



Factors Influencing Uptake of Institutional Delivery Among Scheduled Tribe and Non-scheduled Tribe Women in India:

Evidence from the National Family Health Survey, 2019-21

Abstract: Scheduled tribe (ST) women in India continue to face disparities in maternal healthcare services due to sociocultural norms and geographic isolation. This study compared the estimates of institutional delivery across ST-women and non-ST women for the most recent childbirth using nationally representative data from NFHS 2019-21. A weighted sample size of 174 964 women aged 15-49 years was included in this study. Bivariate and multivariate logistic regression were used to assess the associations between institutional delivery and individual, socio-economic, physical accessibility and mass media factors. Findings revealed a lower institutional delivery rate among ST women (83.6%) compared to non-ST women (90.8%) for the most recent childbirth preceding the survey. Younger maternal age was associated with higher institutional delivery across both the groups while delayed marriage was significantly beneficial for ST women. Four or more ANC visits significantly improved institutional delivery odds across both the groups. Type of residence (urban vs rural) was not a strong predictor once socioeconomic factors were adjusted. However, regional disparities persisted more among ST women. Education emerged as a strong enabler for both the groups, but wealth index consistently influenced institutional delivery only among non-ST women. Mass media exposure through television was positively associated with maternal health service utilization only among non-ST women. The study findings underscore the need for differentiated strategies—culturally sensitive, geographically focused, and socioeconomically targeted—to ensure equitable and inclusive utilization of maternal health services by both groups.

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Introduction

India's Scheduled Tribe (ST) communities face significant disparities in accessing maternal healthcare, a consequence of sociocultural norms and geographic isolation. Although India has made strides in reducing maternal mortality, a critical gap remains, particularly concerning the needs of tribal women, which are often overlooked. This study aims to address this gap by comparing institutional delivery rates between ST and non-ST women, and by identifying the factors that influence the uptake of institutional delivery. Nationally representative data from the NFHS 2019-21 will be used for this analysis.

Background

The Constitution of India recognizes tribal communities as 'Scheduled Tribes' to confer certain constitutional rights and protections on these groups notified under Article 342. These population groups exhibit different family, social, and cultural values, as well as unique lifestyles and tribal languages/ dialects from the established mainstream society (Biswas et al., 2022; Mitra, 2008). India is home to 104 million tribal people, who constitute around 8.6 percent of the country's population (Census, 2011). There are 705 different Scheduled Tribes in India who are scattered across the country primarily in rural, remote, forested, and hilly areas and thus, often face poor access to basic health necessities. Caste and tribe deeply influence health outcomes in India and globally owing to differences in access to resources, health and education, sociocultural norms, as well as discrimination (Mahapatro et al., 2021). Though the Constitution of India protects the rights of tribal communities and provides a range of welfare schemes for their upliftment, these communities remain among the most marginalized and vulnerable populations in India, particularly in terms of health outcomes. Traditionally, women in Indian society have less autonomy and limited freedom to take informed decisions on their own physical and mental



wellbeing contributing to early conception, premature births, high maternal deaths, malnutrition, and gender-based violence. Tribal women represent the intersection of gender and ethnic marginalization, facing even greater challenges in accessing basic healthcare services. These challenges include geographical isolation and infrastructure deficiencies, healthcare workforce shortages, cultural and language barriers, socioeconomic disadvantages, and health inequities, often resulting in poor health and wellbeing of tribal women (Hamal et al., 2020; Madankar et al., 2024).

Over the last two decades, India has witnessed a significant decline in maternal mortality rate (MMR) from 384 in the year 2000 to 103 in the year 2020 (WHO, 2023). This decline showcases a higher annual rate of reduction (ARR) of 6.36% in India compared to the global ARR of 2.07%. This positive change is attributable to multiple initiatives of the national and state governments through transformation of the health system and effective implementation of health, nutrition, economic empowerment, and women and child development schemes. However, tribal women still face a number of health issues and high maternal mortality due to early marriage of the girl child, frequent pregnancies, and unsafe deliveries (Kumar et al., 2020; Prema et al., 2021). This highlights a critical gap in India's healthcare system where the specific needs of tribal women are neither sufficiently addressed nor optimally prioritized. A published report based on a review of 124 tribal maternal deaths revealed that 29 percent of women visited two facilities, and another 29 percent visited three or more facilities before receiving care, and cited long distances as a major barrier to healthcare access for tribal women (Dasra, 2016).

Good health is central to human development and directly impacts how a woman becomes a mother, a mother breastfeeds her child, a child is raised and attends school, an adult earns to live and feed the family, and an elderly receives care. India is still struggling to address vulnerabilities related to factors such as low socioeconomic status, high maternal and child mortality rates, changing disease patterns, malnutrition, uneven distribution of morbidities and mortalities, widespread poverty, and similar challenges. The fact remains that poor people

have very limited access to quality healthcare services (Das & Mohpal, 2016). Public health efforts in India have shown impressive growth. However, several obstacles continue to hamper its quest for achieving universal health coverage. Lack of affordability, accessibility, and awareness about quality healthcare services continue to inhibit the uptake of these services in the country, affecting vulnerable and marginalized communities the most (Gambhir et al., 2018).

India experiences high rates of maternal mortality, infant mortality, and morbidity among tribal populations. Tribal populations frequently live in unfavourable socioeconomic and social health conditions which often lead to adverse health consequences. These conditions include adherence to traditional harmful practices, limited access to health services and nutrition, and neglect of women's health due to the double burden of domestic and professional labour, all of which are aggravated by poverty, geographical isolation, and suboptimal healthcare infrastructure (Madankar et al., 2024). The National Family Health Survey (NFHS), 2019-2021 of Ministry of Health and Family Welfare, Government of India, revealed very poor health indicators among tribal women. More than one-fourth (25.8%) of the tribal women in the age-group of 20-24 years were married during adolescence before attaining the legal age of marriage i.e., 18 years. A little higher than two-thirds of the tribal women (68.6%) had an antenatal check-up (ANC) in the first trimester of pregnancy while only 58.6 percent women had at least 4 ANC visits. Two-thirds of the women (67%) in the late adolescent age-group i.e., 15-19 years were anaemic. Three out of every five pregnant women in the tribal group were anaemic at the time of the survey. More than one-third of the tribal women (34.6%) reported using unhygienic methods of protection during menstrual periods. Use of alcohol and tobacco was higher among tribal women than among non-tribal women. Notably, tribal women (82.3%) had a lower institutional delivery rate than the others (89.3%) in India and also incurred out-of-pocket-expenditures for institutional deliveries at public health facilities, indicating poor access to healthcare.

A comparative analysis of population, health, and nutrition indicators using NFHS 2019-21 data revealed deep disparities, with

tribal populations being disadvantaged in 81 of 129 indicators, including many directly related to maternal health (Subramanian & Joe, 2024). These differences call for a detailed exploration of institutional delivery trends among tribal and non-tribal populations as spatial patterns in service utilization can identify geographical disparities and other factors that may have direct or indirect influence on service accessibility. Accordingly, this study aims to compare institutional delivery rates for the most recent childbirth within five years preceding the survey, and identify factors influencing institutional delivery uptake, among scheduled tribe (ST) and non-scheduled tribe (non-ST) women using nationally representative data from NFHS 2019-21.

Method

Data Source

NFHS 2019-21 covered all 28 states and 08 UTs of India by adopting a modular approach to arrive at estimates up to district level. This national survey was conducted in two phases from June 2019 to April 2021 and covered 636,699 households by interviewing 724,115 women and 101,839 men in the eligible age-groups. The survey questionnaire for women included questions on a variety of women's health topics such as reproduction, menstrual hygiene, family planning, antenatal care, delivery care, postnatal care, nutrition, etc. The survey was conducted by the International Institute for Population Sciences (IIPS), Mumbai under the Ministry of Health and Family Welfare, Government of India.

Study population

This study focused on women aged 15-49 years who had given birth to a child during the five years preceding the survey. The NFHS 2019-21 data included information on 724,115 women, of which a total of 176,877 women met the criteria. This data was further categorized into scheduled tribe women (n=35,395) and non-scheduled tribe women (n=141,482). Non-scheduled tribe women included all women other than the scheduled tribe women including those who did not disclose their caste/tribe identity. In the analysis, weighted sample size as provided in the NFHS 2019-21 datasets for individual women has been used after dividing it by 1,000,000 for reaching the approximate

number of cases as per the 'Sample Design, Stratification and Sampling Weights' guidelines of DHS (Guide to DHS Statistics DHS-8). In this process, a total of 174,964 weighted sample size was obtained which provided a weighted sample size of 17,295 scheduled tribe women and 157,672 non-scheduled tribe women.

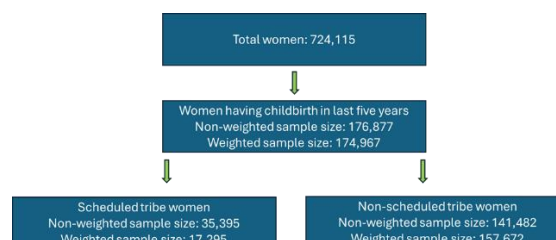


Figure 1: Study population (non-weighted and weighted sample size)

Outcome variable

Place of delivery for the most recent childbirth was the main outcome variable in this study. A delivery in different health facilities irrespective of their types such as public, private, etc. was categorized as institutional delivery, whereas all the remaining childbirths, whether at women's home, parents' home or any other place other than a health facility, were categorized as other deliveries.

Explanatory variable

Explanatory variables were categorized into four broad categories, i.e., **individual characteristics** (age, age at marriage, age at first childbirth, birth order, number of living children, history of terminated pregnancy), **socioeconomic characteristics** (religion, caste, education, occupation, wealth index), **physical accessibility** (place of residence and regions), and **exposure to mass media and communication**. In individual characteristics, age of the respondents (15-24, 25-34 and 35-49), age at marriage (<18 years and 18 or > 18 years), age at first childbirth (<18 years and 18 or > 18 years), birth order (1, 2, 3, 4 and 4+), number of living children (1, 2, 3, 4 and 4+), history of terminated pregnancy (yes, no) and number of antenatal care visits (no or <4 ANC's and ≥4 ANC's) were considered. Socio-economic characteristics included religion (Hindu, Muslim, Christian and Others), caste (Scheduled Caste, Scheduled Tribes, Other Backward Classes and Others), education (illiterate, primary, secondary and higher), occupation (working, not working,



and others), and wealth index (poorest, poorer, middle, richer and richest). **Physical accessibility** included place of residence (urban and rural) and regions (north, central, east, north-east, west, and south). In the regions, Indian states/union territories of Jammu & Kashmir, Himachal Pradesh, Punjab, Chandigarh, Uttarakhand, Haryana, NCT of Delhi, Rajasthan, and Ladakh were considered as North while other regions included East (Bihar, West Bengal, Jharkhand, and Odisha), West (Gujarat, Dadra & Nagar Haveli And Daman & Diu, Maharashtra, and Goa), Central (Uttar Pradesh, Chhattisgarh, and Madhya Pradesh), South (Andhra Pradesh, Karnataka, Lakshadweep, Kerala, Tamil Nadu, Puducherry, Andaman & Nicobar Islands, and Telangana) and Northeast (Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, and Assam). **Exposure to mass media and communication** has been considered as access to any of the mass media platforms such as newspaper or magazine, television, or radio.

Statistical analysis

Descriptive statistics was employed to describe the distribution of various variables across ST and non-ST women. Bivariate analysis using chi-square test was performed to examine association between institutional delivery and explanatory variables. Multivariate logistic regression identified the factors significantly associated with the outcome variable. Adjusted odds ratio (AOR) with 95% confidence interval (CI) were calculated.

Ethical considerations

This study uses the datasets provided in the public domain by the Demographic and Health Surveys (DHS) Program and does not contain any personal identifiers of the study population. There is no risk associated at individual or institutional level. Permission for usage of the datasets was obtained from the DHS Program on May 20, 2024 and no further ethical approval was required.

Results

Table 1 demonstrates the individual characteristics, socio-economic characteristics, physical accessibility and exposure to mass media status of the ever-

married women who had at least one childbirth during the five years preceding the NFHS 2019-21. Majority of the women in both the categories i.e., ST and Non-ST were in the 25-34 years of age group. Findings revealed early childbearing to be relatively higher among ST women (35.3%) than among the non-ST women (32%) in the 15-24 years of age group. The percentage of women in the 35-49 years of age-group is nearly same (ST Women – 9.7%, Non-ST Women – 9.2%) in both the groups. The other indicator i.e., age at cohabitation/ marriage revealed that child marriage is still practiced in various parts of India as a considerable proportion of ST women (36.3%) and non-ST women (32.1%) got married before the age of 18 years. Early pregnancy before attaining the age of 18 years is a bit higher among ST women while comparing the same with non-ST women (ST women – 13.5%, non-ST women – 11.1%) which may possibly be linked to child marriage. High birth order (4 or more children) is relatively higher among ST women (15.9%) than among non-ST women (12.6%) which may have an impact on maternal health and institutional delivery. The proportion of women reporting zero living children at the time of survey is lower in both the groups. However, percentage of ST women reporting 3 or more living children (30.3%) was on a little higher side than non-ST women (26.0%) which shows that the ST women are more likely to have larger families than the others. History of terminated pregnancy was reported by higher percentage of non-ST women (16.7%) compared to ST women (10.6%) which could potentially be due to differences in the fertility preferences, access to reproductive health services, etc. No or less than four ANC visits were nearly same in both the population groups (ST women: 42.4%, non-ST women: 41.4%) while four and more than four ANC visits were 57.6 per cent and 58.6 per cent among ST and non-ST women, respectively.

Socioeconomic characteristics are based on respondents' status on religion, education, working status and wealth index. Caste has not been classified separately as the entire study population has been categorized in two groups i.e., ST women and non-ST women. Majority of ST (85.0%) and non-ST women (79.0%) belong to Hindu religion. Muslim religion has been the second largest among non-ST women (17.4%) while among ST women, Christian religion has been the second highest



(8.7%). Findings revealed significant disparities between ST and non-ST women. Near to one-third (30.7%) ST women had no formal education compared to 18.3 percent non-ST women. The disparity was also observed in higher education (ST women – 7.2%, non-ST women – 18.4%) which may lead to an understanding that ST women tend to have poor access to higher education. A higher percentage of ST women reported their engagement in work (29.6%) compared to non-ST women (16.2%). From an economic perspective, the trend may lead to economic empowerment of the ST women but on the other hand, it may also depict their economic compulsion to earn, possibly in informal or low-income settings. Findings on the wealth index revealed a stark economic divide between both these groups. Nearly half of the ST women (48.5%) belong to the poorest wealth quintile which indicates that this group is disproportionately concentrated in lower economic strata.

Physical accessibility indicators are based on the type of place of residence of the respondents, and their locations in different regions across India. Exposure to mass media

includes access to newspapers or magazines, television and radio for various purposes by both the population groups. Majority of the ST women (87.9%) reside in rural areas while 70 percent women in non-ST group are living in rural areas. The relatively higher percentage of ST women living in rural areas indicates that ST women are predominantly rural which may also have an impact on their access to various essential healthcare services, including institutional deliveries. The regional distribution of ST women shows that the highest percentage of ST women were from the eastern region (26.6%) followed by the central region (22.9%) and the western region (19.3%), while the non-ST women respondents are relatively evenly distributed with higher percentage in the central region (27.1%) followed by the eastern region (25.7%). In the northeast region, the studied population had substantial proportion of ST women. Findings revealed lower access to mass media among ST women for all the three indicators i.e., newspaper or magazine (20.6%), radio (10.2%) and television (57.0%). Among the three mass media sources, percentage of ST women who had watched television is the highest.

Table 1: Individual characteristics, socio-economic characteristics, physical accessibility and exposure to mass media status of ever married women aged 15-49 years in the ST and non-ST women groups who had at least one childbirth in the last five years, NFHS, 2019-21.

Explanatory variables	Weighted %		n	
	ST Women	Non-ST Women	ST Women	Non-ST Women
Individual characteristics				
<i>Age of mother</i>				
15-24 Years	35.3	32.0	6098	50522
25-34 Years	55.0	58.8	9513	92670
35-49 Years	9.7	9.2	1684	14480
Age at cohabitation/ marriage				
<18 Years	36.3	32.1	6260	50611
≥18 Years	63.7	67.9	10992	106939
Age at first childbirth				
Before 18 Years	13.5	11.1	2328	17437
At 18 Years or later	86.5	88.9	14967	140235
Birth order				
1	33.1	34.4	5727	54239
2	33.0	36.7	5715	57842
3	17.9	16.3	3100	25708
4 or 4+	15.9	12.6	2752	19884
Living Children				



0	1.1	0.9	195	1350
1	34.5	35.6	5961	56062
2	34.1	37.5	5895	59158
3	17.1	15.7	2961	24812
4 or 4+	13.2	10.3	2283	16290
History of terminated pregnancy				
No	89.4	83.3	15456	131415
Yes	10.6	16.7	1839	26257
Number of ANC Visits				
No or <4 ANCs	42.4	41.4	7324	65289
≥ 4 ANCs	57.6	58.6	9968	92367
Socio-economic characteristics				
<i>Religion</i>				
Hindu	85.0	79.0	14701	124520
Muslim	2.4	17.4	406	27439
Christian	8.7	1.4	1513	2178
Others	3.9	2.2	675	3536
Education				
No education	30.7	18.3	5318	28837
Primary	14.9	11.4	2572	17961
Secondary	47.2	51.9	8167	81905
Higher	7.2	18.4	1238	28969
Working status				
Not working	70.4	83.8	1835	20146
Working	29.6	16.2	771	3892
Wealth index				
Poorest	48.5	20.0	8390	31456
Poorer	24.2	20.7	4185	32630
Middle	14.2	20.2	2460	31794
Richer	8.3	20.4	1442	32211
Richest	4.7	18.8	818	29581
Physical accessibility				
Type of place of residence				
Urban	12.1	30.0	2093	47253
Rural	87.9	70.0	15202	110419
Regions				
North	10.3	13.9	1785	21991
Central	22.9	27.1	3961	42674
East	26.6	25.7	4598	40534
Northeast	10.5	3.3	1813	5279
West	19.3	12.2	3337	19273
South	10.4	17.7	1803	27922
Exposure to mass media				
Newspaper or magazine	20.6	31.5	3570	49632
Radio	10.2	12.3	1765	19321
Television	57.0	70.8	9861	111686

Table 2 presents bivariate association (chi-square) of institutional delivery (weighted %) and the different background characteristics i.e., individual characteristics, socioeconomic characteristics, physical accessibility and exposure to mass media among ST women and non-ST women for the most recent childbirth in five years preceding the survey. Findings revealed highly significant association ($\chi^2=598.36$, $p<0.001$) which shows that institutional delivery significantly gets decreased with increasing age of women, particularly in ST women (87.4% for women aged 15-24 years to 72.3% for 35-49 years) compared to non-ST women (91.9% for women aged 15-24 years to 86.5% for 35-49 years). Similarly, findings on age at cohabitation/marriage revealed highly significant association ($\chi^2=2349.90$, $p<0.001$) which indicates that women married at the age of ≥ 18 years had higher institutional deliveries (ST women: 85.7%, non-ST women: 93.2%) than the women married at a younger age of less than 18 years. Women giving birth at ≥ 18 years age were more likely to have institutional births (ST women - 84.7%, non-ST women - 91.7%) than younger women ($\chi^2=1390.29$, $p<0.001$). There was also highly significant association ($\chi^2=9025.69$, $p<0.001$) in respect of birth order which shows that institutional delivery gets decreased with increasing birth order (ST women - 1st birth (91.5%), 4+ births (66.7%), non-ST women - 1st birth (96.0%), 4+ births (76.0%)). Institutional delivery declined (0 children: ST women 86.1%, non-ST women 90.1%; ≥ 4 children: ST women 65.5%, non-ST women 75.4%) with increase in number of living children ($\chi^2=8602.89$, $p<0.001$). There was no significant association observed between history of terminated pregnancy and institutional delivery ($\chi^2=1.39$, $p=0.499$). However, four or more ANC visits were significantly associated with institutional delivery ($\chi^2=5264.84$, $p=p<0.001$).

Socioeconomic characteristics on religion showed highly significant association ($\chi^2=949.15$, $p<0.001$) as ST women belonging to Christians and Muslims had lower institutional delivery than ST women belonging to Hindus (Christian - 69.1%, Muslims - 75.8%, Hindu - 85.9%). Highly educated women had higher institutional delivery (ST women - 97.0%, non-ST women - 98.3%) than those without education ($\chi^2=10931.66$, $p<0.001$). Non-working women

had slightly higher institutional delivery (ST women - 83.2%, non-ST women - 90.8%) compared to working women (ST women - 80.8%, non-ST women - 89.6%) and the same had significant association ($\chi^2=16.50$, $p<0.001$). Similarly, the findings on wealth index revealed highly significant association ($\chi^2=10664.53$, $p<0.001$) as richer the women, higher the institutional delivery (Poorest: ST women - 75.6%, non-ST women - 78.4%, Richest: ST women 96.5%, non-ST women - 97.9%).

Findings on physical accessibility by type of place of residence revealed highly significant association ($\chi^2=1687.77$, $p<0.001$) as women living in urban areas had higher institutional delivery (ST women - 93.1%, non-ST women - 94.8%) than the women living in rural areas (ST women - 82.5%, non-ST women - 89.0%). Regional estimates revealed notable differences with highly significant association ($\chi^2=6303.35$, $p<0.001$) with women living in southern region having highest institutional delivery (ST women - 95.1%, non - ST women - 98.6%) and the lowest institutional delivery in the northeast region for ST women (75.6%) and in the eastern region for non - ST women (84.8%). All forms of media, i.e., newspaper/ magazine, radio and television had a positive influence on the uptake of institutional delivery.



Table 1: Bivariate association (chi-square) of institutional delivery and the different background characteristics of ever-married women in the 15-49 years of age-group for the most recent childbirth in the last five years, NFHS, 2019-21.

Independent variables	Institutional Delivery (Weighted %)		Chi-square (X ²)	p-value
	ST Women	Non-ST Women		
Individual characteristics				
<i>Age of mother</i>	(n=17291)	(n=157656)	598.36	p < 0.001
15-24 Years	87.4	91.9		
25-34 Years	83.5	90.8		
35-49 Years	72.3	86.5		
<i>Age at cohabitation/ marriage</i>	(n=17248)	(n=157533)	2349.90	p < 0.001
<18 Years	80.6	85.6		
≥18 Years	85.7	93.2		
<i>Age at first childbirth</i>	(n=17291)	(n=157656)	1390.29	p < 0.001
Before 18 Years	78.2	83.2		
At 18 Years or later	84.7	91.7		
<i>Birth order</i>	(n=17291)	(n=157656)	9025.69	p < 0.001
1	91.5	96.0		
2	86.3	92.8		
3	80.2	86.3		
4 or 4+	66.7	76.0		
<i>Living Children</i>	(n=17291)	(n=157656)	8602.89	p < 0.001
0	86.1	90.1		
1	91.1	95.8		
2	85.7	92.6		
3	79.4	85.0		
4 or 4+	65.5	75.4		
<i>History of terminated pregnancy</i>	(n=17291)	(n=157656)	1.39	p > 0.05
No	83.6	90.8		
Yes	85.4	90.4		
<i>Number of ANC Visits</i>	(n=17291)	(n=157656)	5264.84	p < 0.001
No or less than 4 ANC's	76.7	84.7		
4 or 4+	89.0	95.0		
Socio-economic characteristics				
<i>Religion</i>	(n=17291)	(n=157656)	949.15	p < 0.001
Hindu	85.9	91.4		
Muslim	75.8	86.4		
Christian	69.1	96.8		
Others	74.9	96.2		
<i>Education</i>	(n=17291)	(n=157656)	10931.66	p < 0.001
No education	72.8	77.3		
Primary	80.9	86.5		



Secondary	89.9	93.8		
Higher	97.0	98.3		
Working status	(n=2607)	(n=24037)	16.50	p < 0.001
Not working	83.2	90.8		
Working	80.8	89.6		
Wealth index	(n=17291)	(n=157656)	10664.53	p < 0.001
Poorest	75.6	78.4		
Poorer	87.5	88.8		
Middle	93.5	93.3		
Richer	97.3	95.8		
Richest	96.5	97.9		
Physical accessibility				
Type of place of residence	(n=17291)	(n=157656)	1687.77	p < 0.001
Urban	93.1	94.8		
Rural	82.5	89.0		
Regions	(n=17291)	(n=157656)	6303.35	p < 0.001
North	93.0	94.4		
Central	81.2	87.3		
East	78.1	84.8		
Northeast	75.6	85.9		
West	88.2	96.6		
South	95.1	98.6		
Exposure to mass media	(n=17291)	(n=157656)		
Newspaper or magazine	(n=17291)	(n=157656)	3274.14	p < 0.001
No Exposure	81.5	88.1		
Exposure	92.6	96.5		
Radio	(n=17291)	(n=157656)	273.09	p < 0.001
No Exposure	83.5	90.3		
Exposure	86.5	93.8		
Television	(n=17291)	(n=157656)	6951.71	p < 0.001
No Exposure	75.8	82.0		
Exposure	89.8	94.3		

The bivariate analysis highlighted significant differences in institutional delivery rates between ST and non-ST women in India. The majority of the explanatory variables were significantly associated with institutional delivery, with chi-square tests confirming the strength of association in both the groups.

Table 3 presents adjusted odds ratio (AOR) and 95% confidence interval (CI) from the multivariate logistic regression which analyzed the determinants of institutional delivery among ST and non-ST women. In the multivariate logistic regression, two variables i.e., birth order and number of living children were excluded as they had high multicollinearity which was assessed

using variance inflation factor (VIF) and tolerance statistics. Both these variables had VIF values greater than 10 and tolerance values less than 0.2, which were considered indicative of potential multicollinearity.

Demographic characteristics

Findings revealed that ST women aged 25–34 (AOR:0.638, CI: 0.491-0.829) and 35–49 years (AOR:0.464, CI: 0.312-0.689) had lower odds of institutional delivery compared to 15–24 years group. Similar patterns were observed among the other group: non-ST women aged 25–34 years (AOR:0.805, CI: 0.721-0.899) and 35–49 years (AOR:0.687, CI: 0.581-0.812) showed

reduced odds compared to younger women. In both the groups, younger mothers were significantly more likely to have institutional deliveries. Women married at 18 years or later among ST women had higher odds (AOR: 1.412, CI: 1.084-1.840) of institutional delivery compared to those married/cohabitated before 18 years while the same was not statistically significant among non-ST women. These findings suggest that delayed marriage increases institutional delivery more strongly among ST women, compared to non-ST women. Childbearing age of mothers (18 years or later) at the first childbirth was not significant among ST women while the same had higher odds among non-ST women (AOR: 1.330, CI: 1.153-1.534). This suggests that early childbearing has a stronger negative impact on institutional delivery behavior among non-ST women.

History of terminated pregnancy and antenatal care visits

The history of terminated pregnancy was non-significant both in bivariate analysis and multi logistic regression. However, understandably, the number of antenatal care (ANC) visits i.e., 4 or 4+ ANC visits had over twice the odds of institutional delivery in both the groups (ST women – AOR: 2.131, CI: 1.697-2.677, non-ST women – AOR: 2.235, CI: 2.020-2.473). This shows that 4 or more ANC visits are strong, consistent positive predictors across both the groups.

Socioeconomic factors

Socioeconomic determinants on religion showed contrasting effects. Among ST women, Christian affiliation was significantly associated with lower odds of institutional delivery (AOR:0.303, CI: 0.196-0.468), indicating a 70% reduction in the likelihood of delivering in health facilities compared to Hindu ST women. In contrast, among non-ST women, only Muslim religious affiliation was significantly associated with reduced odds of institutional delivery (AOR=0.809, 95% CI: 0.723-0.906), and the magnitude of reduction was smaller (~19%). Working status was non-significant among ST women while non-ST women had slightly lower odds of institutional delivery (AOR: 0.857, CI: 0.756-0.971). This suggests that employment status of women had little to negative impact on institutional delivery. Wealth index was a strong

determinant among both ST and non-ST women. Among ST women, poorer (AOR: 1.764, CI: 1.286-2.419), middle (AOR: 2.481, CI: 1.526-4.036), and richer (AOR: 3.211, CI: 1.386-7.438) had higher odds of institutional delivery compared to the poorest but the findings were non-significant for the richest group, despite having higher odds (AOR: 1.134, CI: 0.446-2.883). Among non-ST women, all wealth groups i.e., poorer, middle, richer, and richest consistently showed higher odds.

Physical accessibility and regional variation

Findings on the type of residence were not significant, which means living in a rural or urban area did not alter the institutional delivery rates once other important factors were taken into consideration. The analysis of regional disparities revealed that among ST women, regions other than the Northern region were generally associated with lower odds of institutional delivery. ST women from the Central region (AOR:0.407, CI: 0.257–0.645), Eastern region (AOR:0.612, CI: 0.386–0.971), Northeastern region (AOR:0.482, CI: 0.269–0.864), and Western region (AOR:0.509, CI: 0.307–0.845) exhibited significantly reduced odds of institutional delivery compared to ST women in the Northern region. Findings in Southern region were not statistically significant among ST women. Similarly, non-ST women from the Central region (AOR:0.634, CI: 0.531–0.758), Eastern (AOR:0.644, CI: 0.536–0.774), and Northeastern (AOR:0.699, CI: 0.530–0.921) regions showed lower odds of institutional delivery compared to the North. However, non-ST women from the West had higher odds but with non-statistical significance. Notably, non-ST women from the Southern region exhibited very high odds of institutional delivery (AOR:3.685, CI: 2.646–5.132): they were nearly four times more likely to deliver institutionally compared to their counterparts in the North.

Exposure to mass media

Mass media exposure (newspaper or magazine, radio, or television) did not show statistically significant associations for ST women. Exposure to television amongst non-ST women was the only significant (AOR: 1.325, CI: 1.190-1.477) determinant suggesting that mass-media campaigns on television had shaped positive health seeking behaviour in non-ST



women while ST women relied more on other sources such as community-based information.

Table 2: Results of multivariate logistic regression on the determinants of institutional delivery (1= Institutional Delivery; 0 = Other Delivery) of ever-married women in the 15-49 years of age-group for the most recent childbirth in the last five years, NFHS, 2019-21.

Determinants	Institutional Delivery (ST Women)			Institutional Delivery (Non-ST Women)		
	AOR	95% C.I. for AOR		AOR	95% C.I. for AOR	
		Lower	Upper		Lower	Upper
Individual characteristics						
Age of mother						
15-24 Years [®]						
25-34 Years	0.638	0.491	0.829	0.805	0.721	0.899
35-49 Years	0.464	0.312	0.689	0.687	0.581	0.812
Age at cohabitation/ marriage						
<18 Years [®]						
≥18 Years	1.412	1.084	1.840	1.086	0.973	1.211
Age at first childbirth						
Before 18 Years [®]						
At 18 Years or later	1.222	0.866	1.724	1.330	1.153	1.534
History of terminated pregnancy						
No [®]						
Yes	0.994	0.701	1.409	0.913	0.807	1.032
Number of ANC Visits						
No or less than 4 ANC's [®]						
4 or 4+	2.131	1.697	2.677	2.235	2.020	2.473
Socio-economic characteristics						
Religion						
Hindu [®]						
Muslim	0.521	0.258	1.055	0.809	0.723	0.906
Christian	0.303	0.196	0.468	0.939	0.441	1.999
Others	0.655	0.394	1.089	1.260	0.768	2.068
Education						
No education [®]						
Primary	1.465	1.077	1.993	1.468	1.279	1.686
Secondary	2.265	1.694	3.027	2.035	1.800	2.300
Higher	16.016	3.500	73.280	4.886	3.701	6.449
Working status						
Not working [®]						
Working	0.982	0.770	1.253	0.857	0.756	0.971
Wealth index						
Poorest [®]						
Poorer	1.764	1.286	2.419	1.741	1.542	1.966



Middle	2.481	1.526	4.036	1.809	1.553	2.107
Richer	3.211	1.386	7.438	2.031	1.679	2.458
Richest	1.134	0.446	2.883	3.313	2.533	4.333
Physical accessibility						
<i>Type of place of residence</i>						
Urban [®]						
Rural	0.621	0.373	1.035	0.985	0.857	1.132
Regions						
North [®]						
Central	0.407	0.257	0.645	0.634	0.531	0.758
East	0.612	0.386	0.971	0.644	0.536	0.774
Northeast	0.482	0.269	0.864	0.699	0.530	0.921
West	0.509	0.307	0.845	1.213	0.943	1.560
South	0.575	0.304	1.090	3.685	2.646	5.132
Exposure to mass media						
Newspaper or magazine						
No Exposure [®]						
Exposure	1.427	0.919	2.214	1.081	0.924	1.264
Radio						
No Exposure [®]						
Exposure	0.964	0.638	1.455	0.933	0.785	1.108
Television						
No Exposure [®]						
Exposure	1.249	0.963	1.620	1.325	1.190	1.477

Discussion

Bivariate associations indicated a significant association between institutional delivery and most of the indicators, but the same was not sustained in multivariate logistic regression for many determinants after adjustment for other factors. It is understood that the relationship observed in the bivariate analysis may have been confounded by different background characteristics. The multivariate analysis highlights substantial differences in the determinants of institutional delivery between ST women and non-ST women in India, as per the National Family Health Survey, 2019-21. Older women in both groups had lower odds of institutional delivery compared to the younger women aged 15–24 years. Findings underscore a higher likelihood of institutional deliveries among younger mothers in both these social groups, indicating that young mothers in communities with strong support for institutional care and better access to health information are more likely to seek institutional delivery than older women following deep-rooted traditional

birthing practices (Chandra & Singh, 2020; Kesterton et al., 2010). Age at marriage showed an opposite pattern in these groups. Among ST women, those who married at 18 years or older exhibited significantly higher odds of institutional delivery, but the same was not statistically significant among non-ST women. This suggests that delayed marriage may have a stronger protective effect on institutional delivery behaviour within the ST population. In contrast, for non-ST women, having the first child at 18 years or later was significantly associated with higher institutional delivery rates, but not for ST women. Thus, early childbearing negatively influenced institutional delivery more prominently among non-ST women. Research has highlighted that pregnancy during adolescence often discourages girls and their families from seeking care (Lancet Regional Health – Southeast Asia, 2024). Factors such as cultural norms, societal beliefs, decision-making capability, education, and geographical access often play a more dominant role (Bohren et al., 2014; Gabrysch & Campbell, 2009).



The number of ANC visits was observed to be a critical determinant of institutional delivery. Women with ≥ 4 ANCs showed significantly higher rates of institutional delivery in both groups, emphasizing the importance of consistent and continuing care, engagement with healthcare providers during pregnancy, and the impact of community mobilization programmes—generally implemented through Accredited Social Health Activist (ASHA)—towards increasing service uptake (Barman et al., 2020; Mishra et al., 2024). Religious affiliation influenced institutional delivery more sharply among ST women, particularly among Christians, while among non-ST women, only Muslim affiliation was associated with reduced institutional delivery rates. Education has been a strong determinant in both groups, with different levels of educational attainment—i.e., primary, secondary, and higher education—increasing the likelihood of institutional delivery compared with women with no education. This underscores the eminent role of education in breaking cultural taboos and traditional norms, and in encouraging service utilization at health facilities (Dixit & Dwivedi, 2024). The wealth index was a robust predictor for both groups, indicating a consistent wealth gradient. However, the association for the richest group was not statistically significant among ST women. Contrary to common assumptions, the type of residence (urban vs. rural) was not a statistically significant factor for either group, which suggests that once socioeconomic and service-related factors have been controlled, urban-rural differences in institutional delivery largely diminish. Regional disparities were observed, with ST women living in the Central, Eastern, Northeastern, and Western regions having lower odds of institutional delivery, with a non-significant association in the Southern region. Among non-ST women, the association was non-significant in the Western region, while the Southern region exhibited significantly higher odds—nearly four times greater than their Northern counterparts. This highlights the relatively better maternal healthcare infrastructure and programme effectiveness in Southern India, at least among non-ST populations. Mass media exposure through television, radio, and newspapers or magazines had no effect on ST women, while exposure to television significantly influenced institutional delivery amongst non-ST women—

potentially due to higher literacy, awareness levels, and tech-based access in this population subset—highlighting different drivers of maternal care behaviour (Kandpal & Dutta, 2024; Saha & Paul, 2021).

Conclusion

The study findings provide a nuanced understanding of the determinants of institutional delivery among ST and non-ST women in India using the NFHS 2019-21 data. While younger maternal age, higher education, wealth status, and four or more ANC visits emerged as strong positive predictors of institutional delivery across both groups, notable differences in sociodemographic and regional influences were observed. Delayed marriage was associated with increased institutional delivery among ST women, while early childbearing had a strong negative effect among non-ST women. Wealth was a consistent enabler of institutional delivery for non-ST women, whereas the richest ST women did not show a significant advantage. Rural—urban residence had no notable effect, suggesting reduced geographical inequalities. However, regional disparities persisted, with ST women outside the Northern region experiencing lower odds, while non-ST women in Southern India demonstrating higher rates—reflecting regional healthcare inequalities. Additionally, television exposure significantly influenced institutional delivery only among non-ST women, likely due to better access, literacy, and awareness. Together, these observations highlight the urgent need for a targeted policy approach that incorporates culturally sensitive strategies, and region-specific programme designs to promote equitable and inclusive maternal health outcomes.

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