

Demography India

A Journal of Indian Association of Study of Population

Journal Homepage: <https://demographyindia.iasp.ac.in/>



Status of Antenatal Care Utilization among ST and Non-ST Mothers in West Champaran and Banka districts of Bihar

Rajnee Kumari^{1*} and Rajeev Kamal Kumar²

Abstract

Maternal and new-borns mortality represent an ongoing public health crisis throughout developing nations across the globe. Many of these maternal deaths could be prevented with proper and timely antenatal care. This study examines full ANC utilization among Scheduled Tribe (ST) and Non-Scheduled Tribe (Non-ST) mothers in study population of Bihar. A cross-sectional study was conducted in West Champaran and Banka districts of Bihar, focusing on 300 married women aged 15 to 49 years. Primary data were collected using a structured interview schedule. The dependent variable was "full ANC," including at least four ANC visits, two TT injections, and 100 days of IFA intake. Data were analysed using Stata 16, with descriptive and chi-square tests to examine the association across the socio-economic and demographic determinants and full ANC utilization. It highlights the gap in full ANC utilization among these groups. Only a small percentage of ST women completed four ANC visits or took iron tablets for 100 days. In contrast, Non-ST women performed better in all ANC indicators. ST women had lower ANC access due to low education, poor income, and limited exposure. Rural residence, early pregnancy, and low media exposure further affected ANC utilization. Despite government schemes like JSY and PMMVY, full ANC utilization is found to be low among the study population, especially among ST women. The study found strong links across education, income, employment, and full ANC utilization. Women with higher education and media access had better service utilization.

Keywords

Antenatal Care,
Bihar, Maternal
Health, NFHS,
Scheduled Tribe,
Socio-economic
Disparities

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Introduction

Developing countries face the major public health burden from maternal and new-born mortality across the world (Moller et al., 2019). A total of 287,000 women experienced maternal deaths worldwide throughout 2020; while the Maternal Mortality Ratio (MMR) reached 223 deaths per 100,000 live births among 185 countries and territories. Between 2000 and 2020 the worldwide drop in maternal deaths reached 34.3 percent yet the rate remains extreme due to daily deaths of approximately 800 women alongside one maternal death occurring every two minutes during and following pregnancy and childbirth. India accounted for 24,000 maternal deaths in 2020, contributing to 8.3 percent of the global share (WHO 2023). The Maternal Mortality Ratio (MMR) in India has fallen to 97 deaths per 100,000 live births in 2018–2020 yet major obstacles persist before reaching the Sustainable Development Goal (SDG) target 3.1 regarding worldwide maternal mortality reduction to less than 70 deaths per 100,000 births by 2030. Moreover, approximately 38 percent of maternal deaths between 2018–2020 occurred among women aged 15–24 years. The situation is particularly concerning in Empowered Action Group (EAG) states, including Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Odisha, Rajasthan, Uttar Pradesh, Uttarakhand, and Assam, as these states contribute significantly to maternal deaths, with an MMR of 137 per 100,000 live births (SRS 2022, WHO 2019). Bihar, as part of this group, reported an MMR of 118 per 100,000 live births during 2018–2020 (SRS 2022).

The Scheduled Castes (SCs) together with the Scheduled Tribes (STs) are marginalized sections of the society. These communities

have suffered through persistent economic struggle and societal discrimination since long. They are officially acknowledged as disadvantaged communities in the Constitution of India (Dumont 1980). The caste system in Indian society uses as one of the major factors that shapes the socio-economic disparities throughout different well-being aspects. The public classification names four specific caste categories including Scheduled Castes (SCs), Scheduled Tribes (STs), Other Backward Classes (OBCs) and General castes. India's population consists of 16.6 percent SCs, with 16 percent in Bihar. SCs remain at the lowest category in the caste system. They mainly perform agricultural labour in rural areas. However, they possess no land ownership rights (Census 2011).

In India, the indigenous population mainly consists of tribal communities, which are officially recognized as Scheduled Tribes (STs). The population of STs in India accounts for 8.6 percent of the total population, while in Bihar it is 1.3 percent (Census 2011). Their social categorization emerges from isolated living patterns combined with cultural customs rather than their position in the caste system (Nayar 2007). Scheduled Tribes represent India's most disadvantaged community facing social, economic and political obstacles throughout historical times (Kumar et al., 2016; Bango et al., 2022).

The combined impact of past discrimination and restricted access to resources and opportunities with ongoing socio-economic disparities affects the current situation of SC and ST communities. These challenges have adjusted the socio-economic conditions while shaping both demographic profiles,

and health outcomes and still affect their overall wellness (Thapa et al., 2021). Members of the scheduled caste (SC) and scheduled tribe (ST) face higher occurrences of diseases that could be prevented (Radkar et al., 2007). Their life expectancy is lower as compared to OBC and general groups, although slightly higher than SCs. The life expectancy at birth was estimated at 63.1 years for SC, 64.0 years for STs, 65.1 years for OBC and 68.0 years for general (Kumari et al., 2020). Tribes in India suffer from major difficulties which affect them significantly. They account for considerable maternal deaths and infant mortality in India. The infant mortality rate among tribal children is 30 percent higher than the India average. For children under five, it is 61 percent higher. The high IMR and MMR in tribal populations are due to poor social conditions. Education levels are low. There is a lack of trained healthcare workers. Access to healthcare is limited. The funding for health presents itself as a significant problem (Dasra, 2016; Kumar et al., 2020). However, a substantial proportion of these maternal deaths could be prevented with adequate and timely antenatal, delivery, and postpartum care (Singh et al., 2023).

Timely and proper care for mothers and new-borns can greatly reduce these deaths. The necessary assistance runs throughout all developmental periods starting from pre-conception and extending into pregnancy and childbirth and early childhood (WHO.2023; Raina et al., 2023). Health authorities recognize the vital role of offering the "continuum of care" strategy for better maternal and new-born health results (Wojcieszek et al., 2023). The continuum of care covers essential healthcare services for mothers and children. It includes at least four antenatal care (ANC) visits, childbirth assisted by a skilled birth attendant (SBA),

and postnatal care (PNC) within 48 hours for both mother and new-born. In 2016, the WHO updated its guidelines, increasing the recommended ANC visits to a minimum of eight. This change aims to further improve the health outcomes of mothers and new-borns (WHO 2022; Margareth 2017).

Antenatal care (ANC) is the healthcare given to pregnant women to confirm and track their pregnancy. It helps ensure that the pregnancy is progressing well. ANC also prepares mothers for childbirth and possible complications. This care is essential for the best health outcomes for both mother and baby (WHO 2016). Antenatal care with prompt delivery of high-quality services functions as a fundamental method to stop maternal deaths. Reducing maternal mortality is an important development goal for developing countries. These countries account for more than 99 percent of maternal deaths worldwide (WHO 2019). Based on the World Health Organization's recommendations and available data from all four survey rounds, the full ANC indicator was measured using specific criteria. It included women who had at least four antenatal check-ups, received at least one tetanus toxoid injection, and took iron and folic acid tablets or syrup. This measurement applied to their last live birth within the three years preceding the survey period (IIPS and ICF 2017).

Access to proper antenatal care is still a big issue in India and in other low- and middle-income countries. This problem is worse in rural areas. Data from NFHS-5 (2019-21) showed a clear gap between rural and urban women using these health services. According to the survey, 58.1 percent of women had at least four ANC visits during their last pregnancy, as advised by the WHO. But 6 percent of women did not get

any ANC visits at all. More urban women received four or more ANC sessions. In urban areas, this number was 68.1 percent. In rural areas, it was lower at 54.2 percent. Also, 92.0 percent of mothers had their last birth protected against neonatal tetanus. Only 44.1 percent of mothers took iron folic acid for 100 days or more during pregnancy. The proportion of women aged 15-49 receiving any ANC in India increased from 84 percent in NFHS-4 (2015-16) to 94 percent in NFHS-5 (2019-21). In NFHS-5, 85 percent of women received ANC from a skilled provider. Additionally, 70 percent had their first ANC visit in the first trimester. Despite these improvements, Bihar continues to have the lowest percentage of women receiving four or more ANC visits, with only 25.2 percent meeting the recommended check-ups, while 81.6 percent have had at least one ANC visit. In Bihar, 68 percent of women received antenatal care for their last birth from a health professional—39 percent from a doctor and 29 percent from an auxiliary nurse midwife (ANM), lady health visitor (LHV), nurse, or midwife. However, 18 percent of mothers did not receive any antenatal care. The overall utilization of ANC in Bihar remains low, particularly for the recommended four or more visits during pregnancy (IIPS and ICF 2017; IIPS and ICF 2021).

The government launched the National Rural Health Mission (NRHM) initially for the period 2005-2012 to improve access to quality healthcare. This initiative focused on reaching rural communities, the poor, women, and children who often face barriers to medical services (NFHS-5). One of its key goals was to bring better healthcare services directly to households. This was done through female Accredited Social Health Activists (ASHAs), who serve

as a bridge between the community and the public health system (NFHS-5). Alongside NRHM, the government introduced the RMNCH+A approach, which stands for reproductive, maternal, new-born, child, and adolescent health. This strategy aimed to reduce mortality among women and children by addressing delays in accessing and using healthcare services. The goal of RMNCH+A was to establish the "continuum of care" framework so health efforts would align to all life stages according to NFHS-5 (MoHFW 2005; IIPS and ICF, 2021).

Government initiatives have proved inadequate for raising sufficient ANC use among adolescence mothers from SC/ST communities who need substantial service improvement. Social disadvantages impede these groups from receiving maternal healthcare services because they encounter multiple barriers to access services. Several socioeconomic factors influence the utilization of full ANC among adolescent SC/ST mothers. Household wealth, low education, religion, place of residence, and interaction with frontline workers all play a role in determining access to care. Pregnant women who register their pregnancy, receive benefits from the government's ICDS program, and have health insurance are more likely to access full ANC services. However, certain factors reduce the chances of receiving full ANC. These include lower maternal education, belonging to a lower wealth quintile, having multiple births, lack of support from the father during ANC visits, teenage pregnancy, and unintended pregnancies. Addressing these challenges is essential to improving maternal healthcare for adolescent SC/ST mothers. (Singh et al., 2023; Kumar et al., 2016). This study aims to understand the current full antenatal care utilization among mothers from Scheduled

Tribes and other communities in West Champaran and Banka districts of Bihar. The study evaluates maternal healthcare by assessing both the number of prenatal visits and the nature of care as well as cultural and social influences on maternity services. By analysing these aspects, the research seeks to identify gaps in the existing healthcare system. The findings will help in developing recommendations to improve antenatal care services in these underserved areas.

Material and Methods

The sampling procedure followed a multistage approach. Initially, the districts

of West Champaran and Banka were selected purposively based on both tribal population density and trends in early pregnancy prevalence. Within each district, blocks were chosen based on accessibility and demographic diversity. Villages and urban wards within these blocks were then selected using purposive sampling. Finally, within each selected village or ward, households with eligible women (aged 15–49 and having had a recent birth) were selected randomly. This multistage approach combined purposive and random sampling methods to ensure both representativeness and feasibility.

Table 1 Justification for Selection of Study Districts Based on Early Pregnancy Trends and Tribal Population in Bihar

Districts	ST Population (%)	Early Pregnancy Trend (NFHS-4 to NFHS-5)
West Champaran	High	Decline (19.5% to 12.5%)
Banka	Moderate	Increase (10.6% to 19.2%)

Data Source

A cross-sectional study was conducted in West Champaran and Banka districts of Bihar. This study is based on primary data and used a quantitative research approach to compare full ANC utilization among ST and Non-ST mothers. The selecting criteria of districts are prevalence of early pregnancy and availability “or” dominance of tribal people. Firstly, the districts have been selected with positive and negative trend of prevalence of early pregnancy during period of fourth and fifth round of NFHS which was conducted in 2015-16 and 2019-21 respectively in India. The districts Sheohar (10.7 percent), Gaya (7.7 percent), West Champaran (7.4 percent) and Kaimur (6.2 percent) shows higher percent of decline in prevalence of early pregnancy during the fourth to fifth round of NFHS.

This is the positive trend of decline in prevalence of early pregnancy. On the other hand, the districts Saharsa (11.7 percent), Purnia (9.1 percent), Banka (8.6 percent) and Bhagalpur (6.1 percent) shows higher percent of incline in prevalence of early pregnancy during the fourth to fifth round of NFHS. Which indicate the negative trend of incline in prevalence of early pregnancy. Finally, keeping the selecting criteria (availability “or” dominance of tribal people) and convenience in field work of the study in mind, the districts West Champaran and Banka has selected for the present study according to the census 2011. The prevalence of early pregnancy has declined from 19.5 percent to 12.5 percent as per fourth to fifth round of NFHS in West Champaran Which shows a positive figure of prevalence of early pregnancy but on other hand, Banka shows a negative figure

of increased prevalence of early pregnancy from 10.6 percent to 19.2 percent as per NFHS-4 (2015-16) to NFHS-5 (2019- 21) respectively.

The research focused on 300 married women aged 15 to 49 years. These women were randomly selected from households in the study areas. Out of the 300 respondents, 200 were from rural areas and 100 from urban areas. This selection aimed to ensure a diverse representation of antenatal care experiences among Scheduled Tribe mothers and other categories. The choice of West Champaran and Banka was based on the 2011 Census data, which provided insights into tribal population density and fieldwork feasibility. After selecting the districts, specific blocks, villages, and wards were chosen. In West Champaran, the selected villages were Manguraha and Mahuawa (Gaunaha block), and Ward-2 in Narkatiaganj. In Banka, Bhelwa and Salaiya Kalan villages (Katoria block) were chosen, along with Ward-4 in Deoda (Banka block). Primary data were collected through a structured interview schedule. This schedule was designed to assess awareness, accessibility, and utilization of antenatal care services. It included questions about the frequency of ANC visits, healthcare services received, and socio-cultural factors influencing maternal healthcare utilization.

Variable Construction

Variables have been constructed, and these variables have been divided into two categories, i.e., predictor variables and dependent variables, to fulfil the present study.

Dependent Variable

In this study, the dependent variable was defined as "full ANC." This term includes three main components: having at least four

antenatal care visits, receiving at least two tetanus toxoid (TT) injections, and taking iron-folic acid (IFA) tablets or an equivalent IFA syrup for 100 days during pregnancy. A pregnant mother was classified as having received "full ANC" only if she met all three of these criteria. The "full ANC" indicator is recommended by the Ministry of Health and Family Welfare, Government of India, and the World Health Organization.

Although the World Health Organization (WHO) revised its antenatal care (ANC) recommendations in 2016—raising the minimum number of ANC contacts from four to eight—the present study continues to adopt the four-visit benchmark. This choice is grounded in national-level data collection frameworks such as the National Family Health Survey (IIPS and ICF, 2021), which defines full ANC based on at least four antenatal visits, two tetanus toxoid injections, and iron-folic acid supplementation for 100 days. Given that India's health policy continues to track ANC performance using this four-visit threshold, particularly in underserved regions like Bihar where resource and access constraints persist, using the four-visit definition ensures compatibility with national indicators and allows for meaningful comparison with official data sources (IIPS and ICF, 2021; WHO 2016).

Independent Variables

The present study has used several predictor variables, which are re-coded for the purpose of effective analysis and comparison of the result. The predictor variable is used to understand the linkage with the dependent variable. The predictor variables are: Place of residence, Religion, Current age of mother, Wealth status of mother, Mother's exposure to media, Caste mothers' occupation, Exposure to mass

media, meeting with ASHA worker, parity, region of residence. This study incorporates various socioeconomic and demographic factors to evaluate their role in explaining the differences in maternal healthcare service utilization between Scheduled Tribes and other categories.

Statistical Analysis

Bivariate analyses were performed to determine Full ANC utilization among ST and Non-ST women by selected characteristics of women and binary logistic regression has been used to determine the potential determinants of utilization of full ANC services. The chi-square test is used to assess the independence of the variables associated with the factors, and the p-value is used to see the significance of the results.

A binary logistic regression model can be written in a compact form as follows:

$$\text{Logit}(p_i) = \ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k$$

Where β_0 is the intercept, $\beta_1, \beta_2, \dots, \beta_k$, are the regression coefficients indicating the relative effect of a particular explanatory variable on the outcome, $x_1, x_2, \dots, x_k$, are the control variables. The statistical package STATA version 16 was used for all statistical analyses.

Results

Socio-economic profile of the ST and Non-ST women by socio-economic and demographic determinants in study population of Bihar

Table 2 presents the percent distribution of women aged 15–49 years belonging to Scheduled Tribe (ST) and Non-Scheduled Tribe (Non-ST) categories across selected districts of Bihar based on various background characteristics. The majority of

ST women are aged 20–24 years (37.8 percent), whereas most Non-ST women fall in the 25–29 age group (47.5 percent). The rural population (90.8 percent) includes most ST women but Non-ST women distribute fairly evenly between urban and rural locations. Educational attainment among ST women is low, with 23.5 percent illiterate and only 1.7 percent having graduate-level education or higher; in contrast, 9.9 percent of Non-ST women are graduates and only 17.7 percent are illiterate. All ST women in the sample are Hindu, while 17.1 percent of Non-ST women follow Islam.

A larger proportion of ST women are not working (72.3 percent) compared to Non-ST women (59.1 percent). Among working women, the majority of ST earn below ₹5000 per month (87.9 percent), and none earn above ₹10000, while a small proportion of Non-ST women (10.8 percent) fall in the higher income brackets. In terms of reproductive behaviour, 43.7 percent of ST and 42.5 percent of Non-ST women had their first birth between 15–19 years. Media exposure is lower among ST women, with nearly half (49.6 percent) having no exposure, compared to 26.5 percent among Non-ST women. In terms of maternal health services, 65.6 percent of ST and 78.45 percent of Non-ST women received two or more TT injections; however, only 18.5 percent of ST women consumed IFA tablets for 100 or more days, compared to 33.2 percent among Non-ST women. Similarly, only 19.3 percent of ST women received at least four ANC visits, as opposed to 32.6 percent of Non-ST women, and 17.7 percent of ST women received full ANC, compared to 32 percent among Non-ST women. The total sample includes 119 ST women and 181 Non-ST women.

Table 2 Percentage distribution of ST and Non-ST women aged 15-49 years in study population of Bihar

Background Characteristics	(%) Age Distribution of ST Women	Total no. of ST Women (N=119)	(%) Age Distribution of Non-ST Women	Total no. of Non-ST Women (N=181)
Mother's Current age				
15-19	13.5	16	12.2	22
20-24	37.8	45	18.2	33
25-29	31.1	37	47.5	86
30 & above	17.7	21	22.1	40
Place of residence				
Rural	90.8	108	50.8	92
Urban	9.2	11	49.2	89
Education Status				
Illiterate	23.5	28	17.7	32
Primary	21.0	25	11.6	21
Upper primary	26.1	31	23.2	42
Secondary	17.7	21	23.2	42
Higher Secondary	10.1	12	14.4	26
Graduate & above	1.7	2	9.9	18
Religion				
Hindu	100.0	119	82.9	150
Muslim	0.0	0	17.1	31
Working status				
Homemakers	72.3	86	59.1	107
Employed	27.7	33	40.9	74
Monthly Income (*Only Employed women)		*(n=33)		*(n=74)
below 5000	87.9	29	68.9	51
5001-10000	12.1	4	20.3	15
10001-15000	0.0	0	8.1	6
15001 & above	0.0	0	2.7	2
Age at first birth				
15-19	43.7	52	42.5	77
20-24	52.9	63	43.1	78
25-29	3.4	4	12.7	23
30 & above	0.0	0	1.7	3
Media Exposure				
Not Exposed	49.6	59	26.5	48
Partially exposed	9.2	11	18.2	33
Regularly exposed	41.2	49	55.3	100
Two or more TT injections				
No	34.5	41	21.55	39
Yes	65.6	78	78.45	142
Taken IFA tablets/syrup for 100 or more days				
No	81.5	97	66.9	121
Yes	18.5	22	33.2	60
At least four Antenatal care visits				
No	80.7	96	67.4	122
Yes	19.3	23	32.6	59
Full ANC				
No	82.4	98	68.0	123
Yes	17.7	21	32.0	58
Overall	100.0	119	100.0	181

Source: Field survey (Household Data), 2023

Full ANC utilization among ST and Non-ST women by socio-economic and demographic characteristics in selected districts of Bihar

Table 3 shows the percentage of Full ANC among ST and Non-ST women by socio-economic and demographic characteristics. In the selected districts of Bihar, Full ANC coverage among ST women is highest in the 30 and above age group (33.3 percent), while it is lowest among those aged 15–19 (6.3 percent). For Non-ST women, the highest coverage is in the 25–29 age group (38.4 percent) and the lowest is also in the 15–19 age group (4.6 percent). In both ST and Non-ST groups, women aged 15–19 receive the least Full ANC. In rural areas, 18.5 percent of ST women received Full ANC, which is higher than 14.1 percent among Non-ST women. However, in urban areas, the trend is reversed. Only 9.1 percent of ST women received Full ANC, while the coverage among Non-ST women was much higher at 50.6 percent. The results show, Full ANC utilization increases with education among both ST and Non-ST women. Among illiterate women, 10.7 percent of ST and 9.4 percent of Non-ST received Full ANC. Among women with higher secondary education, 58.3 percent of ST and 53.9 percent of Non-ST received Full ANC. Among graduates, all ST women and 94.4 percent of Non-ST women received Full ANC. Higher education is linked to better ANC coverage in both groups. Among Hindu women, 17.7 percent of ST and 36 percent of Non-ST received Full ANC. Among Muslim women, 12.9 percent of Non-ST received Full ANC. Full ANC coverage is higher among Hindu Non-ST women compared to both Hindu ST and Muslim Non-ST women. Working women,

both ST (36.4 percent) and Non-ST (51.4 percent), have higher Full ANC utilization compared to non-working women, ST (10.5 percent) and Non-ST (18.7 percent). The data shows that women from the Scheduled Tribe (ST) group have lower monthly incomes compared to Non-ST women, and this income disparity influences Full ANC utilization. Higher income levels lead to higher Full ANC utilization in both groups. Among women earning below ₹5,000, 31 percent of ST women and 33.3 percent of Non-ST women received Full ANC. However, as income increases, the percentage of women receiving Full ANC rises significantly, with all Non-ST women earning above ₹10,000 receiving Full ANC. Full ANC utilization among Non-ST women is highest in the 25–29 age group at 65.2 percent and lowest in the 15–19 group at 15.6 percent. Among ST women, the highest Full ANC is in the 20–24 age group at 22.2 percent. In the 25–29 group, no ST women received Full ANC. This shows that as age at first birth increases, Full ANC utilization also increases, especially among Non-ST women. Among women with no media exposure, 3.4 percent of ST women and 2.1 percent of Non-ST women received Full ANC. With partial exposure, 9.1 percent of ST and 12.1 percent of Non-ST women received Full ANC. With regular media exposure, 36.7 percent of ST and 53.0 percent of Non-ST women received Full ANC. Full ANC increases with media exposure in both groups. Non-ST women benefit more from media exposure than ST women. The association is statistically significant.

Table 3 Percentage of full ANC among ST and Non-ST women by socio-economic and demographic characteristics in study population of Bihar

Background Characteristics	(%) Full ANC among ST Women	Total no. of ST Women (N=119)	(%) Full ANC among Non-ST Women	Total no. of Non-ST Women (N=181)
Mother's Current age				
15-19	6.3	16	4.6	22
20-24	17.8	45	36.4	33
25-29	13.5	37	38.4	86
30 & above	33.3	21	30.0	40
(χ^2 , p-value)	(5.42;<0.04)		(9.58;<0.02)	
Place of residence				
Rural	18.5	108	14.1	92
Urban	9.1	11	50.6	89
(χ^2 , p-value)	(0.61;<0.4)		(27.57;<0.001)	
Education Status				
Illiterate	10.7	28	9.4	32
Primary	12.0	25	9.5	21
Upper primary	0.0	31	14.3	42
Secondary	28.6	21	38.1	42
Higher Secondary	58.3	12	53.9	26
Graduate & above	100.0	2	94.4	18
(χ^2 , p-value)	(32.84;<0.001)		(57.09;<0.001)	
Religion				
Hindu	17.7	119	36.0	150
Muslim	-	-	12.9	31
(chi2, p-value)	-	-	(6.29;<0.01)	
Employment status				
Homemakers	10.5	86	18.7	107
Employed	36.4	33	51.4	74
(χ^2 , p-value)	(11.01;<0.001)		(21.43;<0.001)	
Monthly Income (*Only Employed women)		*(n=33)		*(n=74)
below 5000	31.0	29	33.3	51
5001-10000	75.0	4	86.7	15
10001-15000	-	-	100.0	6
15001 & above	-	-	100.0	2
(χ^2 , p-value)	(2.94;<0.08)		(21.70;<0.001)	
Age at first birth				
15-19	13.5	52	15.6	77
20-24	22.2	63	37.2	78
25-29	0.0	4	65.2	23
30 & above	-	-	66.7	3
(χ^2 , p-value)	(2.39;<0.3)		(23.80;<0.001)	
Media Exposure				
Not Exposed	3.4	59	2.1	48
Partially exposed	9.1	11	12.1	33
Regularly exposed	36.7	49	53.0	100
(χ^2 , p-value)	(21.09;<0.001)		(45.97;<0.001)	
Overall (N)		119		181

Source: Field survey (Household Data), 2023; Note: ***p<0.001, **p<0.01, *p<0.05

Utilization of full ANC and different components of full ANC among ST and Non-ST Women in study population of Bihar

Figure 1 highlights the gap in ANC utilization between ST and Non-ST women. Only 17.7 percent of ST mothers received

full ANC compared to 32 percent of Non-ST mothers. Among the components, 19.3 percent of ST mothers had four or more ANC visits, whereas 32.6 percent of Non-ST mothers had the same. Only 65.6% of ST women received two or more TT injections, compared to 78.5% of Non-ST women.

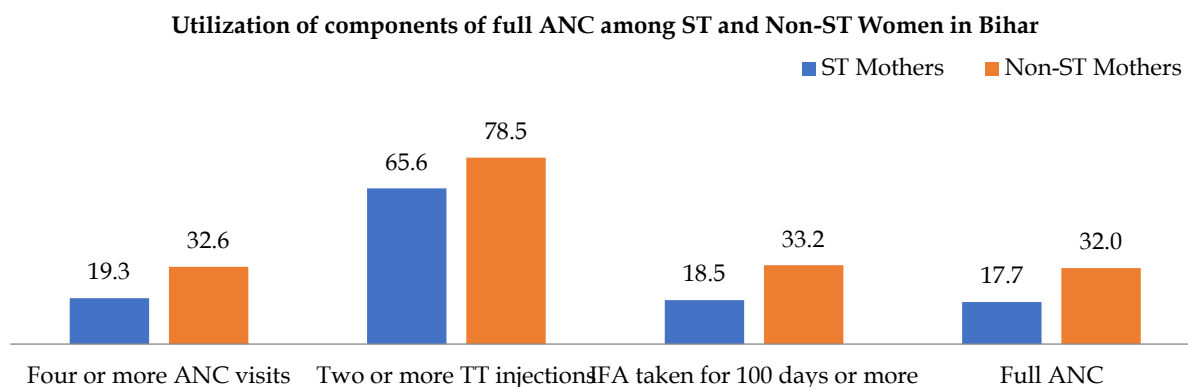


Figure 1 Utilization of components of full ANC among ST Women and Non-ST Women in Selected Districts of Bihar

Iron and folic acid (IFA) supplementation for 100 days or more was received by just 18.5 percent of ST women, compared to 33.2 percent of Non-ST women. These differences indicate that Non-ST women have significantly better access to and utilization of maternal health services than ST women.

Utilization of full ANC services among women age group (15 to 49 years) belongs to Caste/Tribe in study Population of Bihar

The bar chart (Figure 2) provides a comparative depiction of full antenatal care (ANC) utilization among women aged 15–49 years in Bihar, categorized by caste and tribe. In order to enhance conceptual clarity,

the broad classification of “Non-ST” has been further disaggregated into distinct social groups—General, Other Backward Classes (OBC), and Scheduled Castes (SC). Women belonging to the General category reported the highest utilization rate at 60.0 percent, indicating relatively better access to or uptake of maternal health services. In contrast, Other Backward Classes (OBC) and Scheduled Castes (SC) showed significantly lower utilization, with 30.1 percent and 32.1 percent respectively. The Scheduled Tribes (ST) recorded the lowest utilization rate at just 17.7 percent highlighting a major gap in access or awareness of ANC services among tribal populations.

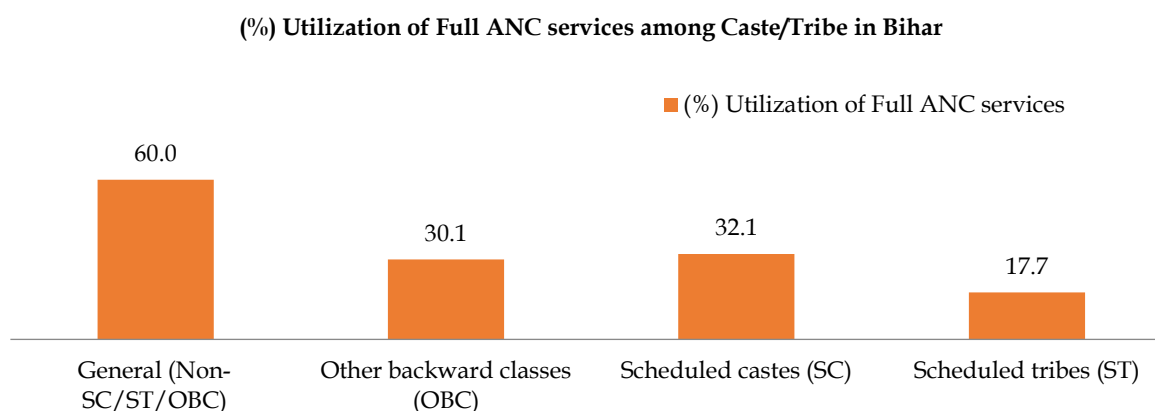


Figure 2 Utilization of full ANC services among Caste/Tribe (women age group 15 to 49 years)

Adjusted Odds of Full ANC Use among married women by Socio-Economic determinants in Bihar

The table 4 indicate that several socio-economic characteristics significantly influence full antenatal care (ANC) utilization among women aged 15–49 years in Bihar. Maternal age plays a prominent

role—women aged 20–24 years are about 11 times more likely to receive full ANC (OR = 11.13; 95% CI: 1.95–63.46) compared to those aged 15–19 years. Similarly, those aged 25–29 years (OR = 9.52; 95% CI: 1.72–52.62) and 30 years & above (OR = 9.63; 95% CI: 1.64–56.55) also show significantly higher odds, suggesting that increasing age is associated with greater ANC utilization.

Table 4 Socio-economic determinants of Utilization of Full ANC services among women (Age group 15–49 years) in Bihar

Background Characteristics	Odd Ratio (95% CI)
Mother's Current age	
15–19 Years ®	1
20–24 Years	11.13** [1.95,63.46]
25–29 Years	9.52** [1.72,52.62]
30 Years & above	9.63* [1.64,56.55]
Place of residence	
Rural ®	1
Urban	1.04 [0.43,2.55]
Caste/Tribe	
General (Non-SC/ST/OBC) ®	1
Other backward classes (OBC)	0.44** [0.08,2.38]
Scheduled castes (SC)	0.66* [0.10,4.51]
Scheduled tribes (ST)	0.51** [0.09,2.95]
Education Status	
Illiterate ®	1
Primary	0.64 [0.20,2.11]
Secondary & above	5.48** [1.75,17.09]
Working status	
Homemakers ®	1
Employed	3.50*** [1.74,7.03]
Media Exposure	
Not Exposed ®	1
Exposed	18.53*** [5.07,67.70]

Source: Field survey (Household Data), 2023; Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Caste and tribe identity emerge as significant predictors of ANC use. Compared to women from General (non-SC/ST/OBC) backgrounds, those belonging to Other Backward Classes (OBC) (OR = 0.44; 95% CI: 0.08–2.38), Scheduled Castes (SC) (OR = 0.66; 95% CI: 0.10–4.51), and Scheduled Tribes (ST) (OR = 0.51; 95% CI:

0.09–2.95) show lower odds of receiving full ANC, and the coefficients for OBC and ST categories are statistically significant. This indicates a substantial disadvantage in ANC utilization among socially marginalized groups, especially ST women.

Education status is another key factor. Women with secondary education or above

are over five times more likely to receive full ANC (OR = 5.48; 95% CI: 1.75–17.09) compared to illiterate women. Employment also plays a significant role—employed women have 3.50 times higher odds (OR = 3.50; 95% CI: 1.74–7.03) of utilizing full ANC services than homemakers.

Exposure to media is the strongest positive determinant observed in the model. Women who are regularly exposed to media are nearly 18.53 times more likely to receive full ANC services (OR = 18.53; 95% CI: 5.07–67.70) than those who are not exposed.

Discussion

The Indian government is dedicated to providing extensive ANC services. This effort aims to safeguard maternal health (Kumar et al., 2017). Therefore, the present study examined the coverage of full antenatal care (ANC) among Scheduled Tribe (ST) and Non-Scheduled Tribe (Non-ST) mothers in selected districts of Bihar. Understanding the reasons for low use of maternal healthcare services in socially deprived groups is essential for policy improvement. Full ANC utilization is one of the key components of maternal healthcare services (Kumar et al., 2016). Pregnant women face health risks if they do not get ANC during pregnancy. Taking IFA tablets and TT injections on time can reduce these risks. These steps help protect both the mother and the baby (Kumar et al., 2017). The study supports the findings from a prior study of India that ST mothers have lower coverage of full ANC compared to Non-ST mothers. Among the components of full ANC, four or more visits and IFA tablets/syrup for 100 or more days intake were the least covered. Two or more TT injections had higher coverage (Singh et al., 2023). The study reveals that socio-

economic and demographic determinants such as: age, place of residence, wealth status, level of education, place of residence, age at first pregnancy, and media exposure contribute significantly to the disparity in full ANC utilization (Singh et al., 2023; Kumar et al., 2016).

The findings of this study underscore persistent inequities in full ANC utilization across caste and tribal groups in Bihar. Our graph shows that Scheduled Tribe (ST) women report the lowest rate of full ANC uptake at just 17.7 percent while utilization among Other Backward Classes (OBC) and Scheduled Castes (SC) stands at 30.1% and 32.1 percent respectively—considerably lower than the 60.0 percent observed in the General category. The adjusted logistic regression further confirms these disparities: ST (OR = 0.51) and OBC (OR = 0.44) women show significantly reduced odds of receiving full ANC relative to General category women. These caste-based disparities are consistent with national-level evidence on maternal health inequities: even after adjusting for socioeconomic variables such as education and media exposure, marginalized caste groups, especially ST communities, often experience reduced access to maternal health services due to structural and institutional barriers (Tripathi et al., 2024; Gupta et al., 2025).

A remarkable finding from the regression model is the very strong association between media exposure and ANC utilization: women with regular exposure to media are over 18 times more likely to receive full ANC (OR = 18.53) compared to those with no exposure. This finding mirrors results from national surveillance and regional studies that show women with media exposure are significantly more likely to access ANC and skilled maternal

healthcare (Gupta et al., 2025; Barman et al., 2021).

Moreover, education and employment status emerged as critical enablers of full ANC utilization. Women with secondary or higher education had substantially increased odds of ANC uptake—a trend corroborated by large-scale analyses from NFHS 4 data, which show consistent and positive effects of education on maternal healthcare usage (Yadav et al., 2021). Employment likely enhances decision-making power, autonomy, and economic independence, thereby facilitating better healthcare-seeking behaviour.

The findings from percent distribution ST women are concentrated in rural areas. They have significantly lower levels of education, with very few reaching graduate level. Scheduled Tribe women have lower employment rates compared to Non-ST women. Employed ST women have lower income levels compared to Non-ST women, with Non-ST women earning above ₹10,000. Early childbearing between ages 15–24 is common among ST women. Media exposure is poor among ST women, especially in Banka. A previous study also showed similar results. Scheduled Tribe women, who belong to deprived communities, had lower development in key socio-economic areas. Their status was poorer compared to the rest of the population (Singh et al., 2023; Kumar et al., 2016; Singh et al., 2021).

Age significantly influences full ANC utilization. The lowest coverage was seen among adolescent mothers aged 15–19, with very few ST and Non-ST women receiving full ANC. While utilization of full ANC among women aged 25 and above in both groups had the highest coverage. Older

women were more likely to access complete ANC services compared to younger ones (Singh et al., 2023; Kumar et al., 2019; Singh et al., 2021; Lodha 2022). These findings are aligned with findings from South Indian districts. A significant number of women in these backward tribal and rural areas are becoming mothers at a young age. This is mainly due to early marriages, which is a serious issue. The utilization of ANC services is also affected by this early age of conception (Varma et al., 2011) The present study found that Place of residence has a strong impact on the use of full ANC services. In rural areas, more ST women received full ANC compared to Non-ST women. However, in urban areas, the trend reversed, with very few ST women accessing full ANC while a large number of Non-ST women did. This shows that Non-ST women gain more from urban healthcare facilities. ST women, being mostly in rural regions, have limited reach and access in urban areas due to their small numbers (Singh et al., 2023; Kumar et al., 2016; Lodha 2022).

Education has a strong positive impact on ANC utilization. Among illiterate women, very few from both ST and Non-ST groups received full ANC. However, women with higher secondary education had significantly better access to full ANC. Among graduates, nearly all ST women and most Non-ST women received full ANC. This shows that higher education greatly increases the likelihood of using full ANC services in both groups (Kumar et al., 2019; Singh et al., 2023; Kumar et al., 2016; Rustagi et al., 2021; Singh et al., 2021; Lodha, 2022; Shekhawat et al., 2018). The study of Rajasthan also indicate that low level of education directly influenced full coverage ANC utilization (Chauhan 2012).

Religion also affects utilization of full ANC. Hindu Non-ST women had better access to full ANC compared to others. Hindu ST women had lower coverage. Muslim Non-ST women had the least coverage. In this study, all ST women were Hindu. This shows that religion plays a role in ANC utilization, with Hindu Non-ST women using services more (Singh et al., 2021; Fulpagare et al., 2019).

Employment influences full ANC use. Employed women in both groups accessed full ANC utilization more. Non-ST employed women had the highest coverage. ST employed women also showed better use than homemakers. Homemakers in both groups had very low coverage. This shows that being employed improves full ANC utilization (Singh et al., 2023).

Income level also impacts full ANC use. Among women earning below ₹5,000, 31percent of ST and 33.3percent of Non-ST received full ANC. As income increased, ANC coverage improved. All Non-ST women earning above ₹10,000 received full ANC. The present study showing a strong link between income and full ANC utilization (Kumar et al., 2019; Fulpagare et al., 2019; Chauhan 2012).

Media exposure played a significant role in full ANC utilization. Women with no media exposure had very low coverage of ANC in both groups. However, those with regular media exposure showed much higher utilization of full ANC. ST women benefited from media exposure, but Non-ST women had a higher increase in ANC use with media access. This highlights the important role media plays in raising awareness about Antenatal care (Singh et al., 2021).

Finally, the utilization of different components of full ANC further reflected the gap. While 65.6percent of ST women received two or more TT injections, only 19.3percent had four or more ANC visits and just 18.5percent consumed IFA tablets for 100 or more days. In contrast, Non-ST women performed better across all components, particularly in IFA intake and ANC visits (Rustagi et al., 2021). The Indian government launched Janani Suraksha Yojna (JSY), Pradhan Mantri Matru Vandana Yojana (PMMVY) and ICDS services to improve antenatal care. PMMVY is a conditional cash transfer scheme. A woman becomes eligible after registering her pregnancy at the Anganwadi Centre within four months. She must attend one prenatal session. She must also take IFA tablets and TT injection. Despite these efforts, full ANC utilization remains low among ST and Non-ST mothers in selected districts of Bihar (Kumar et al., 2019, Ministry of Women & Child Development, 2023 and National Health Portal of India, 2023).

These findings show that ST women face socioeconomic disadvantages, such as low education, poor income, and limited media exposure. These factors are major barriers to using full ANC services. The Swabhimaan programme in India found that education, wealth, and access to support services like PDS, SHG, ICDS, and VHSND are linked to better ANC utilization, especially for pregnant adolescents (Fulpagare et al., 2019). Women with higher education are more likely to use ANC and have institutional deliveries. Those from wealthier backgrounds are also more likely to receive ANC and PNC and have institutional deliveries. Considering the inter-EAG States like Bihar, Jharkhand,

Madhya Pradesh, Rajasthan, Uttar Pradesh, and Uttarakhand are performing poorly. Despite government efforts, the utilization of MCH services remains low among tribal women in these states (Algur et al., 2023).

Conclusion

The study found low coverage of full antenatal care in the study population of Bihar. ST mothers had lower access to ANC services compared to Non-ST mothers. Education, income, age, and media exposure were key factors affecting ANC utilizations. Rural women, especially from tribal backgrounds, faced more challenges. Many did not complete four ANC visits or take iron tablets for 100 days. Even with government's various schemes like; "*Janani Suraksha Yojna*" (JSY), "*Pradhan Mantri Matru Vandana Yojana*" (PMMVY) and ICDS services to improve antenatal care, full ANC utilization remains poor. Pregnancy at early age is a significant factor in the limited use of full antenatal care (ANC).

The study shows that women from the General category accessed ANC at far higher rates than those from OBC, SC, or ST backgrounds. Education, employment, and media exposure emerged as strong enablers of ANC uptake. Notably, women with secondary or higher education and those exposed to media had significantly better odds of receiving full ANC.

To address these inequities, state health departments should strengthen the role of ASHA workers, especially in remote tribal areas, by providing targeted training focused on health education, community engagement, and follow-up. Integrating ANC awareness with existing welfare schemes and expanding outreach through mobile health units or village health and nutrition days (VHSND) could also

improve service coverage. Finally, disaggregating ANC data by caste and tribe will help in developing more inclusive and targeted maternal health policies.

Limitation of the Study

This study has several limitations. First, the relatively small sample size, limited to two districts in Bihar, may restrict the generalizability of the findings to other regions. Second, since the study relied on self-reported data, there is a possibility of recall bias in reporting ANC service utilization. Lastly, the cross-sectional nature of the data prevents causal inferences, and unmeasured confounding variables may influence the results.

Declarations

Funding: No funding was received for the study from any funding agency, commercial entity, or not-for-profit organization.

Conflict of Interests: The authors affirm that they have no financial conflicts of interest or close personal ties that might have looked to have affected the current study.

Ethics approval: Ethical considerations were maintained during community engagement and data collection. Both verbal and written informed consent was obtained from all participants prior to participation in the survey.

Authors' contributions

R.K.: Conceived and designed the research paper and data curation, analyzed the data, and prepared the original manuscript.

R.K.K.: Supervision, validation, and critical review of methodology, analysis, and editing of the final manuscript.

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