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Levels and Determinants of Self-Reported STIs among Men in India: Evidence from National Family Health Surveys

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Abstract

Introduction Sexually transmitted infections (STIs) remain a public health concern, particularly in low- and middle-income countries. Despite the availability of nationally representative data, evidence on self-reported STIs (SR-STIs) among men in India remains limited. This study examines the prevalence of SR-STI symptoms and associated factors among sexually active men in India.

Data and methods The data used in this study were drawn from the National Family Health Surveys; NFHS-4 (2015–16) and NFHS-5 (2019–21). The analysis included men aged 15–54 years who ever had sexual intercourse (NFHS-4: $n = 78,085$; NFHS-5: $n = 71,128$). Descriptive and bivariate analyses were conducted, followed by binary logistic regressions to estimate adjusted odds ratios (aORs) with 95% confidence intervals. Geographic variation in SR-STIs was examined using choropleth maps.

Results The proportion of men who had ever heard of any sexually transmitted infection (STI) increased from 89% in 2015–16 to 95% in 2019–21, while the prevalence of SR-STIs rose from 7% to 9%. Substantial inter-state variation in prevalence of SR-STIs was observed across both survey rounds. Younger age, Muslims, men with higher age at marriage and lower wealth status, alcohol and tobacco use, multiple sexual partners, and higher mass media exposure were significantly associated with SR-STI symptoms. The positive association of reported symptoms with mass media exposure may reflect greater awareness and reporting of symptoms rather than increased biological risk. Men residing in central, southern and eastern states showed higher odds of SR-STIs compared with those in northern states.

Conclusion Self-reported STI symptoms remain a notable public health concern among sexually active men in India, with nearly one in ten men reporting such symptoms. Interventions should prioritize younger less educated men and those engaging in high-risk sexual behaviours, strengthen condom promotion and risk-reduction counselling, and improve access to confidential STI screening and treatment services. Targeted, male-centered and region-specific strategies are essential to reducing STI burden and improving sexual health outcomes.

Keywords Sexually transmitted infections (STI), Sexual behaviour, Men's health, India



1 Introduction

Sexually transmitted infections (STIs), primarily transmitted through sexual intercourse, remain a significant public health concern [1]. STIs can occur in bacterial or viral forms and can cause symptoms that affect morbidity, mortality, mental health, psychosocial well-being, family relations, and the overall quality of life [2–4]. Though viral STIs, like human papillomavirus (HPV) and HIV, are still incurable and can be fatal, some bacterial STIs – like chlamydia, gonorrhoea, syphilis, and trichomoniasis – are curable if detected and treated. Each year, 357 million new cases of these four curable STIs are acquired by people aged 15–49 [5]. The consequences of STIs and their symptoms pose public health challenges, especially in low- and middle-income countries with limited health system infrastructure [1, 5]. Given the public health impact of STIs against the fact that most infections are curable, the WHO Global Health Sector Strategy on Sexually Transmitted Infections (2016–2021) laid out a roadmap for STI prevention and control [6]. Although STIs affect both men and women, evidence on STI burden among men remains limited, particularly in low- and middle-income countries like India. Men are often asymptomatic carriers and may underutilize sexual health services, contributing to sustained transmission and under-representation in surveillance data.

Socio-demographic factors and economic conditions are associated with STI prevalence to varying degrees. Several such factors increase susceptibility to STIs, including low education, poverty and rural or urban place of residence [7–10]. Preliminary evidence from regional studies in the Indian context suggests increased STI prevalence in certain vulnerable social groups, such as those illiterate or educated below the primary grade, and unemployed [11, 12]. However, recent nationally representative evidence on self-reported STI symptoms among men in India remains scarce. Although self-reporting plays a crucial role in controlling STIs, research on self-reported STIs (SR-STIs) has not received adequate attention, particularly in the context of males in the Indian context. Therefore, the primary objective of this study is to understand the awareness of STI and prevalence of self-reported STI symptoms among sexually active men in India. The study further aims to identify socio-demographic and behavioural factors associated with these symptoms using nationally representative data.

2 Data

2.1 Data source

This study is a cross-sectional secondary analysis of nationally representative data from the National Family Health Survey (NFHS-4, 2015–16 and NFHS-5, 2019–21). The National Family Health Survey (NFHS) is part of the Indian Demographic and Health Survey (DHS), a nationally representative household-based health surveillance system. In the NFHS-4 survey, data were collected from 640 districts. However, by the time the NFHS-5 was conducted, the number of districts had increased by 67 ($n=707$). The National Family Health Survey employed a stratified, two-stage cluster sampling design, with enumeration areas (EAs) from the 2011 India census as the primary sampling unit (PSU) and households as the secondary sampling unit (SSU). Informed consent for participation in the survey was obtained for all respondents prior to the interview. Interviewers were trained to conduct interviews with the respondent alone, ensuring privacy and excluding other eligible respondents in the household. The National Family Health

Survey (NFHS) data for India is publicly available and can be retrieved upon data request from the Measure DHS program website at www.dhsprogram.com/data/dataset_admin.

3 Methods

3.1 Study variables

3.1.1 Outcome variable

In both NFHS-4 and NFHS-5 rounds, respondents were asked whether they had ever had sexual intercourse and whether they had heard about sexually transmitted infections (STIs). Men aged 50–54 years were included because the NFHS men's survey collects sexual behaviour and STI symptom information for this age group, allowing assessment among older sexually active men. Men who reported having had sexual intercourse were asked whether, during the last 12 months, they had a disease that they acquired through sexual contact. This variable was coded as a primary outcome of self-reported STI in the present study.

Regardless of whether respondents had heard about STIs, men were also asked: (1) During the last 12 months, have you had an abnormal discharge from your penis? and (2) During the last 12 months, have you had a sore or ulcer on or near your penis? These two separate SR-STI symptom variables were combined and coded as a single dichotomous variable indicating the presence of any SR-STI symptom, including abnormal penile discharge, genital sore, or genital ulcer.

In this study, abnormal penile discharge and genital ulcer symptoms were combined to construct a single indicator of self-reported STI symptoms (SR-STIs). These symptoms are commonly used in large population-based surveys as proxy indicators of possible STI exposure when laboratory-confirmed diagnoses are not available. However, it is important to note that these measures represent self-reported symptoms rather than clinically confirmed infections and may therefore be subject to misclassification bias, as some symptoms may arise from conditions other than sexually transmitted infections.

For the analyses, respondents were categorized as having experienced SR-STIs if they reported either an STI or any STI-related symptom during the past 12 months.

3.1.2 Explanatory variables

Background information includes age group (15–19, 20–29, 30–39, 40–49, and 50–54 years); place of residence (urban, rural); education (no education, primary, secondary, and higher); caste (schedule caste, schedule tribe, OBC, none of them); religion (Hindu, Muslim, Christian, others); Marital status (Unmarried, married, WDS-widowed-divorced-separated); age at marriage (Below 21, 21–30, and above 30); Current residing status (staying with wife/partner, staying elsewhere); wealth index (poorest, poorer, middle, richer, richest); media exposure (no exposure, medium (weekly), high (everyday)); tobacco use (yes, no); alcohol use (yes, no); both tobacco & alcohol (yes, no), work in last 12 months (no, in the past year, currently working), decision on earning (respondent alone, respondent and wife/partner, wife partner alone, someone else), region(north, central, east, north-east, west, south).

3.2 Statistical analysis

The statistical analysis, encompassing both descriptive and analytical approaches, was performed using Stata version 16.0. All analyses accounted for the complex survey

design of NFHS by applying sampling weights, clustering, and stratification using survey (svy) commands in Stata. Initially, descriptive statistics were employed to calculate the background factors of the men included in the study. To ensure the sampling probability and non-response representativeness of the data, the information on men was weighted. Bivariate associations between self-reported STI symptoms and explanatory variables were assessed using chi-square tests. To ensure the validity of the final model, multicollinearity among covariates was assessed using Variance Inflation Factors (VIFs), which ranged from 1.2 to 2.8, suggesting no multicollinearity. A binary logistic regression analysis was then conducted to identify factors associated with SR-STIs. Model adequacy was evaluated using the Hosmer–Lemeshow goodness-of-fit test, which indicated acceptable model fit for both NFHS-4 and NFHS-5 models ($p > 0.05$). Separate models were estimated for NFHS-4 and NFHS-5 rather than a pooled analysis because of changes in administrative boundaries and updated sampling frames between survey rounds, and to allow clear comparison of patterns across time. The results from the descriptive analysis were presented as proportions, while the regression outcomes were reported as adjusted odds ratios (aORs) with corresponding 95% confidence intervals and p-values. This rigorous and comprehensive statistical approach provides a reliable basis for understanding the factors influencing SR-STIs prevalence, allowing for informed decision-making in the development of targeted interventions and strategies to combat sexually transmitted infections. To visualize the geographical patterns of SR-STIs, state-level prevalence was mapped using choropleth techniques based on tercile classification in GIS software. Cases with missing information on the outcome variable or key covariates were excluded using listwise deletion and that the proportion of missing observations was small and unlikely to substantially affect the overall estimates.

4 Results

Awareness and prevalence of SR-STIs: Among men (*irrespective of marriage*) who reported ever having sexual intercourse (NFHS-4: $n = 78,085$; NFHS-5: $n = 71,128$), awareness of STIs and the prevalence of SR STI symptoms were examined across socio-demographic and behavioural characteristics. Figure 1 illustrates the level of awareness about STIs among men aged 15–54 years in India. It is evident that the percentage of

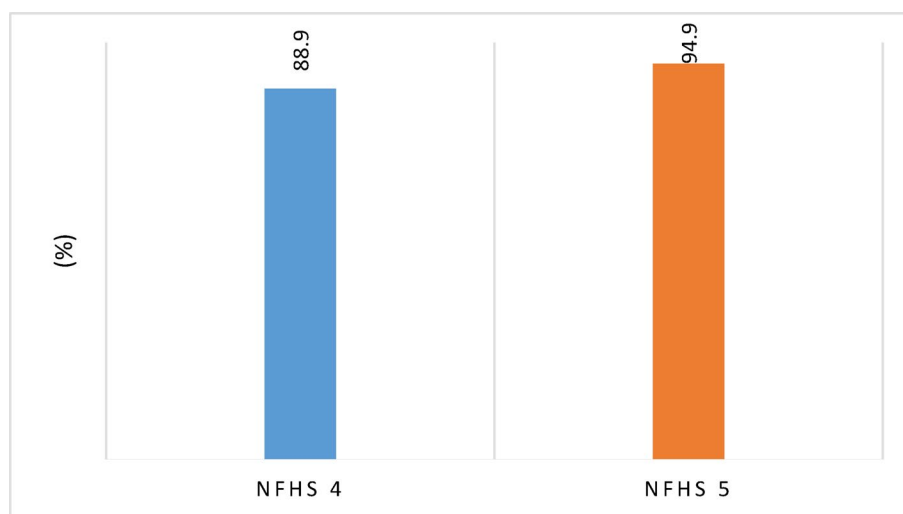


Fig. 1 Percentage of men aged 15–54 years ever heard about an STI in India

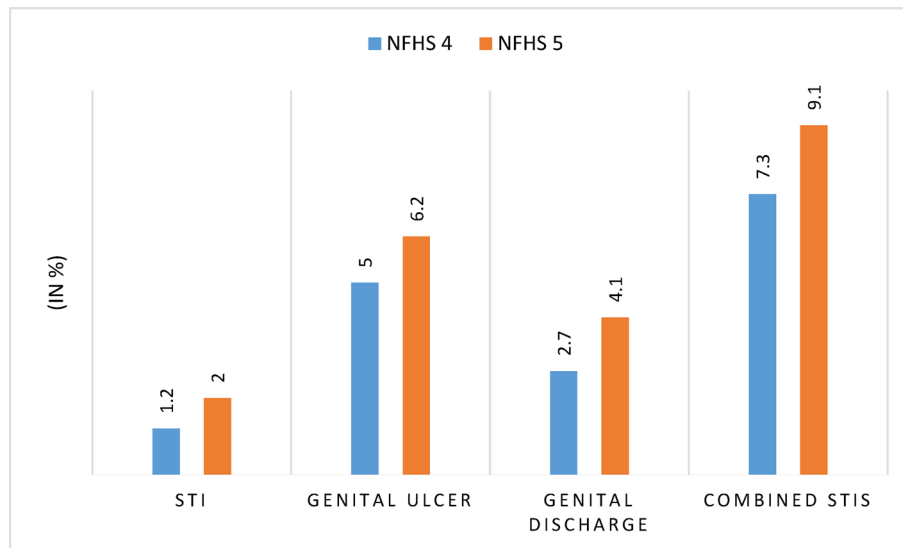


Fig. 2 Self-reported STI among men aged 15–54 years in the last year prior to the survey, who have ever had sexual intercourse in India

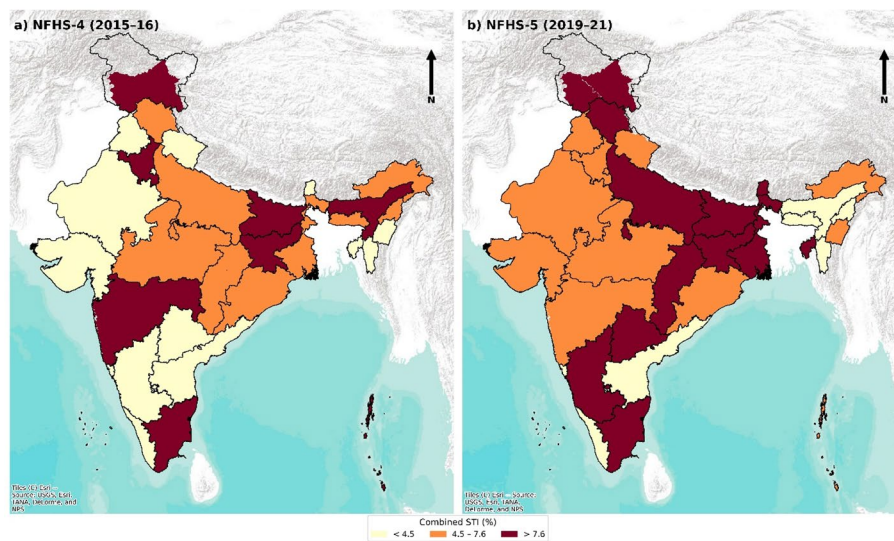


Fig. 3 Geographical distribution of SR-STIs among men aged 15–54 years in the last one year prior to survey across the India's States/UTs

men who heard about STIs increased from approximately 89% during the NFHS 4 survey (conducted in 2015–16) to 95% in the NFHS 5 survey (conducted in 2019–21). Moving on to Fig. 2, it displays the self-reported cases of STIs (SR-STI) among men aged 15–54 years who have engaged in sexual intercourse in the year preceding the survey. In NFHS 5 data, compared with NFHS 4, there has been an increase in reported SR-STIs among men. Specifically, around 7% of men in the NFHS 4 survey stated that they had contracted a sexually transmitted disease through sexual contact, whereas this percentage rose to approximately 9% in the NFHS 5 survey.

To describe the nationwide SR-STI landscape, combined SR-STI prevalence was examined through tercile classified choropleth map. Figure 3a and b present the state-level geographical distribution of SR-STIs for NFHS-4 and NFHS-5, respectively. In NFHS-4,

states such as Jammu and Kashmir, Haryana, Bihar, and Tamil Nadu fall into the higher-prevalence category. A similar pattern is observed in NFHS-5, with Jammu and Kashmir, Ladakh, and Tamil Nadu continuing to show higher SR-STI prevalence. Several other states, including Karnataka, Telangana, Chhattisgarh, Uttar Pradesh, Jharkhand, and West Bengal, also fall within the medium-to-high prevalence categories across both survey rounds.

Association of SR-STIs: Table 1 presents the bivariate distribution of self-reported STI symptoms among men aged 15–54 years in India by selected background characteristics. Higher prevalence of SR-STI symptoms was observed among younger men, particularly those aged 15–19 years, in both NFHS-4 and NFHS-5. Men belonging to the Scheduled Castes and those identifying as Muslim also reported a comparatively higher prevalence of SR-STIs. Men living away from their spouse or partner, as well as those reporting tobacco and alcohol use, showed a higher prevalence of SR-STI symptoms compared with their counterparts. Additionally, unmarried and widowed/divorced/separated men reported a higher prevalence of SR-STIs than married men across both survey rounds. Overall, these bivariate patterns indicate that age, religion, substance use, living arrangements, and number of sexual partners are important correlates of SR-STI symptoms, which were further examined in the multivariate logistic regression analysis.

Table 2 presents the results of binary logistic regression models examining the association between selected background characteristics and SR-STI symptoms among men aged 15–54 years in India. The likelihood of reporting SR-STI symptoms decreased with increasing age in both survey rounds. Muslim men had significantly higher odds of reporting SR-STI symptoms compared with Hindu men. Men whose age at marriage was above 30 years also showed higher odds of SR-STIs compared with those married before age 21. In contrast, men in the richest wealth quintile had lower odds of SR-STI symptoms than those in poorer households. Higher mass media exposure was also associated with significantly greater odds of reporting SR-STI symptoms in both NFHS rounds. Regional patterns indicate that men residing in southern states had consistently higher odds of SR-STI symptoms compared with those in northern states. Notably, several associations observed in NFHS-4 were attenuated or became statistically non-significant in NFHS-5, suggesting possible changes in behavioural patterns, reporting, or underlying epidemiological dynamics over time.

We have tried to see more in detail about SR-STIs among married men. Figure 4 shows a higher prevalence of SR-STI symptoms among men reporting a greater number of non-spousal sexual partners. In NFHS 4, men with 4+ sexual partners have around five times more SR-STIs than those with zero sexual partners apart from spouses. This trend continues even in NFHS 5, as men having 4+ sexual partners have around three times more SR-STIs than those men having zero sexual partners apart from spouses.

The relationship between the most recent sex partner and SR-STIs prevalence among men is shown in Fig. 5. It is indicated that men who had sex with TG/ Male partners have reported having the highest SR-STIs compared to the rest. Men whose most recent sexual partner was male or transgender reported a higher prevalence of self-reported STI symptoms; however, these estimates should be interpreted with caution due to the small number of observations in these categories. Apart from this, men whose recent sex partner was a commercial sex worker also exhibit heightened SR-STIs. These estimates

Table 1 Bivariate estimates of self-reported combined STIs in one year prior to survey among men aged 15–54 years by background characteristics in India

Background information	NFHS-4 (2015-16)		NFHS-5 (2019-21)	
	SR-STI (%)	N	SR-STI (%)	N
Age group	***		***	
15–19	13.9	1,718	14.6	1,420
20–29	9.0	18,453	11.7	15,636
30–39	7.0	26,675	8.9	24,310
40–49	6.3	22,738	8.0	21,281
50–54	5.7	8,501	7.3	8,481
Place of residence	*		*	
Rural	6.9	54,227	9.7	53,363
Urban	7.9	23,858	7.8	17,765
Educational level	***		***	
No education	6.4	13,238	9.5	10,853
Primary	7.3	12,138	10.9	10,166
Secondary	7.6	41,684	8.8	38,929
Higher	7.0	11,025	8.0	11,180
Caste	***		***	
Schedule caste	7.9	13,947	9.8	13,474
Schedule tribe	6.7	14,676	8.8	14,096
OBC	7.6	30,141	8.7	27,288
None of them	6.6	15,520	7.2	13,236
Religion	***		***	
Hindu	6.9	58,868	8.8	54,221
Muslim	10.0	9902	12.1	8,029
Christian	8.1	5464	4.2	5,090
Others	4.9	3851	6.9	3,788
Marital status	***		***	
Unmarried	14	6315	13.7	6,197
Married	6.7	70,145	8.7	63,366
WDS	8.1	1625	10.1	1,565
Age at marriage			***	
Below 21	6.3	22,198	8.9	19,527
21–30	6.8	42,841	8.8	40,324
Above 30	7.7	5178	7.5	5,080
Current residing status	**		***	
Staying elsewhere	7.8	1690	9.1	1,504
With wife/partner	6.7	68,455	8.7	61,862
Wealth index	***		***	
Poorest	7.5	13,714	11.8	14,385
Poorer	7.7	16,246	9.9	15,766
Middle	7.1	16,628	9.3	15,036
Richer	7.3	15,840	7.8	13,878
Richest	6.9	15,657	7.0	12,063
Media exposure	***			
No exposure	5.8	8,383	9.3	11,553
Medium	6.9	21,482	10.0	18,728
High	7.6	48,220	8.7	40,847
Tobacco use	***		***	
No	6.8	46,720	8.0	45,982
Yes	8.1	31,365	11.3	25,146
Alcohol use	***		***	
No	6.6	48,108	10.0	26,958
Yes	8.5	29,977	11.8	10,759

Table 1 (continued)

Background information	NFHS-4 (2015-16)		NFHS-5 (2019-21)	
	SR-STI (%)	N	SR-STI (%)	N
Both tobacco and alcohol use	***		***	
No	6.8	16,621	8.7	63,855
Yes	9.3	16,464	12.8	7,273
Work in last 12 months	***		***	
No	9.7	3,911	9.7	3,706
In the past year	8.1	4,828	8.7	4,796
Currently working	7.1	69,345	9.1	62,626
Decision on earning	***		***	
Respondent alone	7.6	17,435	9.7	15,905
Respondent and wife/partner	6.1	45,644	7.7	42,555
Wife/partner alone	7.5	5,524	13.2	3,932
Someone else	7.5	416	13.0	234
Region	***		***	
North	6.1	16,628	7.8	14,385
Central	5.9	20,055	10.0	16,477
East	8.3	12,124	13.7	10,644
North east	8.0	10,199	4.3	10,549
West	6.5	8,764	6.1	8,354
South	8.8	10,315	8.1	10,719

Significance level * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

should be interpreted with caution, as the number of men reporting transgender or male sexual partners was small, which may inflate prevalence estimates.

5 Discussion

Using two rounds of nationally representative NFHS data, this study examined the awareness, prevalence and determinants of self-reported STI symptoms (SR-STIs) among sexually active men in India. The study showed an increase in the SR-STIs in NFHS-5 compared with NFHS-4. Genital ulcer symptoms are more prevalent in our findings, which is a consistent pattern observed in previous studies [13, 14]. Clinic-based studies in India have documented diverse etiologies underlying genital ulcer symptoms; however, the present analysis is limited to self-reported symptoms and does not permit etiological classification [15].

In the present study, men aged 15–29 years have higher prevalence of self-reported STI symptoms compared to older age groups, a pattern consistent with findings from previous population-based studies [11, 12, 16]. This age gradient is observed consistently across both NFHS-4 and NFHS-5, suggesting a stable association over time. Higher vulnerability among younger men may be linked to broader patterns of partnership dynamics and life-course transitions during early adulthood, rather than any single behavioural factor. Similar age-related differentials in STI symptom reporting have also been documented in other low- and middle-income settings, including China and Lesotho [17, 18]. Taken together, these findings indicate that younger men constitute an important group for targeted STI awareness, prevention, and early intervention strategies. Our findings indicate that men reporting a greater number of sexual partners have a higher prevalence of self-reported STI symptoms. In particular, approximately 33% of men who reported four or more non-spousal sexual partners experienced STI symptoms, highlighting the strong association between multiple partnerships and STI risk. Similar patterns have

Table 2 Predictors for SR-STIs among men aged 15–54 years in India

Background information	NFHS-4	NFHS-5
	aOR (95% CI)	aOR (95% CI)
Age group		
15–19 ^o		
20–29	0.64 (0.44,0.93)**	1.41 (0.61;3.28)
30–39	0.54 (0.37,0.78)***	1.13 (0.49;2.63)
40–49	0.49 (0.34,0.71)***	1.07 (0.46;2.5)
50–54	0.48 (0.33,0.7)***	0.97 (0.41;2.27)
Place of residence		
Rural ^o		
Urban	1.09 (1,1.17)**	0.95 (0.85;1.07)
Educational level		
No education ^o		
Primary	1.05 (0.94,1.17)	0.94 (0.83;1.07)
Secondary	1.19 (1.08,1.31)***	0.92 (0.82;1.03)
Higher	1.08 (0.94,1.24)	0.88 (0.73;1.07)
Caste		
Schedule caste ^o		
Schedule tribe	0.92 (0.82,1.03)	0.91 (0.8;1.04)
OBC	0.92 (0.84,1)*	0.95 (0.85;1.05)
None of them	0.85 (0.76,0.94)***	0.85 (0.74;0.97)**
Religion		
Hindu ^o		
Muslim	1.72 (1.56,1.89)***	1.62 (1.43;1.84)***
Christian	0.90 (0.77,1.06)	0.75 (0.59;0.94)***
Others	0.63 (0.52,0.76)***	1.12 (0.89;1.41)
Age at marriage		
Below 21 ^o		
21–30	1.03 (0.96,1.1)	1.09 (1;1.19)**
Above 30	1.19 (1.04,1.35)**	1.35 (1.13;1.61)***
Current residing status		
Staying elsewhere ^o		
With wife/partner	0.85 (0.71,1.03)*	0.97 (0.75;1.25)
Wealth index		
Poorest ^o		
Poorer	0.86 (0.78,0.96)***	0.93 (0.83;1.04)
Middle	0.74 (0.66,0.83)***	0.95 (0.84;1.08)
Richer	0.76 (0.67,0.86)***	0.83 (0.72;0.97)**
Richest	0.76 (0.65,0.87)***	0.75 (0.62;0.91)***
Media exposure		
No exposure ^o		
Medium	1.23 (1.09,1.39)***	1.11 (1;1.24)*
High	1.29 (1.13,1.46)***	1.19 (1.03;1.36)**
Tobacco use		
No ^o		
Yes	1.08 (0.98,1.18)	1.14 (1.03;1.26)**
Alcohol use		
No ^o		
Yes	1.27 (1.16,1.38)***	0.97 (0.83;1.13)
Both tobacco & alcohol		
No ^o		
Yes	1.01 (0.89,1.15)	1.2 (1;1.44)**
Work in last 12 months		
No ^o		

Table 2 (continued)

Background information	NFHS-4	NFHS-5
	aOR (95% CI)	aOR (95% CI)
In the past year	1.02 (0.81,1.28)	0.92 (0.67;1.26)
Currently working	1.06 (0.87,1.29)	1.11 (0.84;1.47)
Decision on earning		
Respondent alone ^o		
Respondent and wife/p	0.85 (0.79,0.91)***	0.78 (0.71;0.85)***
Wife/partner alone	1.00 (0.89,1.12)	1.35 (1.16;1.57)***
Someone else	1.00 (0.69,1.45)	1.12 (0.62;2.01)
Region		
North ^o		
Central	0.79 (0.71,0.88)***	1.28 (1.13;1.46)***
East	1.30 (1.16,1.44)***	1.35 (1.17;1.55)***
North-east	0.96 (0.83,1.1)	0.67 (0.56;0.8)***
West	0.94 (0.83,1.06)	1.03 (0.88;1.21)
South	1.38 (1.23,1.54)***	1.41 (1.2;1.66)***

aOR Adjusted Odds Ratio; significance level * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

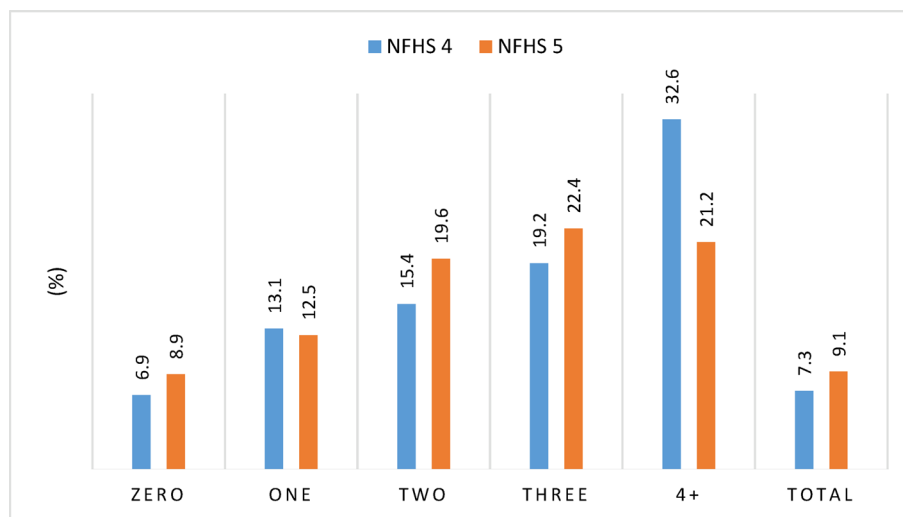


Fig. 4 Number of sex partners, excluding spouse, in the last 12 months prior to the survey and SR-STI among men aged 15–54 years in India

been reported in previous studies. For example, Banerjee et al. (2017) documented that among a mobile community of fish spawn traders, 3% of respondents reported having no sexual partners, 11% reported four to seven partners, and 59% reported more than ten partners in the past year [19]. The risk of exposure to sexually transmitted infections increases with the number of sexual partners, as well as with higher rates of partner change and recruitment within sexual networks [20]. Consistent with findings from other developing country settings, including Ethiopia, Kenya, and Lao PDR, men reporting multiple sexual partners have been shown to have significantly higher odds of sexually transmitted infections compared with those reporting monogamous relationships [21–23]. These findings underscore the importance of promoting safer sexual practices, including consistent condom use and partner reduction, as key strategies for STI prevention.

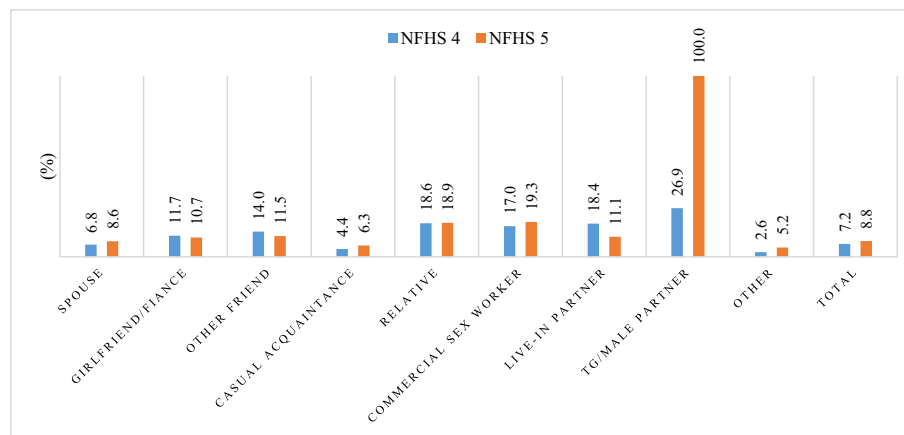


Fig. 5 Relationship with most recent sex partners and SR- STI prevalence among men aged 15–54 years in India. Estimates related to male or transgender sexual partners are based on small sample sizes and should therefore be interpreted with caution

The study finds that Muslim men have higher chances of STIs compared to other religious groups, which aligns with previous literature. This pattern may reflect differences in marital composition, partnership patterns, and broader socio-cultural contexts that may influence STI risk [21, 24–26]. Taken together, these factors underscore the importance of considering both marital status and cultural practices when formulating targeted STI prevention and intervention strategies among different populations in India. A comprehensive approach that addresses these specific risk factors can lead to more effective control and reduced STI transmission within affected communities. The study highlights that higher educational attainment is protective against STIs. A meta-analysis from 27 resource-limited settings showed that higher educational attainment is often associated with increased HIV risk, particularly in older cohorts and rural areas, and this risk was similar in women and men [27]. The association between higher education and reduced STIs could be mediated through safer sexual behaviour, suggesting education may act as a “social vaccine.”

In our study, southern regions had a higher prevalence of STIs, suggesting that more developed regions were positively associated with STIs [28]. With rising disposable income due to rapid socio-economic development in India in the past decades [29], the availability of disposable economic resources may have increased the likelihood of risky sexual behaviours. There is evidence that in some epidemiological studies of HIV, wealthier individuals may engage in risky sexual behaviours that increase their vulnerability to infections [27, 30]. Other work in Uganda has found that men from affluent regions and with disposable income posed a higher risk for STIs [28].

In contrast to some studies [21, 31, 32], other studies found that sexually active men (SAM) with less mass media exposure had lower odds of STIs than those with greater exposure. Seidu et al. (2020) reported that men exposed to newspapers had higher odds of paying for sex, a risky sexual behaviour for STIs [33]. Exposure to certain media content may influence sexual attitudes and behaviours, potentially encouraging risk-taking behaviour among SAM. Newspapers are generally more easily accessible in urban areas than in rural areas. This trend suggests that urban dwellers who can readily access these newspapers are more likely to have STIs. Asekun-Olarinmoye and colleagues indicated in a study conducted in Nigeria that exposure to mass media could trigger risky

sexual behaviour by serving as risk factors for STIs [34]. This association may reflect greater awareness and reporting of STI symptoms among men exposed to mass media rather than a direct increase in biological risk [35]. Greater exposure to sexual health information through newspapers, television, and other media sources may improve awareness and recognition of STI symptoms, thereby increasing the likelihood that individuals report such symptoms in surveys. Consequently, higher reporting among men with greater media exposure may partly reflect improved awareness rather than a true increase in STI incidence.

Strengths and limitations.

In this study, nationally representative data were used to assess the factors associated with SR-STIs among sexually active men in India. The data collection technique and methodology followed best practices set by experienced, well-trained data collectors, resulting in a high response rate. Findings from this study should be interpreted cautiously, as they are based on self-reported STI symptoms rather than laboratory-confirmed diagnoses. Self-reported information may be subject to recall bias and social desirability bias, potentially leading to underreporting or misclassification of symptoms. Despite these strengths, causal inference cannot be drawn from the study's findings due to the cross-sectional design. The outcome variable was also measured via self-report, with no medical practitioner validation through testing. Hence, the information provided may be subject to bias. Also, study participants did not indicate the exact type of STI.

6 Conclusion

This study demonstrates that self-reported STI symptoms remain a concern among sexually active men in India, with higher likelihood observed among younger men, those reporting multiple sexual partners, men with greater mass media exposure, individuals from poorer households, and in central, eastern and southern states. Prevention strategies should therefore prioritize younger men and those engaging in high-risk sexual behaviours, condom promotion and risk-reduction counselling, and improve access to confidential STI screening and treatment services. Given the positive association between mass media exposure and symptom reporting, public health messaging should focus on accurate sexual health education and early care-seeking. Tailored, region-specific, and male-centered interventions are essential to reduce STI burden and improve sexual health outcomes in India.

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Author contributions

RRS and AC developed the concept for this study, and wrote the methods section. GK and SND performed data analysis. RRS and SND wrote the background, interpretation text and discussion. AC, RRS and SND performed editorial checks and reviewed the manuscript for intellectual content. All authors read and approved the final version of the manuscript.

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Data availability

The datasets analyzed during the current study are publicly available from the Demographic and Health Surveys (DHS) Program website (<https://dhsprogram.com/data/available-datasets.cfm>) and the International Institute for Population Sciences (IIPS) website.

Declarations

Ethics approval and consent to participate

This study is based on secondary analysis of anonymized data from the National Family Health Survey (NFHS-4, 2015–16 and NFHS-5, 2019–21). Ethical approval for the original surveys was obtained by the International Institute for Population Sciences (IIPS), Mumbai, and relevant national ethical review committees. The datasets are publicly available and contain no identifiable information; therefore, no additional ethical approval was required for the present analysis.

Informed consent

Informed consent was obtained from all participants by the NFHS implementing agencies at the time of data collection. Participation was voluntary, and respondents' confidentiality was strictly maintained.

Competing interests

The authors declare no competing interests.

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