Original Article

Human Immunodeficiency Virus Prevalence and High-Risk Behavior of Home-Based and Nonhome-Based Female Sex Workers in Three High-Prevalent North-Eastern States of India

Subrata Biswas[1], Abhik Sinha[2], Shobini Rajan[3], Pankaj Kumar Khan[4], Deepika S. Joshi[5], Malay Kumar Saha[6]

[1]Project Coordinator, [2]Scientist C, [4]Data Manager, [6]Scientist F, ICMR-National Institute of Cholera and Enteric Diseases, Kolkata, West Bengal, [3]Assistant Director General-Strategic Information, National AIDS Control Organization, New Delhi, India, [5]Commonwealth Scholar, University of Edinburgh, College of Medicine and Veterinary Medicine, UK

Abstract

Background: Female sex workers (FSWs) have been identified as an important target group for human immunodeficiency virus (HIV)/sexually transmitted infections prevention. **Objectives:** This study aimed to describe sociodemographic and sex work characteristics and to identify the risk factors for HIV infection with special focus on the variations between home-based (HB) and non-HB (NHB) FSWs in three high-prevalent North-Eastern states of India: Manipur, Mizoram, and Nagaland. **Methods:** Data from the National Integrated Bio-Behavioural Surveillance (IBBS) conducted in India during 2014–2015 were utilized in the study. IBBS is a quantitative survey conducted among identified high risk sub within India. Logistic regression analyses were performed using SAS 9.3.2 to determine the distribution and associations of sociodemographics and risk behaviors with HIV seropositivity of HB and NHB FSWs. **Results:** HIV prevalence was found higher among NHB FSWs compared to HB FSW (7.3% vs. 4.6%). The proportions of FSW among HB (66.7%) were in sex work for longer duration are significantly higher than for NHB (60.2%) while risk of HIV infection due to injecting drug use was higher in NHB FSW (11.7% vs. 8.7%). Reference to FSW who were currently married, those who were widowed/divorced/separated had 2.73-fold risk of HIV. FSW who did not have any other income source were associated with 1.73 times more risk of HIV infection. Injecting drugs user among FSW respondents had four times higher likelihood to be HIV positive. **Conclusion:** A substantial proportion of NHB FSWs is mobile in nature. Targeted interventions are required urgently to minimize HIV risk among those FSWs especially the widowed/divorced/separated, sex work is only income source and who used injecting drugs for nonmedical purpose.

Key words: Female sex worker, integrated bio-behavioral surveillance, North-Eastern India, variation

Introduction

Human immunodeficiency virus (HIV) remains to be one of the key global public health issues, approximately 37.9 million people living with HIV (PLHIV) at the end of 2018.[1] An estimated 2.14 million HIV infections are in India, with the third-largest number of PLHIV in the world.[2] Within India, the northeastern states of Mizoram (2.0%), Manipur (1.4%), and Nagaland (1.1%) have the highest HIV prevalence among antenatal clinic attendees in the country.[2] In India, majority of HIV transmission are believed to occur through heterosexual contact, within which unprotected paid sex is the major transmission route and accounts for approximately 71% for male and 86% for female infections.[3,4] The HIV epidemic in North-Eastern states of India particularly bordering with Myanmar has been recognized historically to the high prevalence due to injection drug use (IDU), but the importance of transmission through heterosexual route has been increasingly recognized in recent years.[5] HIV Sentinel Surveillance reports indicate that HIV prevalence among IDUs in Manipur, Mizoram, and Nagaland has

Access this article online

Quick Response Code:

Website: www.ijph.in

DOI: 10.4103/ijph.IJPH_100_20

Address for correspondence: Dr. Malay Kumar Saha, ICMR-National Institute of Cholera and Enteric Diseases, P-33, C I T Road, Scheme-XM, Beliaghata, Kolkata - 700 010, West Bengal, India. E-mail: sahamk@yahoo.com

Submitted: 11-Nov-2019 **Revised:** 12-Feb-2020
Accepted: 28-Feb-2020 **Published:** 14-Apr-2020

How to cite this article: Biswas S, Sinha A, Rajan S, Khan PK, Joshi DS, Saha MK. Human immunodeficiency virus prevalence and high-risk behavior of home-based and nonhome-based female sex workers in three high-prevalent North-Eastern States of India. Indian J Public Health 2020;64:S46-52.

changed from 12.9% to 7.7%, from 12.0% to 19.8%, and from 2.2% to 1.1% respectively, whereas the prevalence among female sex workers (FSWs) in Manipur and Nagaland changed from 2.8% to 1.4%, and from 3.2% to 3.6%, respectively, between 2011 and 2017 time period and 24.7% HIV prevalence reported among FSWs in Mizoram in 2017.[6]

The National AIDS Control Programme (NACP) of India has focused on prevention services through targeted intervention (TI) for key populations such as FSW, men who have sex with men (MSM), and IDU for over two decades. NACP funded community-based organizations and nongovernmental organization (NGO) following specific guidelines for the provision of prevention services implemented these interventions.[7] On the basis of their work environment, FSW may be categorized as brothel-based (BB), home-based (HB), lodge-based, highway based, dhaba based, etc., Work environment consists of a combination of physical, economic, social, and policy features of the sex work environment. A number of studies conducted globally on the types of sex work environment and their association with HIV risks.[8-12]

In a study in Maharashtra by Mamulwar *et al*., it was found that the prevalence of HIV was 9.9% among the BB FSWs while it was 3.1% for HB FSWs.[7] In another study by Suryawanshi *et al*., consistent condom use was found to be 36% among BB FSWs, and it was 69% for HB FSWs.[13] Moreover, the BB FSWs are comparatively easy being an organized sector. On the other hand, HB FSWs are being a more nonorganized sector, and the receptivity of the interventions is comparatively difficult. In the present study, we have tried to decipher the differences in various aspects of vulnerability in HIV/AIDS among the HB and non-HB (NHB) FSWs so that specific interventions to both the groups may be designed.

The National Integrated Bio-Behavioural Surveillance (IBBS) was conducted during 2014–2015 across six key population groups comprising FSW, transgender, MSM, IDU, Migrants, and currently married women with the objectives of to understand HIV-related risk behaviors and prevalence in different regions by linking behaviors with biological findings.[14] Using data collected from IBBS 2014–2015 among FSW in three high HIV prevalence North-Eastern states in India namely Manipur, Mizoram and Nagaland, this study was conducted to describe sociodemographic and sex work characteristics of FSWs and to identify the risk factors for HIV infection with special focus on the variations between HB and NHB FSWs in these states.

Materials and Methods

Study design, subjects, and sampling

Three high HIV prevalent North-Eastern states (Manipur, Mizoram, and Nagaland) were selected for the analysis. The data for these analyzes were drawn from a population-based, cross-sectional survey of FSW recruited in the IBBS study (National AIDS Control Organization [NACO], 2015) during November 2014–February 2015. Four districts (Aizawl, Dimapur, Imphal East, and Senapati) from North-Eastern states were purposely selected because of their diverse sociocultural backgrounds and significant size of the FSW populations.

Eligible study subjects

Fifteen years or more aged women who engaged in consensual sex in exchange for cash or in kind payment at least once within the past 1 month. The target sample size per domain, the IBBS survey unit, was 400 completed interviews plus blood samples with an anticipated sample of 1600 FSW from four sites. It was expected that a minimum 75% (300) sample should be completed per domain in 3-month period to use the data. Detailed survey design has been elaborated in NACO (2015) IBBS report.[14] In each domain, a list of hotspots was prepared, and the functional status of those sites was determined by rapid field assessments. Working through relevant TIs NGOs and government health staff in different cities/towns, the list of streets, bars, nightclubs, and hotels where NHB FSW usually congregate was updated. New hotspots were also identified by searching the entire domain. The information collected from this assessment was then used to develop a sampling frame of primary sampling units or clusters.

Conventional cluster sampling was used where FSW practicing sex work at homes and brothels, relatively stable population. A time location sampling technique was employed to select NHB FSWs and is suitable for obtaining information on hard to reach populations.[15] Each NHB FSW hotspot was divided into four clusters: Peak day-peak time, peak day-lean time, lean day-peak time, and lean day-lean time. The final selection of cluster was random. All regression estimates make use of sample weights provided by NACO to account for the complex survey design. More details of the sampling strategy are available in the online report.[14] A total of 1327 FSWs were interviewed during the survey, of which 435 (32.8%) were HB while 892 (67.2%) were NHB across four domains in three states.

Conceptual framework

The primary independent variable for the study was the FSW typology: HB or NHB FSWs. Variables included in the analysis were as follows (1) sociodemographic characteristics, including age, highest education level, any other income source, literacy status, financial debt, current marital status, use of cell phone, and internet to contact/get clients; (2) sex work characteristics including age at sexual debut, age at starting sex work, sex work duration, client volume, inconsistent condom use behavior and reason; and (3) injecting risk behavior. Outcome variable was HIV prevalence.

The assessment of human immunodeficiency virus status

Unlinked anonymous HIV testing was performed using dried blood samples based on the principles of HIV testing strategy of NACO.[16] Blood samples were initially screened for HIV using a sensitive Enzyme-linked immunosorbent-assay (ELISA). Samples positive for screening were retested using another specific ELISA. As per the NACO guideline of two-test strategy, samples positive for both the ELISA were considered

as HIV seropositive. For ensuring quality, all HIV-positive samples and 2% of HIV-negative samples were sent to designated national HIV reference laboratory.

Ethical issues

Written informed consent was obtained from all eligible participants and provided compensation of an amount of INR 200 for their time and travel. Anonymity of participation was adhered by not using any biometric or nominal identifiers in the questionnaires. The questionnaire was administered in required vernacular languages (Manipuri, Mizo, and Nagamese). The primary study, which focused on HIV transmission risk behaviors among key populations, was approved by the ethics committee of NACO, New Delhi and ICMR-National Institute of Cholera and Enteric Diseases, Kolkata. A custom-designed comprehensive project management package linked with computer-assisted personal interviewing technique was used during data collection. The IBBS study was approved by the ethics committee constituted by the NACO and ICMR-National Institute of Cholera an Enteric Diseases vide No. A-1/2015 IEC dated September 14, 2015.

Statistical analysis

All data analyses were done using SAS version 9.3.2 (SAS software, SAS Institute Inc., Cary, NC, USA). The primary independent variable for the study was the FSW typology: HB or NHB FSWs. Other secondary independent variables include: age, highest education level, clients, and duration of sex work. Descriptive analyses were conducted to determine the distributions of HIV serostatus, various sociodemographic characteristics and high-risk behaviors (overall as well as across the HIV serostatus). Bivariate (unadjusted) and multivariable (adjusted for potential confounders) logistic regression analyses were performed to find the associations of various sociodemographic exposures keeping HIV risk as dependent variable. The strength and direction of associations were expressed in odds ratio (OR) and 95% confidence interval (CI) for both the regression models.

Results

Sociodemographic and related characteristics

A total of 1327 FSWs comprising HB FSWs (32.8%) and NHB FSWs (67.2%) were interviewed during survey. A higher proportion of NHB FSWs (37.9%) (median age 26 years, intelligence quotient [IQ] 22–30) were in 15–24 years of age group than that in HB FSWs (32.4%) (median age 28 years, IQ 22–32) ($P = 0.052$) as shown in Table 1. Participants from HB FSWs were less who had completed secondary education than from NHB FSWs (17.3% vs. 24.7%, $P = 0.003$). A higher proportion of NHB FSWs in compared with HB FSWs reported no income source other than sex work (59.4% vs. 51.4%, $P = 0.006$) and were never married during survey (35.6% vs. 31.0%, $P = 0.063$). Approximately 24.4% HB FSWs reported that they usually practiced sex work only in rural areas, 86.4% used cell phones and approximately 9.0% used internets to contact or get clients while 12.4% NHB FSWs reported that they usually practiced sex work only in rural areas ($P < 0.001$). Approximately 19.7% FSWs were illiterate and about 44.1% of them or their families were under debt.

Overall, 29.8% of the FSW had started sex work when they were under the age of 20 years (median 22 years) and 62.3% were in sex work for the duration of <5 years. 7.9% of FSW reported that client volume was 10 or more in the last 7 days prior to interview. The proportions of FSW among HB (66.7%) were in sex work for 5 years or longer are significantly higher than for NHB (60.2%). Approximately 11.2% NHB FSW reported that they had sexual debut before their 15 years of age. About 23.3% FSW reported that there had at least one instance within the past 30 days prior to interview where they had sexual intercourse with a client without using condom. Most of the reasons (47.8%) for inconsistent condom use of NHB FSW were related to the respondent's client not wanting to use condoms. Inconsistent condom use was also due to nonavailability of condom (11.2%) and client paid more for sex without a condom (10.2%). HB FSW 19.2% did not use condom due to unavailability and 17.3% reported that they did not like using condom [Table 2].

Human immunodeficiency virus prevalence

HIV prevalence as well as crude and adjusted ORs (AOR) is presented in Table 3, by selected background characteristics of FSWs. The overall HIV prevalence in four districts surveyed was 6.4% (95% CI 51–7.7). In multivariable analysis, women under 25 years had a lower prevalence (OR 0.52, 95% CI 0.31–0.88). FSW who were widowed/divorced/separated had a significantly higher odds of being HIV positive (AOR 2.73, 95% CI 1.38–5.41) compared with currently married. The probability of having HIV infection was significantly higher to those FSW who did not have income source other than sex work (AOR 1.73, 95% CI 1.06–2.81). There was no difference in HIV prevalence in multivariable analysis between HB and NHB FSW, although compared with NHB FSW, the odds of being HIV positive was 1.6 times as high of those operating from home. The probability of HIV infection was approximately 56% higher for those who were in sex work for five or more years. There was no significant difference between FSWs in terms of their age of sexual debut. FSW who were IDUs had 4 times higher odds of being positive than those who were not IDUs (AOR 4.02, 95% CI 2.42–6.67).

Discussions

In this paper, we have described sociodemographic and high HIV-risk behaviours of FSW across four districts in three high HIV prevalent North-Eastern states of India. Additionally, we have explored various risk for HIV infection, and the characteristics of individual FSW that may help to explain solicitation-level variations in HIV prevalence. Understanding the demographic, sex work characteristics and other risk is important for improving the reach and effectiveness of prevention programs.[17] In this study, the HIV prevalence among FSWs was 6.4% (95% CI 51–7.7), which is about three times of the prevalence at the national level.[14]

Table 1: Distribution of female sex workers by selected background characteristics and according to the type of sex work

Variables	FSW			Test statistics (χ^2)	*P*
	Total (*n*=1327)	HB (*n*=435)	NHB (*n*=892)		
Age group (years), *n* (%)					
15-24	480 (36.1)	141 (32.5)	338 (37.9)	5.90	0.052
25-34	639 (48.2)	213 (48.9)	426 (47.8)		
35+	209 (15.7)	81 (18.6)	128 (14.3)		
Median (IQ range)	27 (22-31)	28 (22-32)	26 (22-30)		
Highest educational level achieved, *n* (%)					
Never attended school	216 (16.4)	64 (14.7)	152 (17.1)	13.74	0.003
Primary	90 (6.8)	37 (8.5)	53 (5.9)		
Secondary	725 (54.6)	258 (59.5)	466 (52.2)		
Above secondary	295 (22.2)	75 (17.3)	220 (24.8)		
No income source other than sex work, *n* (%)	754 (56.8)	223 (51.4)	530 (59.4)	125.16	0.006
Had financial debt, *n* (%)	586 (44.1)	206 (47.4)	380 (42.6)	51.66	0.102
Current marital status, *n* (%)					
Currently married	317 (23.9)	120 (27.6)	197 (22.1)	5.51	0.063
Never married	453 (34.1)	135 (31.0)	317 (35.6)		
Widowed/divorced/separated	558 (42.0)	180 (41.4)	378 (42.3)		
Practice sex work, *n* (%)					
Only rural	216 (16.3)	106 (24.4)	110 (12.4)	30.91	<0.001
Only urban	750 (56.5)	221 (50.8)	528 (59.3)		
Both	350 (27.2)	108 (24.8)	252 (28.3)		
Use cell phone to contact/get clients, *n* (%)	1075 (81.0)	375 (86.4)	699 (78.4)	97.74	<0.001
Use internet to contact/get clients, *n* (%)	177 (13.3)	39 (8.9)	137 (15.4)	54.57	0.002

FSW: Female sex worker, IQ: Intelligence quotient, HB: Home-based, NHB: Non-HB

Table 2: Distribution of female sex workers by selected sex work characteristics, inconsistent condom use, and human immunodeficiency virus prevalence, according to type of sex work

Variables	FSW			Test statistics (χ^2)	*P*
	Total (*n*=1327)	HB (*n*=435)	NHB (*n*=892)		
Had sexual debut at age <15 years, *n* (%)	126 (9.8)	30 (7.2)	96 (11.1)	34.57	0.02
Median (IQ) age (years) at sexual debut	17 (16-19)	17 (16-19)	17 (16-19)		
Started sex work at age <20 years, *n* (%)	386 (29.8)	118 (27.7)	268 (30.8)	58.29	0.01
Median age (years) started sex work	22 (19-25)	23 (19-26)	22 (19-25)		
With client volume of 10+ a week, *n* (%)	68 (5.1)	16 (3.7)	51 (5.7)	18.28	0.01
Median client (IQ) volume per week	5 (3-7)	4 (3-6)	5 (3-7)		
With duration in sex work <5 years, *n* (%)	827 (62.3)	290 (66.7)	537 (60.2)	73.77	0.01
Median (IQ) duration in sex work	3 (2-6)	3 (2-5)	4 (2-6)		
Sexual intercourse with a client without using condom in last 30 days (inconsistent condom use), *n* (%)	309 (23.8)	104 (24.5)	205 (23.5)	33.01	0.001
Reason not using condom in that instance, *n* (%)					
Client refused	131 (42.4)	33 (31.7)	98 (47.8)	9.36	0.05
Client paid more for sex without a condom	37 (12.0)	16 (15.4)	21 (10.2)		
No condom available	43 (13.9)	20 (19.2)	23 (11.2)		
Was a trusted partner	42 (13.6)	14 (13.5)	28 (13.7)		
Do not like using condom	47 (15.2)	18 (17.3)	29 (14.1)		
At risk of HIV due to use of injectable narcotics in the last 12 months, *n* (%)	142 (10.7)	38 (8.7)	104 (11.7)	30.67	0.01
HIV prevalence (95% CI)	6.4 (5.1-7.7)	4.6 (2.6-6.6)	7.3 (5.6-9.0)	0.61	0.43

CI: Confidence interval, HIV: Human immunodeficiency virus, FSW: Female sex worker, IQ: Intelligence quotient, HB: Home-based, NHB: Non-HB

In the IBBS, the median age of FSWs across most states was between 28 and 30 years, and nationally it was 30 years. However, median age in the North-Eastern states was lower with a larger proportion of younger FSWs among NHB FSWs (37.9%). In comparison, 47.0% and 32.5% of the respondents among HB and NHB, respectively were under the age of 25 years in one independent survey of FSW in Andhra Pradesh.[18] Sex worker in the age group of 15–24 years

Table 3: Predictors of human immunodeficiency virus infection among female sex worker in northeastern states of India

Characteristics	HIV positive, *n* (%)	Crude OR (95% CI)	*P*	AOR[b] (95% CI)	*P*
Current age (years)					
25+	65 (7.66)	1.00[a]	-	1.00[a]	-
<25	20 (4.17)	0.52 (0.31-0.88)	0.013	0.62 (0.33-1.18)	0.146
Current marital status					
Currently married	11 (3.47)	1.00[a]	-	1.00[a]	-
Widowed/divorced/separated	51 (9.14)	2.80 (1.44-5.45)	0.002	2.73 (1.38-5.41)	0.004
Never married	23 (5.08)	1.49 (0.71-3.10)	0.288	1.98 (0.89-4.39)	0.091
Literacy					
Literate	71 (6.67)	1.00[a]	-	1.00[a]	-
Illiterate	14 (5.36)	0.79 (0.44-1.43)	0.440	0.76 (0.41-1.41)	0.754
Source of income other than sex work					
Yes	28 (4.89)	1.00[a]	-	1.00[a]	-
No	57 (7.56)	1.59 (1.00-2.54)	0.050	1.73 (1.06-2.81)	0.027
Primary solicitation place					
HB	20 (4.60)	1.00[a]	-	1.00[a]	-
NHB	65 (7.29)	1.63 (0.97-2.73)	0.063	1.42 (0.84-2.42)	0.190
Age at sexual debut (years)					
15+	80 (6.66)	1.00[a]	-	1.00[a]	-
<15	5 (3.97)	0.58 (0.23-1.46)	0.247	0.49 (0.19-1.28)	0.146
Sex client volume per week					
<10	82 (6.51)	1.00[a]	-	1.00[a]	-
10+	3 (4.41)	0.66 (0.20-2.15)	0.494	0.40 (0.12-1.36)	0.143
Duration in sex work (years)					
<5	41 (4.96)	1.00[a]	-	1.00[a]	-
5+	44 (8.78)	1.85 (1.19-2.87)	0.006	1.56 (0.95-2.58)	0.079
Age at starting sex work (years)					
20+	67 (7.11)	1.00[a]	-	1.00[a]	-
<20	18 (4.66)	0.64 (0.37-1.09)	0.100	0.79 (0.38-1.62)	0.514
Injection use for nonmedical reason					
No	58 (4.91)	1.00[a]	-	1.00[a]	-
Yes	27 (19.01)	4.55 (2.77-7.47)	<0.0001	4.02 (2.42-6.67)	<0.0001
Model fitting equation for multivariate analysis	Intercept only=631.07, χ^2=53.07, df=6, significant <0.0001, R^2 (Nagelkerke)=0.0393				

[a]Reference category, [b]Adjusted for all variables shown in the table. OR: Odds ratio, AOR: Adjusted OR, CI: Confidence interval, HIV: Human immunodeficiency virus, HB: Home-based, NHB: Non-HB

were 2.4 times more likely to be vulnerable compared to the older age groups as reported in a cross-sectional study in West Bengal.[19] This age group may be more at risk among sexually active females trauma to the immature genital tract during sex and due to larger areas of cervical ectopy.[20,21] Behavioral factors that might increase a young women's risk of HIV infection are professional immaturity leading to more unprotected sex and preexisting sexually transmitted infections.[22]

A study of correlates of HIV prevalence among FSW attending sexually transmitted infections clinic in Lucknow, Uttar Pradesh, also indicated the percentage of single women (unmarried/divorced/separated/widowed) was higher in the NHB FSWs as compared to the HB group (53% vs. 32%).[23] FSWs stayed with husbands initiated sex work comparatively later in life and had a lower client volume. However, married women are increasingly opting work outside their household to generate income due to decreasing earning opportunities and increasing poverty. The present marital status of FSW in different work environments has statistically significant influence on the risk of HIV and thus has major policy implications. This study shows that FSW who were widowed/divorced/separated had 2.7 times higher odds of being positive compared with FSW who were currently married during survey.

Place of solicitation of clients is an important environmental factor that we included in our model. Our results suggest that women who worked on the highways, lodges, or street-based (excluding brothels and HB) were more likely to be HIV infected. Soliciting clients on the highways, streets were also significantly related with inconsistent condom use. The findings that the NHB FSWs are more likely to miss condom use because majority of their clients did not accept to use a condom even client paid more for sex without a condom, and sometimes FSWs may pay less attention to their personal health. Although there were no significant differences in the proportion of inconsistent condom use with a client within the last 30 days between HB FSW and NHB FSW, however among

them a significant proportion (19.2%) of HB FSW condom was not used due to unavailability.

FSWs who inject drugs represent an important vulnerable group with HIV risk associated with unsafe sex practices and injection uses.[24] In this study, FSW respondents who were injecting drugs for nonmedical reason had 4 times (4.02 [95% CI, 2.42–6.67]) higher likelihood to be HIV positive. FSWs with concomitant injecting drug use behavior were having 3.4 higher odds of HIV infection compared to their counterparts as reported in a Vietnam study.[25] Inconsistent condom use behavior and IDU behavior are cardinal risk factors for HIV transmission in high-prevalent states, drug injection risk reduction should be as much a focus of HIV prevention along with safe sex practices. However, in low HIV prevalent states, more generalized prominence on harm reduction for all IDUs will benefit FSW.

One of the major strengths of IBBS was the engagement of community persons from key populations with the data collection process as community liaison. The extensive training provided to the interviewer and community liaison on data collection using ethically appropriate methods and techniques, series of community preparation enhanced the value added to the survey process.

Limitations

The use of self-reported data from respondents that leads to under-reporting of risk behavior is one of the potential limitations. Another key limitation of the analysis is the difficulty in determining the temporal relationship between the predictors and outcomes. Moreover, the data were analyzed based on available IBBS data, no new variable besides those in IBBS questionnaire had been included. However, multiple locations and the sample size for the study used alleviate the potential impact this might have had on our findings.

Conclusion

This study has highlighted the heterogeneity of sex work organization and structure and how it is associated with HIV prevalence among FSWs in North-Eastern states of India. Network as well as environment variations with HIV prevalence are commonly influenced by the composition of FSW in terms of their marital status, any income source other than sex work, and IDU behavior, which in turn seem to reflect a variety of other characteristics associated with the HIV risk. These understandings with innovative and sustainable approaches should form an important consideration for empowering FSWs at improving their overall health and wellbeing.

Acknowledgments

The authors would like to acknowledge NACO, New Delhi, Manipur AIDS Control Society, Mizoram State AIDS Control Society, and Nagaland State AIDS Control Society for supporting the study. The author(s) received funding from NACO for conducting the IBBS, authorship, and publication of this article.

Financial support and sponsorship

National AIDS Control Organization, New Delhi.

Conflicts of interest

There are no conflicts of interest.

References

1. HIV/AIDS. Available from: https://www.who.int/news-room/fact-sheets/detail/hiv-aids. [Last accessed on 2019 Sep 29].
2. India HIV Estimation 2017, Technical Report. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India; 2017. Available from: http://naco.gov.in/sites/default/files/HIV%20Estimations%202017%20Report_1.pdf. [Last accessed on 2019 Aug 12].
3. Misra G, Sahu D, Reddy US, Nair S. Correlates of HIV prevalence among female sex workers in four North and East Indian states: Findings of a national bio-behavioural survey. Int J STD AIDS 2019;30:120-30.
4. Subramanian T, Gupte MD, Paranjape RS, Brahmam GN, Ramakrishnan L, Adhikary R, *et al*. HIV, sexually transmitted infections and sexual behaviour of male clients of female sex workers in Andhra Pradesh, Tamil Nadu and Maharashtra, India: Results of a cross-sectional survey. AIDS 2008;22 Suppl 5:S69-79.
5. Medhi GK, Mahanta J, Kermode M, Paranjape RS, Adhikary R, Phukan SK, *et al*. Factors associated with history of drug use among female sex workers (FSW) in a high HIV prevalence state of India. BMC Public Health 2012;12:273.
6. National AIDS Control Organization 2017. HIV Sentinel Surveillance: Technical Brief, India 2016-17. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India. Available from: http://naco.gov.in/sites/default/files/HIV%20SENTINEL%20SURVEILLANCE_06_12_2017_0.pdf. [Last accessed on 2019 Aug 12].
7. Mamulwar M, Godbole S, Bembalkar S, Kamble P, Dulhani N, Yadav R, *et al*. Differing HIV vulnerability among female sex workers in a high HIV burden Indian state. PLoS One 2018;13:e0192130.
8. Gaines TL, Rusch ML, Brouwer KC, Goldenberg SM, Lozada R, Robertson AM, *et al*. Venue-level correlates of female sex worker registration status: A multilevel analysis of bars in Tijuana, Mexico. Glob Public Health 2013;8:405-16.
9. Jain AK, Saggurti N. The extent and nature of fluidity in typologies of female sex work in Southern India: Implications for HIV prevention programs. J HIV AIDS Soc Serv 2012;11:169-91.
10. Chen XS, Liang GJ, Wang QQ, Yin YP, Jiang N, Zhou YJ, *et al*. HIV prevalence varies between female sex workers from different types of venues in Southern China. Sex Transm Dis 2012;39:868-70.
11. Eluwa GI, Strathdee SA, Adebajo SB, Ahonsi B, Azeez A, Anyanti J. Sexual risk behaviors and HIV among female sex workers in Nigeria. J Acquir Immune Defic Syndr 2012;61:507-14.
12. Liao M, Bi Z, Liu X, Kang D, Fu J, Song Q, *et al*. Condom use, intervention service utilization and HIV knowledge among female sex workers in China: Results of three consecutive cross-sectional surveys in Shandong Province with historically low HIV prevalence. Int J STD AIDS 2012;23:e23-9.
13. Suryawanshi D, Bhatnagar T, Deshpande S, Zhou W, Singh P, Collumbien M. Diversity among clients of female sex workers in India: Comparing risk profiles and intervention impact by site of solicitation. implications for the vulnerability of less visible female sex workers. PLoS One 2013;8:e73470.
14. NACO. National Integrated Biological and Behavioural Surveillance (IBBS), India 2014–2015. New Delhi: NACO; 2015. Available from: http://naco.gov.in/sites/default/files/IBBS%20Report%202014-15.pdf. [Last accessed on 2019 Aug 11].
15. Karon JM, Wejnert C. Statistical methods for the analysis of time-location sampling data. J Urban Health 2012;89:565-86.
16. National Guidelines for HIV Testing, National AIDS Control Organization (NACO); Ministry of Health&Family Welfare, Government of India; 2015. Available from: http://www.naco.gov.in/sites/default/files/National_Guidelines_for_HIV_

Testing_21Apr2016.pdf. [Last accessed on 2019 Aug 18].
17. Cowan FM, Chabata ST, Musemburi S, Fearon E, Davey C, Ndori-Mharadze T, *et al*. Strengthening the scale-up and uptake of effective interventions for sex workers for population impact in Zimbabwe. J Int AIDS Soc 2019;22 Suppl 4:e25320.
18. Dandona R, Dandona L, Kumar GA, Gutierrez JP, McPherson S, Samuels F, *et al*. Demography and sex work characteristics of female sex workers in India. BMC Int Health Hum Rights 2006;6:5.
19. Sarkar K, Bal B, Mukherjee R, Saha MK, Chakraborty S, Niyogi SK, *et al*. Young age is a risk factor for HIV among female sex workers – An experience from India. J Infect 2006;53:255-9.
20. Moss GB, Clemetson D, D'Costa L, Plummer FA, Ndinya-Achola JO, Reilly M, *et al*. Association of cervical ectopy with heterosexual transmission of human immunodeficiency virus: Results of a study of couples in Nairobi, Kenya. J Infect Dis 1991;164:588-91.
21. Coombs RW, Reichelderfer PS, Landay AL. Recent observations on HIV type-1 infection in the genital tract of men and women. AIDS 2003;17:455-80.
22. Kaestle CE, Halpern CT, Miller WC, Ford CA. Young age at first sexual intercourse and sexually transmitted infections in adolescents and young adults. Am J Epidemiol 2005;161:774-80.
23. Shukla P, Masood J, Singh JV, Singh VK, Gupta A, Krishna A. Predictors of sexually transmitted infections among female sex workers (FSWs) in a city of Northern India. Indian J Community Med 2015;40:121-6.
24. Burgos JL, Patterson TL, Graff-Zivin JS, Kahn JG, Rangel MG, Lozada MR, *et al*. Cost-effectiveness of combined sexual and injection risk reduction interventions among female sex workers who inject drugs in two very distinct mexican border cities. PLoS One 2016;11:e0147719.
25. Le LV, Nguyen TA, Tran HV, Gupta N, Duong TC, Tran HT, *et al*. Correlates of HIV infection among female sex workers in Vietnam: Injection drug use remains a key risk factor. Drug Alcohol Depend 2015;150:46-53.