



Prevalence and Factors Associated with Primary and Secondary Infertility Among Currently Married Women in India: A Secondary Analysis of National Family Health Survey-5 Data

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Abstract

Background: Infertility is a reproductive health issue that affects people worldwide. Despite its psychosocial and public health implications, population-level evidence on primary and secondary infertility remains limited. The purpose of study was to estimate the prevalence and determinants of primary and secondary infertility among married women of reproductive age in India using National Family Health Survey-5 (NFHS-5) data.

Methods: A cross-sectional secondary data analysis of NFHS-5 (2019-2021) was conducted among 512,408 currently married women aged 15-49 years. Descriptive analysis was used to estimate prevalence of primary and secondary infertility. Chi-square test and multivariable logistic regression analysis were performed to identify factors associated with infertility.

Results: The prevalence of primary infertility was 3.28% (95%CI:3.23-3.33), while secondary infertility was 13.9% (95%CI:13.85-14.05), indicating a higher burden of secondary infertility. Considerable state-wise variation was observed. Higher prevalence of primary infertility was reported in Karnataka, Telangana, Lakshadweep, and Goa, whereas secondary infertility was highest in Mizoram, Meghalaya, and Ladakh. Urban residence, smoking, overweight/obesity, thyroid disorders, and diabetes were significantly associated with both primary and secondary infertility. Delayed age at first marriage was positively associated with primary infertility, whereas increasing age was strongly associated with secondary infertility. Educational attainment and wealth index demonstrated varying associations across infertility types.

Conclusion: Infertility affects a considerable proportion of married women in India, with secondary infertility contributing the larger share of the burden. The substantial regional and socio-demographic disparities observed highlight the need to integrate infertility prevention, surveillance, and equitable access to fertility care within reproductive health programs in India.

Keywords: Infertility, Prevalence, Primary infertility, Reproduction, Secondary infertility, Women.

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Introduction

Infertility is increasingly recognized as a significant public health concern, affecting approximately one in six couples worldwide

and contributing to substantial emotional, social, and economic consequences. According to World Health Organization (WHO), infertility is defined

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as a disease of the male or female reproductive system, identified by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse (1). It is classified into two types; primary infertility refers to the absence of any prior pregnancy, while secondary infertility denotes difficulty conceiving after one or more previous pregnancies (1).

In India, where parenthood carries strong cultural expectations, the experience of infertility can lead to strained marital relationships, psychosocial distress, and significant social stigma (2, 3). Moreover, fragmented care-seeking pathways and the high cost of treatment often lead to delays in accessing care and impose a substantial economic burden on affected couples (4, 5). Despite these implications, infertility has traditionally remained sidelined within India's reproductive health agenda, which has historically prioritized fertility reduction, population control, and contraceptive uptake. Even the national health program on maternal and child health care failed to direct the appropriate care pathway for this significantly ignored public health problem (6).

Population-based measurement of infertility is essential to accurately estimate its burden, assess geographic and demographic variations, and inform health-system planning. However, much of the evidence from India is derived from health-care-based studies, which lack an appropriate population denominator and may therefore underestimate the true burden (7). Large-scale household surveys such as the National Family Health Survey (NFHS) enable the estimation of infertility at the community level using a more representative population sample. Several studies have recently used NFHS-5 data to estimate national-level primary infertility prevalence and to explore broad socio-demographic correlates (8, 9). However, existing analyses vary in their definitions and methodologies, leading to considerable divergence in reported estimates. Moreover, most published works have focused solely on primary infertility, with limited attention to secondary infertility (10), which accounts for a substantial proportion of the burden yet remains under-reported. Against this background, a secondary analysis was conducted to estimate the prevalence of primary and secondary infertility and to describe their state-wise distribution and patterns across various socio-demographic, lifestyle, comorbidity, and contraceptive-related factors among currently married women of reproductive age.

Methods

This cross-sectional analysis was based on nationally representative data from the National Family Health Survey-5 (NFHS-5) and conducted across India in 2019-21. NFHS is a large-scale household survey, implemented periodically since 1992-93 to provide various health related indicators at the district, state, and national levels. NFHS-5 adopted a two-stage stratified sampling design and collected data from households. The dataset includes information for 724,115 women from 636,669 households, with a response rate of 96.9%. NFHS-5 also provides estimates for 34 SDG indicators, expanding its scope from 28 indicators in NFHS-4. In the present study, the individual file (women's file) of the fifth round of NFHS was used, encompassing currently married women aged 15–49 years. The final sample comprised 512,408 currently married women. The sample selection flow for defining primary and secondary infertility is presented in figure 1.

All women who had been married for more than one year were included. To approximate primary and secondary infertility, a composite measure was constructed, comprising six criteria for primary infertility and five for secondary infertility (Table 1).

Statistical analysis: NFHS-5 (2019 to 21) dataset was obtained from Demographic and Health Survey (DHS) website, after obtaining permission for data access. The individual women's file was downloaded and analyzed in SPSS (IBM, USA). Dataset was checked for duplication, missing values, and inconsistencies. Descriptive analysis was carried out using frequencies and proportions for categorical variables. The prevalence of primary and secondary infertility was expressed as a percentage of total married women with an appropriate 95% confidence interval (CI). Risk factors associated with infertility were analyzed using a logistic regression model, adjusting for state/ union territory stratification. Initially, univariate analysis was performed and unadjusted odds ratios (UORs) with 95%CI were reported. For multivariate analysis, adjusted odds ratios (AORs) were calculated for predictor variables with a $p < 0.2$ in the univariate analysis. A $p < 0.05$ was considered statistically significant in the final model.

Results

Overall and state-wise prevalence of infertility: Primary infertility: Out of 512,408 married women in India, 490,641 women were included for the

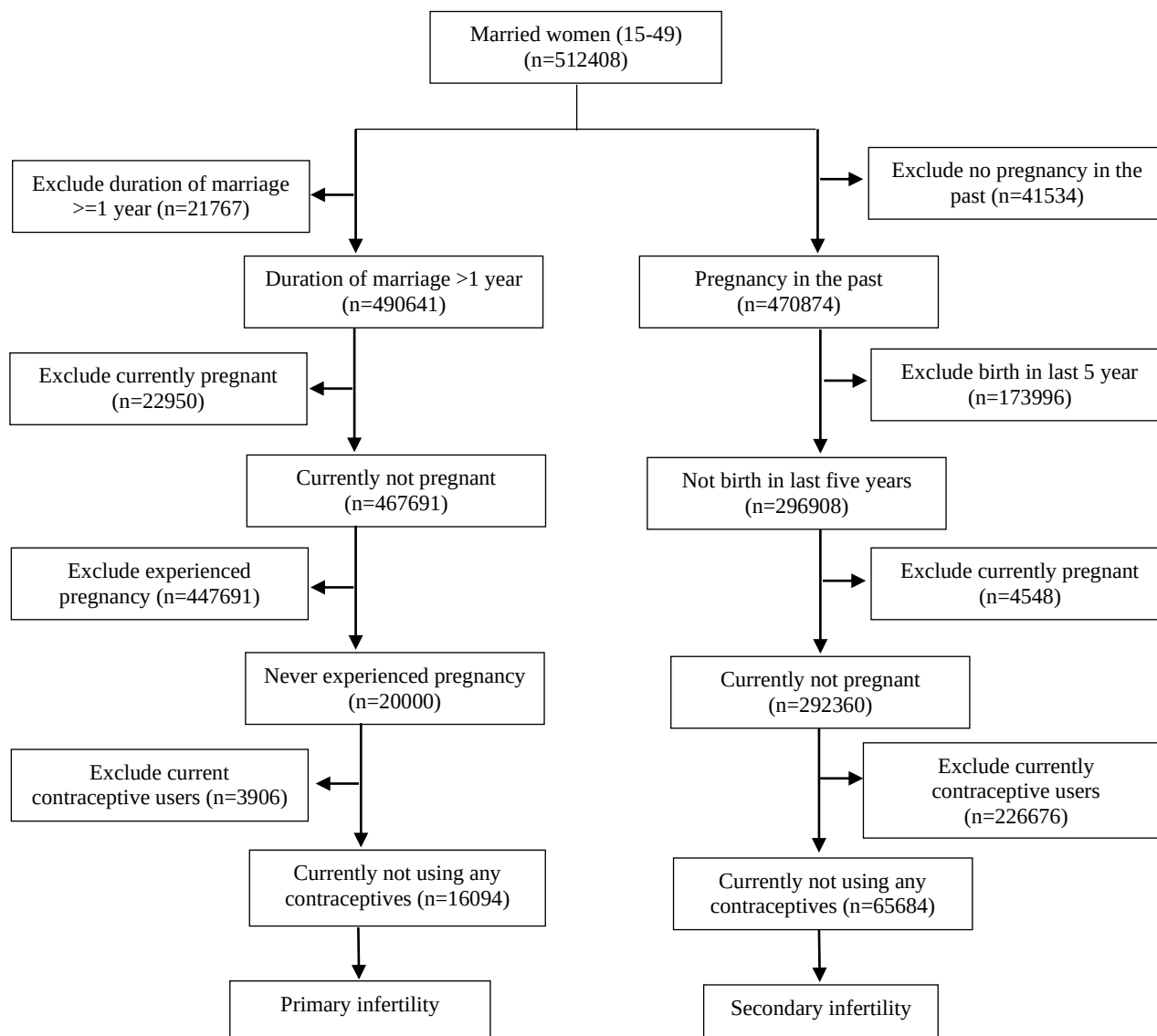


Figure 1. Sample selection flowchart for primary and secondary infertility analysis, NFHS-5, India, 2019–2021

Table 1. Criteria used for measuring primary and secondary infertility

Primary infertility (All criteria to meet)	Secondary infertility (All criteria to meet)
Currently married women	Currently married women
Women in the reproductive age group (15-49)	Women in the reproductive age group (15-49)
Married for more than one year	Women must have had a prior live birth
Currently not pregnant	No birth in the last 5 years following a previous pregnancy, including abortion, termination, or stillbirth
Previous pregnancy (excluding abortion/termination/still birth)	No contraceptive use, including modern methods (female/male sterilization, injectables, IUDs/PPIUDs, oral pills, implants, condoms, diaphragm, foam/jelly, standard days method, lactational amenorrhoea, and emergency contraception) and traditional methods (rhythm, withdrawal, and others)
No contraceptive use, including modern methods (female/male sterilization, injectables, IUDs/PPIUDs, oral pills, implants, condoms, diaphragm, foam/jelly, standard days method, lactational amenorrhoea, and emergency contraception) and traditional methods (rhythm, withdrawal, and others)	-

primary infertility, based on the criteria listed in table 1. The overall prevalence of primary infertility was 3.28% (95%CI: 3.23% to 3.33%), with the varying prevalence across states and union territories. Higher prevalence was observed in Lakshadweep (8.1%) and Goa (6.6%), followed by Andaman and Nicobar Islands (4.8%), and Chhattisgarh (4.8%) while the lowest prevalence was reported in Meghalaya (1.6%), followed by Uttarakhand (2.0%), Haryana (2.2%), Tripura (2.3%), and Arunachal Pradesh (2.4%) (Figure 2). Secondary infertility: A total of 470,874 women were analyzed for secondary infertility. The overall prevalence rate of secondary infertility was 13.9% (95%CI: 13.85% to 14.05%). Higher prevalence was recorded in Mizoram (33.9%), Meghalaya (28.10%), Ladakh (25.2%), Lakshadweep (20.8%), Assam (19.60%), Arunachal Pradesh (19.10%), and Jammu and Kashmir (17.8%) while the lowest rates were observed in Rajasthan (8.4%), Madhya Pradesh (9.4%), followed by Andhra Pradesh (9.8%), Himachal Pradesh (10%), Chandigarh, and Haryana (10.3%) (Figure 3).

Socio-demographic characteristics of currently married women associated with infertility

Primary infertility: The prevalence of primary infertility declined with an increase in age from 18.3% among women aged 15–19 years to approximately 1.8–1.9% among women aged 35 years and above. The prevalence was higher in women residing in urban areas (3.4%) compared

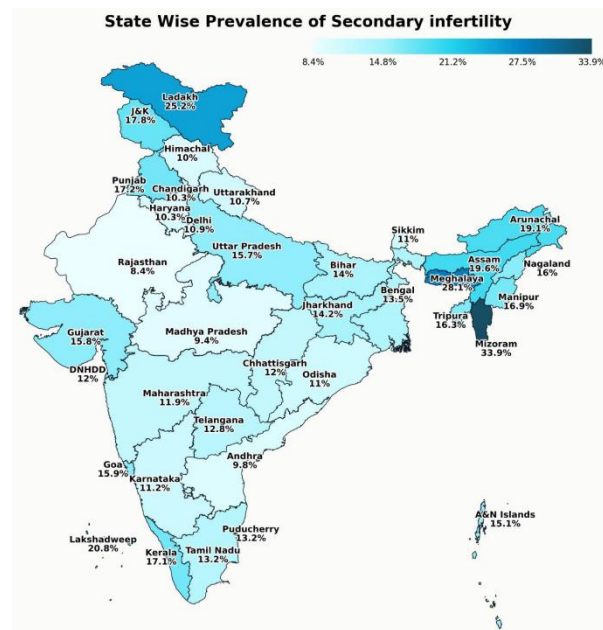


Figure 3. State-wise variation in secondary infertility prevalence in India, NFHS-5, 2019–2021

to women residing in rural areas (3.2%). Among currently married women with primary infertility, 3.3% were Hindus, 3.1% were Muslims, 3.0% were Christians, and the remainder were of other religions. In terms of caste distribution, 3.6% of women were from scheduled tribes (ST), 3.4% from scheduled castes (SC), 3.3% from other backward classes (OBC), and 2.8% belonged to other categories. Primary infertility prevalence showed no substantial variation across wealth quintiles, with rates ranging from 3.1% in the richest quintile to 3.5% in the poorest. In relation to education, primary infertility increased with higher educational attainment (5.2%), compared to no formal education (2.5%).

When considering age at first marriage, the prevalence of primary infertility increased with increasing age at first marriage. The prevalence of primary infertility was >45% among women married at age >41 years, 28% among those married between 36 and 40 years, and 2.2% among those married at <18 years of age. As the duration of marriage increased, the prevalence decreased to 1.6% among women married for more than 9 years, 3% among women married for 7 to 9 years, to 13.7% among women married for less than 3 years.

Secondary infertility: In contrast to primary infertility, the prevalence of secondary infertility increased with age, from 6.9% among women aged

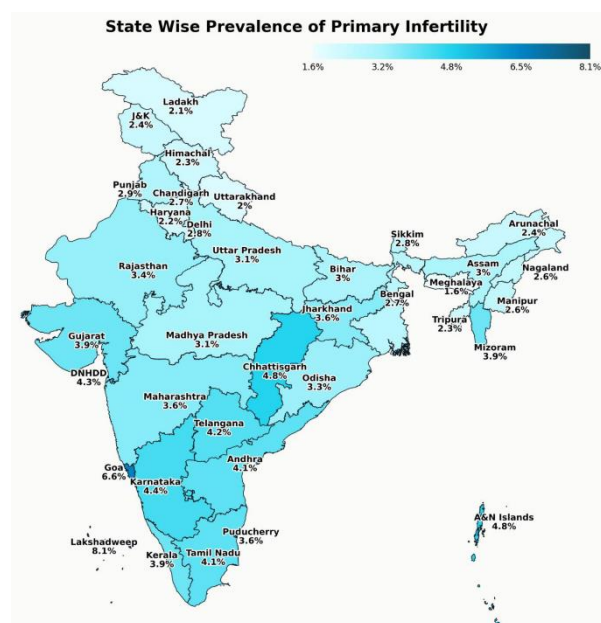


Figure 2. State-wise variation in primary infertility prevalence in India, NFHS-5, 2019–2021

15–19 to 28.2% among currently married women aged 45–49 years. In terms of place of residence, women in urban areas had a higher prevalence of secondary infertility (14.6%) than those residing in rural areas (13.7%). Across religious groups, the rate of secondary infertility was the lowest among Hindus (13.6%) and highest among Christians (21.6%), followed by Muslims (18.4%) and other categories (18.7%). There was not much variation across wealth quantiles, with prevalence of nearly 14% among the richest, richer, poorer, and the poorest quintiles and 13.6% in the middle quantile. With respect to education, secondary infertility decreased among women who completed higher education, similar to the rate observed for primary infertility. The prevalence was 17.3% among women with no formal education, 14% among women with primary education, 12.4% with secondary education, and 11% among those who attained higher education. The pattern observed with age at first marriage was similar to that observed with primary infertility. The prevalence of secondary infertility increased with advancing age at first marriage, from 14.9% among women married before 18 years to 19.8% among those married at 31–35 years, 30.1% at 36–40 years, and 40.3% among women married after 40 years of age. However, women who were married at 45 years of age and above showed no secondary infertility, whereas primary infertility was observed in 100% of women in this category (Table 2).

Prevalence of infertility by lifestyle factors, comorbidities, and contraceptive use

Primary infertility: Table 3 shows that the prevalence of primary infertility did not differ much among women who consumed alcohol or smoked cigarettes. Not much difference was observed across different BMI categories. Among women with and without comorbidities, such as thyroid disorder, diabetes, cancer, hypertension, chronic respiratory disease, and heart disease, the prevalence of primary infertility did not differ substantially, ranging from 2.3% to 4.3%. The prevalence of primary infertility in relation to the use of contraception also did not differ significantly between users and non-users. However, the prevalence among non-users was 0–3% higher than among users.

Secondary infertility: The prevalence of secondary infertility was higher among women who consumed alcohol (18.8%) compared to those who did not (13.8%). Similarly, women who smoked

cigarettes showed a higher prevalence of secondary infertility (33.8%) compared to non-smokers (13.9%). Regarding BMI, higher prevalence was observed among obese women (17.9%), compared with overweight women (16.1%), underweight women (11.5%), and women in the normal BMI category (13.3%). Among women with comorbidities, the prevalence of secondary infertility was higher among women with comorbidities compared to those without such conditions. Women with thyroid disorders had a prevalence of 19.3% compared with 13.8% among their counterparts without the condition. Similarly, women with diabetes had a prevalence of 22.9% compared with 13.7% among those without; hypertension, 20.7% versus 13.5%; chronic respiratory diseases, 20.2% versus 13.8%; cancer, 25.1% vs. 13.9%; and heart disease, 24.6% vs. 13.8%. Regarding contraceptives, women who had used any modern contraceptive method, such as IUD/PPIUD (9.8% vs. 14.2%), injectables (10.5% vs. 14%), oral contraceptive pills (12.7% vs. 14.2%), and emergency contraception (13.1% vs. 14.0%) showed a lower prevalence of secondary infertility than non-users (Table 3).

Determinants of primary and secondary infertility among married women: Based on multivariate analysis, the variables positively associated with primary infertility included age at first marriage (AOR: 1.18; 95%CI: 1.18–1.19), urban residence (AOR: 1.06; 95%CI: 1.01–1.11), women belonging to poorer wealth quintile (AOR: 1.09; 95%CI: 1.04–1.15), alcohol consumption (AOR: 1.22; 95%CI: 1.08–1.37), smoking (AOR: 1.88; 95%CI: 1.39–2.54), overweight (AOR: 1.06; 95%CI: 1.01–1.11), obesity (AOR: 1.19; 95%CI: 1.11–1.28), thyroid disorder (AOR: 1.58; 95%CI: 1.45–1.73), and diabetes (AOR: 1.17; 95%CI: 1.03–1.34).

Conversely, current age of women (AOR: 0.90; 95%CI: 0.89–0.90) and wealth index categories including middle (AOR: 0.94; 95%CI: 0.89–0.99), richer (AOR: 0.90; 95%CI: 0.85–0.95), and richest (AOR: 0.78; 95%CI: 0.73–0.83) quintiles were inversely associated with primary infertility. With regard to secondary infertility, current age (AOR: 1.09; 95%CI: 1.09–1.09), urban residence (AOR: 1.09; 95%CI: 1.06–1.12), poorer wealth index category (AOR: 1.04; CI: 1.01–1.06), secondary education (AOR: 1.04; CI: 1.01–1.06), higher education (AOR: 1.12; 95%CI: 1.07–1.16), smoking (AOR: 1.94; 95%CI: 1.66–2.27), overweight (AOR: 1.06; 95%CI: 1.04–1.08), obesity (AOR:

Table 2. Socio-demographic characteristics of currently married women in India, NFHS, 2019-21

Socio-demographic factors	Primary infertility		Secondary infertility	
	Total women (n/N)	Percentage	Total women (n/N)	Percentage
Age groups				
15-19	1467/8034	18.3%	370/5362	6.9%
20-24	4391/59724	7.4%	1792/52104	3.4%
25-29	3703/96839	3.8%	5677/91594	6.2%
30-34	2230/92355	2.4%	9611/90099	10.7%
35-39	1674/89899	1.9%	13240/88843	14.9%
40-44	1307/72338	1.8%	14958/71755	20.8%
45-49	1322/71452	1.9%	20036/71117	28.2%
Type of residence				
Urban	4050/117562	3.4%	16411/112194	14.6%
Rural	12044/373079	3.2%	49273/358680	13.7%
Religion				
Hindu	12588/376768	3.3%	46049/361133	12.8%
Muslim	1848/58997	3.1%	9573/56612	16.9%
Christian	959/31566	3.0%	6143/30692	20.0%
Others	699/23310	3.0%	3919/22437	17.5%
Caste				
Scheduled caste (SC)	3187/94239	3.4%	11368/90536	12.6%
Scheduled tribe (ST)	3191/87638	3.6%	13135/84190	15.6%
Other backward classes (OBC)	6305/191111	3.3%	23913/183181	13.1%
Others	2570/90930	2.8%	12655/87368	14.5%
Wealth index				
Poorest	3584/103572	3.5%	14082/99835	14.1%
Poorer	3417/108003	3.2%	14568/103994	14.0%
Middle	3300/101680	3.2%	13302/97684	13.6%
Richer	3184/93961	3.4%	12452/89825	13.9%
Richest	2609/83425	3.1%	11280/79536	14.2%
Highest educational level				
No education	3566/142885	2.5%	24349/141099	17.3%
Primary	1826/70134	2.6%	9586/68366	14.0%
Secondary	7962/225129	3.5%	26499/213628	12.4%
Higher	2740/52493	5.2%	5250/47781	11.0%
Age at first marriage				
<18	4526/201431	2.2%	28996/194951	14.9%
18 to 25	9085/259644	3.5%	31230/245824	12.7%
26 to 30	1724/24693	7.0%	3572/22281	16.0%
31 to 35	495/4041	12.2%	682/3436	19.8%
36 to 40	200/694	28.8%	147/489	30.1%
41 to 45	60/134	44.8%	27/67	40.3%
>45	4/4	100%	0/2	0%
Duration of marriage				
1 to 3 years	6312/46106	13.7%	-	-
4 to 6 years	2793/54001	5.2%	-	-
7 to 9 years	1695/56198	3.0%	-	-
>9 years	5294/334336	1.6%	-	-

Table 3. Distribution of infertility according to lifestyle factors, disease conditions, and contraceptive use

Parameters	Primary infertility (n/N)	Percentage	Secondary infertility (n/N)	Percentage
Drinking alcohol				
No	15749/480095	3.3%	63774/460735	13.8%
Yes	345/10546	3.3%	1910/10139	18.8%
Smoking cigarettes				
No	16043/489683	3.3%	65378/469970	13.9%
Yes	51/958	5.3%	306/904	33.8%
BMI				
Normal	9828/298589	3.3%	38026/285599	13.3%
Underweight	2566/62650	4.1%	6906/59809	11.5%
Overweight	2743/97396	2.8%	15116/94067	16.1%
Obese	957/32006	3.0%	5636/31399	17.9%
Current thyroid disorder				
No	15380/473144	3.3%	62466/454207	13.8%
Yes	610/14099	4.3%	2580/13379	19.3%
Current diabetes				
No	15717/474875	3.3%	62345/455440	13.7%
Yes	243/10124	2.4%	2272/9907	22.9%
Current cancer				
No	16017/487595	3.3%	65071/467908	13.9%
Yes	20/689	2.9%	168/670	25.1%
Current hypertension				
No	15357/459092	3.3%	59305/439889	13.5%
Yes	634/27817	2.3%	5659/27342	20.7%
Chronic respiratory disease				
No	15835/481307	3.3%	63828/461767	13.8%
Yes	213/7563	2.8%	1489/7389	20.2%
Current heart disease				
No	15911/484174	3.3%	64195/464580	13.8%
Yes	116/4105	2.8%	986/4004	24.6%
Ever used IUD/PPIUD				
No	16061/460572	3.5%	62729/440752	14.2%
Yes	33/30069	0.1%	2955/30122	9.8%
Ever used injectables				
No	16059/482080	3.3%	64790/462388	14.0%
Yes	35/8561	0.4%	894/8486	10.5%
Ever used pills				
No	15635/414856	3.8%	56219/396269	14.2%
Yes	459/75785	0.6%	9465/74605	12.7%
Ever used emergency contraception				
No	16070/488174	3.3%	65373/468492	14.0%
Yes	24/2467	1.0%	311/2382	13.1%

Table 4. Univariate and multivariate binary logistic regression of factors associated with primary and secondary infertility

Parameters	Primary infertility		Secondary infertility	
	UOR (95%CI)	AOR (95%)	UOR (95%CI)	AOR (95%)
Current age	0.92 (0.92, 0.92) *	0.9 (0.89, 0.9) *	1.09 (1.09, 1.09) *	1.09 (1.09, 1.09) *
Age at first marriage in years	1.12 (1.12, 1.13) *	1.18 (1.18, 1.19) *	0.97 (0.97, 0.98) *	0.97 (0.97, 0.97) *
Residence type				
Rural	Ref			
Urban	1.03 (0.99, 1.07)	1.06 (1.01, 1.11) *	1.11 (1.09, 1.14) *	1.09 (1.06, 1.12) *
Wealth index				
Poorest	Ref			
Poorer	1.11 (1.06, 1.17) *	1.09 (1.04, 1.15) *	1 (0.97, 1.03)	1.04 (1.01, 1.06) *
Middle	0.98 (0.93, 1.03)	0.94 (0.89, 0.99) *	1.02 (0.99, 1.04)	0.97 (0.95, 1)
Richer	1 (0.95, 1.05)	0.9 (0.85, 0.95) *	1.07 (1.04, 1.09) *	0.98 (0.95, 1.01)
Richest	0.95 (0.9, 1.01) *	0.78 (0.73, 0.83) *	1.13 (1.1, 1.16) *	0.94 (0.9, 0.97) *
Highest educational level				
No education	Ref			
Primary	1.08 (1.02, 1.14) *	0.83 (0.78, 0.88) *	0.74 (0.72, 0.76) *	0.93 (0.91, 0.96) *
Secondary	1.48 (1.42, 1.54) *	0.74 (0.71, 0.78) *	0.62 (0.6, 0.63) *	1.04 (1.01, 1.06) *
Higher	2.25 (2.13, 2.37) *	0.75 (0.7, 0.8) *	0.56 (0.54, 0.58) *	1.12 (1.07, 1.16) *
Alcohol consumption				
No	Ref			
Yes	1 (0.89, 1.12)	1.22 (1.08, 1.37) *	1.25 (1.19, 1.32) *	1.01 (0.96, 1.07)
Current smoking				
No	Ref			
Yes	1.78 (1.34, 2.37) *	1.88 (1.39, 2.54) *	2.23 (1.93, 2.57) *	1.94 (1.66, 2.27) *
BMI				
Normal	Ref			
Underweight	1.21 (1.16, 1.27) *	1.02 (0.97, 1.06)	0.89 (0.87, 0.92) *	1.05 (1.01, 1.08) *
Overweight	0.84 (0.8, 0.88) *	1.06 (1.01, 1.11) *	1.26 (1.24, 1.29) *	1.06 (1.04, 1.08) *
Obese	0.87 (0.81, 0.93) *	1.19 (1.11, 1.28) *	1.51 (1.46, 1.55) *	1.17 (1.13, 1.21) *
Thyroid disorder				
No	Ref			
Yes	1.36 (1.25, 1.48) *	1.58 (1.45, 1.73) *	1.5 (1.43, 1.56) *	1.25 (1.19, 1.31) *
Diabetes				
No	Ref			
Yes	0.72 (0.63, 0.81) *	1.17 (1.03, 1.34) *	1.84 (1.75, 1.93) *	1.17 (1.11, 1.23) *

Ref- Reference, * p<0.05, UOR= Unadjusted Odds Ratio, AOR= Adjusted Odds Ratio, CI= Confidence Interval

1.17; 95%CI: 1.13–1.21), and comorbidities such as thyroid disorder (AOR: 1.25; 95%CI: 1.19–1.31) and diabetes (AOR: 1.17; 95%CI: 1.11–1.23) were all positively associated. In contrast, age at first marriage (AOR: 0.97; 95%CI: 0.97–

0.97), the richest wealth quintile (AOR: 0.94; 95%CI: 0.90–0.97), and primary education (AOR: 0.93; 95%CI: 0.91–0.96) were inversely associated with secondary infertility (Table 4).

Discussion

This study presented the prevalence and determinants of primary and secondary infertility in India using NFHS-5 data and highlighted the variation across states. Our findings indicate a four time higher prevalence of secondary infertility compared to primary infertility. Recent NFHS studies have shown a rising trend in the prevalence of secondary infertility over the past few decades (9, 11). In contrast to our findings, a recent systematic review and meta-analysis from India reported that primary infertility (5%) was more prevalent than secondary infertility (2%) among women of reproductive age (12).

State-wise comparison revealed regional variation in infertility prevalence across India. Higher prevalence of primary infertility was observed in southern and western states, such as Karnataka and Telangana, as well as in certain union territories, including Lakshadweep and Goa. However, the estimates from union territories should be interpreted cautiously due to smaller sample sizes, whereas northeastern and northern states such as Meghalaya and Uttarakhand reported comparatively lower levels. Studies have reported that southern states have younger ages of female sterilization and lower fertility rates than northern states. Lifestyle risk factors such as smoking, alcohol consumption, and related comorbidities, including diabetes, are also highly prevalent in Goa and some southern states, which may explain the high infertility rates in these regions (13, 14). In contrast to primary infertility, secondary infertility was more prevalent in the northeastern region including Mizoram and Meghalaya as well as in northern and island regions, such as Ladakh (25.2%) and Lakshadweep (20.8%).

As per the present study findings, the percentages of women experiencing infertility vary among age groups, place of residence, education, wealth index, BMI, and comorbidities. Primary infertility was higher among women aged 15 to 19 years and declined with increasing age and marriage duration of less than 3 years. This pattern likely reflects differences in exposure time to conception rather than true biological infertility, as women with shorter marital duration may not yet have had sufficient time to conceive. This could be due to population-based surveys, such as NFHS, which often capture couples early in their reproductive life course and may temporarily classify recently married women as infertile if pregnancy has not yet occurred. Similar methodo-

logical considerations have been highlighted in global infertility analyses based on demographic and health surveys, which emphasize the importance of accounting for marital duration when estimating infertility prevalence (15). In the aforementioned study, the early years of marriage show higher apparent infertility because many couples are still attempting conception, while successful conception over time reduces the prevalence.

In contrast, secondary infertility in this study was found to increase progressively with advancing age and showed a higher prevalence among women who married early in life. This increase in secondary infertility with age is consistent with well-established evidence on age-related decline in female fecundity, which is associated with reduced ovarian reserve, declining oocyte quality, and hormonal changes occurring with reproductive ageing (16). Age at first marriage showed contrasting associations, with delayed marriage increasing the odds of primary infertility but decreasing those of secondary infertility. Marriage may expose women to early and repeated pregnancies, obstetric complications, and untreated reproductive tract infections, which can contribute to secondary infertility.

Education is often linked to improved health literacy, better reproductive health awareness, and timely health-seeking behavior, which may facilitate early identification and management of fertility-related conditions. Previous studies have reported that educational attainment can have complex relationships with fertility outcomes, with higher education often associated with delayed fertility (15, 17). In this study, higher education attainment was associated with secondary infertility. This pattern may reflect differences in reproductive behavior among more educated women, including delayed childbearing and longer birth intervals, which may influence subsequent fertility.

Lifestyle factors such as alcohol and smoking were significantly associated with infertility, especially primary infertility, in this study. The adverse effects of smoking on female fertility are well-documented (18). Similarly, overweight and obesity were also associated with both primary and secondary infertility, which is consistent with evidence that excess body weight can disrupt ovulation, alter endocrine function, and contribute to conditions such as polycystic ovary syndrome (19). Additionally, women with thyroid disorders

and diabetes had significantly higher odds of infertility, supporting existing evidence that endocrine and metabolic disorders can adversely affect reproductive function and pregnancy outcomes (20, 21).

The strength of the study is that it included data from a large nationally representative sample, which followed a standardized data collection procedure. The sample provided an overview of state-wise prevalence of infertility. A key limitation of this study is the lack of a standardized definition of infertility across demographic surveys. The NFHS does not include a predefined or direct measure of infertility. Therefore, infertility in this study was operationally defined based on duration of marriage (one year) and other relevant variables available within the NFHS dataset.

Conclusion

Using nationally representative NFHS-5 data, this study estimated the prevalence of primary and secondary infertility in India, highlighting a substantially greater burden of secondary infertility. Infertility was strongly associated with increasing age, delayed age at first marriage, smoking, higher BMI, and chronic conditions such as thyroid disorders and diabetes, with notable state-level variation. These findings underscore infertility as an important and unevenly distributed reproductive health issue in India, closely linked to demographic transition and rising risk of non-communicable diseases, warranting greater integration of infertility prevention and care within public health programs.

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Conflict of Interest

The authors declare no conflicts of interest.

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