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Abstract

Background: With the evolution of Health Belief Model, risk perception has been identified as one of several core components of public health interventions. While female sex workers (FSWs) in India continue to be at most risk of acquiring and transmitting HIV, little is known about their perception towards risk of acquiring HIV and how this perception depends upon their history of consistent condom use behavior with different type of partners. The objectiv5.78820000050T31-336(risafn)-335(2a.80/f4(The)0022001eddehe3551.*acti)pith in the sevturinueHttingRAbsamong mobile(ctiof

Background

With the evolution of Health Belief Model (HBM) in 1950, risk perception has been identified as one of the several core components of public health interventions, but it is an important marker to promote safe sex behavior in the context of HIV prevention programs [1]. According to this model, individuals must first feel personally threatened by a disease with serious conse-

years for sex work. The sample size was determined using an estimated proportion of 30% non-condom use, an assumed difference of 3% increase in the proportion with every unit increase in degree of mobility, a confidence level of 95% and power of 80%.

Across the entire study 9,475 FSWs (out of 10,075 contacted) agreed to be interviewed initially, based on a screening questionnaire. Of these, 59% (n = 5,611) were found eligible according to the eligibility criteria described above. Of the total eligible FSWs (5,611), 198 were excluded: 15 could not be interviewed because they were below age 18 years, 21 refused to participate, 51 withdrew midway without completing the interview, the data on socio-economic variables were missing for 26 FSWs, and 85 FSWs did not answer the question on perceived risk of acquiring HIV. This resulted into a total analytical sample of 5,413 FSWs.

Ethical procedures

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 at each stage. For ethical considerations, only those FSWs who were at least 18 years of age were interviewed.

Measures

The dependent variable—HIV risk perception—was created from responses to a direct question asked: "What do you think is the risk of your getting HIV?" The response categories included: high, moderate, and low. This information was used to measure whether FSWs perceived themselves to be at high or low risk of acquiring HIV; those who responded as high or moderate risk

Statistical analysis

Bivariate, analysis of variance, and multilevel logistic regression analysis were conducted to study the relationship between reported condom use behavior and self-perceived risk of acquiring HIV. The sample of FSWs in this study is nested within a district which, in turn, is nested within a state. Analysis of variance was conducted to estimate the percent of variance explained by these two cluster variables. Further, to assess the variation existing across these states in terms of number of high risk populations, HIV prevalence and program implementation [30,40-42]; we used a multilevel logistic model for analysis, which also accounted for the design effect. In the multilevel model, the state with four categories was included as the fixed effect and the district with 22 categories as the random effect. Various covariates known to be associated with either condom use behavior or the individual's perception of HIV risk were included in the multilevel logistic models to eliminate their common effects on the observed relationship between condom use and perceived HIV risk. Adjusted odds ratios were estimated to test these relationships.

Four models were estimated: Model I included the two cluster variables: the district as a random component and the state as the fixed component. These two cluster variables were included in all models. Model II included variables indicating condom use behaviors only; Model III included all the covariates only; and Model IV included condom use variables and other covariates. A comparison of Models II and IV indicates the magnitude of relationship between condom use and perceived HIV risk that is explained by all the covariates included in Model IV. The adjusted odds ratios in Model IV indicate the independent effect of condom use behavior on self-perceived risk of acquiring HIV. All statistical analyses were conducted using STATA version 11.1.

Results

Of the sample of 5,413 mobile FSWs who were included in this study, 40% currently perceived themselves to be at high risk of HIV. Close to three-fourths (71%) reported consistent condom use in sex with occasional clients in one week prior to the survey; and 60% reported consistent use of condoms in sex with regular clients. About 31% of mobile FSWs reported sex with non-paying partners in the last one week; of these about 57% (or 18% of all FSWs) reported consistent condom use in sex with non-paying partners.

Association between prior condom use behavior and current perceived high HIV risk

Results presented in Table 1 indicate that the large majority of FSWs who engaged in risky sexual behaviors in last one week also currently perceived themselves to be at a higher risk of acquiring HIV, and that FSWs assessed their HIV risk mainly based on consistency of condom use with occasional clients rather than on consistency of condom use with regular clients or non-paying partners. The effect of reported consistent condom use with regular clients on the degree of perceived risk of acquiring HIV disappears once we control for consistency of condom use with occasional clients. This can be seen by considering FSWs who reported consistent condom use with occasional clients: among these FSWs, the percentage who perceived themselves to be at high HIV risk does not vary by condom use pattern with regular clients (35% among those who reported consistent condom use vs. 39% of those who reported inconsistent condom use with regular clients; panel 1, Table 1). Similarly, among those who reported inconsistent condom use with occasional clients, 56% perceived themselves to be at a high HIV risk among both groups—those reported consistent condom use as well those who reported inconsistent condom use with regular clients. Likewise, the weak relationship between consistency of condom use with non-paying partners and the degree of perceived HIV risk is explained by its relationship with reported consistency of condom use with occasional clients (panel 2, Table 1).

These relationships could also be restated in terms of the degree of congruence between prior condom use and self-perceived HIV risk at interview. A high degree of congruence was observed between the degree of self-perceived HIV risk and prior risky behavior with respect to condom use with occasional clients. It appears that about 63% of FSWs were able to assess their HIV risk correctly—47% used condoms consistently and correctly considered themselves to be at low HIV risk, and about 16% of FSWs used condoms inconsistently during past one week and correctly perceived themselves to be at high HIV risk at the time of survey (Table 2). About 36% of FSWs assessed their HIV risk incorrectly: 24% used condoms consistently but perceived themselves to be at high HIV risk, and 12% used condoms inconsistently and perceived themselves to be at low HIV risk.

State-level differences

Significant differences in HIV risk perception were noted among the four states included in this analysis; the percentage of FSWs who currently perceived themselves to be at a high HIV risk varied from about 17% in Maharashtra to 56% in Andhra Pradesh (Table 3). While the percentage of FSWs who reported consistent condom use with occasional clients in past one week was similar in Andhra Pradesh, Maharashtra, and Tamil Nadu (about 83% to 91%), a higher percent of FSWs in Andhra Pradesh perceived themselves to be at high HIV

Table 1 Percentage of mobile FSWs in Southern India who perceived themselves to be at high risk of acquiring HIV at interview by prior condom use with different type of clients/partners

Condom use in last one week with occasional clients	Condom use in last one week with regular clients				
	Consistent	Inconsistent	No client	Total	N
Consistent	34.8	38.9	10.7	33.9	3853
Inconsistent	55.6	55.9	57.0	55.9	1514
No client	28.6	(27.3)	–	28.3	46
Total	35.3	50.9	22.7	40.0	
N	3225	1884	304		5413
Condom use in last one week with occasional clients	Condom use in last one week with non-paying partners				
	Consistent	Inconsistent	No partner	Total	N
Consistent	50.5	53.7	25.2	33.9	3853
Inconsistent	77.4	64.2	52.9	55.9	1514
No client	(83.3)	(33.3)	18.9	28.3	44
Total	51.6	58.7	33.5	40.0	
N	954	714	3745		5413

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risk than those in Maharashtra (54% vs. 14%). Only 25% of FSWs in Karnataka reported consistent condom use with occasional clients and 17% with regular clients, which was lowest among all states.

Multilevel logistic regression analysis

The difference in self-perceived risk of HIV among the states is greater than the difference among districts; clustering by states explains about 9% and by districts explains an additional 4% of the variance in the perceived risk of HIV, i.e., the remaining 87% of the variance in perceived HIV risk is not due to clustering but it is due to individual characteristics. The district effect (the standard deviation for the random effect of districts) reduces from 0.99 to 0.54 once the state is included in the fixed part of the model, and does not change much after individual variables are included. However, the district effect remains significantly greater than zero in all models, which indicates that the difference among districts in the degree of self-perceived HIV risk is not explained by the individual characteristics included in these models. Moreover, district effects within each state indicate that districts in Andhra Pradesh and Karnataka are more homogeneous than those in Tamil Nadu and Maharashtra (data not shown).

Multilevel logistic regression results presented in Table 4 confirm the associations observed in the descriptive analysis, even after controlling for several background characteristics. Inconsistent condom use in past one week with occasional clients was independently associated with currently perceived higher risk of acquiring HIV (adjusted odds ratios [aOR] =2.1, 95% CI: 1.7-2.6). However, inconsistent condom use with regular clients was not independently associated with the level of perceived risk of acquiring HIV (aOR=1.0, 95% CI: 0.8-1.2). Inconsistent condom use, in comparison to consistent condom use, with non-paying partners was associated with lower self-perceived risk of acquiring HIV (aOR=0.7, 95% CI: 0.5 - 0.9). These observed associations between prior consistent condom use behaviors

Table 2 Percentage of mobile FSWs according to the degree of congruence between HIV risk perception at interview and prior condom use behavior with occasional clients by states

Congruence between current HIV risk perception and prior condom use with occasional clients	Total	Andhra Pradesh	Karnataka	Maharashtra	Tamil Nadu
I. Congr en	62.6	49.9	62.3	81.1	61.3
a. Consistent condom use and at low HIV risk	47.0	38.4	19.8	77.0	59.8
b. Inconsistent condom use and at high HIV risk	15.7	11.5	42.5	4.1	1.5
II. No congr en	36.4	49.3	37.6	18.4	36.6
a. Consistent condom use and at high HIV risk	24.1	44.5	5.7	12.3	31.3
b. Inconsistent condom use and at low HIV risk	12.3	4.7	32.0	6.1	5.3
No client	0.8	0.8	0.1	0.4	2.0
Total : %	100	100	100	100	100
N	5413	1533	1420	1188	1272

with different types of clients and self-perceived HIV risk at the time of survey are not explained by their

the use of alcohol before sex. The observed association between inconsistent condom use with occasional clients and perceived high HIV risk is not explained by their joint relationships with the experience of STI symptoms, alcohol use, and other covariates. Incorporating experience of STI symptoms increases the accuracy of personal HIV risk assessment from 63% to 80%. While STI symptoms have poor specificity among women in general, their experience of such symptoms may indicat3%curacy

treating STIs as well as reinforcing the message of consistent condom use in all sexual encounters.

Furthermore, the apparent inaccurate perception of high HIV risk among about 7% of FSWs who reported using condoms consistently with occasional clients could simply be a reflection of their perception of high HIV risk associated with their profession. It is possible that this perception has not been modified to low risk with the adoption of consistent condom use. Alternatively, some of these FSWs may not have understood the behavioural communication messages and internalized the links between inconsistent condom use and high HIV risk or may be over-reporting both consistent condom use as well as their HIV risk perception. Nevertheless, the inaccurate perception of high HIV risk by those who reported consistent condom use is not important for controlling the spread of HIV, particularly if they actually used condoms consistently. The critical group of FSWs which should be the focus for controlling the spread of HIV is the 12% who perceived themselves to be at low risk of acquiring HIV even though they reported inconsistent condom use with occasional clients.

However, the finding regarding the congruence between inconsistent condom use during sex with occasional clients and high perceived HIV risk perhaps indicates the success of HIV prevention programs in communicating the HIV risk associated with unprotected sex with occasional clients. This finding is supported by the fact that consistent condom use in sex with occasional clients is high. However, the findings of this study also suggest that education programs may not have adequately emphasized the importance of using condoms consistently in all sexual encounters, especially in sex with regular clients and non-paying partners.

The finding that the variance in the degree of self-perceived HIV risk across districts is not explained by the factors included in the study suggests that there are some important unmeasured individual and district-level contextual factors that have not been included in this study. These may, for example, include the prevalence of STI/HIV and the availability of condoms and STI/HIV treatment in the district, and an individu

relate to risky behavior with each type of client/partner and how this relationship could vary across different contexts.

While the current cross-sectional study of mobile FSWs has important implications for further research as well as HIV prevention programs, these results should be interpreted with caution because of a few limitations and meth-

their prior condom use behavior with occasional clients. However, the link between condom use behavior with regular clients and non-paying partners and perceived HIV risk is not as clearly understood. Findings of this study have important implications for designing the content of IEC materials and the issues to be discussed by peer educators with FSWs. Specifically, these messages and interactions need to emphasize the importance of using condoms in all sexual encounters not only with occasional clients, but also with regular clients as well as with non-paying partners. Peer educators should also enable FSWs to accurately assess their own risk of acquiring HIV based on such markers as frequency of inconsistent condom use with occasional and regular clients as well as with non-paying partners, experience of STI symptoms, and continuing sex while experiencing STI symptoms.

List of abbreviations used

AIDS: Acquired immune deficiency syndrome; aOR: Adjusted Odds Ratio; CI: Confidence Interval; FSW: Female Sex Worker; HBM: Health Belief Model; HIV: Human Immunodeficiency Virus; IEC: Information, Education and Communication; IRB: Institutional Review Board; NACO: National AIDS Control Organisation; STI: Sexually Transmitted Infections.

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Authors' contributions

AKJ led conceptualization, conducted all analyses, and led manuscript development. NS assisted with conceptualization, analytic approach, and manuscript development. BM assisted in manuscript development and literature review. MPS assisted with data analysis. HRM lead fieldwork in two states and helped with interpretation of results. SSH assisted with conceptualization and the interpretation of study findings. RKV assisted with conceptualization of analytic approach, manuscript development, and interpretation of study findings. All authors participated as described above and all read and approved this final submitted manuscript.

Competing interests

The authors have no financial benefits or competing interests related to this submitted work.

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