

Effective Sterilization in India and Contraceptive Use: A Socio-Demographic Analysis Using DHS 2019–2021 Data

Ahmed S. Hassan^{1*}, Nour A. Saleh¹, Karim M. Abdelrahman¹

¹Department of Community Medicine, Faculty of Medicine, Ain Shams University, Cairo, Egypt.

*E-mail ✉ ahmed.hassan@outlook.com

Abstract

This study examines socio-demographic differentials in the use of effective contraceptive methods and sterilization in India using data from the Demographic and Health Survey (DHS) 2019–2021. The analysis considers variations across five-year age groups, place of residence, educational attainment, wealth index, religion, caste, marital status, and occupation. The findings indicate that the prevalence of effective contraceptive use among currently married men and women is substantially higher among younger age groups, urban residents, individuals with higher education, those belonging to the richest wealth quintile, members of the Sikh community, general caste groups, married couples, and individuals employed in professional, technical, or managerial occupations, with minor variations observed across other contraceptive methods. Lower levels of female sterilization, along with reduced mean marital duration and parity at sterilization, are also associated with these socio-demographic groups, with the exception of the Sikh community and married couples. Across all categories, the median age of women undergoing sterilization toward the end of their reproductive span is found to be below 30 years.

Keywords: Sterilization, India, Contraceptive, DHS

Introduction

Contemporary human societies are confronted with multiple challenges, including epidemics, pandemics, environmental pollution, and natural disasters such as cyclones, earthquakes, and floods. Among these concerns, rapid population growth remains one of the most critical issues contributing to overpopulation. According to the most recent United Nations Population Fund estimates, India's population has reached approximately 1.4286 billion, surpassing China's population of 1.4257 billion and positioning India as the most populous country globally. This demographic shift

underscores the urgent need for effective population control strategies.

Contraception, or birth control, refers to the deliberate prevention of conception through the use of medical, behavioral, chemical, or surgical methods. Effective contraceptive use enables individuals to engage in sexual relationships without the risk of unintended pregnancy and supports reproductive autonomy by allowing couples to decide the timing and number of children. Ideally, contraceptive methods should offer high effectiveness with minimal cost and side effects. Certain methods, such as male and female condoms, provide the additional benefit of protecting against sexually transmitted infections (STIs) and HIV/AIDS. Consequently, increasing awareness regarding the availability, proper use, and consistent application of effective contraceptive methods remains essential.

In the Indian context, there is a pressing need to promote contraceptive options that are women-centered, empowering, accessible, and privacy-oriented. Manufacturers and policymakers must also consider the specific needs of adolescents, who represent a

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particularly vulnerable segment of the population. Evidence suggests that the transmission of STIs and HIV/AIDS is more efficient from infected men to uninfected women than vice versa [1]. Therefore, contraceptive practices should not only aim to prevent unintended pregnancies but also facilitate birth spacing and reproductive planning.

Contraceptive methods can be broadly categorized into reversible and permanent options. Reversible methods allow individuals to discontinue use when pregnancy is desired, whereas permanent methods are largely irreversible. In India, family planning efforts have historically emphasized terminal surgical methods, particularly for women who have completed childbearing. As a result, female sterilization continues to dominate the modern contraceptive method mix.

Sterilization represents a permanent form of contraception and remains widely practiced in India. In contrast, data from the United States indicate a more diversified contraceptive method mix, with female sterilization accounting for 18.6%, oral contraceptive pills for 12.6%, long-acting reversible contraceptives (LARCs) for 10.3%, and male condoms for 8.7% among women aged 15–49, based on the National Survey of Family Growth 2015–2017 [2]. Sterilization is regarded as a safe, effective, cost-efficient, and nearly irreversible method of preventing unintended pregnancies. It is widely available in many regions of India and is often perceived as enhancing sexual freedom. Although both male and female sterilization methods are nearly 100% effective, vasectomy remains far less common than female sterilization. Tubectomy continues to be the most prevalent modern contraceptive method in India, providing key insights for evaluating and strengthening family planning programs [3].

Jain and Muralidhar [4] emphasize the importance of contraceptive choices that align with users' needs, preferences, and accessibility, highlighting global trends in contraceptive utilization, including male and female sterilization. Traditional methods constitute a relatively small proportion of contraceptive use in Asia, declining from 13% to 9%. India's reliance on traditional methods remains comparable to regional averages at 7.8%. However, the uptake of oral contraceptive pills in India is notably low at approximately 3%, compared to about 25% in developed countries.

Condom use has been gradually increasing in developing nations, particularly among couples with higher educational attainment, income levels, caste status, urban

residence, and professional occupations. Meanwhile, the proportion of intrauterine device (IUD) users in Asia has declined from 27.9% to 22.8%. According to the National Family Health Survey (NFHS-III), only 1.7% of married women in India currently use IUDs, while injectable contraceptive use remains extremely low at 0.1%. Male sterilization accounts for less than 1% of contraceptive use in India. Across Asia, female sterilization increased from 34% during 1980–1984 to approximately 42–43% during 1985–2005. Limited awareness among younger couples regarding appropriate contraceptive methods may contribute to these patterns. Singh *et al.* [5] analyze the sustained dominance of female sterilization in India over the past two decades using multilevel analyses of NFHS data from 1992–2016. Over the past several decades, extensive research has examined contraceptive use and sterilization practices in both developing and developed countries. However, much of the existing literature has focused on Indian populations, including studies by Bose [6], Rajaretnam and Deshpande [7], Srinivasan [8], Saavala [9], Bairagi [10], Arokiasamy [11], Harkavy and Roy [12], Dwivedi *et al.* [13], Leone and Padmadass [14], Kavanaugh and Jerman [15], Jain and Muralidhar [4], Singh *et al.* [5], Barman [16], Ram *et al.* [17], De Oliveira *et al.* [18], Pradhan and Dwivedi [19], Biswas *et al.* [20], Singh *et al.* [21], Mohanty *et al.* [22], Singh *et al.* [23], Jana and Shekhar [24], and Kumar *et al.* [25].

The primary objective of the present study is to assess socio-demographic differentials in the use of effective contraceptive methods and sterilization in India across five-year age groups, residence, educational attainment, wealth status, religion, caste, marital status, and occupation. The analysis aims to document variations in effective contraceptive use among currently married men and women, as well as patterns of female sterilization in relation to median age, mean marital duration, and parity at the time of sterilization. This study utilizes data from the DHS 2019–2021, a nationally representative survey containing comprehensive information on these critical issues. Details regarding data sources and methodological approaches are provided in Section 2, followed by results and discussion in Section 3. The conclusions are presented in the final section.

Data sources and methods for calculating mean and median

The 2019–21 Demographic and Health Survey (DHS) [26] collected data from ever-married women in the

reproductive age range of 15–49 years, categorized into 5-year age bands. Interviews were conducted privately with each woman, covering her socioeconomic characteristics and complete reproductive history. The dataset provides comprehensive birth records for all children born to these women. Additionally, it includes details on contraceptive adoption (or non-adoption) by couples, along with information on age, parity, and duration of marriage at the time of sterilization. This allows computation of median maternal age, average marital duration, and average parity at sterilization, disaggregated by variables such as 5-year age groups, urban/rural residence, educational attainment, household wealth quintile, religion, caste/tribe affiliation, current marital status, and occupation.

The survey captured extensive information on contraceptive practices, including factors related to parity, marital duration, and age at sterilization. The full list of contraceptive methods reported includes both reversible and permanent options: (i) Oral Pill, (ii) Intra-Uterine Device (IUD), (iii) Injectables, (iv) Diaphragm, (v) Male Condom, (vi) Female Sterilization (Tubectomy), (vii) Male Sterilization (Vasectomy), (viii) Periodic Abstinence, (ix) Withdrawal, (x) Other Traditional Methods, (xi) Lactational Amenorrhea Method (LAM), (xii) Female Condom, (xiii) Foam/Jelly, (xiv) Emergency Contraception, (xv) Other Modern Methods, and (xvi) Standard Days Method (SDM). Roughly 30% of couples reported no contraceptive use and were classified under the “Not Using” category. Male sterilization constituted less than 1% of all methods, in sharp contrast to the much higher prevalence of female sterilization. As a result, data pertaining to male sterilization were excluded from the present analysis.

Given this distribution, the study concentrates on the predominant methods that account for approximately 70% of contraceptive demand among couples. These key methods comprise Oral Pill, Intra-Uterine Device (IUD), Male Condom, Female Sterilization (Tubectomy), Periodic Abstinence, and Withdrawal. The remaining methods showed very low uptake among currently married individuals.

Calculating the mean for grouped data with class intervals

For a discrete frequency distribution involving values x_i with corresponding frequencies f_i (where $i=1,2,\dots,n$), the arithmetic mean is computed as:

$$X = \frac{1}{N} \sum_{i=1}^n f_i x_i \quad (1)$$

where $\sum_{i=1}^n f_i = N$

When dealing with a continuous frequency distribution, the class midpoint is used as the representative value for x_i in each interval, and the mean is derived using the same formula.

Calculating the median for grouped data with open-ended class intervals

In grouped frequency distributions that include open-ended intervals, the median class is the one whose cumulative frequency first exceeds half the total observations ($N/2$). The median is then estimated via interpolation with the formula:

$$\text{Median} = l + \frac{h}{f} \left[\frac{N}{2} - C \right] \quad (2)$$

where l is the lower boundary of the median class, h denotes the class interval width, f is the frequency within the median class, and C represents the cumulative frequency of the class immediately before the median class.

Results and Discussion

The appropriateness and utilization of effective contraceptive methods, including female sterilization, are examined using Demographic and Health Survey (DHS) data from 2019–2021. The analysis considers variations across several socio-demographic characteristics, namely five-year age groups, place of residence, level of educational attainment, wealth index, religion, caste, current marital status, and occupational category of couples.

Table 1 presents the distribution of currently married men and women using effective contraceptive methods across five-year age intervals. The results indicate a steady decline in the use of reversible effective contraceptive methods with increasing age, whereas the prevalence of female sterilization rises toward the later stages of the reproductive period. Notably, approximately half of all female sterilizations are completed before the age of 30, despite sterilization being most prevalent toward the end of reproductive life. This pattern may reflect greater awareness among couples regarding the correct and consistent use of contraceptive methods at younger ages. Increased exposure to education, training, and modern

communication platforms—such as social media, messaging applications (e.g., WhatsApp), online videos, and digital content—may have enhanced access to information and facilitated informed contraceptive decision-making. A graphical illustration of these trends is provided in **Figure 1**.

Table 1. Percentage distribution of currently married men and women using effective contraceptive methods by five-year age groups.

Contraceptive Method	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Withdrawal	5.13	5.32	5.22	5.09	4.80	4.17	2.73
Intra-Uterine Device (IUD)	4.31	3.83	3.48	3.24	2.63	1.81	1.05
Female Sterilization	1.33	13.22	28.54	39.74	47.46	51.97	53.92
Oral Pill	8.89	7.15	7.24	7.18	6.12	3.81	2.08
Male Condom	8.27	10.90	11.35	10.04	7.80	4.91	2.68
Periodic Abstinence	6.45	7.31	7.29	7.03	6.89	6.57	4.44

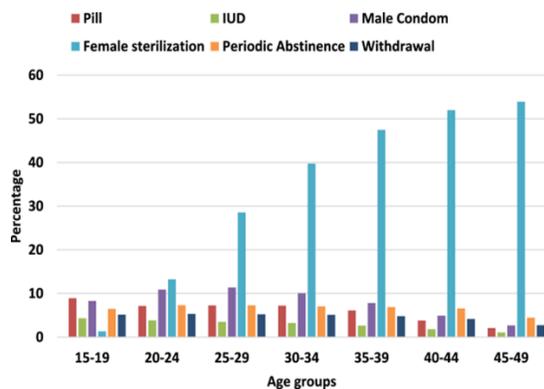


Figure 1. Depicts age-specific patterns in the use of effective contraceptive methods among currently married men and women, based on five-year age categories using Demographic and Health Survey (DHS) data from India for the period 2019–2021.

Table 2 summarizes key reproductive indicators—namely median age, average length of marital union, and mean number of children—at the time women undergo sterilization, disaggregated by five-year age groups. The analysis reveals that women typically complete sterilization before reaching 30 years of age across all reproductive stages. As age advances, both the duration of marriage and the average number of children at the time of sterilization show a consistent upward trend. This progression is consistent with expected life-course dynamics, as marital exposure and childbearing accumulate with age. These relationships are further illustrated in **Figure 2**.

Table 2. Age at sterilization and associated marital and fertility characteristics of currently married women by five-year age intervals.

Indicator	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Mean parity at sterilization	2.10	2.39	2.71	2.98	3.22	3.42	3.60
Mean marital duration at sterilization (years)	2.82	4.63	6.12	7.59	8.90	9.99	10.84
Median age at sterilization	–	–	–	25.50	26.74	27.59	28.60

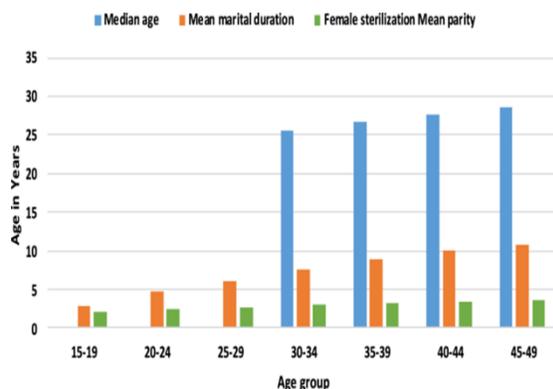


Figure 2. Presents age-specific estimates of median age, average marital duration, and mean number of children among currently married women at the time of sterilization, based on Demographic and Health Survey (DHS) data for India, 2019–2021.

Table 3 compares the prevalence of different contraceptive methods among currently married men and women across urban and rural areas. The findings indicate modest spatial differences in method preference. Use of oral contraceptive pills is marginally lower among urban couples (4.31%) than their rural counterparts

(5.54%), suggesting slightly reduced reliance on pill-based contraception in urban settings. In contrast, intrauterine device (IUD) adoption is more common in urban areas (3.03%) than in rural areas (2.31%), reflecting greater availability and acceptance of clinical contraceptive services in urban environments.

A pronounced urban–rural disparity is observed in male condom use, with urban prevalence (11.63%) nearly double that of rural areas (6.14%). This pattern may be associated with higher educational attainment, greater exposure to health information, and increased awareness regarding dual protection benefits among urban couples. Female sterilization remains the dominant contraceptive method in both settings, accounting for 41.52% of usage in urban areas and 43.56% in rural areas, indicating minimal variation by place of residence.

Traditional methods show limited spatial differentiation. Periodic abstinence is practiced at nearly identical levels in urban (6.40%) and rural (6.43%) areas, while withdrawal is slightly more common among urban couples (4.89%) compared to rural couples (4.26%), though the observed difference is relatively small. The spatial distribution of contraceptive method use is visually summarized in **Figure 3**.

Table 3. Distribution (%) of contraceptive method use among currently married men and women by place of residence.

Contraceptive Method	Rural	Urban
Male Condom	6.14	11.63
Intra-Uterine Device (IUD)	2.31	3.03
Periodic Abstinence	6.43	6.40
Withdrawal	4.26	4.89
Female Sterilization	43.56	41.52
Oral Pill	5.54	4.31

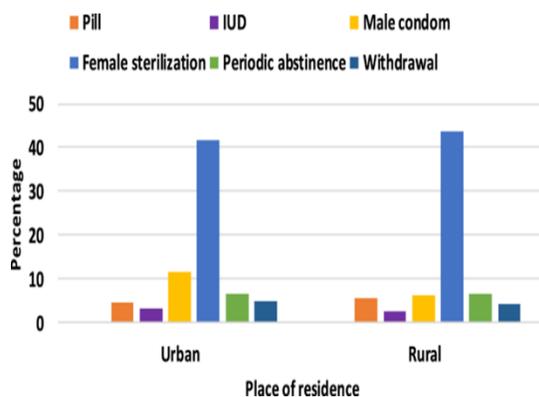


Figure 3. Illustrates the distribution of effective contraceptive method use among currently married men and women across urban and rural areas, using Demographic and Health Survey (DHS) data for India, 2019–2021.

Table 4 examines differences in the timing and reproductive characteristics associated with female sterilization by place of residence. The results show minimal variation in the median age at sterilization between urban and rural women. Urban women undergo sterilization at a median age of 26.42 years, while the corresponding figure for rural women is marginally higher at 26.67 years, indicating broadly similar age patterns across residential settings.

However, notable differences emerge in marital and fertility histories at the time of sterilization. Women residing in rural areas report a longer average duration of marriage (9.30 years) prior to sterilization compared with their urban counterparts (8.20 years). Additionally, rural women have a higher mean number of children at the time of sterilization (3.33) than urban women (2.99), suggesting that rural couples generally complete larger families before opting for a permanent contraceptive method. These contrasts highlight distinct reproductive trajectories across residential contexts. The patterns described in **Table 4** are graphically summarized in **Figure 4**.

Table 4. Median age at sterilization, average marital duration, and mean parity of currently married women by place of residence.

Indicator	Rural	Urban
Mean marital duration at sterilization (years)	9.30	8.20
Mean parity at sterilization	3.33	2.99
Median age at sterilization	26.67	26.42

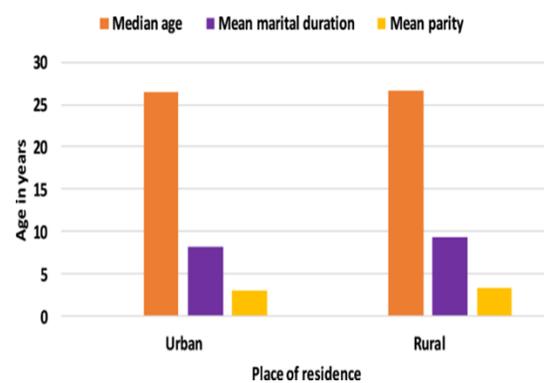


Figure 4. Summarizes residential contrasts in the reproductive profile of women undergoing permanent contraception, highlighting differences in age at sterilization, length of marital exposure, and cumulative fertility among currently married women using DHS India 2019–2021 data.

Educational attainment plays a decisive role in shaping contraceptive behavior, as evidenced in **Table 5**, which details the prevalence of selected contraceptive methods across schooling categories. The analysis covers modern reversible methods (oral pills, IUDs, condoms), permanent contraception (female sterilization), and traditional practices (periodic abstinence and withdrawal).

The use of oral contraceptive pills demonstrates a modest rise with increasing education up to the secondary level, followed by a decline among women with advanced education. Specifically, pill adoption is least common among women without schooling (3.99%), increases among those with primary (5.98%) and secondary education (6.48%), and drops among women with higher education (4.28%). Uptake of IUDs shows a clearer educational gradient, expanding steadily from minimal use among women with no education (1.27%) to progressively higher levels among women with primary (2.23%), secondary (3.50%), and higher education (4.28%).

A pronounced shift toward male-controlled contraception is evident with rising education. Condom use remains limited among couples lacking formal education (4.31%) but increases incrementally with schooling—5.62% among those with primary education and 9.05% among those with secondary education—before rising sharply among highly educated couples (19.84%). In contrast, dependence on female sterilization declines systematically as education increases. Nearly one in two women without schooling rely on sterilization (48.85%), whereas the proportion falls to 46.43% among women with primary education, 38.73% among those with secondary education, and just 25.65% among women with higher education.

Traditional contraceptive practices exhibit comparatively weak educational differentiation. Periodic abstinence remains stable across schooling levels, fluctuating within a narrow range of 5.72% to 7.29%. Withdrawal is slightly more prevalent among women with higher education (5.64%) and secondary education (5.13%) compared with women who have primary education (4.31%) or no

education (3.52%). These contrasting patterns are illustrated in **Figure 5**.

Table 5. Educational gradients in contraceptive method choice among currently married men and women in India.

Contraceptive Method	No Education	Higher	Secondary	Primary
Intra-Uterine Device (IUD)	1.27	4.28	3.50	2.23
Male Condom	4.31	19.84	9.05	5.62
Female Sterilization	48.85	25.65	38.73	46.43
Periodic Abstinence	6.75	7.29	6.24	5.72
Withdrawal	3.52	5.64	5.13	4.31
Oral Pill	3.99	4.28	6.48	5.98

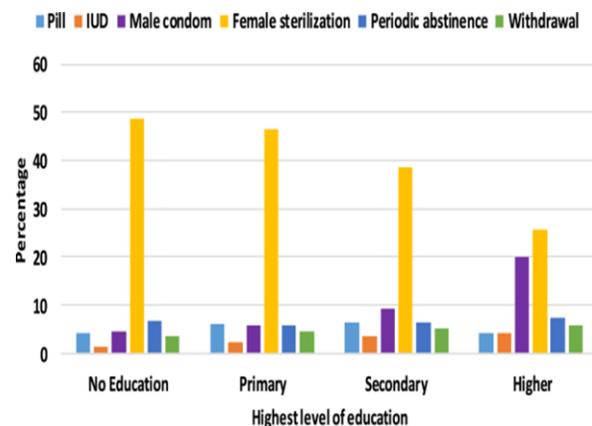


Figure 5. Illustrates variations in the use of effective contraceptive methods among currently married men and women according to educational attainment, using Demographic and Health Survey (DHS) data for India, 2019–2021.

Table 6 examines how educational level is associated with the timing of female sterilization and related reproductive characteristics among currently married women. Specifically, the table reports median age at sterilization, average duration of marriage, and mean number of children at the time the procedure is undertaken.

The findings indicate that the median age at sterilization shows little variation across educational categories, suggesting that women with no formal education and those with higher education tend to undergo sterilization

at broadly similar ages. In contrast, the duration of marital life prior to sterilization differs systematically by education. Average marital duration at sterilization tends to increase as educational attainment rises, indicating an inverse relationship between education and the speed with which women adopt permanent contraception. Women with higher education appear to delay sterilization despite achieving their desired family size later, likely reflecting greater autonomy, awareness of contraceptive alternatives, and capacity to manage fertility through non-permanent methods.

Educational differences are most pronounced with respect to fertility outcomes at sterilization. Mean parity declines steadily with increasing education, highlighting a clear fertility gradient. Women with no education report the highest average number of live births at sterilization (3.67), followed by women with primary education (3.27) and secondary education (2.81), while women with higher education record the lowest mean parity (2.33). This pattern suggests that educational advancement facilitates smaller completed family sizes, potentially through improved access to information, greater reproductive agency, and more effective use of suitable contraceptive methods prior to opting for sterilization.

Table 6. Educational differentials in age at sterilization, marital duration, and parity among currently married women in India.

Indicator	No Education	Higher	Secondary	Primary
Mean marital duration at sterilization (years)	10.57	6.46	7.48	8.95
Mean parity at sterilization	3.67	2.33	2.81	3.27
Median age at sterilization	27.39	27.93	25.77	26.05

Its graphical presentation is shown in **Figure 6**.

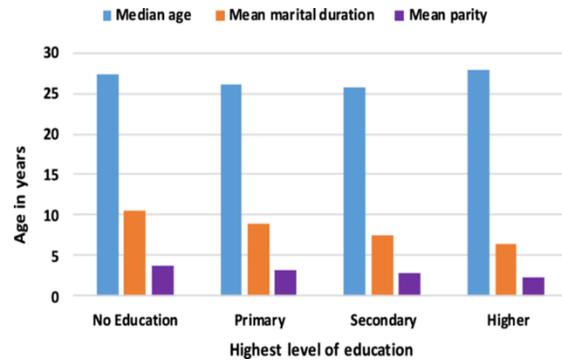


Figure 6. Displays educational variations in age at sterilization, duration of marriage, and cumulative fertility among currently married women, using data from the Demographic and Health Survey (DHS), India, 2019–2021.

Economic position also shapes contraceptive behavior in distinct ways. **Table 7** reports the distribution of effective contraceptive methods among currently married men and women across five wealth quintiles—poorest, poorer, middle, richer, and richest—revealing clear wealth-related patterns in method selection.

Reliance on oral contraceptive pills shows a declining trend with rising economic status. Pill use is most common among women in the poorest category (6.69%) and decreases steadily across successive wealth groups, reaching its lowest level among the richest. This inverse relationship suggests that households with fewer economic resources may favor pills because they are low-cost, familiar, and often distributed through public health channels, whereas wealthier couples may shift toward alternative methods.

In contrast, the prevalence of intrauterine device (IUD) use shows only modest variation across wealth strata, with a slight upward movement from the poorest to the richest groups. This relative stability may reflect the widespread availability of IUD services through government health facilities, reducing economic barriers to access across income levels.

Male condom use exhibits the strongest wealth gradient. Usage rises sharply with increasing wealth, from just 3.77% among the poorest couples to 16.66% among the richest. This pattern likely reflects differences in education, exposure to family planning information, and access to private healthcare and retail outlets, all of which tend to improve with economic status.

Patterns of female sterilization differ from those of reversible methods. Sterilization is most prevalent among couples in the middle wealth category (48.16%) and

declines slightly among richer and richest households. Lower prevalence is observed among the poorest (38.08%) and poorer (43.14%) groups. These differences may indicate that permanent contraception is more commonly adopted once couples reach their preferred family size and have sufficient access to health services required for surgical procedures.

Traditional methods display minimal sensitivity to economic variation. The practice of periodic abstinence

remains relatively uniform across all wealth quintiles, likely because it relies primarily on knowledge of fertility cycles rather than financial resources. Similarly, withdrawal shows little fluctuation by wealth status, as it requires no monetary investment and can be practiced regardless of economic standing. The wealth-based distribution of contraceptive methods is illustrated in **Figure 7**.

Table 7. Wealth-wise distribution (%) of effective contraceptive methods among currently married men and women in India.

Contraceptive Method	Poorer	Middle	Poorest	Richest	Richer
Intra-Uterine Device (IUD)	2.38	2.31	2.16	3.26	2.60
Male Condom	5.28	6.43	3.77	16.66	9.05
Female Sterilization	43.14	48.16	38.08	39.56	47.46
Periodic Abstinence	6.43	5.49	7.43	7.10	5.51
Withdrawal	4.52	4.05	4.75	4.61	3.94
Oral Pill	6.34	4.84	6.69	3.00	4.03

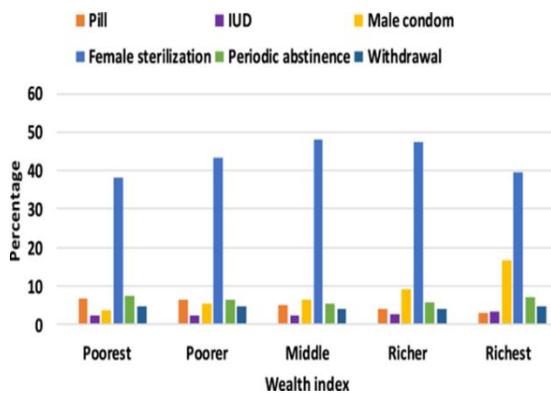


Figure 7 Shows wealth-based differences in the adoption of effective contraceptive methods among currently married men and women in India, using Demographic and Health Survey (DHS) data for 2019–2021.

Economic status is further examined in **Table 8**, which outlines variations in the timing and fertility context of female sterilization across wealth quintiles. The indicators considered include median age at sterilization, average length of marriage at the time of the procedure, and mean number of live births.

Across wealth categories, the median age at sterilization remains broadly stable, indicating limited variation in the age at which women opt for permanent contraception. However, the highest median age is observed among women in the poorest wealth group (27.81 years), after which the age declines gradually across the poorer,

middle, and richer categories. This pattern suggests that economically disadvantaged women may postpone sterilization, potentially due to continued childbearing associated with restricted access to contraceptive services and family planning information. In contrast, women in higher wealth groups are more likely to undergo sterilization earlier once their desired family size is achieved, reflecting improved access to healthcare infrastructure and reproductive health knowledge.

A similar gradient is evident with respect to marital duration. The average length of marriage at sterilization decreases consistently with rising wealth, demonstrating a negative association between economic status and marital exposure prior to sterilization. Longer marital durations among poorer women may indicate delayed access to permanent contraceptive services, whereas women from wealthier households may exercise greater control over reproductive timing and planning.

Fertility levels at sterilization also vary markedly by wealth. Mean parity is highest among women in the poorest category (3.72 live births) and declines steadily with increasing wealth. This suggests that economic advantage is associated with smaller completed family sizes, likely due to better education, heightened awareness of family planning options, and greater utilization of effective contraceptive methods before sterilization. These wealth-related differentials are visually summarized in **Figure 8**.

Table 8. Wealth-based differentials in median age at sterilization, marital duration, and parity among currently married women in India.

Indicator	Poorer	Poorest	Middle	Richest	Richer
Mean parity at sterilization	3.42	3.72	3.13	2.78	2.97
Mean marital duration at sterilization (years)	9.55	10.75	8.50	7.84	7.99
Median age at sterilization	26.75	27.81	25.94	26.64	25.88

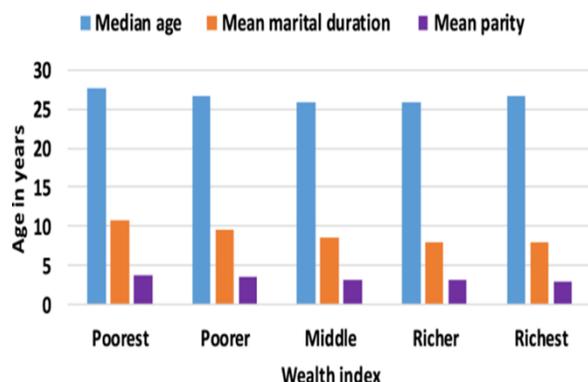


Figure 8. Presents graphical trends in median age, mean marital duration, and mean parity at the time of female sterilization across wealth index categories, based on DHS 2019–2021 data.

Religious affiliation also emerges as an important dimension of contraceptive behavior. **Table 9** reports the percentage distribution of effective contraceptive methods among currently married men and women across major religious groups.

Use of oral contraceptive pills differs substantially across religious communities. The highest levels are observed among Buddhists/Neo-Buddhists (13.01%) and Christians (7.60%), followed by Muslims (10.66%). In contrast, pill use is comparatively low among Sikhs (2.09%) and Hindus (4.07%). These differences may reflect variation in religious norms, cultural attitudes toward fertility regulation, and differential exposure to family planning information and services.

Adoption of intrauterine devices (IUDs) also varies by religion. Christians report the highest prevalence (7.93%), followed by Sikhs (3.12%), Muslims (2.47%),

and Hindus (1.83%). Such disparities may be shaped by community-level acceptance of clinical contraceptive methods, regional availability of services, and culturally mediated perceptions of method safety and suitability.

Patterns of male condom use show pronounced religious contrasts. Usage is highest among Sikhs (17.68%), followed by Muslims (9.65%) and Hindus (7.19%), while Buddhists/Neo-Buddhists (5.47%) and Christians (2.52%) report lower levels. These variations may be influenced by differing norms related to male involvement in contraception, perceptions of modern methods, and access to retail or health-sector distribution channels.

Female sterilization remains the dominant method among several religious groups but with considerable variation. The highest prevalence is recorded among Hindus (49.14%), followed by Sikhs (35.23%). Lower levels are observed among Buddhists/Neo-Buddhists (33.87%), Muslims (23.74%), and Christians (22.22%). These differences likely stem from religious teachings, cultural acceptance of permanent contraception, and variation in access to sterilization services.

Traditional methods such as periodic abstinence and withdrawal also exhibit religious differentiation. Practices related to fertility awareness may be shaped by religious doctrines and cultural norms governing sexual behavior and family planning. Similarly, reliance on withdrawal varies across religious groups, reflecting differences in attitudes toward modern contraception, knowledge dissemination, and method accessibility. These religious patterns in contraceptive use are illustrated in **Figure 9**.

Table 9. Distribution (%) of effective contraceptive methods among currently married men and women by religion.

Contraceptive Method	Hindu	Muslim	Christian	Sikh	Buddhist/Neo-Buddhist
Oral Pill	4.07	10.66	7.60	2.09	13.01
Intra-Uterine Device (IUD)	1.83	2.47	7.93	3.12	5.01
Male Condom	7.19	9.65	2.52	17.68	5.47
Female Sterilization	49.14	23.74	22.22	35.23	33.87
Periodic Abstinence	6.46	7.89	3.58	9.63	1.57
Withdrawal	3.75	6.02	7.58	4.06	5.93

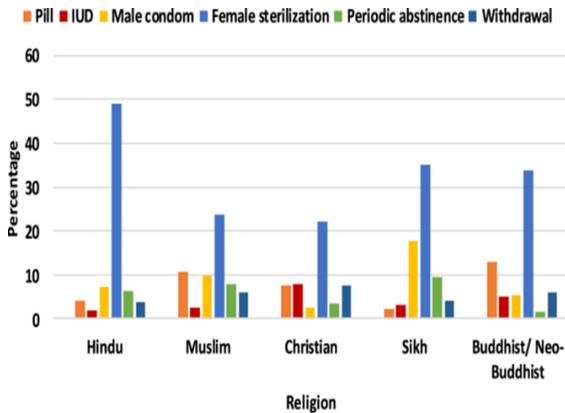


Figure 9. Illustrates differences in the prevalence of effective contraceptive methods among currently married men and women across major religious groups in India, using Demographic and Health Survey (DHS) data for the period 2019–2021.

Religious affiliation is further examined in **Table 10**, which documents variations in the timing of female sterilization and associated marital and fertility characteristics. Specifically, the table reports median age at sterilization, average length of marriage at the time of the procedure, and mean number of live births, disaggregated by religion.

Substantial inter-religious variation is observed in the age at which women opt for sterilization. The highest median age is recorded among Christian women (28.50 years), followed by Muslim women (27.50 years) and Sikh women (26.96 years). Hindu women (26.44 years) and

Buddhists/Neo-Buddhists (26.85 years) exhibit relatively similar median ages, positioned between the higher and lower ends of the distribution. These differences likely reflect religion-specific norms related to reproductive timing, acceptance of permanent contraception, and differential access to family planning services.

Patterns of marital exposure prior to sterilization also differ across religious communities. The longest average marital duration at sterilization is observed among Muslim women (9.62 years), followed by Christians (9.10 years) and Hindus (9.03 years). Shorter marital durations are recorded among Buddhists/Neo-Buddhists (8.51 years) and Sikhs (8.29 years). Such variation suggests that the decision to adopt permanent contraception occurs at different points within the marital life course across religious groups, potentially shaped by community norms, contraceptive availability, and reproductive expectations.

Fertility levels at the time of sterilization further highlight religious differentials. Muslim women report the highest mean parity (3.45 live births), closely followed by Christian women (3.39). Hindu women average 3.24 live births at sterilization, while lower parity levels are observed among Sikh (3.08) and Buddhist/Neo-Buddhist women (3.04). These differences may be associated with culturally embedded preferences regarding ideal family size, as well as variations in contraceptive use prior to sterilization. The combined patterns of age, marital duration, and parity by religion are graphically summarized in **Figure 10**.

Table 10. Religious differentials in median age at sterilization, marital duration, and parity among currently married women in India.

Indicator	Muslim	Hindu	Sikh	Christian	Buddhist/Neo-Buddhist
Mean marital duration at sterilization (years)	9.62	9.03	8.29	9.10	8.51
Mean parity at sterilization	3.45	3.24	3.08	3.39	3.04
Median age at sterilization	27.50	26.44	26.96	28.50	26.85

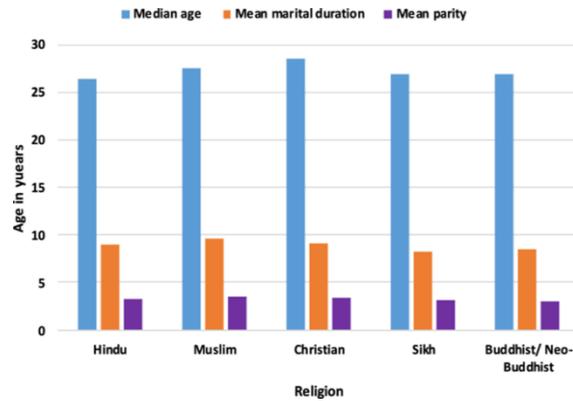


Figure 10. Presents religious differentials in the median age at sterilization, average marital duration, and mean parity among currently married women, based on DHS 2019–2021 data for India.

Caste-based variation in contraceptive behavior is summarized in **Table 11**, which reports the distribution of effective contraceptive methods among currently married men and women across Scheduled Castes, Scheduled Tribes, Other Backward Classes (OBCs), and the General category.

Temporary modern method use exhibits noticeable caste gradients. Oral contraceptive use is most prevalent among Scheduled Tribe women (6.75%), while OBCs record the lowest uptake (3.52%), with Scheduled Castes and the General category positioned between these extremes. Such differences may reflect disparities in

educational attainment, access to reproductive health services, and exposure to family planning information.

A similar pattern of variation is evident for IUD use, although overall prevalence remains modest across all caste groups. Male condom use, however, demonstrates sharper differentiation. Couples belonging to the General category report the highest prevalence (12.11%), compared with substantially lower levels among Scheduled Castes (7.57%) and OBCs (7.43%), and the lowest level among Scheduled Tribes (3.08%). These contrasts likely correspond to differences in awareness, negotiation capacity within relationships, and accessibility of contraceptive commodities.

Female sterilization remains the dominant method across all caste categories, with relatively narrow variation. Prevalence is highest among Scheduled Castes (47.86%) and OBCs (48.09%), while lower but still substantial levels are observed among Scheduled Tribes (36.84%) and the General category (38.36%). This widespread reliance on permanent contraception suggests the continued influence of national family planning programs that promote sterilization irrespective of caste. Traditional methods display minimal caste-based differentiation. Periodic abstinence and withdrawal are used at comparable levels across groups, indicating that these practices are less sensitive to structural inequalities related to caste. The caste-wise distribution of contraceptive methods is illustrated in **Figure 11**.

Table 11. Percentage distribution of effective contraceptive methods among currently married men and women by caste.

Contraceptive Method	Scheduled Tribe	Scheduled Caste	Other Backward Classes (OBC)	General	Contraceptive Method
Intra-Uterine Device (IUD)	4.56	1.62	1.74	2.65	Intra-Uterine Device (IUD)
Male Condom	3.08	7.57	7.43	12.11	Male Condom
Female Sterilization	36.84	47.86	48.09	38.36	Female Sterilization
Periodic Abstinence	4.47	6.87	7.26	6.87	Periodic Abstinence
Withdrawal	5.71	3.42	3.52	5.66	Withdrawal
Oral Pill	6.75	3.98	3.52	5.41	Oral Pill

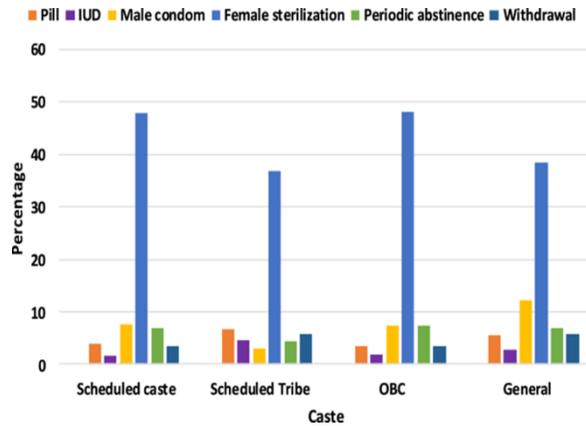


Figure 11. Illustrates caste-based patterns in the use of effective contraceptive methods among currently married men and women, drawing on DHS 2019–2021 data for India.

Table 12 examines variations in the timing and fertility context of female sterilization across caste groups by presenting median age at sterilization, mean marital duration, and average parity among currently married women.

Across caste categories, the median age at which women undergo sterilization shows only marginal variation, indicating broadly comparable timing of adoption of permanent contraception. These small differences nonetheless suggest the influence of caste-linked social

environments, including disparities in health awareness, educational exposure, and access to family planning services, which together shape reproductive decision-making.

Clearer differentiation emerges with respect to marital exposure prior to sterilization. Women belonging to Scheduled Tribes report the longest average duration of marriage at the time of sterilization (9.70 years), followed closely by Scheduled Castes (9.48 years). In contrast, women from OBCs (8.81 years) and the General category (8.52 years) tend to opt for sterilization after shorter marital spans. Longer marital duration may reflect delayed access to permanent methods or prolonged reliance on alternative contraceptive strategies.

Parity at sterilization also differs across caste groups, though within a relatively narrow range. The highest mean number of live births is observed among Scheduled Tribes (3.50) and Scheduled Castes (3.41), while lower parity levels are recorded among OBCs (3.18) and the General category (3.00). These differences likely correspond to variations in fertility preferences, socioeconomic conditions, and the availability and use of spacing methods prior to sterilization.

The combined caste-wise patterns in median age, marital duration, and parity at sterilization are summarized graphically in **Figure 12**.

Table 12. Median age at sterilization, mean marital duration, and mean parity among currently married women by caste.

Indicator	Scheduled Tribe	Scheduled Caste	Other Backward Classes (OBC)	General	Indicator
Mean marital duration at sterilization (years)	9.70	9.48	8.81	8.52	Mean marital duration at sterilization (years)
Mean parity at sterilization	3.50	3.41	3.18	3.00	Mean parity at sterilization
Median age at sterilization	27.44	26.60	26.29	26.64	Median age at sterilization

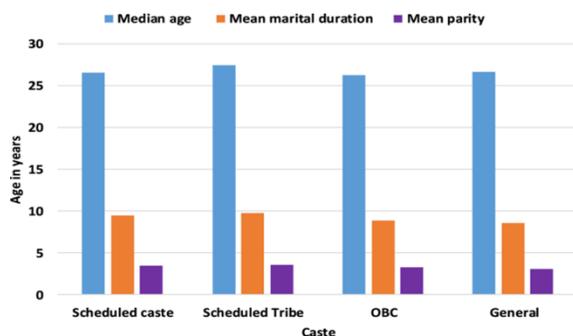


Figure 12. Presents caste-wise variations in the median age at sterilization, average duration of

marriage, and mean number of children among currently married women, based on Demographic and Health Survey (DHS) data for India, 2019–2021.

Table 13 summarizes the distribution of effective contraceptive methods among currently married men and women according to their present marital status, demonstrating substantial differences across marital categories.

Use of oral contraceptive pills shows marked variation by marital status. The highest prevalence is observed among married individuals (5.56%), whereas use declines

sharply among those who are separated or no longer living together (1.32%) and is minimal among widowed (0.35%) and divorced individuals (0.86%). This pattern indicates that pill use is primarily associated with active marital unions, while individuals outside such unions report limited reliance on this method.

A similar marital-status gradient is evident for IUD use. Adoption is most common among married individuals (2.59%) and considerably lower among widowed (0.31%) and divorced groups (0.69%). This suggests that long-acting reversible methods are predominantly utilized by couples in stable relationships, whereas individuals who are widowed, divorced, or separated may face reduced need or access to such options.

Male condom use is also concentrated among married respondents, with a prevalence of 7.73%. In contrast, usage remains very low among widowed (0.32%), divorced (0.58%), and separated individuals (0.87%). This distribution reflects the close association between condom use and ongoing partnerships.

Patterns differ somewhat for permanent methods. Female sterilization is highly prevalent among both married

(43.17%) and widowed women (45.69%), indicating that sterilization decisions are often made during marriage and persist regardless of subsequent changes in marital status. Significantly lower proportions are observed among divorced women (18.50%) and those living separately (32.55%), possibly reflecting disrupted reproductive trajectories or differing family completion outcomes.

Traditional contraceptive practices also vary by marital status. Periodic abstinence is reported most frequently among married individuals (6.78%) but is rare among widowed (0.48%), divorced (0.34%), and separated respondents (0.56%). Likewise, withdrawal is most commonly practiced within marriage (4.72%) and remains infrequent among widowed (0.25%), divorced (0.65%), and separated groups (0.92%). These trends underscore the reliance of traditional methods on sustained partner interaction. The marital-status differentials in contraceptive use are illustrated graphically in **Figure 13**.

Table 13. Percentage of currently married men and women using effective contraceptive methods by current marital status

Contraceptive Method	Widowed	Married	Divorced	No longer living together/Separated	Contraceptive Method
Intra-Uterine Device (IUD)	0.31	2.59	0.69	1.05	Intra-Uterine Device (IUD)
Male Condom	0.32	7.73	0.58	0.87	Male Condom
Female Sterilization	45.69	43.17	18.50	32.55	Female Sterilization
Periodic Abstinence	0.48	6.78	0.34	0.56	Periodic Abstinence
Withdrawal	0.25	4.72	0.65	0.92	Withdrawal
Oral Pill	0.35	5.56	0.86	1.32	Oral Pill

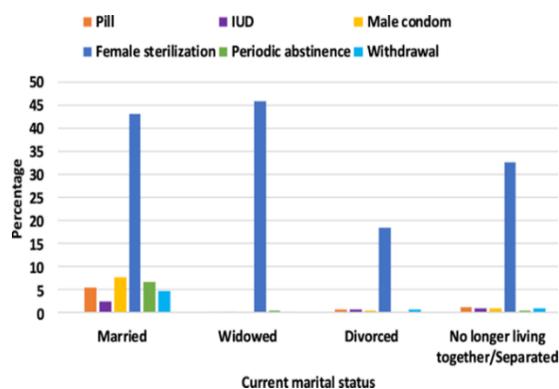


Figure 13. Illustrates variations in the adoption of effective contraceptive methods among currently married men and women across different marital

status categories, using data from the Demographic and Health Survey (DHS), India, 2019–2021.

Table 14 summarizes key reproductive indicators—namely the median age at sterilization, average duration of marriage, and mean number of live births—among currently married women, classified by their present marital status. The findings reveal clear distinctions that correspond to differences in marital trajectories and reproductive life courses.

The timing of female sterilization, as reflected by the median age, is not uniform across marital categories. These differences indicate that decisions regarding permanent contraception are closely linked to marital

circumstances and evolving household structures. Women who remain married often postpone sterilization until their reproductive goals are fully realized, whereas those who are divorced or separated may reach this decision earlier due to altered family planning priorities. Substantial variation is also evident in the length of marriage prior to sterilization. Married and widowed women report the longest average marital exposure before undergoing sterilization, with mean durations of 9.08 and 9.15 years, respectively. In contrast, women who are divorced (7.69 years) or living separately from their spouses (7.54 years) exhibit shorter marital durations, suggesting earlier transitions into sterilization relative to marriage length.

Patterns in childbearing further reinforce these distinctions. The average number of children at the time

of sterilization is highest among married and widowed women, exceeding three live births on average. Conversely, divorced and separated women record lower mean parity, indicating that sterilization in these groups often occurs after fewer births. This divergence highlights the influence of marital continuity on cumulative fertility prior to opting for permanent contraception.

The combined differences in age, marital duration, and parity at sterilization underscore the role of marital stability and disruption in shaping reproductive behavior. These relationships are visually presented in **Figure 14**, which depicts the distribution of these indicators across marital status categories.

Table 14. Median age at sterilization, mean marital duration, and mean parity of currently married women by current marital status

Indicator	Married	Widowed	Divorced	No longer living together/Separated	Indicator
Median age at sterilization	26.65	26.03	24.78	24.96	Median age at sterilization
Mean marital duration at sterilization (years)	9.08	9.15	7.69	7.54	Mean marital duration at sterilization (years)
Mean parity at sterilization	3.26	3.29	2.70	2.85	Mean parity at sterilization

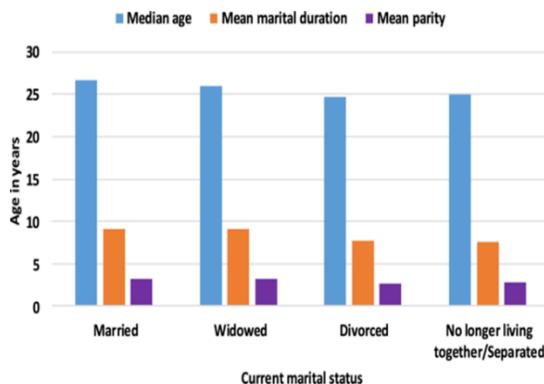


Figure 14. Illustrates differences in median age at sterilization, average marital duration, and mean parity among currently married women according to their present marital status, based on Demographic and Health Survey (DHS) data for India, 2019–2021.

Table 15 reports occupational differentials in the use of effective contraceptive methods among currently married men and women. The findings indicate that contraceptive behavior varies noticeably across occupational groups, reflecting disparities in socio-economic conditions, educational exposure, and access to reproductive health services.

Use of oral contraceptive pills shows only marginal variation by occupation; however, the lowest prevalence is observed among individuals employed in professional, technical, and managerial positions. In contrast, relatively higher use is recorded among women who are not engaged in paid employment. These patterns may reflect differences in reproductive intentions, autonomy in decision-making, and uneven access to healthcare facilities and family planning counseling.

Occupational contrasts are more evident in the adoption of intrauterine devices (IUDs). Uptake is highest among those working in professional, technical, managerial, and clerical roles (approximately 3.5%), while substantially lower levels are reported among individuals engaged in skilled or unskilled manual labor and other occupational categories. Greater awareness of long-acting reversible contraception and improved interaction with healthcare systems among white-collar workers may contribute to this disparity.

Male condom use displays a pronounced occupational gradient. Prevalence is greatest among professionals, technicians, and managers (13.78%), followed by those not currently working (9.04%) and clerical workers (7.83%). Conversely, individuals employed in

agriculture (3.36%) and other informal occupations report considerably lower usage. These differences may be linked to variations in health literacy, exposure to safe-sex messaging, and availability of condoms across occupational settings.

Female sterilization emerges as the dominant method among agricultural workers (56.25%) and those involved in skilled and unskilled manual labor (49.70%). In contrast, reliance on sterilization is notably lower among individuals in professional, technical, and managerial occupations (37.83%), suggesting a preference for delayed or reversible methods among groups with greater educational attainment and occupational stability.

Sterilization in these contexts typically reflects the completion of desired family size.

Traditional methods, including periodic abstinence and withdrawal, remain comparatively infrequent across all occupational groups. Periodic abstinence, which requires accurate knowledge of fertility cycles, shows limited adoption, possibly due to its complexity. Withdrawal varies modestly by occupation and appears more common among groups with greater access to reproductive health information, given its reliance on partner communication and cooperation.

The occupational distribution of contraceptive methods is visually summarized in **Figure 15**.

Table 15. Percentage of currently married men and women using effective contraceptive methods by occupation

Contraceptive method	Not employed	Clerical staff	Professional / technical / managerial	Sales workers	Service & domestic workers	Agricultural workers	Skilled & unskilled manual workers	Other occupations	Contraceptive method
Intrauterine device (IUD)	2.66	3.48	3.46	3.29	2.52	2.33	1.95	2.57	Intrauterine device (IUD)
Male condom	9.04	7.83	13.78	6.71	6.66	3.36	6.89	6.66	Male condom
Female sterilization	38.13	45.80	37.83	42.23	47.03	56.25	49.70	39.43	Female sterilization
Periodic abstinence	7.24	3.33	5.31	5.45	4.70	1.00	6.00	4.19	Periodic abstinence
Withdrawal method	4.98	2.75	4.98	4.25	5.00	4.80	4.64	3.41	Withdrawal method
Oral pill	5.98	4.64	3.65	5.90	5.45	3.76	4.42	5.64	Oral pill

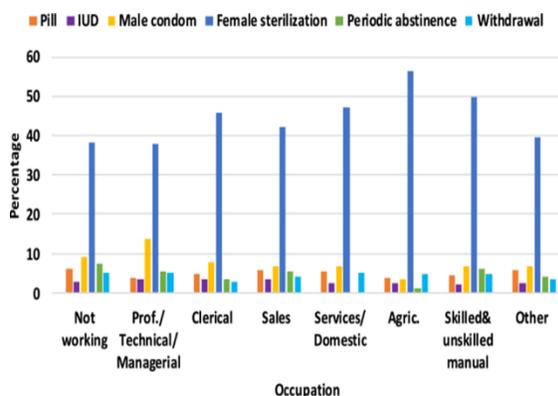


Figure 15. Presents occupational differences in the use of effective contraceptive methods among currently married men and women in India, based on DHS 2019–2021 data.

Table 16 focuses on women who have undergone sterilization and compares three key characteristics—age at sterilization, length of marriage, and number of children—across occupational groups. The timing of

sterilization, measured by median age, varies modestly by occupation. Higher median ages suggest postponement of sterilization until later stages of the reproductive life course, while lower values reflect earlier adoption of the method. Overall, variation in median age is limited across most occupational categories. Non-working women appear more likely to delay sterilization until family-building goals are met, whereas women in professional, technical, and managerial employment may opt for sterilization earlier, possibly reflecting work-related constraints and greater control over reproductive choices.

Differences become more pronounced when marital duration is considered. The average length of marriage at sterilization is shortest among women in professional, technical, and managerial occupations (7.56 years), indicating earlier completion of childbearing within marriage. In contrast, women engaged in agricultural work experience sterilization after a longer marital span

(9.40 years), pointing to extended periods of fertility and family expansion before adopting a permanent method. Occupational contrasts are also evident in parity levels at the time of sterilization. Women in technical and managerial positions report the smallest family size (mean parity of 2.70), consistent with planned and

smaller families. Agricultural workers, by comparison, reach sterilization after having more children on average (mean parity of 3.39), reflecting differing reproductive norms and economic contexts. These relationships are visually summarized in **Figure 16**.

Table 16. Occupational patterns in age, marital duration, and parity among currently married women at the time of sterilization.

Indicator at sterilization	Not employed	Clerical workers	Professional / technical / managerial	Sales workers	Service & domestic workers	Agricultural workers	Skilled & unskilled workers	Other occupations	Indicator at sterilization
Mean duration of marriage (years)	9.21	8.85	7.56	8.37	8.41	9.40	9.13	9.02	Mean duration of marriage (years)
Mean parity (number of children)	3.26	3.01	2.70	3.14	3.14	3.39	3.29	3.31	Mean parity (number of children)
Median age (years)	26.90	27.14	27.23	26.71	26.19	26.40	26.57	26.56	Median age (years)

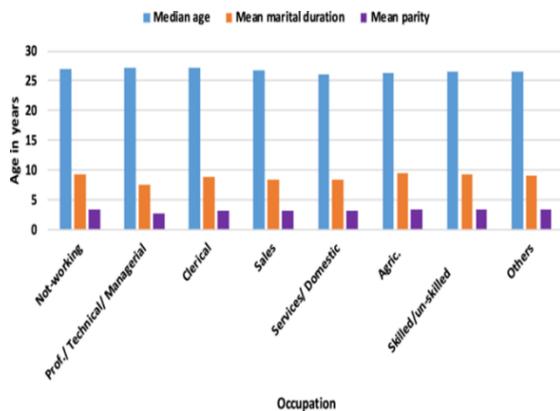


Figure 16. Illustrates occupational differences in the median age, average marital duration, and mean parity of currently married women at the time of sterilization, based on data from the Demographic and Health Survey (DHS), India, 2019–2021.

Conclusion

India, a country with a long historical legacy and wide socio-cultural diversity, continues to face the challenge of rapid population growth. Addressing this issue requires effective and accessible contraceptive strategies that enhance reproductive autonomy and expand family planning services. Contraceptive methods are broadly classified into reversible and permanent options, each offering distinct advantages and constraints. Among permanent methods, male vasectomy and female

tubectomy remain key solutions for couples who have completed their desired family size.

This study examines socio-demographic variations in the use of effective contraceptive methods and sterilization among currently married men and women in India. Using DHS data for 2019–2021, the analysis considers differences across age groups, place of residence, educational attainment, wealth status, religion, caste, marital status, and occupation (DHS, 2019–2021).

Findings indicate that the use of effective contraceptive methods among currently married women declines with advancing age, whereas reliance on female sterilization increases and reaches its highest levels before the age of 30. A substantial proportion of sterilizations occur before women complete their full reproductive span, shaped by factors such as educational exposure, access to mass media, and availability of reproductive health information. Both mean marital duration and parity at the time of sterilization rise with age, while the median age at sterilization remains below 30 years across all demographic categories.

Female sterilization emerges as the dominant contraceptive method in both urban and rural settings, although male condom use ranks second in urban areas. Urban residents demonstrate relatively higher uptake of reversible methods such as IUDs, whereas rural women tend to undergo sterilization after longer marital

durations and with higher parity, reflecting delayed family limitation practices.

Educational attainment plays a significant role in contraceptive choice. Women with higher education levels show greater reliance on male condoms (19.84%) and reversible methods such as IUDs (4.28%) and periodic abstinence (7.29%), while women with no formal education predominantly depend on female sterilization. Higher education is also associated with sterilization occurring at later ages, shorter marital durations, and fewer children, indicating more deliberate reproductive planning.

Economic status further differentiates contraceptive behavior. Couples belonging to wealthier households exhibit higher usage of male condoms (16.66%) and IUDs (3.26%), whereas sterilization remains more common among economically disadvantaged groups. Women from wealthier backgrounds tend to undergo sterilization earlier in life, after shorter marital durations and with lower parity, likely reflecting improved access to healthcare services and family planning information.

Religious affiliation also influences contraceptive preferences. Christians demonstrate relatively higher usage of IUDs (7.93%) and withdrawal (7.58%), while Sikh couples report the highest prevalence of male condom use (17.68%). Female sterilization is most prevalent among Hindus (50%) and Buddhists/Neo-Buddhists (33.87%). Lower adoption of sterilization among Muslims and Sikhs suggests the role of religious beliefs and norms in shaping contraceptive decisions.

Caste-based variations are evident as well. Couples from the General caste show a stronger preference for male condoms (12.11%), whereas female sterilization predominates among Scheduled Castes (47.86%) and Other Backward Classes (48.09%). Scheduled Tribe populations display comparatively higher use of IUDs (4.56%) and withdrawal (5.71%). General caste women tend to experience sterilization at younger ages, with shorter marital durations and lower parity, possibly due to better awareness and healthcare accessibility.

Marital status also affects contraceptive use patterns. Married women exhibit higher usage of methods such as pills (5.56%) and male condoms (7.73%), while sterilization is most common among widowed women (45.69%), reflecting completed family size and altered life circumstances. Differences in age at sterilization, marital duration, and parity are closely linked to marital transitions and reproductive histories.

Occupational differences reveal additional layers of inequality in contraceptive behavior. Individuals in professional and clerical occupations demonstrate greater use of modern and reversible contraceptive methods, likely due to improved access to healthcare, higher awareness, and stable income. In contrast, women engaged in agricultural and manual labor occupations rely more heavily on permanent methods, particularly female sterilization. Occupational status also influences the timing of sterilization, marital duration, and family size at the time of the procedure, shaped by socio-economic conditions, career trajectories, and cultural expectations.

Among occupational groups, higher usage of pills (5.98%), periodic abstinence (7.24%), and withdrawal (4.98%) is observed among women who are not employed. Male condom use is highest among professional, technical, and managerial groups (13.78%) and lowest among agricultural workers (3.36%), with relatively similar levels across other occupations. This pattern may reflect differences in education, digital exposure, health awareness, and access to information through social media platforms such as WhatsApp, Instagram, and Facebook. Female sterilization is most prevalent among agricultural workers (56.25%), followed by skilled and unskilled manual workers (49.70%), service and domestic workers (47.03%), clerical employees (45.80%), and sales workers (42.23%). Women in professional, technical, and managerial occupations exhibit shorter marital durations and lower parity at sterilization, although their median age at sterilization does not differ markedly from other groups. These trends likely stem from higher education, long-term planning, and work-related commitments.

Overall, the findings underscore the urgent need to strengthen family planning initiatives to address India's population growth and promote sustainable development. Expanding access to affordable, reliable, and side-effect-free contraceptive options—particularly at the community level—remains critical. Increasing parental awareness of the long-term costs of childrearing, including education, healthcare, and nutrition, may further encourage informed reproductive decisions. Introducing family life education at an early age, including during primary schooling, can equip young people with essential reproductive knowledge before marriage and parenthood. Addressing misconceptions surrounding fertility, especially ovulation timing and traditional methods, is equally important to reduce

unintended pregnancies. Promoting innovative contraceptive technologies, expanding social marketing strategies, and implementing targeted awareness campaigns in both rural and urban areas can enhance informed contraceptive use. Such efforts would also help normalize male and female sterilization as shared responsibilities, ultimately contributing to national development and gender empowerment.

Limitations of the results

Although the findings are robust within the socio-demographic and cultural context of India, their applicability to other countries may be limited. Nations with different economic structures, healthcare systems, and cultural norms may exhibit distinct contraceptive patterns. Developed countries, for instance, often provide broader access to reversible contraceptive methods, resulting in lower sterilization rates among younger women. In less developed regions, limited healthcare infrastructure, economic constraints, and cultural preferences may shape alternative sterilization behaviors. Socio-economic conditions may exert stronger influences on contraceptive decision-making in such settings. Consequently, caution is warranted when generalizing these results beyond India, as differing social norms and health systems may lead to substantially different outcomes.

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