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Exploring the Effects of Sex Composition of Living Children on Contraceptive Use among Tribal Women in India: A Regional Analysis

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Abstract: Although India's tribal communities have historically been characterized by relatively egalitarian gender relations, increasing interaction with mainstream society may have contributed to the emergence of son preference in some tribal communities. While contraceptive use among tribal women has been widely studied, little is known about how the sex composition of living children influences contraceptive behaviour. This study, using data from the National Family Health Survey (NFHS), examines the effects of the sex composition of living children on contraceptive use among currently married Scheduled Tribe (ST) women in India. Descriptive statistics and multivariable logistic regression were employed to assess this effect while controlling for socioeconomic and demographic factors. The findings show that ST women have lower contraceptive use than other social groups, with female sterilization being the predominant contraceptive method. Women with only daughters were consistently less likely to use contraception than women with one or more sons, suggesting that the absence of a son may encourage continued childbearing. The strength of this association varied across regions, demonstrating that India's tribal communities are culturally heterogeneous and should not be viewed as a homogeneous population. These findings indicate that contraceptive behaviour among tribal women is shaped by the sex composition of living children within broader regional and sociocultural contexts rather than by tribal identity alone. The study highlights the need for culturally sensitive family planning programmes that promote gender-equitable norms, address son preference, and expand access to a wider range of modern contraceptive methods.

Keywords: contraceptive use; sex composition; sex preference; tribal women; region; India

1. Introduction

After 1951, India's population grew steadily, crossing the billionth mark milestone in 2001 to reach 1.21 billion, with a decadal growth rate of 17.64 per cent in 2011 [1]. According to the authoritative World Development Indicators database, India's population exceeded that of China for the first time in 2022, with 1417 million in India and 1412 million in China [2]. Indigenous people (called 'Scheduled Tribe' in India) are distinct social and cultural groups that share collective ancestral ties to the lands and natural resources where they live, occupy or from which they have been displaced [3]. The ST population constitutes 8.6% of India's total population [1].

At the national level, ST populations have lower fertility than the most socioeconomically comparable non-tribal population, namely Scheduled Castes, despite sharing many structural disadvantages, including lower levels of income, education, and access to health services. Although many tribal communities have historically been



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characterized by relatively more egalitarian gender relations than many non-tribal groups, evidence suggests that some tribal populations have experienced shifts in reproductive preferences alongside increasing interaction with the wider society, including the emergence of stronger son preference in certain settings [4]. However, India's more than 700 tribal communities are culturally diverse, and reproductive preferences are likely to vary according to kinship systems, inheritance practices, marriage institutions, and broader socioeconomic contexts rather than tribal identity alone [4,5]. In the broader Indian context, son preference is shaped by economic, social, cultural, and religious factors. Within mainstream Indian society, son preference has been linked to expectations of old-age support, continuation of the family lineage, and broader economic and social security, particularly where formal systems of social protection remain limited [6–8]. Strong son preference has been widely documented across India, particularly in the northern states, and has been shown to influence fertility and contraceptive behaviour [9,10]. In many mainstream Hindu communities, these preferences are reinforced by patriarchal inheritance practices, expectations of old-age support, and religious traditions that assign sons important ritual responsibilities [11–13]. Although these mechanisms have been documented primarily in mainstream Hindu society, they provide a broader sociocultural context for interpreting the emergence of son preference among some tribal communities rather than implying that these beliefs are inherent to tribal societies. However, this process is unlikely to be uniform because tribal communities differ substantially in their kinship systems, inheritance practices, and degree of interaction with the wider society.

Globally, contraception is recognized as one of the most important proximate determinants of fertility and plays a central role in improving maternal and child health [14–16]. By enabling couples to plan the number and spacing of their children, contraceptive use helps prevent unintended pregnancies, unsafe abortions, reproductive tract infections, sexually transmitted infections, and maternal and child morbidity and mortality [17]. As per the World Health Organization Expert Committee, 1971, Family planning refers to the voluntary adoption of practices that enable individuals and couples to determine the number and spacing of their children through informed decision-making. The 1974 Bucharest World Population Conference further recognized the right of individuals and couples to decide freely and responsibly the number and spacing of their children and to have access to the information and means necessary to exercise this right [18,19]. Although India was the first country to launch a National Family Planning Programme in 1952, contraceptive uptake remained gradual, prompting successive policy initiatives, including the National Population Policy in 1976, to promote population stabilization [20]. Among ST populations, younger age at marriage, higher fertility norms, son preference, and limited access to family planning information and services have all been associated with lower contraceptive use, with poor access remaining a major barrier [21]. Despite efforts to expand family planning services, the programme continues to rely predominantly on female sterilization. During 2014–15, more than four million sterilizations were performed in India, of which only 2.5% involved men, and the male-to-female sterilization ratio was approximately 1:52 in 2016–2017 [22].

Biologically, the sex of the baby is a random event, with a slight natural bias favouring boys [23]. However, in India, a strong son preference has led to a persistently male-skewed population sex ratio, well documented in the literature. In the broader Indian context, son preference has been attributed to economic, social, and cultural factors, including expectations of old-age support, continuation of the family lineage, and differential economic value attached to sons and daughters [6,7,9]. These mechanisms have been documented primarily for mainstream Indian society and are presented here to provide the broader context within which reproductive preferences among some tribal communities may increasingly evolve rather than implying that they universally apply across all tribal groups. Understanding the relationship between sex composition of living children and contraceptive use is therefore important for designing policies that promote reproductive autonomy, gender equality, and progress toward SDG 3 and SDG 5. Prior research, however, has assessed these factors rarely in a tribal context where contraceptive access is lower. The present study was undertaken to explore the regional differences in terms of the effects of the Sex composition of living children on contraceptive use among currently married ST women in India. To achieve the objectives, these questions are to be answered: Does the sex composition of living children affect contraceptive use? Do sex preferences affect contraception? The findings may assist policymakers in their pursuit of gender equality and fertility reduction among ST women in India.

2. Data and Methods

Data Source

The study used data from all five rounds of the NFHS, conducted in India during 1992–1993, 1998–1999, 2005–2006, 2015–2016, and 2019–2021. NFHS is a nationally representative household survey that collects information on fertility, family planning, reproductive health, maternal and child health, nutrition, and related

demographic characteristics. NFHS-5 used a stratified two-stage sampling design: primary sampling units (villages in rural areas and Census Enumeration Blocks in urban areas) were selected via probability proportional to size, followed by systematic sampling of 22 households per cluster. Of the selected households, 636,699 were successfully interviewed (98% response rate). Data was collected through standardized household surveys administered as structured face-to-face interviews using computer-assisted personal interviewing (CAPI) with 724,115 women (97% response rate) and 101,839 men (92% response rate). The survey identified the caste/tribe categories as ‘Scheduled Tribe’ (ST), ‘Scheduled Caste’ (SC), ‘Other Backward Class’ (OBC), and ‘Others’. Caste/tribe status was recorded for each household, allowing currently married ST women to be identified directly from the individual women’s dataset for analysis. Among the women interviewed in NFHS-5, 135,239 belonged to the ST category. Since fertility in India is predominantly marital, the present study focused on currently married ST women aged 15–49 years ($n = 91,976$), excluding women who were never married, widowed, divorced, or separated. Figure 1 shows the steps to select a representative sample of ST women aged 15–49 for the study from NFHS-5 (2019–2021).

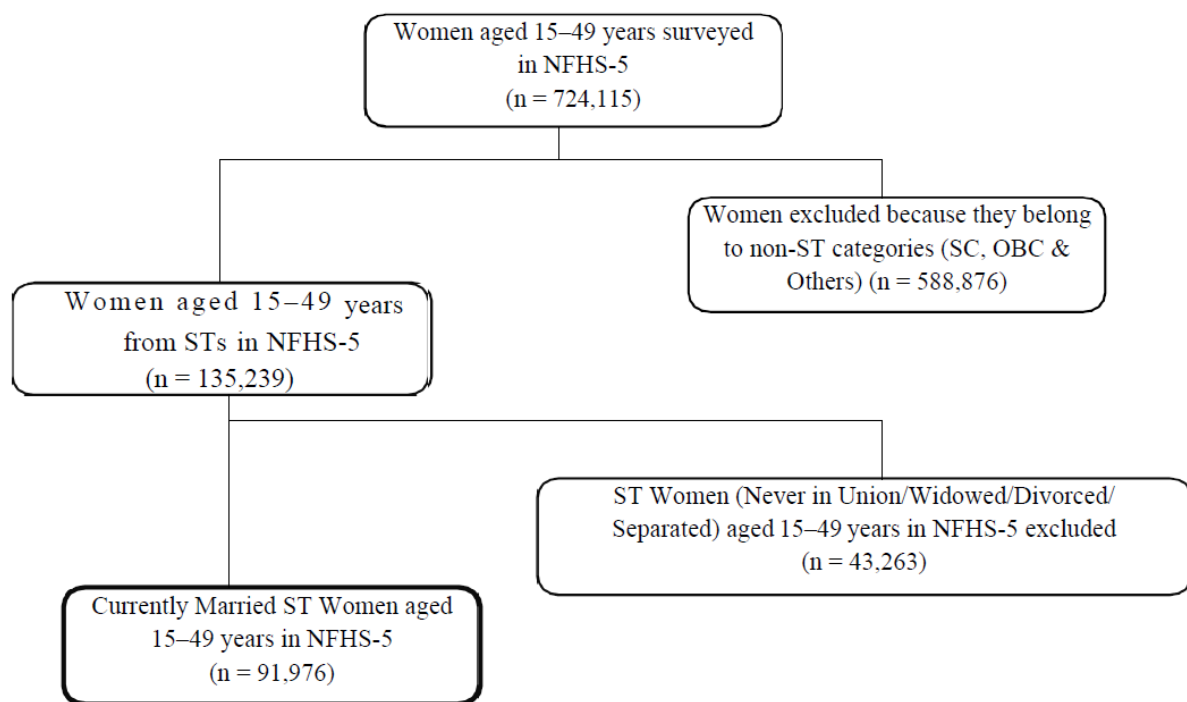


Figure 1. The steps to select a representative sample of ST women aged 15–49 for the study from NFHS-5 (2019–2021).

3. Measurements

3.1. Dependent Variable

The dependent variable for the study was contraceptive use. The usage or non-usage of any of the contraceptive methods was coded as a binary outcome (1 = ever used any contraceptive method; 0 = never used any method). Those women aged 15–49 were asked a direct question about their contraception, i.e., “Have you ever used anything or tried in any way to delay or avoid getting pregnant?” There were two responses, i.e., ‘Yes’ and ‘No’. If the response is ‘Yes’, she is considered a user of contraception, and if the response is ‘No’, it means those who never used any methods are considered non-users. There were two contraceptive methods: (i) Modern methods, (ii) Traditional methods. Oral contraceptives (pills), male and Female sterilization, Intrauterine Devices (IUDs), Injectables, Diaphragm, Male and Female condoms, Standard day’s method (SDM) and Locational Amenorrhoea Method (LAM) were considered modern methods. Periodic Abstinence and Withdrawal were traditional methods.

3.2. Independent Variable

The independent variables comprised demographic characteristics (age, age at marriage, duration of cohabitation, age at first sex, age at first birth, number of living children, number of living sons, number of living daughters, and sex of the household head), socioeconomic characteristics (education, religion, household wealth

index, and exposure to family planning messages), and geographic characteristics (place of residence and region). Age of the respondent was categorized into 15–29, 30–39 and 40–49. Residence was defined as where women reside, whether in urban or rural areas. The religious affiliation of women was classified into two categories—‘Hindu’ and ‘Non-Hindu’, which included Muslim, Christian, Buddhist and others. Education was assessed by asking women to report their highest year of education. It was divided into the categories: low level of education and high level of education. Household wealth status was assessed using asset ownership and housing amenities (e.g., TV, radio, bicycle, electricity, drinking water supply, type of toilet, flooring material, etc). Principal Component Analysis (PCA) generated factor scores for each item, which were summed and standardized to place households on a continuous wealth scale. These scores were then categorized into quintiles to rank the household as poorest/poorer/middle/richer/richest. The exposure to family planning messages was categorized into ‘Yes’ and ‘No’. It included the family planning messages on radio, TV, newspaper/magazine, Internet and wall painting or hoarding. Age at marriage was divided into two categories. Early marriage included women marrying before 18, and late marriage included women married at 18 and after 18. The duration of cohabitation was divided into two categories: shorter duration (less than 20 years) and longer duration (20 years or more than 20). The age at first sex was divided into two categories: women having sexual relations at the age of less than 18 and at the age of 18 or older than 18. The age at first birth was divided into three categories: Women not having any birth, women having a birth at the age of less than 18, and women having a birth at 18 and more than 18. The country was stratified into six regions mainly: ‘Northern’ includes the states of Jammu & Kashmir, Ladakh, Himachal Pradesh, Punjab, Rajasthan, Haryana, Uttarakhand, and the Union Territories (UTs) of Chandigarh and Delhi; ‘Central’ includes the states of Uttar Pradesh, Madhya Pradesh, and Chhattisgarh; ‘Eastern’ includes the states of Bihar, Jharkhand, West Bengal, and Odisha; ‘North-Eastern’ includes the states of Sikkim, Assam, Meghalaya, Manipur, Mizoram, Nagaland, Tripura, and Arunachal Pradesh. ‘Western’ consists of the states of Gujarat, Maharashtra, Goa and UTs of Dadra & Nagar Haveli and Daman & Diu; ‘Southern’ consists of the states of Kerala, Karnataka, Andhra Pradesh, Tamil Nadu and the UTs of Andaman & Nicobar Islands, Pondicherry and Lakshadweep. Region was included as a broad contextual variable to capture geographical variation in contraceptive behaviour. It was not intended to represent tribe-specific kinship systems, marriage practices, or the degree of interaction with mainstream society, as such information was not available in the NFHS data. The sex of the household head was categorized into ‘Male’ and ‘Female’. Women were asked to report the total number of living children they had ever had, which was used to measure the number of children in the current analysis. It was grouped into ‘No Living Child’, ‘One Living Child’, ‘Two Living Children’, ‘Three Living Children’ and ‘More than three Living Children’. The number of living children, rather than children ever born, was used because contraceptive decision-making is more likely to depend on the number of living children than on total births. The number of sons at home is grouped into ‘No Son’, ‘One Son’, ‘Two Sons’, ‘Three Sons’, and ‘More than three Sons’. The number of daughters at home was grouped into ‘No Daughter’, ‘One Daughter’, ‘Two Daughters’, ‘Three Daughters’, and ‘More than three Daughters’.

3.3. Statistical Analyses

All analyses were performed using sampling weights to account for the complex survey design of the NFHS. The data were analysed using STATA MP version 17, and statistical significance was assessed at the 5% level. Descriptive statistics were used to summarize the distribution of the outcome and explanatory variables. Bivariate analyses were conducted to examine the prevalence of ever use of contraceptive methods among currently married ST women aged 15–49 years according to selected socioeconomic and demographic characteristics. Regional differences in the ever use of contraceptive methods and the distribution of contraceptive methods were also examined using bivariate analysis. Multicollinearity among the explanatory variables was assessed before fitting the final regression model, and variables showing substantial multicollinearity were not entered simultaneously into the model. Binary logistic regression was then used to examine the association between the sex composition of living children and the ever use of any contraceptive method while adjusting for demographic, socioeconomic, and geographic characteristics. Region was included as a broad contextual covariate to account for geographical variation and was not interpreted as a direct measure of tribe-specific kinship systems, marriage practices, or interaction with mainstream society. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) are presented.

4. Results

Figure 2 shows trends in the ever use of any contraceptive method among currently married ST women aged 15–49 years across the five rounds of the NFHS. Contraceptive use increased substantially from 33.8% in NFHS-1

(1992–1993) to 64.4% in NFHS-5 (2019–2021). Regionally, the Northern region showed the greatest increase (25.8% to 70.0%), whereas the Northeastern region continued to report the lowest prevalence (53.3%) in NFHS-5.

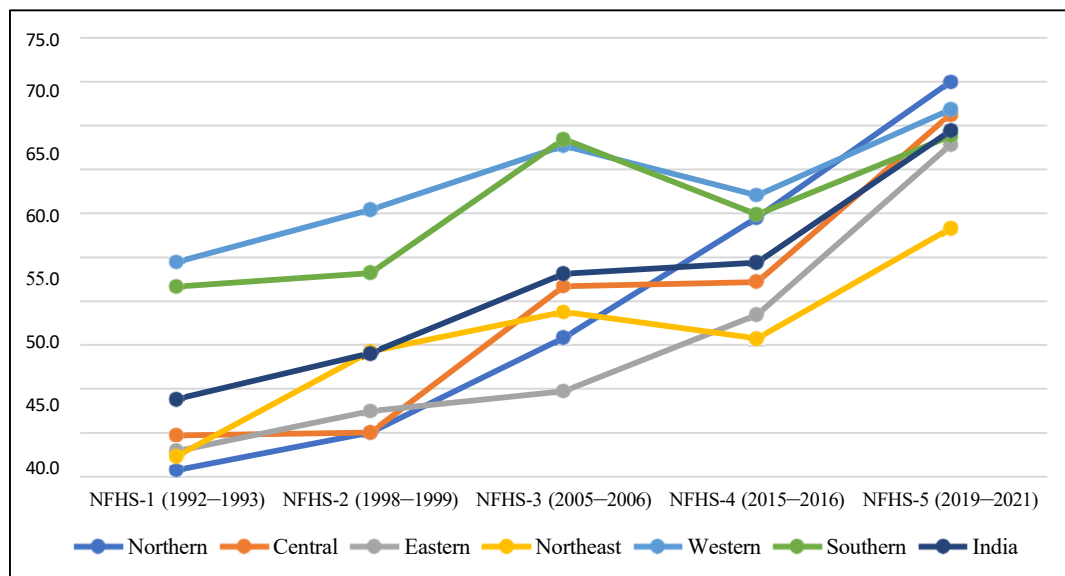


Figure 2. Percentage of currently married ST women aged 15–49 years who had ever used any contraceptive method, NFHS-1 to NFHS-5. Source: Computed from individual data files of NFHS-1, 2,3,4,5.

4.1. Ever Use of Family Planning Methods

Table 1 presents the prevalence of ever use of any contraceptive method among currently married women aged 15–49 years by social group and region in India. Nationally, about two-thirds of women had ever used contraception, with prevalence ranging from 59.2% in the Northeastern region to 71.4% in the Northern region. Among social groups, ST women reported the lowest prevalence (64.4%). Within the ST women, ever use ranged from 53.3% in the Northeastern region to 70.0% in the Northern region.

Table 1. Percentage of currently married women aged 15–49 years who had ever used any contraceptive method, by social group and region, NFHS-5 (2019–2021).

Regions	SC	ST	OBC	Others	Total
Northern	70.8	70.0	71.1	72.8	71.4
Central	63.9	66.3	65.3	66.1	65.2
Eastern	68.1	62.8	62.4	69.4	65.6
Northeastern	62.0	53.3	62.6	61.6	59.2
Western	64.4	66.8	66.7	66.7	66.2
Southern	68.0	63.8	68.7	68.1	68.2
India	67.0	64.4	66.4	68.5	66.8

Source: Computed from Individual Data file of NFHS-5.

Figure 3 presents the state-wise prevalence of ever use of any contraceptive method among currently married ST women aged 15–49 years. Contraceptive use was highest in Uttarakhand (77.9%), whereas Meghalaya (28.1%) and Mizoram (30.9%) reported the lowest prevalence, highlighting substantial state-level disparity.

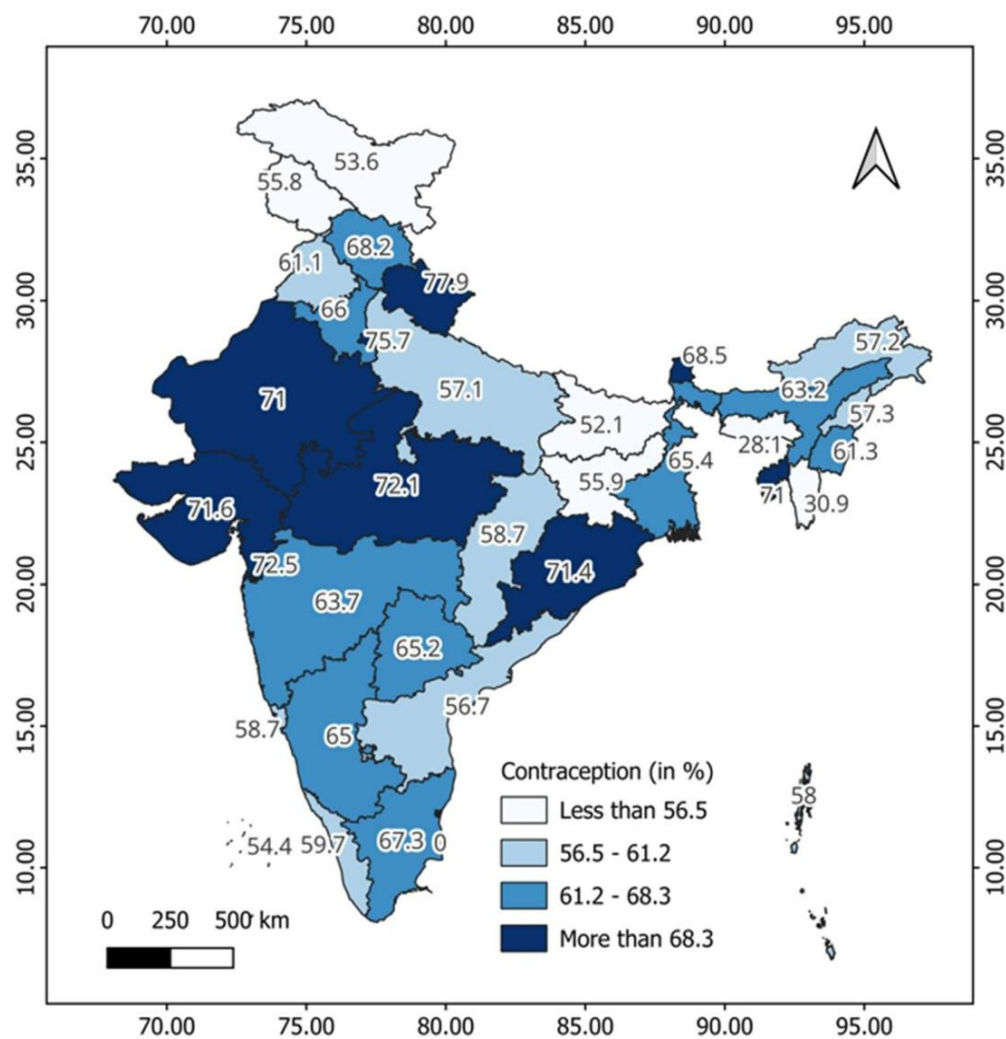


Figure 3. Percentage of currently married ST women aged 15–49 years who had ever used any contraceptive method in India, NFHS-5 (2019–2021). Source: Computed from individual data file of NFHS-5.

Table 2 and Figure 4 present the distribution of contraceptive methods among currently married ST women aged 15–49 years across regions. Overall, 64.4% had ever used any contraceptive method. Female sterilization was the predominant method (40.3%), particularly in the Southern (55.7%) and Western (51.6%) regions. Among reversible methods, male condom use was highest in the Northern region (10.7%) and oral pill use in the Northeastern region (17.5%), whereas IUD use remained low across all regions.

Table 2. Percentage distribution of contraceptive use by region among currently married ST women aged 15–49 in India, NFHS-5 (2019–2021).

Methods of Contraception	Northern	Central	Eastern	Northeast	Western	Southern	India	N **
Non-users	30.0	33.7	37.2	46.7	33.2	36.2	35.6	36,640
Users	70.0	66.3	62.8	53.3	66.8	63.8	64.4	55,336
Traditional Methods	10.5	6.1	16.9	15.4	5.3	1.2	9.3	10,113
a. Withdrawal	5.5	2.0	7.7	10.2	1.6	0.8	4.3	5759
b. Periodic Abstinence	5.0	4.2	9.2	5.1	3.7	0.4	5.0	4354
Modern Methods	59.5	60.1	45.9	37.9	61.5	62.6	55.1	45,223
a. Pill	2.8	2.7	8.5	17.5	1.4	0.9	5.0	7034
b. IUD	2.1	1.7	2.9	5.7	1.1	1.8	2.3	4214
c. Injections	1.1	0.4	0.7	0.6	0.1	0.2	0.5	636
d. Male Condom	10.7	4.9	3.8	3.3	5.8	2.5	5.0	4116
e. Female Sterilization	41.5	46.9	27.9	10.0	51.6	55.7	40.3	27,135
f. Other Modern Methods *	1.4	3.6	2.1	0.8	1.5	1.5	2.1	2088
Total	100	100	100	100	100	100	100	91,976

Source: Computed from Individual Data file of NFHS-5; * Other modern methods include Male Sterilization, Female Condom, Diaphragm, Lactational Amenorrhea (LAM), Emergency Contraception, Standard Day's Method (SDM). **: Percentages are weighted using the NFHS sampling weights, whereas sample sizes (N) are unweighted.

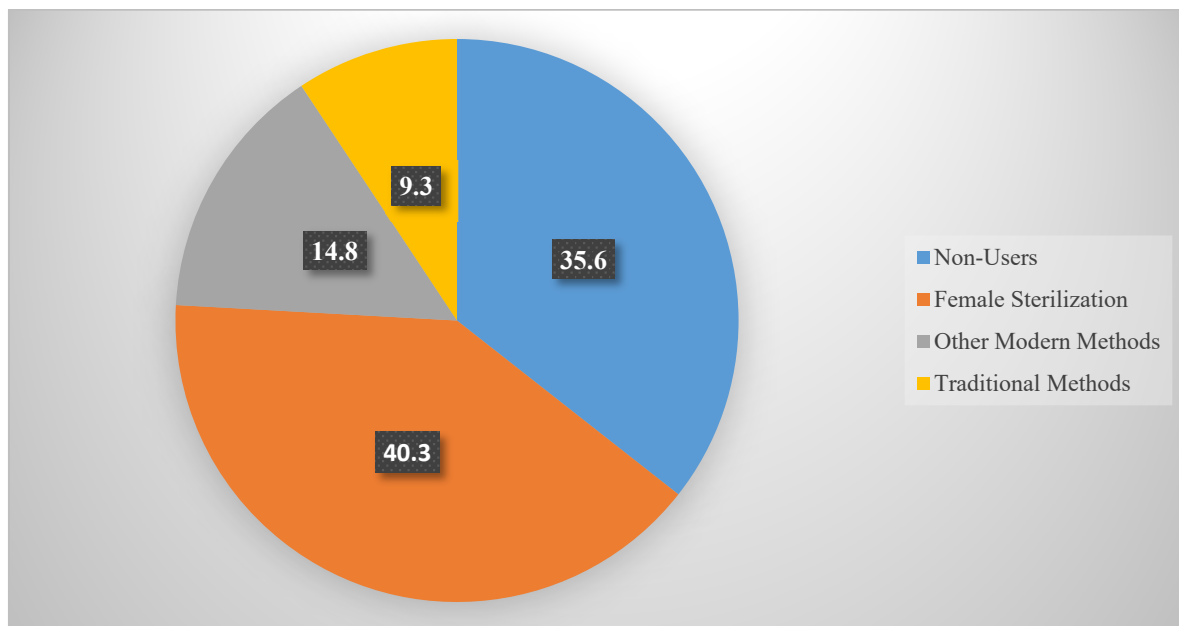


Figure 4. Percentage distribution of ever use of contraceptive methods among currently married ST women aged 15–49 years, India, NFHS-5 (2019–2021). Source: Computed from individual data file of NFHS-5; Other modern methods include Pills, IUD, Injections, Male Condoms, Male Sterilization, Female Condoms, Diaphragm, Lactational Amenorrhea (LAM), Emergency Contraception, Standard Day's Method (SDM).

4.2. Socioeconomic and Demographic Differentials in Contraceptive Usage

Table 3 presents contraceptive use among currently married ST women aged 15–49 years by selected demographic and socioeconomic characteristics across regions. Contraceptive use increased with age, from 49.0% among women aged 15–29 years to the highest levels among those aged 30–39 years, with particularly high prevalence in the northern (81.8%) and western regions. The 40–49 age group also showed high usage, with the highest percentage in the Northern (81.5%) and Western (81.6%) regions, while the Northeastern region recorded the lowest (49.4%). Urban women generally exhibited higher contraceptive usage compared to rural women. In urban areas, usage was highest among the tribal women living in the Northern region (72.5%), followed by the Central (69.6%) and Western (67.8%) regions. In rural areas, the usage is comparatively lower in the northeastern (54.6%), followed by the eastern (62.4%) and the southern (62.7%). Tribal women following the Hindu religion consistently reported higher contraceptive use than non-Hindu women (65.9% vs. 54.1%), with the largest differences observed in the northern and northeastern regions.

Women with lower educational attainment consistently reported higher contraceptive use than those with higher education across all regions. Nationally, contraceptive use was 69.1% among women with low education compared with 58.1% among those with higher education. The northern region reported the highest contraceptive use among women with low education (74.7%), followed by the southern (72.2%) and western (72.1%) regions, whereas the northeastern region consistently recorded the lowest contraceptive use across both educational groups. Differences in contraceptive use across household wealth categories were minimal. Nationally, contraceptive use was 64.3% among poorer women and 65.1% among richer women. Although some regional variation was observed, the northeastern region consistently reported the lowest contraceptive use across wealth categories.

Women who were aware of family planning reported higher contraceptive use than those not exposed across all regions. Nationally, contraceptive use was 66.2% among women exposed to family planning messages compared with 60.9% among those who were not exposed. Women who married before the age of 18 consistently reported higher contraceptive use than those who married at age 18 years or later across all regions. Nationally, contraceptive use was 69.1% among women married before age 18 compared with 60.2% among those married at age 18 years or later. Regionally, contraceptive use among women married before age 18 was highest in the northern region (75.6%), whereas the northeastern region reported the lowest contraceptive use among women married at age 18 years or later (52.6%). Women with a longer duration of cohabitation (≥ 20 years) consistently reported higher contraceptive use than those with shorter durations (< 20 years) across all regions. Nationally, contraceptive use was 76.0% among women with a cohabitation duration of 20 years or more compared with 59.4% among those with shorter durations. Regionally, contraceptive use among women with longer cohabitation

was highest in the northern, central, western, and southern regions (approximately four-fifths) and lowest in the northeastern region (50.7%).

Women who initiated sexual activity before age 18 reported higher contraceptive use than those whose sexual debut occurred at age 18 years or later across all regions. Nationally, contraceptive use was 68.3% among women whose sexual debut occurred before age 18 compared with 59.7% among those initiating sexual activity at age 18 years or later. The highest prevalence among women with sexual debut before age 18 was observed in the Southern (72.2%), Northern (71.9%), and Central (71.0%) regions, whereas among women whose sexual debut occurred at age 18 years or later, the lowest prevalence was reported in the Northeastern region (44.4%). Women with no births reported the lowest contraceptive use nationwide, ranging from 7.0% in the Southern region to 21.0% in the Eastern region. Among women whose first birth occurred before age 18, contraceptive use was highest in the Central (80.0%) and Northern (79.7%) regions and lowest in the Northeastern region (57.1%). Among those whose first birth occurred at age 18 years or later, contraceptive use remained highest in the Northern region (74.7%). Nationally, contraceptive use was generally higher among women whose first birth occurred before age 18 than among those whose first birth occurred at age 18 years or later.

The difference between the larger and smaller households was minimal in contraceptive usage except the Northern, Central and Eastern regions. The tribal women in households with fewer than five members generally showed lower contraceptive usage compared to those in larger households across the regions. The northern region reported the highest usage for larger households (71.5%), followed by the central and western regions. In the Western region, the usage was higher among smaller households (67.5%) than larger ones (66.5%), showing a difference from the national trend. In male-headed households, contraceptive usage was consistently higher among tribal women across all the regions, with the highest percentage observed in the northern region (70.9%), followed by the western and central regions. For women living in female-headed households, contraceptive usage was relatively lower across the regions, highlighting the large difference between the women living in a household headed by females (36.5%) and males (56.5%) in the northeastern region. Nationally, women living in male-headed households reported a higher average usage (65.8%) than women living in female-headed households (53.4%).

Women who desired at most two children generally reported higher contraceptive use than those desiring more than two children across most regions. This pattern was less evident in the Eastern and Northeastern regions, where contraceptive use among women desiring more than two children remained comparatively lower. A similar pattern was observed for the ideal number of sons. Contraceptive use was slightly higher among women who desired more than one son (66.2%) than among those who desired only one son (63.7%), except in the Eastern and Northeastern regions. Contraceptive use generally increased with the number of living children, from low levels among women with no living children (7.1–21.5% across regions) to the highest levels among women with three living children, before declining slightly among those with more than three children. Regional variation persisted, with the highest use observed in the Northern (84.8%) and Southern (82.5%) regions and the lowest in the Northeastern region (59.7%).

A similar pattern was observed for the number of living sons. Fewer than half of women with no sons used contraception across all regions, and contraceptive use generally increased with the number of living sons. Nationally, women with two sons reported the highest contraceptive use, with the highest proportions observed in the Northern (85.4%) and Southern (82.3%) regions. Among women with more than three sons, contraceptive use remained high in the Southern region (90.8%) but was considerably lower in the Northeastern region (31.5%). Contraceptive use generally increased from women with no daughters to those with one or two daughters before declining among women with three or more daughters. Women with no daughters reported the lowest contraceptive use across regions, with the lowest prevalence in the Northeastern region (48.4%). Women with one daughter showed higher contraceptive use, particularly in the Northern (77.3%) and Western (72.9%) regions. Among women with more than three daughters, contraceptive use declined in most regions, reaching its lowest level in the Northeastern region (38.8%), while remaining relatively high in the Southern region (73.4%).

Table 3. Percentage of currently married ST women aged 15–49 years who had ever used any contraceptive method, by region, India, NFHS-5 (2019–2021).

Background Characteristics	Northern	Central	Eastern	Northeastern	Western	Southern	India
Age							
15–29	52.9	47.7	53.0	48.2	47.4	42.2	49.0
30–39	81.8	76.9	73.0	60.7	76.9	74.1	74.5
40–49	81.5	79.9	65.8	49.4	81.6	81.3	74.4
Place of Residence							
Urban	72.5	69.6	67.3	45.8	67.8	66.4	65.6
Rural	69.7	66.0	62.4	54.6	66.7	62.9	64.2
Religion							
Hindu	71.1	66.4	63.6	63.4	66.9	64.2	65.9
Non-Hindu	56.9	64.4	59.6	45.0	65.3	57.7	54.1
Education							
Low level of education	74.7	71.9	64.5	53.0	72.1	72.2	69.1
High level of education	61.1	56.5	59.7	53.5	61.3	55.6	58.1
Wealth Quintile							
Poor	70.0	66.1	62.4	54.3	67.3	62.9	64.3
Rich	69.7	68.1	69.8	47.3	65.1	66.1	65.1
Heard about Family Planning							
No	67.8	64.1	57.9	48.2	62.4	63.1	60.9
Yes	71.0	67.5	65.9	55.6	68.8	64.1	66.2
Age at marriage							
Early marriage (<18)	75.6	73.2	64.1	54.9	71.0	70.6	69.1
Delayed marriage (≥18)	65.3	59.2	61.5	52.6	63.3	57.8	60.2
Duration of Cohabitation							
Shorter duration (<20)	64.8	58.9	60.9	54.1	60.2	55.3	59.4
Longer duration (≥20)	82.8	81.6	67.5	50.7	81.1	81.5	76.0
Age at first sex							
<18	71.9	71.0	64.6	53.4	70.2	72.2	68.3
≥18	62.4	59.4	63.0	44.4	62.4	56.3	59.7
Age at first birth							
No Birth	19.1	10.3	21.0	19.6	15.9	7.0	15.5
Early motherhood (<18)	79.7	80.0	69.5	57.1	78.7	78.2	75.0
Delayed motherhood (≥18)	74.7	70.0	67.7	56.4	70.3	68.2	68.5
Household size							
Smaller household (<5)	66.7	63.2	60.0	53.8	67.5	65.2	62.7
Larger household (≥5)	71.5	68.1	65.1	52.8	66.5	62.2	65.6
Sex of the household head							
Male	70.9	67.2	64.5	56.5	67.7	65.0	65.8
Female	61.6	57.7	52.4	36.5	57.4	56.5	53.4
The ideal number of children							
At most two children	68.2	63.5	63.3	60.5	64.6	61.6	63.7
More than two children	73.7	70.6	61.8	44.4	74.6	70.9	65.9
The ideal number of Sons							
At most one son	68.0	63.5	63.1	59.0	65.4	61.8	63.7
More than one son	74.4	71.7	62.2	44.0	73.0	72.5	66.2
Number of Living Children							
No Living Child	18.7	10.3	21.5	19.4	16.5	7.1	15.8
One Living Child	49.0	43.5	53.6	53.1	43.6	36.5	47.0
Two Living Children	79.5	76.2	75.0	61.4	77.5	81.6	76.1
Three Living Children	84.8	82.1	73.3	59.7	81.2	82.5	78.4
more than three	80.9	79.4	69.8	49.5	80.5	78.2	74.3
Number of Sons at Home							
No Son	43.4	39.6	46.2	45.2	43.4	44.8	43.8
One Son	75.5	73.3	68.6	59.3	74.0	72.5	71.1
Two Sons	85.4	82.7	76.2	56.9	81.1	82.3	79.2
Three Sons	84.9	81.7	72.8	51.3	80.0	82.5	76.1
More than three sons	82.4	74.4	63.9	31.5	72.6	90.8	62.8
Number of Daughters at Home							
No Daughter	60.0	56.6	55.3	48.4	59.5	55.2	56.3
One Daughter	77.3	72.9	68.2	58.6	72.9	70.7	70.5
Two Daughters	77.4	73.9	71.6	55.8	74.3	74.3	72.1
Three Daughters	74.9	71.3	65.4	47.8	72.5	75.4	68.4
more than three daughters	59.2	69.0	56.6	38.8	62.4	73.4	61.1
Total	70.0	66.3	62.8	53.3	66.8	63.8	64.4
N	8373	16,729	13,384	37,515	9703	6272	91,976

Source: Computed from Individual Data file of NFHS-5.

Table 4 presents contraceptive use among currently married ST women according to the sex composition of living children. Among women with one child, contraceptive use was generally higher among those with one son (50.4%) than among those with one daughter (42.3%) across most regions, except in the Southern region. The

highest contraceptive use among women with one son was observed in the Eastern (56.5%) and Northeastern (54.0%) regions, whereas among women with one daughter it was highest in the Northeastern (52.0%) and Eastern (49.7%) regions. Among women with two children, contraceptive use was highest among those with two sons (79.7%), followed by one son and one daughter, and lowest among those with two daughters (60.5%). Similar patterns were observed in the Northern and Central regions, whereas the Southern region showed relatively high contraceptive use even among women with two daughters (68.1%). The Northeastern region consistently reported the lowest contraceptive use across all sex compositions.

Among women with three children, contraceptive use remained highest among those with one daughter and two sons (81.4%) and those with three sons (80.7%) but declined to 57.7% among women with three daughters. The Southern and Western regions reported comparatively high contraceptive use, whereas the Northeastern region consistently showed the lowest levels across most sex compositions. Among women with more than three children, contraceptive use declined as the number of daughters increased, from 77.6% among women with only sons to 61.1% among women with more than three daughters. The Southern region reported the highest contraceptive use among women with only sons (87.7%), whereas the Northeastern region consistently reported the lowest contraceptive use, particularly among women with more than three daughters (38.8%).

Table 4. Percentage of currently married ST women aged 15–49 years who have ever used any contraceptive method, by sex composition of living children, India, NFHS-5 (2019–2021).

	Sex Composition	One Child	Two Children	Three Children	More Than Three Children
India	No daughter	50.4	79.7	80.7	77.6
	One daughter	42.3	77.0	81.4	76.5
	Two daughters		60.5	76.3	76.4
	Three daughters			57.7	72.5
	More than Three daughters				61.1
Northern	No daughter	53.3	84.7	86.3	82.3
	One daughter	41.7	80.1	88.3	88.6
	Two daughters		57.5	83.1	81.7
	Three daughters			46.7	80.5
	More than three daughters				59.2
Central	No daughter	46.8	81.9	86.2	84.7
	One daughter	39.1	77.2	85.8	81.1
	Two daughters		53.4	78.4	81.5
	Three daughters			58.6	76.0
	More than three daughters				69.0
Eastern	No daughter	56.5	78.1	75.3	69.1
	One daughter	49.7	74.2	75.6	72.5
	Two daughters		69.2	71.1	74.0
	Three daughters			60.7	67.0
	More than three daughters				56.6
Northeastern	No daughter	54.0	59.5	62.4	54.0
	One daughter	52.0	64.5	59.3	50.9
	Two daughters		55.1	59.5	52.0
	Three daughters			53.7	45.4
	More than three daughters				38.8
Western	No daughter	48.2	81.1	81.6	82.3
	One daughter	36.4	79.2	85.2	83.1
	Two daughters		56.5	80.9	82.5
	Three daughters			55.3	82.2
	More than three daughters				62.4
Southern	No daughter	40.3	83.1	84.2	87.7
	One daughter	31.8	83.6	84.5	73.2
	Two daughters		68.1	79.7	74.8
	Three daughters			66.0	83.4
	More than three daughters				73.4

Source: Computed from Individual Data file of NFHS-5.

4.3. The Effect of Sex Composition of Living Children on Contraceptive Use

Table 5 presents the Adjusted Odds Ratios (AORs) and Confidence Intervals (CIs) showing the effect of the sex composition of living children on contraceptive use among currently married ST women in India. The reference category was “no daughter”. For women with one child, at the country level, the women with only one daughter were less likely to use contraceptive methods [A.O.R. 0.756, 95% C.I.: 0.677–0.844] than the women with only one son. The Northern region showed the lowest odds for contraceptive use among women with one daughter [A.O.R. 0.63, 95% C.I.: 0.473–0.84] than the women with only one son, while the Central

[A.O.R. 0.774, 95% C.I.: 0.633–0.947] and Eastern [A.O.R. 0.723, 95% C.I.: 0.592–0.884] regions were less likely to use contraceptive methods than the women with only one son. The Western region similarly was seen reduced odds [A.O.R. 0.719, 95% C.I.: 0.518–0.998]. In contrast, the Northeastern and Southern regions showed no association between women with one daughter and contraceptive use.

For women with two children, in India, the women with two daughters were 50% less likely to use contraceptive methods than the women with two sons [A.O.R. 0.48, 95% C.I.: 0.409–0.571]. In the Northern and Central regions, women with two daughters were 70 per cent less likely to use contraceptive methods than women with two sons [A.O.R. 0.34, 95% C.I.: 0.222–0.52; A.O.R. 0.36, 95% C.I.: 0.277–0.473, respectively]. In the Central and Eastern regions, the women with one daughter-one son had an 80 per cent likelihood to use any method of contraception than the women having two sons [A.O.R. 0.81, 95% C.I.: 0.66–0.99; A.O.R. 0.78, 95% C.I.: 0.62–0.98 respectively]. The Eastern and Northeastern regions also showed a declined likelihood of using contraceptive methods for women having two daughters [A.O.R. 0.63, 95% C.I.: 0.465–0.852; A.O.R. 0.73, 95% C.I.: 0.587–0.909, respectively]. Similarly, the women with two daughters from Western and Southern regions were significantly less likely to use contraceptive methods than the women with two sons [A.O.R. 0.38, 95% C.I.: 0.237–0.618; A.O.R. 0.58, 95% C.I.: 0.36–0.933].

For women with three children, in India, women with one daughter-two sons were slightly more likely to use contraceptives compared to those with three sons [AOR 1.146, 95% C.I.: 0.98–1.343], while those with three daughters were 70 per cent less likely [AOR 0.385, 95% C.I.: 0.301–0.492]. The women with three daughters from the Northern region were significantly less likely to use contraceptive methods compared to those with three sons [AOR 0.116, 95% C.I.: 0.055–0.244]. In the Western region, women with one daughter and two sons were 70 per cent more likely to use contraceptive methods compared to those having three sons [AOR 1.747, 95% C.I.: 1.139–2.677]. In the Southern, Western and Northeastern regions, women with three daughters were less likely to use contraceptive methods compared to those having three sons [AOR 0.37, 95% C.I.: 0.167–0.823; AOR 0.4, 95% C.I.: 0.22–0.738 and AOR 0.67, 95% C.I.: 0.477–0.945 respectively]. The Central and Eastern regions followed similar patterns, with significantly lower contraceptive use for women with three daughters compared to women with three sons [AOR 0.375, 95% C.I.: 0.240–0.587 and AOR 0.450, 95% C.I.: 0.278–0.729].

For women with more than three children, in India, women with three daughters [AOR 0.8, 95% C. I.: 0.65–0.99] and more than three daughters [AOR 0.45, 95% C. I.: 0.35–0.57] showed significantly lower probability to use contraceptive methods compared to those with more than three sons (no daughter). In Northern India, women having more than three daughters were 80 per cent less likely to use contraceptive methods compared to those with more than three sons (no daughters) [AOR 0.28, 95% C.I.: 0.14–0.56]. The Central region followed a similar trend, where having three daughters [AOR 0.54, 95% C. I.: 0.36–0.81] or more than three daughters [AOR 0.39, 95% C. I.: 0.25–0.60] were significantly less likely to use contraceptive methods compared to those with more than three sons (no daughter). In Eastern and northeastern India, women with more than three daughters were also less likely to use contraceptive methods compared to those with more than three sons (no daughters) [AOR 0.56, 95% C.I.: 0.35–0.89; OR 0.75, 95% C.I.: 0.55–1.01]. The western region also showed a lower likelihood of contraceptive use among women with more than three daughters [AOR 0.39, 95% C.I.: 0.20–0.80].

Table 5. Adjusted Odds Ratio (AOR) Showing the effect of Sex Composition of Living Children on Contraceptive use by Region among Currently married ST Women in India, NFHS-5 (2019–2021).

Sex Composition of Living Children		One Child		Two Children		Three Children		More Than Three Children	
		AOR	CI	AOR	CI	AOR	CI	AOR	CI
India	No daughter [®]								
	One daughter	0.756 ***	0.677–0.844	0.911	0.799–1.038	1.146 *	0.979–1.343	0.958	0.789–1.163
	Two daughters			0.483 ***	0.409–0.571	0.889	0.749–1.056	1	0.815–1.228
	Three daughters					0.385 ***	0.301–0.492	0.802 **	0.647–0.994
	More than three daughters							0.446 ***	0.351–0.566
Northern	No daughter [®]								
	One daughter	0.63 ***	0.473–0.84	0.814	0.606–1.092	1.229	0.764–1.976	1.621	0.861–3.055
	Two daughters			0.34 ***	0.222–0.52	0.836	0.503–1.391	0.965	0.523–1.781
	Three daughters					0.116 ***	0.055–0.244	0.959	0.484–1.9
	More than three daughters							0.281 ***	0.141–0.559
Central	No daughter [®]								
	One daughter	0.774 **	0.633–0.947	0.812 **	0.661–0.996	1.151	0.846–1.565	0.7 **	0.493–0.996
	Two daughters			0.362 ***	0.277–0.473	0.792	0.563–1.114	0.736	0.505–1.072
	Three daughters					0.375 ***	0.24–0.587	0.541 ***	0.363–0.805
	More than three daughters							0.388 ***	0.251–0.599
Eastern	No daughter [®]								
	One daughter	0.723 ***	0.592–0.884	0.782 **	0.621–0.985	0.98	0.714–1.344	1.159	0.812–1.655
	Two daughters			0.629 ***	0.465–0.852	0.722 *	0.512–1.019	1.303	0.89–1.908
	Three daughters					0.45 ***	0.278–0.729	0.881	0.584–1.33
	More than three daughters							0.556 **	0.348–0.889
Northeastern	No daughter [®]								
	One daughter	0.95	0.811–1.113	1.097	0.937–1.285	0.916	0.741–1.132	0.986	0.785–1.239
	Two daughters			0.731 ***	0.587–0.909	0.898	0.707–1.14	1.159	0.907–1.479
	Three daughters					0.671 **	0.477–0.945	0.917	0.698–1.203
	More than three daughters							0.745 *	0.549–1.011
Western	No daughter [®]								
	One daughter	0.719 **	0.518–0.998	0.954	0.647–1.405	1.747 **	1.139–2.677	1.107	0.595–2.058
	Two daughters			0.382 ***	0.237–0.618	1.404	0.899–2.194	1.19	0.605–2.341
	Three daughters					0.403 ***	0.22–0.738	1.133	0.586–2.189
	More than three daughters							0.394 ***	0.195–0.799
Southern	No daughter [®]								
	One daughter	0.961	0.635–1.455	1.17	0.848–1.615	1.261	0.762–2.086	0.493	0.197–1.236
	Two daughters			0.579 **	0.36–0.933	0.977	0.577–1.654	0.582	0.208–1.63
	Three daughters					0.371 **	0.167–0.823	1.054	0.349–3.183
	More than three daughters							0.487	0.136–1.75

Note: ® represents the reference category; *, **, ***: refers to <0.05, <0.01 and <0.001 level of significance. The socioeconomic and demographic variables i.e. age, place of residence, religion, education level, wealth quintile, family planning messages, age at marriage, duration of cohabitation, age at first sex, age at first birth, household size, sex of the household head, Ideal number of children, Ideal number of sons, number of living children, number of sons at home have been kept adjusted in the model. Source: Computed from Individual Data file of NFHS-5.

5. Discussions

The study explored the effects of sex preferences and the sex composition of surviving children on contraceptive use among currently married tribal women in India. Our study revealed that tribal women were less likely to use contraception than women from other social groups, a finding consistent with previous studies [21,24–26]. Lower contraceptive use may reflect persistent socioeconomic disadvantage and barriers to accessing reproductive health services. A study reported that reasons for not using any contraception included side effects, religious beliefs, overcrowded living conditions with limited privacy, and, in some cases, a preference for a male child. Specifically, women living in shared or congested households often lacked sufficient privacy to discuss, obtain, store, or use contraceptive methods confidentially, which discouraged contraceptive adoption [27]. Another study proposed that male dominance in decision-making is regarded as an obstacle to the utilization of modern contraceptive methods. However, fears and misconceptions about side effects among both men and women appeared to be a more powerful deterrent to contraceptive use than inequitable gender norms [28].

The contraceptive use increased substantially between NFHS-1 and NFHS-5, although the northeastern region continued to report considerably lower use than the rest of the country. Although Meghalaya reported the lowest contraceptive prevalence (28%), with 86% of the population as a ST, this should not be interpreted as evidence of stronger son preference. The low uptake may also reflect geographic barriers, limited availability of healthcare services, and local sociocultural practices that cannot be examined using NFHS data. Therefore, low contraceptive use and son-preference-driven contraceptive behaviour should not be considered equivalent. The substantial regional variation observed in the present study underscores that India's STs comprise more than 700 culturally diverse communities with distinct kinship systems, marriage practices, social organization, and reproductive behaviours. Therefore, tribal populations should not be regarded as a homogeneous group. In this study, region should be interpreted as a broad contextual variable reflecting differences in the concentration of tribal communities, kinship systems, access to health services, geographic isolation, and interaction with mainstream society. Because NFHS lacks tribe-specific contextual information, these mechanisms could not be examined directly. Consequently, the findings should be interpreted as broad national patterns, and region should be viewed as a contextual rather than causal factor in explaining contraceptive behaviour among tribal women. Future studies combining national surveys with tribe-specific or ethnographic data are needed to better understand these contextual differences.

In the present study, female sterilization was the most prominent method of contraception among tribal women aged 15–49. The willingness for sterilization is also influenced by sex preference and the outcome of pregnancy in terms of the sex of the child [29]. This predominance of female sterilization may also explain the higher contraceptive use observed among women with longer durations of cohabitation, as these women are more likely to have completed childbearing and adopted permanent methods. Because female sterilization constituted the predominant contraceptive method in this study, the outcome variable of 'ever use of any contraceptive methods' reflects both permanent stopping behaviour and the use of reversible methods for spacing or limiting births. Consequently, part of the observed association between the sex composition of living children and contraceptive use may represent women who had already achieved their desired family size and number of sons before opting for sterilization, rather than ongoing contraceptive decision-making among women still at risk of pregnancy [30]. The increasing prevalence of contraceptive use with the number of living sons is also consistent with the possibility that many women adopted contraception after achieving their desired family size and number of sons. Given the predominance of female sterilization, these findings should be interpreted as reflecting completed fertility and stopping behaviour rather than ongoing contraceptive decision-making.

Several studies identify the age of women, place of residence, wealth status, educational attainment, parity, age at first marriage, awareness about family planning, and fertility preference as the important determinants influencing contraceptive use [31–33]. The present study found that the contraceptive rate was increasing with age, with slight variations among the tribal women. This finding was consistent with previous studies, attributed to the fact that women start using contraceptive methods after attaining the desired family size, which usually corresponds to women in their mid-30s [24,25,34]. Similarly, women with longer durations of cohabitation, earlier sexual debut, and an earlier age at first birth were more likely to have ever used contraception. These associations should be interpreted cautiously because contraceptive use among tribal women was predominantly driven by female sterilization. Women with longer reproductive exposure are more likely to have completed their desired family size and subsequently adopted permanent methods; therefore, these findings are likely to reflect completed fertility and stopping behaviour rather than independent effects of cohabitation duration, age at sexual debut, or age at first birth. Because the outcome was ever use of contraception rather than current use, these associations reflect contraceptive experience over the reproductive life course and should not be interpreted as

determinants of current contraceptive behaviour. Urban women were using more contraception than their rural counterparts; the same association is reported previously [25,34,35]. This disparity may reflect better access to health services and family planning information in urban areas. Contraceptive use was also higher among Hindu women than among non-Hindu women, consistent with previous studies [24,34]. Contrary to most previous studies, contraceptive use was lower among women with higher educational attainment [24,25]. In contrast, a study reported a positive correlation between contraception and education as per NFHS-4 [18,34]. Because contraceptive use in the present study was dominated by female sterilization among older, high-parity women, this inverse association may reflect differences in age and parity rather than the independent effect of education. In contrast to previous studies reporting higher contraceptive use among wealthier women [24,36], the present study observed little variation by household wealth.

In the present study, the number of live births was one of the strongest correlates of ever contraceptive use. Women who had two to three children demonstrated a higher propensity to utilize contraceptive methods compared to women with a single child or more than three children [18]. A study found that for women with two living children in most of the South Asian countries, the desire to have another child within two years only shows a preference for having at most one son [37]. The present study also reported lower contraceptive use among women having two daughters than among women having one son and one daughter, indicating a high probability of having another child. Our findings differ from those reported among tribal communities in Bangladesh, where little evidence of son preference was observed [38]. Rather than contradicting the present study, this comparison highlights the heterogeneity of tribal populations across South Asia. Differences in kinship systems, inheritance practices, marriage institutions, and interaction with surrounding societies are likely to shape fertility preferences more strongly than tribal identity alone.

Consistent with this, women with one or more sons, or an equal number of sons and daughters, were significantly more likely to use contraception than those having no sons but one or more daughters. A similar study also found that contraceptive use was higher among women with an equal number of sons and daughters than among women who reported no sons and one or more daughters [24]. Although the present findings were consistent with the broader literature suggesting that son preference may become more pronounced in some tribal communities undergoing social change [4,39], the present study did not directly measure interaction with mainstream society. Therefore, these findings should be interpreted as associations rather than evidence of a causal assimilation process. Consistent with previous studies from India [9,40], the association between son preference and contraceptive use was strongest in the northern, central, and western regions. The observed regional variation further suggests that reproductive behaviour among tribal women is shaped by diverse social and cultural contexts rather than a single underlying process.

A limitation of this study was that ever use of contraception was analysed as a single outcome. Because female sterilization predominated, the outcome combined permanent stopping behaviour with reversible contraceptive use. Consequently, part of the observed association between sex composition and contraceptive use may reflect completed fertility after achieving the desired family size rather than ongoing contraceptive decision-making. Future research should distinguish between permanent and reversible contraceptive methods, examine the timing of sterilization in relation to childbearing, and incorporate composite parity–sex indicators to provide a more direct assessment of stopping behaviour following the birth of sons.

6. Conclusions

This study demonstrates that contraceptive use among tribal women is strongly associated with the sex composition of living children and varies considerably across regions, suggesting that son preference continues to influence contraceptive behaviour in many tribal communities in India. The observed regional variation also highlights the heterogeneity of India's ST populations and the need for region-specific, culturally appropriate family planning strategies rather than a uniform approach. Policies should promote gender-equitable norms, strengthen culturally sensitive family planning counselling, encourage greater male participation in reproductive health, and improve access to a broader range of modern reversible contraceptive methods alongside equitable and respectful reproductive health services. Future research should integrate nationally representative survey data with tribe-specific contextual information on kinship systems, marriage practices, and interaction with mainstream society, while distinguishing between permanent and reversible contraceptive methods to better understand the relationship between sex composition, fertility intentions, and contraceptive behaviour among tribal women.

Author Contributions

H.S. conceptualized the study and developed the methodology. A.V. acquired and analyzed the data, prepared the visualizations, and drafted the original manuscript. H.S. validated the findings, critically reviewed and edited the manuscript, and supervised the study. All authors have read and agreed to the published version of the manuscript.

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Ethical review and approval were waived for this study because it involved secondary analysis of publicly available, anonymized National Family Health Survey (NFHS) data. The authors did not collect data directly from participants, interact with participants, or have access to personally identifiable information.

Informed Consent Statement

Not applicable.

Data Availability Statement

The data are publicly available at the DHS Program: <https://dhsprogram.com/Data/> [41].

Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

No AI tools were utilized for this paper.

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