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HIV Risk Behaviors among Female Sex Workers Using Cell Phone for Client Solicitation in India

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Abstract

Background: With the emerging technological revolution in India, the use of cell phone among female sex workers (FSWs) for client solicitation has increased rapidly in the recent past. This study examines the association between FSWs' cell phone use and their HIV risk behaviors.

Methods: Data were drawn from a cross-sectional behavioral survey conducted across 22 districts of southern and western India during 2007-08. The analytical sample consisted of 3028 FSWs. Bivariate and multivariate methods were used to examine the association between use of cell phone and HIV risk behaviors.

Results: One-fourth (25%) FSWs used cell phones to solicit clients. Results from the multivariate analyses suggest that FSWs who use cell phones than those who do not use cell phones, were more likely to report inconsistent condom use with occasional clients (Adjusted Odds Ratio (AOR):1.9, 95% confidence interval (CI):1.5-2.3), inconsistent condom use with regular clients (AOR:1.6, 95% CI:1.3-2.0), experience of STI-related symptoms (AOR:2.4, 95% CI:1.9-3.1), consumption of alcohol prior to sex (AOR:1.7, 95% CI:1.4-2.0) and difficulty in negotiating condom use with clients (AOR:2.1, 95% CI:1.7-2.6). Except for home-based, the use of cell phone had a multifold effect on FSWs' HIV risk behaviors in other typologies of sex work.

Conclusion: Use of cell phone is associated with increased HIV risk behaviors among FSWs, independent of their place of solicitation. These findings document the need for developing new strategies to reach FSWs, particularly those who use cell phones or newer technologies for client solicitation.

Keywords: Cell phone; HIV; Female sex worker; Sexual behavior; Condom

Introduction

Globally, the face of sex work is dramatically changing with advances in technology [1] and female sex workers (FSWs) are increasingly using the cell phones for client solicitation [2]. The use of cell phones by FSWs has affected the traditional methods of sex work practice where sex workers congregate at hotspots and wait for prospective clients [2-4]. With the use of cell phones, clients can directly contact sex workers as well as FSWs can contact their known clients directly which can form a closed sexual network with undisclosed sexual activity [5]. FSWs using cell phones are likely to have complex sexual networks, as it has been argued in social network research that use of cell phone can enable an individual to build network in which some members are rapidly added or removed [5] while others are always present [6]. Studies conducted in India suggest that FSWs' place of sex work is fluid which is associated with their HIV risk behavior [3,4]. These studies suggest that the success of HIV prevention interventions would largely depend on the extent to which FSWs are profiled by their typology [3,7] and the way programs are implemented in the context of changing typology [4]. There is evidence that FSWs' use of cell phone is increasingly becoming common in India [3]. Studies in Andhra Pradesh in India showed that the use of cell phones by FSWs to solicit clients has increased from 3% in 2006 to 9% in 2009 [8,9] and to 27% in 2011 [10].

Due to a shift in the nature of client solicitation from traditional places such as brothels, homes, and streets to the use of cell phones, FSWs are increasingly becoming hard to reach for outreach and providing STI services, which has been recognized as a programmatic challenge in the coming years [3,4]. While the research highlighted that FSWs who use cell phones for client solicitation are at risk for HIV [4], their relative vulnerability in the context of other traditional ways of soliciting clients is not yet known in India. Moreover, there is little evidence to date in India about the HIV risk behaviors of FSWs who use cell phone [4]. Such research would be particularly relevant for India, in the light of increasing cell phone use both among high risk populations and the general population in India. Therefore, this study examines the association between use of cell phones by FSWs and their HIV risk behaviors such as inconsistent condom use, experience of STI-related symptoms, alcohol consumption prior to sex and perceived difficulty in condom use negotiation with clients. Secondarily, this study examines the association between the traditional typology (home-based, street-based, brothel-based and lodge-based) of sex work and HIV risk behaviors among FSWs who use cell phones.

Methods

Data

This study is based on data from a cross-sectional survey conducted among FSWs in 22 high in-migration districts across four states in

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southern (Andhra Pradesh, Karnataka, Tamil Nadu) and western (Maharashtra) India [11]. The study districts were identified using mapping and enumeration data on FSWs in each state; districts with more than 2,000 estimated FSWs were chosen (5 districts each in the states of Andhra Pradesh, Karnataka and Tamil Nadu and 7 districts in Maharashtra). The mapping and enumeration data at district level indicated large variations in the size of hotspots (place of sex work activities) which included brothel areas and soliciting places such as roads, highways, bus stands, railway stations and market areas. This list of hotspots formed the sampling frame and was used to prepare a list of clusters. Clusters were formed by combining small hotspots or by segmenting large hotspots such that each cluster has approximately 500 FSWs. Three such clusters from each district were randomly selected to obtain a minimum of 150 eligible participants per district. The number of FSWs to be interviewed was proportionately allocated according to the size of brothel-based and non-brothel-based FSWs. Independent sampling strategies were adopted for selecting brothel-based and non-brothel-based FSWs due to differences existing in the nature of sex work practice.

For selection of FSWs in brothel-based areas, a two-stage systematic sampling procedure was used. First, a list of lanes/small pockets/areas within a brothel site in a cluster was prepared. About 20% of the lanes or small areas were systematically selected in the first-stage sampling. In the second-stage sampling, brothel houses were systematically selected from selected lanes, with the first house selected randomly and subsequent houses selected based on a calculated interval. All FSWs in the selected brothel houses were interviewed using a screening tool to confirm their eligibility for the survey.

For selection of FSWs in non-brothel-based hotspots, a time location sampling procedure was adopted. Based on the information on peak day, peak time, lean day and lean time, a list of time linked hotspots was created where one hotspot can occur more than once depending on the variation in operation of sex work activities in a day. Time linked hotspots were selected using a systematic sampling approach. Thus, for each area, time slots were fixed for the interviewers to visit the site. Interviewers visited each of those sites as per the allotted time slot and waited for sex workers. FSWs who came to the site at the defined times were selected for interview using a screening tool.

About 94% (9475) of FSWs who were initially contacted (10075) agreed to participate in the study screening. Of these, 5611 (59%) FSWs were found eligible for detailed interview according to the study definition of mobile FSWs: those who had moved to two or more different locations for sex work during the previous 2 years, one of which included a move across districts. Of the total eligible FSWs (5611), 113 were excluded: 15 were not interviewed because they were below age 18 years, 21 refused to participate, 51 withdrew during the interview and for an additional 26 FSWs data were missing on socio-demographic variables. This resulted in a sample of 5498 FSWs at the end of the survey. Interviews were conducted by multilingual research assistants trained and experienced in different data collection techniques.

Ethical approval for the study was obtained from the institutional review boards (IRBs) of the Population Council and the University of Manitoba, Canada. Verbal consent was obtained from all respondents prior to participation in the survey. For ethical reasons, only FSWs who were at least 18 years of age were finally interviewed.

Measures

HIV risk behaviors in the study were measured using the following indicators: inconsistent condom use, experience of STI-related symptoms, alcohol consumption prior to sex and difficulty in condom use negotiation. These variables and its categories considered in this study were consistent with previous research recommendations [3,4,11-14].

Inconsistent condom use was assessed separately for occasional and regular clients. For each of these types of clients, participants were asked the frequency of condom use (indicated by 1=always, 2=sometimes, 3=never) during sex in the past one week and condom use at last sex. FSWs who had “always” used condoms in the last week and reported using a condom at last sex were coded as zero (consistent condom users) and the rest were coded as 1 (inconsistent condom users).

To determine the experience of STI-related symptoms, participants were asked whether they had experienced any of the following four symptoms in the six months prior to the survey: ulcers/sores in the genital area, swelling in the groin area, pain during intercourse and frequent painful urination. Those responding “yes” to any of these symptoms were classified as having experienced STI symptoms (1=yes, 0=no).

Alcohol consumption prior to sex with clients was assessed based on a single item question asked to all survey participants. Response categories included “yes-always”, “yes-sometimes” and “no”. The categories of "yes-always" and "yes-sometimes" were combined to define alcohol use prior to sex and was coded as 1, the category of "no" was coded as 0. Similarly, perceived difficulty on condom use negotiation was assessed using a single item question where FSWs who responded “yes” were coded as “1” (faced difficulty in condom negotiation); and "no" were coded as “0”.

Sex work typology: The key independent variable in this study was use of cell phone for client solicitation. Respondents were asked about the places where and how they generally solicit clients. Spontaneous multiple responses were recorded in 14 categories with cell phone as one of the response categories. Based on this, FSWs were categorized into two groups: those who used versus those who did not use cell phones for solicitation. As seen in Table 1, irrespective of cell phone use for solicitation, FSWs also solicited at traditional places of solicitation like brothels, homes and streets. In order to examine the effect of cell phone use on HIV risk behavior in the context of these traditional sex work typologies, we defined sex work typology (also known as place of solicitation) as recommended by the Indian National AIDS Control Organization (NACO). NACO recommended the following six categories of sex work typology: brothel-based, street-based, lodge-based, *dhaba*-based, home-based and highway-based [15]. However, in this study, taking into consideration the similarity in the nature of sex work and to ensure sufficient cell frequencies in each category without distorting the similarity in the nature of solicitation, we

Place of solicitation	Not using cell phone for solicitation (N=4266)	Using cell phone for solicitation (N=1232)
	% (n)	% (n)
Home-based[1]	25.6 (1091)	20.8 (256)
Street-based[2]	69.6 (2969)	18.1 (223)
Brothel-based[3]	32.2 (1375)	8.4 (104)
Lodge-based[4]	33.7 (1439)	14.0 (173)

[1]Home-based sites include client’s home, rented room and own home.
[2]Street-based sites include on the road sites, railway station/bus stands, market areas, cinema halls, labor nakas and vehicles.
[3]Brothel-based sites include brothels and bar/night clubs.
[4]Lodge-based sites include hotels, lodges and dhabas.

Table 1: Distribution of FSWs’ typology of sex work by use of cell phone for solicitation.

Background characteristics	Not using cell phone for solicitation (N=2272)	Using cell phone for solicitation (N=756)	P-Value
	% (n) or Mean(SD)	% (n) or Mean(SD)	
Age, Mean (SD)	30.3 (6.3)	28.2 (4.4)	<0.001
Education			
No formal education	34.3 (779)	24.5 (185)	<0.001
Primary schooling	17.1 (390)	25.6 (194)	<0.001
Secondary or higher schooling	48.6 (1103)	49.9 (377)	0.529
Marital Status			
Never married	14.0 (318)	21.6 (163)	<0.001
Currently married	36.6 (831)	16.9 (128)	<0.001
Formerly married	49.4 (1123)	61.5 (465)	<0.001
Sex work related characteristics			
Income only from sex work	57.2 (1299)	67.2 (508)	<0.001
Age at sex work debut, Mean (SD)	24.3 (5.2)	23.9 (3.8)	0.031
Place of solicitation			
Home-based[1]	10.5 (239)	33.9 (256)	<0.001
Street-based[2]	57.8 (1312)	29.5 (223)	<0.001
Brothel-based[3]	27.6 (626)	13.8 (104)	<0.001
Lodge-based[4]	4.2 (95)	22.9 (173)	<0.001

SD: Standard deviation
[1]Home-based sites include client's home, rented room and own home.
[2]Street-based sites include on the road sites, railway station/bus stands, market areas, cinema halls, labor nakas and vehicles.
[3]Brothel-based sites include brothels and bar/night clubs.
[4]Lodge-based sites include hotels, lodges and dhabas.

Table 2: Profile of FSWs by use of cell phone for solicitation in four states of India (N=3028).

grouped sex workers into the following four categories of sex work typology: brothel-based, home-based, street-based and lodge-based. In this classification, *dhaba*-based category was grouped with lodge-based and highway-based sex workers were merged with the street-based typology. According to the suggested classification, home-based settings included client's home, respondent's home and rented room; street-based included road side, railway station, bus stand, market area, cinema hall, labor *naka* (a place where daily wage laborers congregate) and vehicle; lodge-based included hotel, lodge and *dhaba*; and brothels include brothel and bar/night club.

Socio-demographic and sex work related variables: Information on socio-demographic variables like age (continuous), marital status (currently married, never married and formerly married), sources of income (only from sex work or any other source), education (no formal education, formal education) and age when initiated sex work (continuous) were assessed using single item questions. These variables were used as covariates in the multiple logistic regression analyses while predicting the risk associated with the use of the cell phones for different HIV risk behaviors.

Statistical analyses

Descriptive statistics were obtained for socio-demographic variables and covariates. The test for differences in proportion was used to examine the differences in socio-demographics of FSWs who used cell phones versus those who did not use cell phones for solicitation. A series of multiple logistic regression models were generated, first to examine the effect of cell phone use on HIV risk behaviors and then to understand the association between cell phone use and HIV

HIV risk behaviors (*dependent variables*)		Using cell phone for solicitation		Place of solicitation			
		No	Yes	Street-based[3]	Brothel-based[4]	Lodge-based[5]	Home-based[6]
Inconsistent condom use with occasional client in past week[1]							
	% (N)	23.9 (2255)	52.0 (750)	22.9 (1520)	24.4 (729)	59.9 (267)	49.9 (489)
	Model 1: AOR (95% CI)	Referent	2.7 (2.2-3.2)				
	Model 2: AOR (95% CI)	Referent	1.9 (1.5-2.3)	Referent	0.8 (0.6-1.0)	2.7 (1.9-3.6)	2.1 (1.7-2.7)
Inconsistent condom use with regular client in past week[2]							
	% (N)	32.1 (2134)	59.5 (738)	28.5 (1480)	36.2 (657)	75.4 (256)	56.6 (479)
	Model 1: AOR (95% CI)	Referent	2.4 (2.0-2.9)				
	Model 2: AOR (95% CI)	Referent	1.6 (1.3-2.0)	Referent	0.9 (0.7-1.2)	4.3 (3.0-6.0)	2.1 (1.6-2.6)
Experienced STI-related symptoms, past six months							
	% (N)	65.7 (2272)	85.1 (756)	69.3 (1535)	64.7 (730)	79.9 (268)	78.0 (495)
	Model 1: AOR (95% CI)	Referent	2.6 (2.1-3.2)				
	Model 2: AOR (95% CI)	Referent	2.4 (1.9-3.1)	Referent	0.8 (0.6-1.0)	1.0 (0.7-1.4)	1.1 (0.8-1.4)
Consumed alcohol prior to sex							
	% (N)	51.4 (2272)	63.8 (756)	53.4 (1535)	53.6 (730)	58.2 (268)	57.4 (495)
	Model 1: AOR (95% CI)	Referent	1.7 (1.4-2.0)				
	Model 2: AOR (95% CI)	Referent	1.7 (1.4-2.0)	Referent	1.1 (0.9-1.3)	1.0 (0.8-1.3)	1.0 (0.8-1.2)
Faced difficulty in condom negotiation							
	% (N)	21.7 (2272)	47.5 (756)	20.3 (1535)	24.8 (730)	48.9 (268)	46.1 (495)
	Model 1: AOR (95% CI)	Referent	2.8 (2.3-3.4)				
	Model 2: AOR (95% CI)	Referent	2.1 (1.7-2.6)	Referent	1.1 (0.9-1.4)	2.2 (1.6-2.9)	2.2 (1.7-2.8)

AOR: Adjusted Odds Ratio, CI: Confidence Interval
Model 1 and Model 2 were adjusted for participant's age (continuous), educational status, marital status, income only from sex work and age at initiation of sex work (continuous).
[1]Computed among FSWs who had occasional clients; N=3005; [2]Computed among FSWs who had regular clients; N =2872.
[3]Street-based sites include on the road sites, railway station/bus stands, market areas, cinema halls, labor nakas and vehicles.
[4]Brothel-based sites include brothels and bar/night clubs.
[5]Lodge-based sites include hotels, lodges and dhabas.
[6]Home-based sites include client's home, rented room and own home.

Table 3: Unadjusted percent and adjusted odds ratios predicting effect of cell phone use and typology of sex work on inconsistent condom use, sexually transmitted infection (STI), alcohol consumption prior to sex and difficulty in condom use negotiation among FSWs in four states of India (N=3028).

risk behaviors within FSWs' typology of sex work. To examine the effect of use of cell phone on HIV risk behaviors, we fitted two sets of logistic regression models; model 1 with use of cell phone as the key independent variable and other socio-demographic variables added in the model as controlled covariates and model 2 was similar to model 1 with place of solicitation also controlled in the model along with other socio-demographic variables. Results from the logistic regression were presented in the form of odds ratios (OR) and their corresponding 95% confidence intervals (CI). All the analyses were performed using STATA 11.1.

Methodological consideration: Table 1 indicates a considerable overlap between places of solicitation of FSWs. In such a scenario, one cannot control for the effect of place of solicitation in the multivariate model while examining the effect of cell phone use on HIV risk behaviors. Therefore, we excluded observations from the analysis who reported more than one place of solicitation irrespective of their cell phone use. This resulted in an analytical sample of 3028 FSWs who reported only one place of solicitation.

Results

About two-fifths (43%) of FSWs recruited in the survey had a cell phone. One-fourth (25%) of FSWs reported using a cell phone for soliciting clients. FSWs who used cell phones to solicit clients were younger, better educated, never married and more dependent on income from sex work than others (Table 2). A large proportion of FSWs using cell phones were soliciting clients primarily in home- or lodge-based settings than those not using cell phones for solicitation.

Adjusted regression analyses (Table 3) suggest that FSWs who used cell phones for client solicitation were more likely to report inconsistent condom use with occasional clients (52% vs. 24%; adjusted odds ratio (AOR):2.7, 95% CI:2.2-3.2), inconsistent condom use with regular clients (60% vs. 32%; AOR:2.4, 95% CI:2.0-2.9), experience of STI-related symptoms (85% vs. 66%; AOR: 2.6, 95% CI:2.1-3.2), alcohol consumption prior to sex (64% vs. 51%; AOR:1.7, 95% CI:1.4-2.0) and difficulty in condom negotiation (48% vs. 22%; AOR: 2.8, 95% CI:2.3-3.4) than those who did not use cell phones to solicit clients. The effect of cell phone use on HIV risk behaviors remained the same even after controlling for place of solicitation. Further, lodge- or home-based FSWs were more likely to report inconsistent condom use with occasional clients, inconsistent condom use with regular clients and difficulty in condom negotiation as compared to street-based FSWs.

As the use of cell phone was associated with the place of solicitation, we further examined the effect of cell phone use on HIV risk behaviors among FSWs within each typology (Table 4). Results indicate that apart from home-based typology, in all other typologies of sex work FSWs who used cell phone as compared to those who did not use cell phones were more likely to report inconsistent condom use with their occasional and regular clients and difficulty in condom use negotiation. For example, the odds of using condoms inconsistently with occasional clients was higher among FSWs who used cell phones for solicitation in street-based (40% vs. 20%, AOR: 2.0, 95% CI: 1.4-2.8), brothel-based (56% vs. 19%, AOR: 4.5, 95% CI: 2.8-7.1) and lodge-based settings (69% vs. 43%, AOR: 2.5, 95% CI: 1.4-4.3) than those who did not use cell phones for solicitation. Similarly, the odds of experiencing STI-related symptoms and consumption of alcohol prior to sex were higher among FSWs who used cell phones for solicitation than who did not use cell phones irrespective of their place of solicitation. Furthermore, among cell phone users, HIV risk behaviors were more likely to be reported by lodge-based FSWs compared to those from other typologies.

Discussion

The current study, to the best of our knowledge, is the first to examine the association between use of cell phone for solicitation and HIV risk behaviors in its entirety among FSWs. The practice of FSWs using cell phones appears to be common in India, as the current study conducted in 2007-08 indicates that one-fourth of FSWs used cell phones to solicit clients. The findings further indicate that FSWs using cell phone for solicitation, as compared to those not using cell

HIV risk behaviors (*dependent variables*)		Place of solicitation							
		Street based[1]		Brothel based[2]		Lodge based[3]		Home based[4]	
		Not using cell phone (N=1312)	Using cell phone (N=223)	Not using cell phone (N=626)	Using cell phone (N=104)	Not using cell phone (N=95)	Using cell phone (N=173)	Not using cell phone (N=239)	Using cell phone (N=256)
Inconsistent condom use with occasional client in past week	% (n)	20.1 (262)	39.5 (86)	19.2 (120)	56.3 (58)	42.6 (40)	69.4 (120)	50.6 (118)	49.2 (126)
	Adjusted OR (95% CI)	Referent	**2.0 (1.4-2.8)**	Referent	**4.5 (2.8-7.1)**	Referent	**2.5 (1.4-4.3)**	Referent	0.8 (0.5-1.1)
Inconsistent condom use with regular client in past week	% (n)	26.0 (327)	43.0 (95)	31.7 (177)	61.6 (61)	61.8 (55)	82.6 (138)	55.3 (126)	57.8 (145)
	Adjusted OR (95% CI)	Referent	**1.7 (1.2-2.3)**	Referent	**3.0 (1.9-4.7)**	Referent	**1.8 (0.9-3.6)**	Referent	0.8 (0.5-1.2)
Experienced STI-related symptoms in past six months	% (n)	67.3 (883)	81.2 (181)	60.7 (380)	88.5 (92)	59.0 (56)	91.3 (158)	72.8 (174)	82.8 (212)
	Adjusted OR (95% CI)	Referent	**1.8 (1.3-2.6)**	Referent	**4.2 (2.2-7.9)**	Referent	**7.5 (3.7-15.2)**	Referent	**1.8 (1.1-2.9)**
Consumed alcohol prior to sex	% (n)	52.2 (685)	60.1 (134)	49.5 (310)	77.9 (81)	46.3 (44)	64.7 (112)	54.0 (129)	60.6 (155)
	Adjusted OR (95% CI)	Referent	**1.4 (1.0-1.8)**	Referent	**3.3 (2.0-5.4)**	Referent	**2.1 (1.2-3.6)**	Referent	**1.5 (1.0-2.2)**
Faced difficulty in condom negotiation	% (n)	18.2 (239)	32.7 (73)	19.0 (119)	59.6 (62)	37.9 (36)	54.9 (95)	41.4 (99)	50.4 (129)
	Adjusted OR (95% CI)	Referent	**1.9 (1.4-2.6)**	Referent	**5.3 (3.3-8.5)**	Referent	**1.9 (1.1-3.4)**	Referent	1.3 (0.8-1.8)

OR: Odds Ratio, CI: Confidence Interval

Multivariate models adjusted for respondent's age, educational status, marital status, income only from sex work and age at initiation of sex work.

[1]Street-based sites include on the road sites, railway station/bus stands, market areas, cinema halls, labor nakas and vehicles. Analysis was limited to a sub-sample of 1535 FSWs who solicit only in street-based sites irrespective their use of cell phone.

[2]Brothel-based sites include brothels and bar/night clubs. Analysis was limited to a sub-sample of 730 FSWs who solicit only in brothel-based sites irrespective their use of cell phone.

[3]Lodge-based sites include hotels, lodges and dhabas. Analysis was limited to a sub-sample of 268 FSWs who solicit only in lodge-based sites irrespective their use of cell phone.

[4]Home-based sites include client's home, rented room and own home. Analysis was limited to sub-sample of 495 FSWs who solicit only in home-based sites irrespective their use of cell phone.

Table 4: Unadjusted percent and adjusted odds ratios predicting inconsistent condom use, sexually transmitted infection (STI), alcohol consumption prior to sex and difficulty in condom use negotiation within FSWs' primary typology with use of cell phone as the predictor variable among FSWs in four states of India.

phones, were more likely to report inconsistent condom use, experience STI-related symptoms, consume alcohol prior to sex and face difficulty in condom use negotiation independent of their traditional places of solicitation. Furthermore, among FSWs using cell phone, lodge-based FSWs were more likely to engage in high HIV risk behaviors than FSWs practicing sex work in brothels, streets or homes.

Evidence from past research suggests that FSWs' condom use practices are influenced by several factors such as the degree of intimacy with sexual partners [16-18], charges per sex act [19-22], condom negotiation skills [19,23, 24] and alcohol consumption [11,25-27]. The current research shows that such behaviors are more likely to occur among FSWs using cell phones for solicitation than others, leading into higher inconsistent condom use with both occasional and regular clients. FSWs using cell phones for solicitation may be entertaining clients with whom they have established rapport and trust. In such circumstances, FSWs may not be able to insist on condom use because of their familiarity with the client, or more money being earned or their inability to negotiate condom use. Consistent with other studies, the current research also indicates that inconsistent condom use with clients is higher among FSWs who solicit clients in lodges as compared to other sex work typologies [3]. It is possible that though sex workers' primary place of solicitation is the lodge, they may have solicited client on the cell phone; the choice of a lodge for engaging in sex may have been based on the client's preference and may not be the same as their primary place of solicitation. In such a scenario, FSWs' negotiation skills could be hampered to a large extent by the unfavorable environment at the place of sex.

The fact that sex workers who use cell phones for solicitation appear to be at increased risk of STI/HIV can be an indication that this sub-group of women needs special programmatic attention. Although FSWs who use cell phones are better educated, younger and more dependent on income from sex work than others, their exposure to HIV prevention programs may be limited, as indicated by their high HIV risk behaviors. Further, with the increasing use of cell phone, FSWs may not visit traditional venues like streets, lodges and brothels to solicit clients [3,4]. Such dynamics can pose several challenges to program planners when designing outreach strategies for FSWs. This finding calls for future research to understand whether FSWs using cell phones for solicitation are reached by HIV prevention programs, and if so, the extent of such coverage. Further, in-depth research is needed to understand the network structure among FSWs using cell phones. Investigations should be carried out on the type of sexual exchange and degree of intimacy between sexual partners and FSWs who use cell phones. It is also important to conduct further research to understand the profile of clients solicited through cell phones and whether they are different from clients who are solicited in traditional places of solicitation.

The current research, further, indicates that FSWs use cell phone only as a medium to contact clients; they primarily solicit from locations like brothels, lodges, homes or streets. Therefore, one can argue that FSWs' HIV risk behaviors may not be due to the use of cell phone but rather due to the risk associated with the sex work setting, as indicated in past research [3,28,29]. Analyses examining the association between HIV risk behaviors and the use of cell phones within sex workers' typology indicated that FSWs using cell phone were at increased risk of HIV independent of their place of solicitation. However, we did not find any effect of cell phone use on HIV risk behaviors among home-based FSWs, apart from the experience of STIs. Home-based sex workers practice sex work through a network of known clients even before cell phone came into use. Further, a careful look at the sub-sample of FSWs using cell phone suggests that the lodge-based sex workers compared to home-based FSWs were more likely to report inconsistent condom use and experience of STI-related symptoms. Contrary to earlier research conducted among sex workers [28-30], the current research observes that among cell phone users, the HIV risk behaviors of home- and brothel-based FSWs do not differ, suggesting that the pattern of sexual behavior of FSWs is largely influenced by the use of cell phone rather than the typology of sex work.

Although the findings of this analysis provide important insights into the HIV risk behaviors of FSWs who use cell phones and those who do not use cell phones to solicit clients, the results should be interpreted with caution in the light of certain study limitations. First, the results of this study are based on a selective group of FSWs who were mobile (moved to at least two places in the past two years); hence, findings should not be generalized to all FSWs in India. However, given the nature of solicitation among mobile FSWs using cell phones for client solicitation, there are reasons to believe that non-mobile FSWs using cell phones may be engaging in similar sexual risk behaviors. To this end, further research is required to confirm this argument. Second, the analytical sample was limited to a group of FSWs who had reported only one place of solicitation. Post-hoc analyses among 5498 FSWs (all surveyed FSWs) suggest that the relationship between use of cell phone and HIV risk behaviors does not alter. Third, the key independent variable "use of cell phone for solicitation" used in this study was collected using a spontaneous multiple response question. This could have under-estimated the proportion of FSWs reporting use of cell phone for solicitation. Fourth, the indicators used in the current research are based on self-reports and there is a likelihood of certain degree of social desirability bias. In order to reduce such bias, interviews were conducted in a private place to ensure confidentiality of the respondents. Another limitation of the current research is related to the degree of cell phone use for sex work. The survey did not collect information on the extent and duration of cell phone use. Future research is, therefore, needed to understand the extent to which FSWs are dependent on cell phone use for client solicitation.

The widespread use of cell phone by FSWs has undoubtedly changed the structure of sex work, resulting in fewer traditional sex work venues in the recent years [2-4]. Nevertheless, our study shows that the use of cell phone for solicitation is currently in combination with other traditional sex work venues; however, those using cell phones are more likely to have high sexual risk behaviors than those not using cell phone for client solicitation. These results suggest that outreach programs for FSWs needs to be strengthened with special attention to those FSWs who use cell phones. In addition, HIV prevention programs should develop a network of sex workers through which outreach services to such FSWs using cell phone can be enhanced. Further, mapping of FSWs should be undertaken at regular intervals to understand the changing dynamics of sex work. An effective way of providing communication messages to FSWs who use cell phone may be through text messaging, which needs further research to understand the types of messages that FSWs would be comfortable receiving. Such communication messages can be either individually customized or group-targeted and could emphasize to improve knowledge about HIV/AIDS, information on HIV risk reduction, sexual negotiation skills, proper condom use, and development of partner norms supportive of consistent condom use. For better acceptance of communication messages, voice of a leader or peer acceptable to sex worker's community can be used to record those messages. Further, a toll-free helpline can be set up to provide counseling services and instant information on HIV prevention services

available at locations near the sex worker's locality. In summary, with the growing use of cell phone for solicitation, appropriate HIV prevention programs need to be developed that use technology to promote sexual risk reduction among FSWs in India and elsewhere.

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Authors' Contribution

BM led the study design, conception, data analysis and preparation of the manuscript. NS led in study design and data collection and assisted in finalizing analysis plan and interpretation of the findings. SS assisted in writing of manuscript and interpretation of study findings. AKJ provided overall guidance with analytical approach and interpretation of study findings. All authors read and approved the final manuscript.

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