ORIGINAL ARTICLE

Prevalence and Predictors of Sexually Transmitted Infections Among Female Sex Workers in Rural Eastern India: A Cross-Sectional Study

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ABSTRACT

Female sex workers (FSWs) remain a highly vulnerable population for sexually transmitted infections due to structural, behavioural, and occupational risk factors that often go unaddressed in rural settings. This study aimed to estimate the prevalence and identify the predictors of sexually transmitted diseases (STDs) among brothel-based FSWs in a rural area of eastern India, to guide targeted public health interventions. This community-based cross-sectional study was conducted among 210 brothel-based female sex workers in Matia Bazar, Basirhat, a rural area in eastern India, using simple random sampling from the Durbar Mahila Samanwaya Committee (DMSC) registry. Data were collected using a predesigned and pretested questionnaire. Our study found that 44.8% of FSWs showed symptoms of STIs or RTIs in the past year. Key predictors included a higher client load [AOR: 2.30; 95% CI: 1.24–4.30] and condom breakage during intercourse [AOR: 2.62; 95% CI: 1.02–6.75]. Although condom use with clients was reportedly universal, only 18.8% used them with cohabiting partners. Condom breakage was reported by 84.3%, yet post-exposure measures such as emergency contraception were infrequently adopted. The final model explained 21% of the variance in STI/RTI occurrence. High client load and condom failure significantly increase the risk of STI/RTI among brothel-based FSWs, underscoring the urgent need for enhanced condom use training and tailored intervention programmes.

Keywords: Brothel, Eastern India, Female sex workers, Risk factors, Vulnerability, Sexually transmitted disease

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INTRODUCTION

Sexually transmitted diseases (STDs) remain a significant global public health concern, affecting over one million individuals each day, with a disproportionately high burden in low- and middle-income countries.[1] In 2020 alone, an estimated 374 million new infections occurred globally from one of the four curable STDs: chlamydia, gonorrhoea, syphilis, and trichomoniasis.[2] The burden is particularly high among key populations such as female sex workers (FSWs), who are at increased risk due to the nature of their work, social stigma, limited access to healthcare, and exposure to multiple sexual partners.[3]

Studies from sub-Saharan Africa, Southeast Asia, and Latin America have consistently reported higher STD prevalence among FSWs compared to the general population.[4] Structural vulnerabilities including poverty, criminalisation of sex work, and gender-based violence further heighten this risk.[5] Globally, the intersection of socio-economic marginalisation and limited

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access to sexual health services contributes to delayed diagnosis, untreated infections, and sustained STD transmission.[5]

In India, FSWs are recognised as a priority population under the National AIDS Control Programme (NACP), with targeted interventions including peer-led outreach, condom promotion, and routine screening.[6] These efforts have contributed to a decline in HIV prevalence in urban centres. However, rural regions remain underserved, and rural FSWs often go unrecognised in surveillance systems and programme implementation. Factors such as social stigma, low literacy, financial dependence, and weak healthcare infrastructure further limit their access to timely and appropriate care.[7]

West Bengal, a state of eastern India, with high levels of migration and trafficking, is home to numerous rural FSWs who operate in informal, often hidden settings. The dual burden of social invisibility and limited-service availability places them at heightened risk. Most existing studies have focused on urban sites such as Sonagachi, while little is known about STD prevalence and its associated factors among FSWs in rural areas, more specifically, in eastern part of India.[8] Health-seeking behaviour in this population is influenced not only by individual risk factors but also by cultural norms, stigma from providers, and the absence of women-centred services within rural health systems.[9]

To date, no comprehensive, community-based study has examined the burden of STDs among FSWs in any rural area of eastern India or explored the complex interplay of socio-demographic, behavioural, and healthcare-related determinants. This study aims to address this critical evidence gap by estimating the prevalence of STDs and identifying key associated factors in a rural setting of east zone of India. The findings are expected to guide inclusive, culturally sensitive, and geographically relevant interventions for one of the most neglected and vulnerable groups in public health policy and planning.

METHODS

This community-based observational study employed a cross-sectional design to assess the prevalence of sexually transmitted diseases (STDs) and their determinants among brothel-based female sex workers (FSWs). The study was conducted in Matia Bazar, located along Taki Road in the Basirhat-II block of North 24 Parganas district, approximately 60 kilometres from Kolkata, West Bengal, India. The area includes approximately 100 brothels clustered within a defined locality. A drop-in centre and clinic in the area are managed by the Durbar Mahila Samanwaya Committee (DMSC).

The study population comprised brothel-based FSWs registered with the DMSC. Eligible participants included those residing in the study area for at least one year prior to data collection. FSWs who were critically ill or unwilling to participate were excluded.

Assuming a prevalence of 35.8% for STDs among FSWs, the minimum required sample size was calculated using Cochran's formula as 173(95% confidence level, 20% relative precision).[10] To account for an anticipated 20% non-response rate, the final sample size was increased to 210. A line list of eligible FSWs was obtained from the DMSC register, and participants were selected using simple random sampling without replacement.

A pre-designed and pre-tested interview schedule was developed in English and translated into Bengali by a linguistic expert. To ensure semantic accuracy, it was retranslated into English by two independent bilingual researchers unaware of the original version. Face and content validity were assessed by public health experts. Reliability was tested using the test-retest method. The tool was pretested and pilot-tested before final use.

Face-to-face interviews were conducted after obtaining written informed consent. The investigator was accompanied by a peer educator from DMSC who acted solely as a liaison. Interviews and clinical examinations were conducted at the participants' residences in the presence of a female attendant. If participants were unavailable, up to two repeat visits were made. In cases of refusal or exclusion, the next eligible neighbour was approached. Socio-demographic, behavioural, and health-related data were collected, and appropriate counselling or referrals were provided where necessary. All data collection adhered to ethical guidelines and ensured confidentiality.

Data were entered in Microsoft Excel (2021) and analysed using Jamovi software, Version 2.5.3 (The Jamovi Project, Sydney, Australia).

Descriptive statistics (frequencies, percentages, means, standard deviations) were used to summarise the data. Chi-square or Fisher's exact tests were applied for categorical variables to identify statistically significant association. A p-value <0.05 was considered statistically significant. Bivariate analysis was used to identify potential predictors of STIs. Variables found to be significant in bivariate analysis were included in a multiple logistic regression model to determine adjusted odds ratios (AOR) and 95% confidence intervals (CI). Model performance was evaluated using Nagelkerke R^2 to assess explanatory power, and the Hosmer–Lemeshow test to assess the model's goodness-of-fit.

RESULTS

A total of 210 female sex workers (FSWs) aged 19–49 years participated in the study (mean age: 29.3 ± 5.6 years; median: 29 years). The majority (60%) were aged between 21 and 30 years. Regarding marital status, 43.3% were separated/divorced, and 40% were currently married. Living arrangements varied; 36.7% reported having no partner, 35.7% lived with a husband, 23.3% with a 'babu' (non-marital partner), and 4.3% with both. In terms of education, 33.3% had completed middle school, 24.3% primary school, 16.2% had no formal education, and only 3.8% had studied beyond higher secondary level. A minority (13.8%) had an additional occupation, such as working as a maid, tailor, or running a small business. Most participants (49%) reported having two children (mean: 1.52±0.8), and the majority had three or more dependents (mean: 3.96±1.3). Daily income ranged from ₹400 to ₹9000, with a mean income of ₹2104±1176 and a median of ₹2000; while majority (61%) earned ≤₹2000 per day. Substance use was reported by more than half (54%) of participants. Smoking was prevalent in 29.5% (with 22.8% reporting use for ≤5 years), smokeless tobacco in 23.8% (14.3% >5 years), and alcohol in 27.6% (20.9% ≤5 years). (Table 1). Nearly half of the FSWs (45.2%) entered the profession between the ages of 21 and 25 years, with entry ages ranging from 15 to 39 years (mean: 24.1±4.7 years). The average duration in the profession was 5.1 ± 4.6 years (median: 3.5 years, IQR: 4.8), with a significant proportion (71%) engaged in sex work for ≤5 years. Participants reported serving an average of 9.6±5.2 clients per day and working 19.1±3.4 days per month. The number of clients per month ranged from 30 to 552, with a median of 155 (IQR: 152). Notably, 41.4% of participants had tattoos or body piercings. Additionally, 26.2% reported having engaged in sexual activity under the influence of alcohol. Non-vaginal sexual practices were reported by 18.1%, including 15.2% who engaged in oral sex and 2.9% who reported both oral and anal sex (Table 2). All participants reported consistent condom use with clients. However, only 18.8% used condoms with cohabiting partners. Among those who reported irregular condom use with such partners (86.5%), the most commonly cited reason was trust (64.4%). In the past six months, notably, 84.3% of FSWs experienced condom breakage. Of these, 78.5% responded by washing the genital area only, and just 3.5% took emergency contraception. Awareness of female condoms was low (16.7%), and only one FSW had ever attempted to use one, but discontinued due to partner resistance. The majority (89.0%) reported using sanitary napkins during menstruation; the remainder cited financial barriers or usual habit. A small proportion (1.4%) reported engaging in sexual activity during menstruation (Table 3). Overall, nearly half of the participants (44.8%) reported experiencing symptoms suggestive of a sexually transmitted or reproductive tract infection in the past year. Common symptoms included foul-smelling vaginal discharge (38.3%), lower abdominal pain unrelated to menstruation (24.5%), and genital itching or redness (17.0%). At the time of data collection, majority (55.3%) had recovered, 38.3% were undergoing treatment, and 6.4% had not sought any treatment (Table 4). Multivariable logistic regression analysis identified two significant predictors of self-reported STIs/RTIs in the past year. A higher client volume per month was associated with increased odds of infection (AOR: 2.30; 95% CI: 1.24–4.30), and condom breakage during intercourse also emerged as a significant predictor (AOR: 2.62; 95% CI: 1.02–6.75). The final model demonstrated satisfactory explanatory power (Nagelkerke R^2=0.21), indicating that 21% of the variance in RTI/STI

occurrence was explained by the model. The model's goodness-of-fit was confirmed by a non-significant Hosmer–Lemeshow test (p=0.936), suggesting an adequate fit (Table 5).

Table 1: Distribution of FSWs according to sociodemographic and behavioral characteristics (n=210)

Characteristics	Frequency (Percentage)
Sociodemographic Profile	
Age groups (in completed years)	
20 and below	8 (3.8)
21-25	50 (23.8)
26-30	77 (36.7)
31-35	49 (23.3)
36-40	20 (9.5)
Above 40	6 (2.9)
Marital Status	
Never married	10 (4.8)
Currently married	84(40.0)
Widowed	25(11.9)
Separated / Divorced	91(43.3)
Cohabiting status	
None	77(36.7)
Husband	75(35.7)
Babu	49(23.3)
Both	9 (4.3)
Educational Status	
No formal education	34(16.2)
Below primary	21(10.0)
Primary	51(24.3)
Middle school	70(33.3)
Secondary	26(12.4)
Higher secondary and above	8 (3.8)
Additional Occupation	
Maidservant	10 (4.8)
Petty business	6 (2.9)
Non-agricultural labor	4 (1.9)
Tailor	4 (1.9)
Bar dancer	3 (1.4)
Peer educator	2 (1.0)
Substance Use	
Smoker	62(29.5)
Up to 5 years	48(22.8)
Above 5 years	14 (6.7)
Smokeless tobacco users	50(23.8)
Up to 5 years	20 (9.5)
Above 5 years	30(14.3)
Alcohol users	58(27.6)
Up to 5 years	44(20.9)
Above 5 years	14 (6.7)

Table 2: Distribution of FSWs according to occupational and high-risk behavioral characteristics (n=210)

Characteristics	Frequency (Percentage)
Occupational Profile	
Age of joining the profession (In completed years)	
20 and below	54(25.7)
21-25	95(45.2)
26-30	34(16.2)
31-35	22(10.5)
36-49	5 (2.4)
Duration of work in this profession (in completed years)	
1-5	149(71.0)
6-10	38(18.1)
>10	23(11.0)
Clients per month	
≤100	59(28.1)
101-200	78(37.2)
201-300	45(21.4)
301-400	15(7.1)
>400	13(6.2)
High Risk Behavioral Practices	

Characteristics	Frequency (Percentage)
Occupational Profile	
Tattooing/ body piercing	87(41.4)
Sexual intercourse under the influence of alcohol	55(26.2)
Sexual intercourse other than the vaginal route	38(18.1)
Only oral	32(15.2)
Oral and anal	6 (2.9)

Table 3: Distribution of FSWs according to reproductive health-related practices (n=210)

Characteristics	Frequency (Percentage)
Condom Use (Self-Reported)	
Paying partner	210 (100.00)
Cohabiting partner (n=133)	25 (18.8)
During the last 2 weeks with a cohabiting partner (n=133)	
Regularly	18(13.5)
Irregularly	115(86.5)
The predominant reason for not using regularly (n=115)	
Trust in the partner	74(64.4)
Partner disagreement	16(13.9)
Using another contraceptive	11 (9.6)
Permanent sterilization	9 (7.8)
Participant unwillingness	5 (4.3)
Experience of the condom breaking [The majority of cases involving intentional condom tearing by clients are included]	177 (84.3)
Preventive measures (n=177)	
Did nothing	21 (11.8)
Washed genitalia only	139(78.5)
Took an Emergency contraceptive (EC) pill only	11 (6.2)
Both (washed genitalia and took EC pill)	6 (3.5)
Heard about the female condom	35(16.7)
Female condom use	1 (0.5)
Type of sanitary kit	
Sanitary napkin only	186 (89.0)
Both Sanitary napkins and cloth pieces	13 (6.2)
cloth piece only	10 (4.8)
Cause of non-usage of sanitary napkin(n=23):	
Financial	12(52.2)
Using cloth pieces was an old habit	11 (47.8)
Continue sexual intercourse during menstruation	3 (1.4)

Table 4: Distribution of FSWs according to STIs and RTIs within 1 year (n=210)

Characteristics	Frequency (Percentage)
STIs and RTIs	94(44.8)
Symptoms (n=94) (multiple response)	
Foul-smelling vaginal discharge	36(38.3)
Lower abdominal pain without a period	23(24.5)
Genital itching or redness	16(17.0)
Genital ulcer or sore	13(13.8)
Pain during intercourse	9 (9.6)
Pain while passing urine	8 (8.5)
Genital warts	7 (7.5)
Present Status (n=94)	
Cured	52(55.3)
Under treatment	36(38.3)
Untreated (recently developed)	6 (6.4)

Table 5: Factors Associated with STIs/RTIs in the last year (n=210)

Characteristic	Category (total)	STIs/RTIs Frequency (Percentage)	OR (95% CI)	AOR (95% CI)
Age (in years)	Below 29 years* (100)	48(48.0)	1.28 (0.74-2.22)	-
	29 years and above (110)	46(41.8)	1	
Cohabiting partner	Present (133)	70(52.6)	2.45 (1.36-4.43)	1.49 (0.47-4.71)
	Absent (77)	24 (31.2)	1	1
Educational status	Up to primary *(106)	48(45.3)	1.04 (0.61-1.80)	-
	More than primary (104)	46(44.2)	1	
Income/day (in Rs.)	Above 2000*(82)	43(52.4	1.67 (0.95-2.91)	-
	Up to 2000(128)	51(39.8)	1	
Any substance use	Yes (114)	59(51.8)	1.87 (1.07-3.26)	0.90 (0.42-1.92)
	No (96)	35(36.5)	1	1
Duration in profession (year)	3.5 year and above* (105)	56(53.3)	2.02 (1.16-3.50)	1.59 (0.85-2.98)
	Less than 3.5 year (105)	38(36.2)	1	1
Client/month	155 and above *(105)	59(56.2)	2.57 (1.47-4.49)	2.30 (1.24-4.30)
	Less than 155 (105)	35(33.3)	1	1
Sexual intercourse under the influence of alcohol	Yes (55)	35(63.6)	2.85 (1.51-5.39)	1.78 (0.62-5.13)
	No (155)	59(38.1)	1	1
Tattooing/body piercing	Present (87)	49(56.3)	2.24 (1.28-3.92)	1.51 (0.77-2.93)
	Absent (123)	45(36.6)	1	1
Sexual intercourse using any non-vaginal route	Yes (38)	26(68.4)	3.31 (1.57-7.01)	1.33 (0.42-4.19)
	No (172)	68(39.5)	1	1
Condom use	Irregular (115	61(53.0)	2.12 (1.21-3.71)	1.15 (0.38-3.46)
	Regular (95)	33(34.7)	1	1
Condom breaking	Yes (177)	86(48.6)	2.96 (1.26-6.90)	2.62 (1.02-6.75)
	No (33)	08(24.2)	1	1

DISCUSSION

This study explored the sociodemographic, behavioural, and occupational characteristics of brothel-based female sex workers (FSWs) in Matia Bazar, Basirhat, and identified key predictors of reproductive tract infections (RTIs) and sexually transmitted infections (STIs). The findings highlighted important public health concerns and context-specific vulnerabilities in a largely overlooked rural population.

Participants were relatively young, with a mean age of 29.3 years, aligning with findings from studies conducted in different cities of India.[11,12] A substantial proportion were separated or divorced, and many cohabited with non-marital partners ("babus"), reflecting the complex relationship dynamics also observed in a study from Karnataka by Beattie TSH et al.[13] Educational attainment was low; only 3.8% had completed higher secondary education. Prior research has linked limited education to increased STI vulnerability due to poor health literacy and reduced access to preventive services.[14]

Financial insecurity was widespread, with most earning less than ₹2,000 daily. Economic vulnerability is a known driver for entry into and continuation in sex work, consistent with evidence from the Aastha Project in Mumbai.[15] Substance use was reported by 54% of participants, mainly involving tobacco and alcohol, which are behaviours known to impair judgement and increase sexual risk-taking. Similar patterns were observed in a study conducted in south India, where alcohol use before sex was associated with reduced condom use.[16]

The mean age of entry into sex work was 24.1 years, and participants had worked for an average of 5.1 years. High client volume (mean: 9.6 clients/day) was significantly associated with STI/RTI risk, a finding consistent with studies from Nepal and Kenya.[17,18] Despite reporting consistent condom use with clients, only 18.8% reported using condoms with intimate partners. This discrepancy, also reported in previous researches, was largely attributed to "trust", underscoring the emotional complexity and risk perception in personal relationships.[19,20]

Condom breakage was reported by 84.3% of participants in the past six months which is substantially higher than national averages.[21] Most managed breakage by washing genitalia, with very few using emergency contraception, indicating poor knowledge of post-exposure practices. Previous research in south India have linked condom failure to poor-quality condoms, improper usage, and lack of lubricants.[22]

Most participants (89%) used sanitary napkins, though some cited financial constraints, a known barrier to hygienic practices in low-income populations.[23] Poor menstrual hygiene has been linked to increased risk of RTIs/STIs, as highlighted in a 2013 systematic review.[24]

Self-reported RTI/STI symptoms were prevalent in 44.8% of participants, more than twice the national average (18.5%) reported by National AIDS Control Organisation (NACO).[6] Common symptoms included abnormal vaginal discharge, abdominal pain, and genital itching. Although 55.3% had recovered and 38.3% were undergoing treatment, 6.4% had not sought care, pointing to persistent barriers such as stigma, cost, and limited awareness. These barriers have been similarly documented from studies conducted in metro cities of India.[25,26]

Higher client volume and condom breakage emerged as significant independent predictors of RTI/STI occurrence. FSWs with higher client loads had over twice the odds of infection, mirroring findings from a study conducted in Kenya.[18] Condom breakage also doubled infection odds, supporting earlier research on the risks of mechanical failure.[21,22] Low condom usage with intimate partners, primarily driven by trust, has also been reported in studies from South India, Cambodia, and Nigeria.[19,27,28]

Although alcohol consumption did not emerge as a statistically significant predictor in this study, 26.2% of participants reported engaging in sex under its influence which is established globally as a risk factor for unsafe sexual practices.[29] Inadequate treatment-seeking among symptomatic FSWs remains concerning. Stigma, discrimination, and healthcare access barriers must be addressed to improve health outcomes and reduce transmission.[30]

The cross-sectional design of the study limited the ability to establish causality between predictors and outcomes. Reliance on self-reported data might have introduced recall and social desirability bias, particularly for sensitive topics such as

substance use or sexual practices. To minimise these biases, several measures were adopted. Participants were assured of confidentiality, and interviews were conducted in presence of trained female staff with the support of trusted peer educators. The questionnaire was pre-tested and culturally adapted to ensure clarity and comfort. Additionally, the recall period was kept short to enhance accuracy, and neutral, non-judgemental language was used throughout the interviews to encourage honest responses. Lastly, the study was limited to a relatively small population of brothel-based FSWs in one rural setting, which might affect generalisability.

Despite of some limitations, the key strength of this study lies in its community-based design, which enabled the inclusion of a traditionally under-researched and marginalised population of brothel-based female sex workers in a rural setting. The use of random sampling enhanced the representativeness of the sample, while the culturally adapted, pre-tested questionnaire ensured contextual relevance and data reliability. Partnering with peer educators facilitated trust and improved participant engagement, leading to a high response rate. Moreover, the combination of behavioural data with clinical symptom reporting allowed for a comprehensive assessment of both risk factors and health outcomes, offering valuable insights for planning and implementing targeted public health interventions in future.

CONCLUSION

This study identified key predictors of reproductive tract infections (RTIs) and sexually transmitted infections (STIs) among brothel-based female sex workers (FSWs) in Matia Bazar, Basirhat which is a rural area of an eastern state of India. The high prevalence of self-reported RTI/STI symptoms (44.8%) highlights a significant public health concern in this under-researched and vulnerable population. Increased client volume and condom breakage emerged as independent predictors, reflecting heightened biological exposure and inadequate protective practices. While reported condom use with clients was universal, the high rate of condom breakage suggests improper usage, poor-quality materials, or insufficient lubrication. Furthermore, the low use of condoms with intimate partners (18.8%), often justified by trust, represents a hidden but critical risk for STI transmission. These findings highlight the urgent need for targeted, context-specific interventions. Programmes should prioritise training female sex workers (FSWs) on correct and consistent condom use, ensure the availability of high-quality condoms and lubricants, and incorporate behavioural communication strategies to challenge misconceptions around trust and the use of protection in non-commercial relationships. As a higher client volume is strongly linked to increased infection risk, regular screening and syndromic management of RTIs/STIs must be expanded, with a particular focus on FSWs serving a larger number of clients. Tailored outreach and inclusive healthcare services are essential to address the unique needs of rural FSWs. Non-governmental organisations (NGOs) play a vital role in delivering these services by facilitating community outreach, providing sexual health education, and linking marginalised populations to care. Such collaborative, community-based efforts are critical to improving sexual health outcomes and reducing the burden of RTIs and STIs among this underserved population.

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Ethical Approval: Ethical approval was obtained from the Institutional Ethics Committee of the All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India. Informed written consent was secured from all participants prior to enrolment in the study. Confidentiality and participant autonomy were strictly maintained throughout the research process.

Authors' Contribution: Concept and design: AB, JP; Questionnaire formulation: AB, JP, SKS; Data Collection and compilation, and analysis: AB, JP, NS; Manuscript writing, critical review, editing and final submission: AB, JP, SKS, NS, MG.

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