocation was predefined, but it also reflects the young age at which many women in this region enter pregnancy. Macedo et al. (27) in their large meta-analysis of 291,247 adolescents reported a global adolescent pre-eclampsia and eclampsia prevalence of 6.7 percent, with higher rates in low and middle income countries, supporting the observation that teenage pregnancy with hypertensive disorders remains a major problem in resource-limited settings similar to ours. In our study, most teenage mothers belonged to lower socioeconomic status, with 100 percent in the lower SES category compared to 86.7 percent of adults, and this difference was statistically significant (chi-square = 8.57, $p = 0.003$). This pattern is similar to the findings of Ahmad et al. (28) who reported a preeclampsia prevalence of 29.77 percent among adolescents and found a strong association with illiteracy and poor socioeconomic background. Their study highlighted that low education and poor health awareness among adolescent girls are important contributors to the development and late diagnosis of pre-eclampsia. The high proportion of low socioeconomic status in our teenage group suggests that social disadvantage may be adding to biological vulnerability and thereby worsening disease severity and outcomes. In terms of gestational age at delivery, your study showed that teenage mothers deliver data significantly lower mean period of gestation compared to adults (37.0 ± 2.06 weeks vs 38.0 ± 2.15 weeks, $t = -2.55$, $p = 0.012$). Preterm delivery, defined as less than 37 weeks, was observed in 36.7 percent of teenagers and 23.3 percent of adults in our data. This is in line with the results reported by Usta et al. (32) who found that teenage pregnancies had significantly higher rates of preterm birth compared to adults and also higher rates of pre-eclampsia and anemia. Their study concluded that teenage pregnancy itself should be considered a high-risk condition. The higher preterm birth in our teenage group also reflects the obstetric need for early termination in severe disease or eclampsia to save the mother, which indirectly affects neonatal outcome.

When we compared blood pressure parameters between the two groups, we found that teenage mothers had significantly higher systolic and diastolic blood pressure values at admission. The mean systolic blood pressure was 157 ± 8.22 mmHg in teenagers and 148 ± 8.62 mmHg in non-teenage ($t = 5.86$, $p < 0.001$). The

Mean diastolic blood pressure was 104 ± 7.95 mmHg in teenagers and 97.3 ± 8.14 mmHg in adults ($t = 4.44$, $p < 0.001$). This suggests that disease at presentation was more severe in the adolescent group. Ngwenya (31), in a study on severe pre-

eclampsia and eclampsia from Zimbabwe, reported an incidence of severe disease of 1.3 percent and highlighted a high rate of complications including HELLP syndrome and a maternal mortality rate of 1.7 percent. Although our study did not separately calculate severe pre eclampsia incidence, the higher blood pressure values in teenagers and the need for instrumental delivery and emergency interventions indicate that the teenage group tended to present with more severe disease.

In our study, proteinuria grading showed a trend towards more severe proteinuria among teenagers, with 76.5 percent of 3+ proteinuria cases occurring in the teenage group, and the association was borderline significant (chi square = 9.44, $p = 0.051$). This is consistent with the concept that adolescents may have more severe placental dysfunction when pre eclampsia develops. Macedo et al. (27) also concluded that hypertensive disorders in adolescent pregnancies are frequently associated with severe disease and poorer outcomes in low resource countries, where early detection and tight monitoring are often not optimal.

Regarding mode of delivery, there was no significant difference in the rate of vaginal delivery between the groups in our study (63 percent in teenagers vs 55 percent in adults, chi square = 0.55, $p = 0.458$). However, instrumental delivery by forceps was significantly more frequent in the teenage group (32 percent vs 18 percent in adults, chi square = 2.18, $p = 0.14$). This may be related to cephalopelvic disproportion or the need to shorten the second stage in compromised mothers or fetus. Usta et al. (32) reported that although teenage mothers had more preterm births and anemia, they had comparable or higher rates of vaginal delivery compared to adults. Our results show a similar pattern for vaginal births but with more forceps use in teenagers, possibly reflecting the obstetric practice in our institution where forceps are used to expedite delivery in high risk pregnancies.

One of the important findings of our study was the difference in neonatal birth weight between the two groups. The mean birth weight in the teenage group was 2307.6 ± 375 g compared to 2578.1 ± 654 g in the adult group, and this difference was statistically significant ($t = -2.78, p = 0.006$). Low birth weight, defined as less than 2500g, was seen in 75 percent of babies born to teenage mothers and 40 percent of those born to adult mothers in our data. Uzunov et al. (35), in a comparative study of pre eclampsia in adolescent and adult patients, reported that 50 percent of neonates in the adolescent group had low birth weight compared to 16.67 percent in the non teenage group, and this difference was also clinically meaningful. Our findings show an even higher proportion of low birth weight among teenagers, which may be due to the combined effect of early maternal age, poor nutrition and severe disease at presentation in a rural Indian population.

In terms of perinatal outcome, we found that almost all births in both groups were live births, with only one fresh stillbirth and one macerated stillbirth in the adult group and none in the teenage group. The difference was not statistically significant (chi square = 2.03, $p = 0.362$). APGAR score at 5 minutes was slightly lower in the teenage group (mean 4.95 ± 1.24) compared to the adult group (5.32 ± 1.38), but this difference did not reach statistical significance ($t = -1.53, p = 0.129$). However, when we looked at fetal complications recorded as low birth weight, very low birth weight and respiratory distress, 35 babies in the teenage group and 20 in the adult group had documented complications, and although the difference was not statistically significant (chi square = 4.59, $p = 0.204$) the trend was towards poorer neonatal outcome in teenagers. Pramesti and Hidayat (30) reported that among adolescents with preeclampsia, 14.5 percent of babies had low birth weight and 26.1 percent had intrauterine fetal death, while 24.6 percent of mothers had preterm deliveries. Compared to their figures, our study shows a much higher proportion of low birth weight but lower stillbirth rate, which may be due to early delivery decisions and availability of emergency intrapartum care in our centre.

Maternal complications in our study included postpartum haemorrhage, acute kidney injury, pulmonary edema, postpartum eclampsia, ARDS and cerebrovascular accident. Overall, 38.3 percent of teenagers and 43.3 percent of adults had at least one recorded maternal complication, and the difference was not statistically significant (chi square = 21.4, $p = 0.125$ when detailed categories were compared). Ngwenya (31) reported high rates of HELLP syndrome and acute renal failure in severe pre eclampsia and eclampsia, with a maternal mortality rate of 1.7 percent. In our series there was only one maternal death, occurring in the teenage group (1.7 percent), and this difference in outcome between the groups was not statistically significant (chi square = 1.01, $p = 0.315$). This maternal mortality rate is similar to that reported by Ngwenya (31), suggesting that even in low resource settings, timely management protocols for eclampsia can keep maternal deaths low, although the burden of morbidity remains high.

Our findings also agree with the observations of Egbe et al. (34) who found that teenage mothers had higher rates of low birth weight and preterm deliveries compared to adults in a Cameroonian district hospital. They reported that 13.3 percent of hospital births were to teenagers and that teenage pregnancy was associated with adverse fetal outcomes. Although our study did not estimate the proportion of teenage pregnancies in the general population, the comparative pattern of poorer neonatal outcomes among adolescents is similar. Rajaei et al. (33) reported a preeclampsia prevalence of 5.8 percent in Hormozgan province with marked variation between districts, and they noted that younger maternal age and poor antenatal care were associated with more severe disease. This supports our observation that teenage mothers with preeclampsia and eclampsia, often from poor socioeconomic backgrounds and with limited antenatal visits, tend to present late and with higher blood pressure levels, which in turn affects fetomaternal outcome.

Overall, our study shows that teenage mothers with preeclampsia and eclampsia have higher blood pressure at presentation, deliver at lower gestational age, and give birth to babies with significantly lower birth weight and higher frequency of neonatal complications compared to adult mothers, although maternal complication rates and mortality are not very different between the two groups. When compared with various national and international studies, our findings are largely in line with the general consensus that adolescent pregnancy complicated by hypertensive disorders is associated with poorer perinatal outcomes and significant obstetric challenges, particularly in low resource rural settings.

Summary:-

- The present study titled “A comparative study of fetal/maternal outcomes in teenage versus non teenage (adults) mothers diagnosed with pre-eclampsia and eclampsia” was conducted in the Department of Obstetrics and Gynaecology, Deben Mahata Government Medical College and Hospital, Purulia, West Bengal over a duration of 12 months after Institutional Ethics Committee approval.
- The study aimed to investigate whether teenage mothers (10 - 19 years) experience different maternal and neonatal outcomes compared to non teenage mothers (20 - 35 years) when diagnosed with preeclampsia or eclampsia. The emphasis was on understanding how young maternal age influences disease severity, obstetric management and fetal survival.
- A total of 120 pregnant women diagnosed clinically with preeclampsia or eclampsia were recruited and divided into two equal groups: 60 teenage mothers and 60 non teenage mothers. All participants were followed from the time of admission until delivery and completion of the postpartum monitoring period or discharge.
- The mean age of the teenage group was 17.4 ± 1.17 years, whereas the adult group had a mean age of 25.6 ± 4.52 years, confirming that pregnancies during late adolescence are still widely prevalent in this region.
- Socio economic profile comparison revealed that all teenage mothers (100%) belonged to lower socioeconomic status, while 86.7% of non teenage mothers were in the same socioeconomic category. The difference was statistically significant ($\chi^2=8.57$, $p=0.003$), indicating stronger social disadvantage among adolescent mothers.
- Regarding antenatal care, teenage mothers had fewer ANC visits, with a majority reporting irregular or delayed antenatal registration, while the adult group showed better ANC coverage. This gap was evident during clinical history recording and supports the link between inadequate antenatal care and disease severity.
- Gestational age comparison showed that teenagers delivered earlier than adults. The mean gestational age at delivery was 37.0 ± 2.06 weeks among teenagers and 38.0 ± 2.15 weeks among adults, and this difference was statistically significant ($t = -2.55$, $p = 0.012$).
- Preterm delivery (<37 weeks) occurred in 36.7% of teenagers and 23.3% of adults, highlighting a greater risk of iatrogenic or spontaneous preterm birth among adolescents.
- Blood pressure severity at admission differed between the groups. Teenage mothers presented with significantly higher mean systolic BP (157 ± 8.22 mmHg) compared to adults (148 ± 8.62 mmHg) ($t=5.86$, $p < 0.001$).

- Similarly, diastolic BP was higher in teenagers (104 ± 7.95 mmHg) compared to adults (97.3 ± 8.14 mmHg) ($t = 4.44$, $p < 0.001$).
- These values indicate more severe disease manifestation among adolescent mothers at the time of admission.
- Protein uriagrading also favoured more severe disease in teenagers, where 76.5 % of all 3 + readings belonged to adolescent mothers. Although the p-value was borderline ($\chi^2 = 9.44$, $p = 0.051$), the trend points to substantial renal involvement in adolescents.
- Mode of delivery showed no statistically significant difference in the rate of vaginal delivery (teenage 63% vs adult 55%, $\chi^2 = 0.55$, $p = 0.458$).
- However, forceps-assisted delivery was significantly higher in the teenage group (32% vs 18%, $\chi^2 = 2.18$, $p = 0.14$), suggesting more fetal distress or poor bearing-down effort during labour in teenager.
- Caesarean section rates were comparable between the two groups, as delivery route was largely dictated by maternal and fetal well being rather than age alone. Emergency cesarean section was noted in cases of severe hypertension, eclampsia or non-reassuring fetal heart patterns.
- Mean neonatal birth weight was significantly lower among teenage mothers, calculated as 2307.6 ± 375 g compared to 2578.1 ± 654 g in the adult group ($t = -2.78$, $p = 0.006$).
- Low birth weight (< 2500 g) was observed in 75% of teenagers and 40% of adults, demonstrating powerful influence of young maternal age on fetal growth.
- Apgar scores at 5 minutes were marginally lower in the teenage group (4.95 ± 1.24) compared to adults (5.32 ± 1.38), although this difference was not statistically significant ($t = -1.53$, $p = 0.129$). Still, many newborns from teenage mothers required closer monitoring immediately after birth.
- Fetal complications were higher among teenage mothers, where 35 neonates had complications compared to 20 neonates in the adult group. These included low birth weight, respiratory distress, sepsis and NICU admissions. Although the association was not statistically significant ($\chi^2 = 4.59$, $p = 0.204$), the clinical difference was notable.
- Maternal complication rates were similar in both groups. 38.3% of teenagers and 43.3% of non teenage experienced complications such as postpartum hemorrhage, acute kidney injury, postpartum eclampsia, pulmonary edema and cerebrovascular accidents. The difference was not statistically significant ($p = 0.125$), suggesting that age alone does not influence maternal complication severity once preeclampsia/eclampsia develops.
- Maternal mortality occurred in one teenage mother (1.7%), where as no deaths were recorded among adults. The difference was not statistically significant ($\chi^2 = 1.01$, $p = 0.315$), but it emphasises the susceptibility of teenage mothers with severe hypertensive disorders in rural resource-limited settings.
- The study demonstrates that adolescent mothers are more likely to present late to the hospital, with high blood pressure, heavy proteinuria and need for emergency obstetric intervention, whereas adult mothers show comparatively better antenatal surveillance and preparedness.
- The search highlights that neonates born to teenage mothers are at significantly higher risk of prematurity, intrauterine growth restriction, low APGAR scores and NICU admission, reflecting the compromised intrauterine environment in young hypertensive pregnancies.
- The study confirms that early antenatal registration, nutritional support and timely screening for hypertension are crucial in reducing complications among adolescent pregnancies. Delayed hospital presentation, lack of awareness and limited reproductive health education aggravate the risk in rural areas.
- The key findings from the study support categorising teenage pregnancies complicated by preeclampsia or eclampsia as a high-risk condition that requires intensified monitoring, individualized birth planning and postnatal follow-up.

- The study provides real-world clinical evidence that investment in adolescent productive health services, community education and access to antenatal care has the potential to reduce perinatal mortality and improve maternal outcomes.
- Based on the study outcomes, it is recommended that hospital protocols should include age-specific risk stratification and enhanced surveillance for teenage mothers with hypertensive disorders of pregnancy, including regular blood pressure charting, fetal growth assessments and early decision-making for timing and mode of delivery.
- The findings from this research can also serve as a reference for health policymakers and public health departments to design targeted interventions for adolescent pregnancy prevention, awareness and management, particularly in rural and socioeconomically deprived regions.

CONCLUSION

The present study was conducted to compare foeto maternal outcomes in teenage mothers and adult mothers diagnosed with preeclampsia and eclampsia in the Department of Obstetrics and Gynaecology, Deben Mahata Government Medical College and Hospital, Purulia, over a period of one year. A total of 120 pregnant women fulfilling the diagnostic criteria were enrolled, among whom 60 were teenage mothers (10–19 years) and 60 were adult mothers (20–35 years). All patients were followed from admission to delivery and throughout the postpartum observation period.

The results of the study clearly showed that teenage pregnancies complicated by preeclampsia and eclampsia were associated with higher disease severity at presentation, increased risk of preterm delivery and significantly poorer neonatal outcomes compared to adult pregnancies. Teenage mothers presented with higher systolic and diastolic blood pressure values and a greater proportion had severe proteinuria at the time of admission. These findings suggest that adolescent mothers tend to seek medical attention later in the disease course or after complications develop, partly influenced by lack of awareness, inadequate antenatal care and socioeconomic constraints.

Although the mode of delivery did not vary significantly between teenagers and adults, forceps-assisted delivery was more frequently required in teenage mothers due to poor bearing-down effort, cephalopelvic disproportion or the need for rapid delivery in cases of maternal or foetal distress. However, the maternal complication rate did not differ significantly between teenage and adult mothers once the disease developed. Both groups experienced complications such as postpartum hemorrhage, acute kidney injury, pulmonary edema and postpartum eclampsia. This finding suggests that proper emergency obstetric care can mitigate maternal mortality even in the presence of severe preeclampsia and eclampsia.

On the other hand, neonatal outcomes showed major differences between the groups. Low birth weight was significantly more common among teenage mothers, and neonatal birth weight was considerably lower compared to adult mothers. Neonates born to adolescent mothers were more likely to require NICU admission due to complications such as respiratory distress, prematurity and low APGAR scores. These findings highlight the adverse effects of placental insufficiency and poor intrauterine growth associated with preeclampsia and eclampsia in young mothers.

A notable observation of the study was that almost all births were live births in both groups, with a very low stillbirth rate. This reflects the positive impact of timely obstetric intervention and neonatal support services available at the institute. However, one case of maternal mortality in the teenage group reinforces the seriousness of adolescent pregnancy complicated by hypertensive disorders and the need for early diagnosis and intervention.

The findings of this study reiterate that preeclampsia and eclampsia in adolescence represent a major high-risk obstetric condition requiring enhanced surveillance, planned delivery and multidisciplinary monitoring. Improving antenatal registration, encouraging early reporting of warning symptoms, and providing reproductive health education to young women can significantly reduce adverse foetomaternal outcomes. Awareness at the community level remains a key preventive tool in regions where early marriage and teenage pregnancy are common.

To conclude, preeclampsia and eclampsia continue to pose a major threat to foeto maternal health, and their impact is more pronounced in adolescent pregnancies. Health interventions must prioritize:

- Early antenatal registration and regular follow-up for pregnant adolescents,

- Nutritional and anemia control programs targeted at young mothers,
- Community-based reproductive and menstrual health education,
- Timely referral systems to tertiary hospitals for high-risk pregnancies, and
- Continuous training for peripheral healthcare workers to recognize early signs of hypertensive disorders.

LIMITATIONS

In the present study, only clinically diagnosed cases of preeclampsia and eclampsia admitted during the study period were included. Pregnant women who developed hypertensive complications outside the hospital setting and were not admitted could not be evaluated. The study was restricted to a single tertiary care centre in Purulia, and therefore the findings may not fully represent the population of other regions with different socio economic and healthcare profiles. The study duration was limited to one year, and seasonal or long-term trends in adolescent pregnancy and hypertensive disorders could not be assessed.

Antenatal records and previous treatment history provided by participants could not always be verified from external sources, which may have introduced recall bias. Ultrasonographic evaluation for fetal growth and Doppler studies were not uniformly available for all patients, and therefore detailed placental insufficiency parameters could not be analyzed. Bio chemical markers of diseases verity such as serum LDH, uric acid and angiogenic biomarkers could not be included consistently in this study due to resource constraints.

Follow-up was limited until discharge from the hospital; long-term maternal outcomes such as persistent hypertension and delayed postpartum complications, and neonatal outcomes such as neuro developmental delay or growth deficits could not be assessed. Furthermore, lifestyle, nutritional and psychological factors that may influence these verities of preeclampsia among teenage mothers could not be evaluated systematically. A larger multicentric study with extended follow-up and advanced laboratory support would provide a more comprehensive understanding of the influence of maternal age on fetal/maternal outcomes in hypertensive disorders of pregnancy.

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