Teenage Pregnancy and Adverse Maternal Outcomes in Northeast India: A District-Level Analysis Using HMIS 2023–24

Kiran Sharma[1]*

Abstract

Keywords

HMIS, Low Birth Weight, Maternal Health, Northeast India, Preterm Birth, Teenage Pregnancy

Teenage pregnancy remains a major public health challenge in India, particularly in the Northeastern states where adolescent health often receives limited policy focus. Despite the recognized risks of maternal complications among teenagers, region-specific evidence remains scarce. Large-scale surveys such as the National Family Health Survey (NFHS) provide broad estimates but lack district-level detail, while the Health Management Information System (HMIS) offers more granular, real-time data that is seldom utilized for adolescent-specific analysis.

This study estimated the prevalence of teenage pregnancy (15–19 years) across 95 districts in eight Northeastern states of India for the year 2023–24 and examined its association with maternal health complications. Data were obtained from the HMIS, and descriptive statistics along with Pearson's correlation were applied using SPSS (version 26). Maternal complications considered included low birth weight, preterm births, blood transfusions, and stillbirths.

The prevalence of teenage pregnancy was found to be notable, with several districts reporting rates exceeding 10%. Significant positive correlations were observed between teenage pregnancy and high-risk pregnancies ($r = .438$, $p = 0.004$), preterm births ($r = .663$, $p = 0.026$), blood transfusions ($r = .533$, $p = 0.050$), and stillbirths ($r = .563$, $p = 0.026$). Several districts showed zero reporting, suggesting possible underreporting or data quality issues.

Districts with higher teenage pregnancy rates exhibited greater maternal complications, highlighting a critical and under-recognized burden in the region. Strengthening adolescent reproductive health services and improving the accuracy of routine data reporting are essential to mitigate preventable risks among teenage mothers in Northeast India.

---

*Corresponding Author

[1] Field Investigator, Institute of Economic Growth, Population Research Centre. Email-Id: kiran182628@icloud.com

Introduction

Teenage pregnancy remains a significant global public health challenge, with far-reaching consequences for maternal and child health. Each year, an estimated 21 million girls aged 15–19 in developing regions become pregnant, of whom about 12 million actually give birth (WHO, 2024). Adolescent mothers face substantially higher risks of pregnancy-related complications – including eclampsia, puerperal infections, preterm delivery, and having low-birth-weight infants – compared to women in their twenties (WHO, 2024). Consequently, pregnancy and childbirth complications rank among the leading causes of mortality for 15–19-year-old females worldwide (Chakole et al. 2022). These outcomes underscore the urgency of addressing teenage pregnancy as a health and development priority in low-resource settings (Chakole et al. 2022).

In India, despite improvements in public health awareness and reproductive health services, early childbearing continues to be prevalent. The National Family Health Survey-5 (NFHS-5) indicates that 6.8% of women aged 15–19 years have already begun childbearing nationally (IIPS and ICF 2021; Pautunthang, 2023). This marks a decline from earlier decades (16% in 2005–06) yet still translates into millions of adolescent pregnancies each year, contributing to India's maternal and neonatal health burden (Pautunthang, 2023; Borah and Das 2022). Studies have noted that adolescent pregnancy is associated with higher maternal morbidity and mortality, as well as elevated neonatal risks, thereby impeding India's progress on maternal and child health indicators (Chakole et al. 2022; Borah and Das, 2022). The persistence of teenage pregnancy in certain populations is tied to underlying social determinants such

as early marriage, low education, and poverty, which remain entrenched in parts of the country (Borah and Das, 2022).

Within this context, the Northeastern states of India emerge as a region of particular concern. These states – despite cultural diversity and matrilineal traditions in some areas – report some of the nation's highest rates of adolescent fertility. For instance, Tripura's latest survey data show that 21.9% of girls 15–19 years have begun childbearing, the highest proportion among all states, and considerably above the national average (Pautunthang, 2023). Other Northeastern states like Assam also exhibit teenage pregnancy levels (around 12%) well above the Indian average (Pautunthang, 2023). This situation is compounded by the region's geographical remoteness and developmental challenges – many communities are rural, hard-to-reach, and underserved by health services (Borah and Das 2022). Notably, the Northeast has long been sidelined in national health discourse, resulting in fewer context-specific interventions and limited research attention. Region-specific evidence on the repercussions of teenage pregnancy remains scant, which hinders informed policymaking for these states. Preliminary reports from Assam, for example, highlight high rates of pregnancy complications and poor outcomes among teenage mothers, yet such insights are isolated (Borah and Das, 2022). A stronger evidence base is needed to capture the magnitude and consequences of adolescent pregnancy in Northeastern India's underserved districts.

Large-scale surveys like NFHS, while invaluable for national and state-level trends, often lack the granularity to reveal intra-state disparities and district-level patterns (IIPS and ICF 2021). In contrast, the Ministry of Health and Family Welfare's

routine Health Management Information System (HMIS) offers an opportunity to analyze disaggregated, facility-reported data on maternal and child health indicators in real time (MoHFW 2023). To date, HMIS data have been underutilized for adolescent health monitoring, even though they can illuminate local hotspots of teenage pregnancy and associated health service gaps. This study seeks to address the evidence gap by leveraging HMIS 2023–24 data from 95 districts across the eight Northeastern states of India to (a) estimate the prevalence of teenage pregnancy (15–19 years) at a district level, and (b) examine whether districts with higher adolescent pregnancy rates also experience elevated maternal complications (such as preterm births, low birth weight, or obstetric emergencies). In doing so, the analysis highlights intra-regional disparities and potential data reporting issues, providing timely evidence to inform adolescent reproductive health strategies in a region that has often been overlooked. The findings are expected to help policymakers and public health programs better target interventions to reduce the preventable risks faced by teenage mothers in Northeast India.

The objectives of the study are to estimate the prevalence of teenage pregnancy (aged 15–19 years) across districts and states in Northeast India using HMIS 2023–24 data; to examine whether districts with higher teenage pregnancy prevalence also report higher maternal complications, including preterm births, low birth weight, and cases managed with blood transfusion, using district-level ecological correlation analysis; and to assess the quality of reporting on teenage pregnancy and related maternal complications, and to identify district-level gaps or missing data that may affect accurate interpretation of findings across Northeast India.

Methodology

Study Design and Approach

This is a secondary data-based, cross-sectional study using an ecological design. The analysis was conducted at the district level to understand the pattern and association of teenage pregnancy with maternal health outcomes in the Northeastern region of India.

Data Source

This study used data from the Health Management Information System (HMIS) for the financial year 2023–24, covering 95 districts across the eight Northeastern states of India. HMIS is a facility-based reporting system managed by the Ministry of Health and Family Welfare (MoHFW), Government of India, which compiles monthly service statistics from public health facilities. For this study, district-level data were extracted from the HMIS web portal (MoHFW 2023).

Study Area and Time Frame

The study covered eight Northeastern states of India: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura, across 95 districts. Data from April 2023 to March 2024 was compiled and analyzed.

Study Variables

The following indicators were analyzed:

Teenage Pregnancy (15–19 years): Pregnant women registered in the age group of 15–19 years, as recorded in HMIS.

Preterm Births: Births occurring before 37 completed weeks of gestation, regardless of birth weight (WHO 2023; Liang et al. 2024).

Low Birth Weight (LBW): Live births weighing less than 2,500 grams, irrespective of gestational age (WHO 2023; Feyisa et al. 2023).

Stillbirths: Fetal deaths occurring at or after 28 weeks of gestation, with no signs of life at birth (MoHFW 2023).

Pregnancies Requiring Blood Transfusion: Women requiring blood transfusion due to maternal anemia, obstetric hemorrhage, or delivery complications, as captured by HMIS (MoHFW 2023).

High-Risk Pregnancies: Pregnancies identified with one or more medical, obstetric, or demographic risk factors (e.g., anemia, hypertension, diabetes, advanced maternal age), based on HMIS reporting guidelines (MoHFW 2020).

Data Extraction and Management

The raw HMIS reports for individual states were downloaded in Microsoft Excel format. Monthly figures for 2023–24 were aggregated to obtain annual totals for each district. Data cleaning included verification for missing values, removal of duplicate entries, and cross-checking for outliers with state averages. Indicators were standardized to allow comparison across districts. Districts with incomplete records (<80% reporting) were excluded from the analysis. All individual state files were cleaned and merged into one dataset. A new column was created to calculate Teenage Pregnancy Prevalence:

(Pregnant women aged 15–19 ÷ Total pregnant women registered) × 100

An additional column for the State name was added to enable state-wise and district-wise analysis.

Statistical Analysis

All analyses were conducted using IBM SPSS Statistics, version 26.0. Descriptive statistics (minimum, maximum, mean, CI, and standard deviation) were used to summarize the prevalence of teenage pregnancy across states and districts. To identify the highest-burden districts, prevalence values were arranged in descending order and the top ten districts were selected for focused comparison. Districts with incomplete denominator data were excluded from this ranking. To facilitate state-wise and district-wise comparisons, the split-file technique in SPSS was applied, enabling stratified analysis within each state.

Since both teenage pregnancy and maternal health indicators were available from HMIS as district-level aggregated prevalence (%) values, individual-level binary outcomes were not accessible. Therefore, the chi-square test was not suitable, and Pearson's correlation coefficient was applied to assess the strength and direction of linear associations between district-level teenage pregnancy prevalence and maternal health outcomes. The r-value ranges from -1 to +1, with positive values indicating a direct association and negative values indicating an inverse association. Statistical significance was assessed using p-values, with p < 0.05 considered significant.

Handling of Missing Data

During the data processing stage, it was observed that 16 out of 95 districts had no reported cases of teenage pregnancy. These districts were flagged, and their absence was considered while calculating valid percentages and interpreting district-level prevalence and associations.

Ethical Consideration

The study is based on secondary data obtained from the Health Management Information System (HMIS). Since the analysis used already available, aggregated, and anonymized data, no primary data collection or direct involvement of human participants was undertaken. Therefore, ethical clearance was not required for this study.

Results

Table 1 State-wise Teenage Pregnancy Prevalence in Northeast India (HMIS 2023-24)

State	No. of Districts (n)	Percentage (%)	95% CI (Lower–Upper)	SD
Tripura	5	17.8	9.95 – 25.65	6.32
Assam	11	12.9	9.70 – 16.10	4.76
Nagaland	12	10.9	8.38 – 13.42	3.96
Meghalaya	11	9.3	6.80 – 11.80	3.72
Mizoram	8	8.2	5.65 – 10.75	3.05
Manipur	7	7.1	4.47 – 9.73	2.84
Arunachal Pradesh	21	6.7	5.48 – 7.92	2.68
Sikkim	4	5.1	1.85 – 8.35	2.04

Table 1 represents the state-wise prevalence of teenage pregnancy in Northeast India using HMIS 2023–24 data. The highest prevalence was documented in Tripura (17.8%), followed by Assam (12.9%) and Nagaland (10.9%), whereas the lowest was observed in Sikkim (5.1%) and Arunachal Pradesh (6.7%). Wider confidence intervals in states with fewer districts, such as Tripura and Sikkim, reflect greater variability and reduced precision, while narrower intervals in Arunachal Pradesh suggest more stable and reliable estimates due to larger district representation. Taken together, these findings indicate that teenage pregnancy remains a significant public health challenge in parts of the region, highlighting the importance of tailored, state-specific interventions, particularly in high-prevalence settings.

Table 2 Top 10 Districts in Northeast India with Highest Teenage Pregnancy Prevalence (HMIS 2023–24)

District	State	Percentage (%)
Gomati	Tripura	34.78
South Tripura	Tripura	21.43
Dimapur	Nagaland	16.23
Changlang	Arunachal Pradesh	12.15
Noklak	Nagaland	10.89
Barpeta	Assam	10.34
Mon	Nagaland	9.89
Churachandpur	Manipur	9.27
West Garo Hills	Meghalya	9.17
Anjaw	Arunachal Pradesh	9.16

Note: Values represent the percentage of reported teenage pregnancies relative to total pregnancies per district.

Table 2 highlights the top ten districts with the highest reported prevalence of teenage pregnancy, many of which mirror broader trends at the state level. Notably, Gomati (34.78%) and South Tripura (21.43%) stand out within Tripura, reinforcing the state's overall high burden. In Nagaland, districts such as Dimapur (16.23%), Noklak (10.89%), and Mon (9.89%) also emerge as significant hotspots.

Despite Arunachal Pradesh recording a comparatively lower state average, certain districts—particularly Changlang (12.15%) and Anjaw (9.16%)—show disproportionately elevated rates. Similarly, Barpeta in Assam, Churachandpur in Manipur, and West Garo Hills in Meghalaya all report figures that surpass their respective state-level means.

These findings highlight districts that require more targeted adolescent health interventions, even within states that may not appear highly burdened overall.
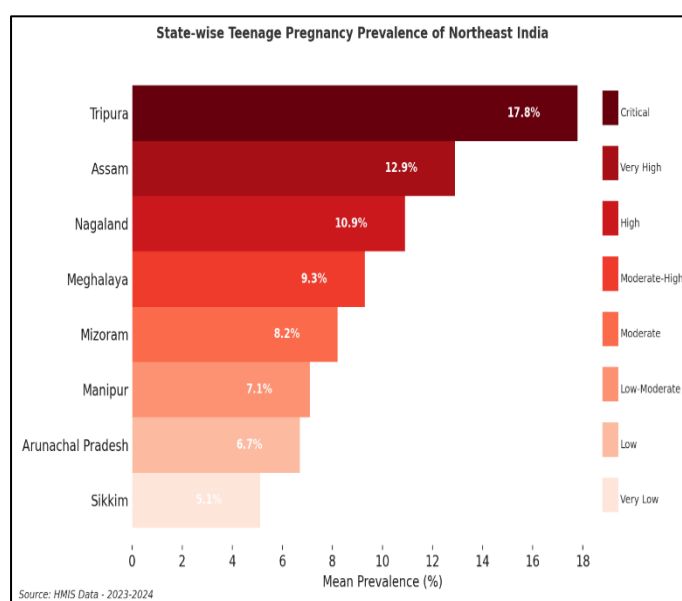
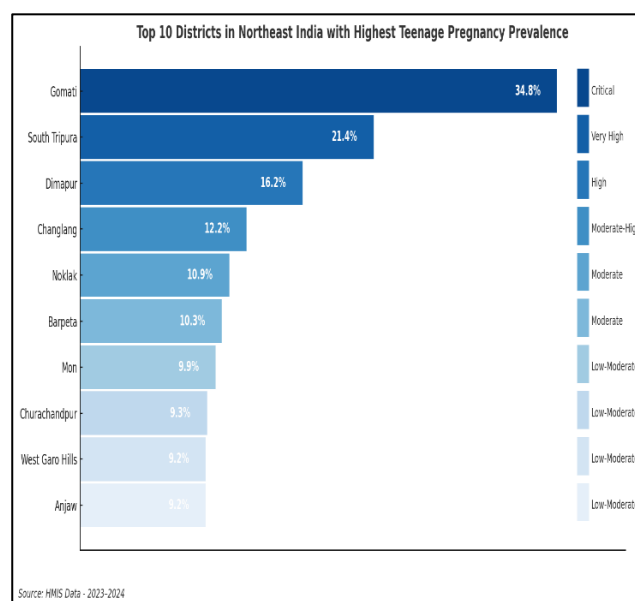**Figure 1** State-wise Teenage Pregnancy Prevalence in Northeast India.

Figure 2 Top 10 Districts in Northeast India with Highest Teenage Pregnancy Prevalence.

Table 3 Correlation Between Teenage Pregnancy Prevalence and Maternal Complications (District-Level, HMIS 2023–24)

Maternal Health Indicators	Correlation (r)	p-value	Statistical Significance
Pregnant Women with Hypertension	0.081	0.500	Not Significant
Pregnant Women with Moderate Anemia (Hb 7.9–10 g/dl)	-0.021	0.861	Not Significant
Gestational Diabetes (OGTT Positive)	0.017	0.888	Not Significant
Pregnant Women with Thyroid Disorder	-0.136	0.259	Not Significant
High Risk Pregnancies	0.438	0.004	Significant
Pregnant Women with Eclampsia	-0.087	0.473	Not Significant
Pregnant Women Treated with Blood Transfusion	0.533	0.050	Significant
Preterm Births	0.663	0.026	Significant
Stillbirths	0.563	0.026	Significant
Low Birth Weight (<2500g)	-0.012	0.920	Not Significant
Very Low Birth Weight (<1800g)	-0.041	0.734	Not Significant
Maternal Deaths Due to Hypertension	-0.028	0.819	Not Significant
Maternal Deaths Among Adolescents (15–19 years)	0.307	0.009	Significant

Note: *Values represent Pearson's correlation coefficients (r) with corresponding p-values, computed from aggregated HMIS district-level data. Chi-square tests were not applicable as individual-level data were unavailable. Statistical significance was considered at p < 0.05."*

Table 3 revealed that teenage pregnancy prevalence was significantly correlated with several maternal health complications across districts. Notably, high-risk pregnancies (r = 0.438, p = 0.004) and maternal deaths among adolescents (r = 0.307, p = 0.009) showed meaningful positive associations. Stronger correlations were observed with blood transfusions (r = 0.533, p = 0.050), stillbirths (r = 0.563, p = 0.026), and preterm births (r = 0.663, p = 0.026), indicating that districts with higher teenage pregnancy rates also reported elevated levels of these adverse outcomes. In contrast, no significant correlation was found between teenage pregnancy and other complications such as hypertension, anemia, thyroid disorders, or low birth weight.

Identification of Data Gaps in Reporting of Maternal Health Indicators

An assessment of HMIS 2023–24 district-level data revealed notable inconsistencies in reporting across several districts in the Northeastern region. Of the 95 districts reviewed, 16 had incomplete records for one or more key maternal health indicators. These data gaps were particularly pronounced in states like Mizoram, where several districts reported either zero or missing values for total registered pregnancies, rendering it impossible to calculate teenage pregnancy prevalence or associated health outcomes.

Commonly missing or partially reported indicators included cases of gestational diabetes (OGTT positive), high-risk pregnancies, very low birth weight (<1800g), and adolescent-specific pregnancy registration (15–19 years). Districts such as Saitual, Champhai, Serchhip, South Salmara Mancachar, and Unakoti showed inconsistencies across multiple variables. In certain cases, teenage pregnancy numbers were recorded, but the absence of total pregnancy registrations led to invalid or uncomputable prevalence rates.

This lack of uniform data reporting underscores the urgent need for improved monitoring systems, particularly at the facility level in remote or difficult-to-access areas. Incomplete data not only weakens the reliability of district-level analysis but also raises concerns around possible under-reporting of complications among adolescent pregnancies.

Discussion

The present study analyzed teenage pregnancy prevalence across the northeastern states of India and its relationship with maternal health complications using HMIS 2023–24 data. It was observed that states like Tripura, Nagaland, and Meghalaya reported relatively higher prevalence, while Sikkim and Arunachal Pradesh had the lowest. These patterns may be influenced by cultural norms, access to education, and awareness about reproductive health services.

Our findings align with those of NFHS-5 (2020-21) , which also reported high adolescent fertility in Tripura (21%), Assam (12%), and Meghalaya (17%). Similarly, Kumari and Sinha (2022) in their study on adolescent health in Assam found that teenage girls from rural and tribal areas were more likely to conceive early due to early marriages and limited access to contraception.

A key finding in our study was the significant association between teenage pregnancy and complications such as stillbirths, preterm births, and adolescent maternal deaths. This supports the findings by Roy et al. (2025), who explored the risk factors associated with teenage marital pregnancy, focusing on similar variables. In another study conducted in Manipur, Das et

al. (2020), highlighted the link between adolescent pregnancies and increased risk of anemia and poor birth outcomes. Our findings of a higher prevalence of complications such as stillbirths and preterm births among teenage pregnancies are consistent with national-level evidence from Patra and Sahoo (2021), who also observed increased maternal complications among adolescent mothers using NFHS-4 data. As noted by Tripathi and Chakrabarty (2024), regional disparities in maternal health services are influenced by differential access and empowerment. The current HMIS-based findings for Northeast India further confirm such disparities at the district level, particularly in states with high teenage pregnancy rates. The present findings resonate with UNICEF India's (2021) observation that adolescent pregnancies contribute substantially to maternal health risks and that strengthening reproductive health services is essential for reducing preventable maternal deaths.

Unlike NFHS-based studies, our analysis used HMIS routine service data, which allowed district-wise observation. This provided a granular understanding of gaps, particularly highlighting that districts with high teenage pregnancy also reported higher maternal risks.

However, the study faced limitations due to missing data in some districts. Mizoram, for example, lacked complete reporting on total registered pregnancies, which made the calculation of prevalence difficult. Similarly, indicators like blood transfusion or OGTT positivity were not age-disaggregated in HMIS, limiting the precision of associations.

Despite these limitations, this study highlights an important pattern: districts with high teenage pregnancy often face greater maternal health burdens. The findings reinforce the need for strengthening

adolescent health services under RKSK, improving data reporting at the block level, and targeting awareness programs in high-burden districts.

Limitations

This study has a few limitations that should be acknowledged. Firstly, the data used were extracted from the Health Management Information System (HMIS) 2023–24, which relies on facility-based reporting. Many districts had incomplete or missing values for one or more indicators, especially among maternal complication variables. Due to this, some associations may not reflect the complete picture across all districts.

Secondly, while teenage pregnancy data were age-specific (15–19 years), most maternal health indicators such as preterm births, eclampsia, and anemia, were reported for all pregnant women, not just adolescents. This made it difficult to analyze a direct age-wise association.

Thirdly, the study followed an ecological design and used district-level aggregated data. Therefore, the findings represent overall patterns at the population level and cannot be interpreted as cause-and-effect relationships at the individual level.

Lastly, due to secondary data usage, the accuracy of reporting and possible underreporting or overreporting from facilities could not be verified.

Conclusion

The findings of this study highlight that teenage pregnancy remains a significant concern in Northeast India, with wide variations across states and districts. The analysis revealed that districts with higher teenage pregnancy prevalence also reported more maternal complications such as preterm births, stillbirths, and maternal deaths among adolescents. Although the

association is not causal, the patterns observed underline the need for targeted interventions focusing on adolescent reproductive health.

Improving age-specific data reporting, strengthening adolescent-friendly health services, and ensuring early identification of high-risk pregnancies can help reduce the burden of adverse outcomes. This study emphasizes the urgent need for better monitoring, education, and support systems to protect the health and future of adolescent mothers in the region. Addressing adolescent reproductive health in the Northeast requires a combination of granular data tracking, targeted programming, and structural investment in facility-level services.

References

Borah, M., & Das, B. R. (2022). Teenage pregnancy and its outcomes in a tertiary care hospital in Assam. *CHRISMED Journal of Health and Research, 9*(3), 193–197.

Chakole, S., Akre, S., Sharma, K., Wasnik, P., & Wanjari, M. B. (2022). Unwanted teenage pregnancy and its complications: A narrative review. *Cureus, 14*(12), e32662. *https://doi.org/10.7759/cureus.32662*

Das, L., Devi, N., & Singh, R. (2020). Maternal health among adolescent girls in Manipur: A community-based assessment. *NEIGRIHMS Journal of Medical & Health Sciences, 18*(2), 78–85.

Feyisa, B. R., Abebe, S. M., Wolde, H. F., Tura, A. K., & Worku, A. (2023). Nutrition, stress, and healthcare use during pregnancy are associated with low birth weight: Evidence from a case–control study in West Ethiopia. *Frontiers in Public Health, 11*, 1213291. *https://doi.org/10.3389/fpubh.2023.1213291*

International Institute for Population Sciences (IIPS), & ICF. (2021). *National Family Health Survey (NFHS-5), 2019–21: India*. Mumbai, India: IIPS. Retrieved from *https://dhsprogram.com/pubs/pdf/FR375/FR375.*

Kumari, R., & Sinha, P. (2022). Adolescent health in Assam: A rural-tribal analysis. *Indian Journal of Public Health Research & Development, 13*(1), 45-52.

Liang, X., Wang, Y., Liu, Z., Zhang, Q., Zhao, Y., Wang, H., *et al.* (2024). Global, regional, and national burden of preterm birth, 1990–2021: A systematic analysis for the Global Burden of Disease Study 2021. *eClinicalMedicine, 67*, 102840. *https://doi.org/10.1016/j.eclinm.2024.102840*

Ministry of Health and Family Welfare (MoHFW), Government of India. (2020). *Rashtriya Kishor Swasthya Karyakram (RKSK) strategy handbook*. New Delhi, India: Ministry of Health and Family Welfare. Retrieved from *https://nhm.gov.in/New_Updates_2018/NHM_Components/RKSK/*

Ministry of Health and Family Welfare (MoHFW), Government of India. (2023). *HMIS indicators reference manual*. New Delhi, India: Ministry of Health and Family Welfare. Retrieved from *https://hmis.nhp.gov.in*

Roy, D., Debnath, A., Roy, N., Sarma, M., Paul, S., Roy, D. Das, J. (2025). Predictors of adolescent pregnancy in Northeast India: A cross-sectional analysis. *National Journal of Community Medicine, 16*(5), 507-513. *https://doi.org/10.55489/njcm.160520255117*

Tripathi, P., Chakrabarty, M., Singh, A., Let, S., et al. (2024). Geographic disparities and determinants of full utilization of the continuum of maternal and newborn healthcare services in rural India. *BMC Public Health, 24*, 3378. *https://doi.org/10.1186/s12889-024-20714-3*

Patra, S., & Sahoo, H. (2021). Exploring maternal complications among teenage pregnancies in India. *BMC Pregnancy and Childbirth, 21*(1), 113

Pautunthang, N. (2023). Levels, trends and differentials of teenage childbearing in India. *Asian Journal of Population Sciences, 2*(1), 37–53. *https://doi.org/10.3126/ajps.v2i1.51089*

UNICEF India. (2021). *Reducing maternal mortality in India*. New Delhi, India: UNICEF. Retrieved from

https://www.unicef.org/india/stories/reducing-maternal-mortality-india

World Health Organization (WHO). (2020). *Adolescent pregnancy: Fact sheet*. Geneva, Switzerland: World Health Organization. Retrieved from https://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy

World Health Organization (WHO). (2023). *Preterm birth: Key facts*. Geneva, Switzerland: World Health Organization. Retrieved from https://www.who.int/news-room/fact-sheets/detail/preterm-birth

World Health Organization (WHO). (2023). *Preterm and low birth weight: Maternal and newborn health*. Geneva, Switzerland: World Health Organization. Retrieved from https://www.who.int/teams/maternal-newborn-child-adolescent-health-and-ageing/newborn-health/preterm-and-low-birth-weight

World Health Organization (WHO). (2024). *Adolescent pregnancy*. Geneva, Switzerland: World Health Organization. Retrieved from https://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy.