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Determinants of HIV Risk among Male Migrant Workers in Mumbai

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ABSTRACT

Despite male migrants in Mumbai being acknowledged as a vulnerable group for HIV/AIDS, there is current research neglect on the determinants of their risk, necessary for prevention. The present study analysed 605 male migrants (collected by PC and TISS) on their socioeconomic and demographic variables of income, age, occupation, education and marital status determining HIV knowledge, risky sexual behaviour (RSB) and sexually transmitted infection (STI) reporting. Additionally, the effects of RSB on STI, and of HIV knowledge on RSB and STI were observed. While results of each risk vary, age, marital status, education and income were significant vulnerability predictors, such that those younger, single, less educated and earning more show higher HIV risk. Increased knowledge was found to increase RSB and STI, attributed to the deficiencies persistent in high HIV knowledge. As expected, higher RSB increased STI. Overall, policies in Mumbai need to be scaled up and better defined to assess and address the needs of vulnerable migrant subgroups.

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ABBREVIATIONS

ANC…… Ante Natal Clinics

CSW…….. Commercial Sex Workers

NACO…… National AIDS Control Organisation

NACP…… National AIDS Control Policies

RSB…… Risky Sexual Behaviour

PC……..…The Population Council

STI……Sexually Transmitted Infections

SE-D…… Socioeconomic and Demographic

TISS…….. Tata Institute of Social Science

VCT…… Voluntary Counselling and Testing

INTRODUCTION

The city of Mumbai is a hub of financial activity, making it the most popular destination for Indian migrants seeking employment opportunities (Chandrasekaran et al., 2006). The 2001 census showed that the number of migrants in the city reached 5.2 million, significantly higher than 1991 that totalled 3.7 million (Registrar General of India, 2001). A large portion of this migration figure is due to short-term interstate mobility from Uttar Pradesh, Bihar and South Tamil Nadu. More favourable to males, the sex ratio is 854 female to 1000 male migrants (Registrar General of India, 2001). Accordingly, a notable feature of migrants in the Mumbai district is a very high level of separation from wives causing migrants to live alone or with friends.

International experience strongly suggests that large extents of migrant short-term mobility can have significant implications for HIV/AIDS throughout Mumbai and the rest of India (Jain et al., 1994; Pais, 1996). Evidence from India itself demonstrates that urban migration is a strong co-factor accelerating HIV prevalence (APSACS, 2007; Verma et al., 2007). Most recently, migrant HIV prevalence was found to be 3.61%, whereas the male adult rate is 0.34% (NACO, 2008). Similarly, compared to Karnataka (Saggurti et al., 2008) and Andra Pradesh (Verma et al., 2007), a stronger association exists in Maharashtra between both in/out migration and HIV prevalence among pregnant women attending ANC clinics and patients at STD clinics (Saggurti et al., 2008). Indeed Mumbai supposes key importance for the HIV spread showing a high prevalence amongst different population groups' vis-à-vis the national averages of those groups. While national CSW prevalence is 4.9%, in Mumbai this rate is 11.2-38.6%. Similarly, national STI and ANC prevalence is 3.7% and 0.6% respectively, whereas in Mumbai it is 21.2% and 1.75-2.25% respectively (NAC0, 2006). This association is critical, marking the spread of infection in India similar to that seen early on in the epidemics in Thailand and Kenya (Bryan et al., 2001). Epidemics initially concentrated on high-risk groups such as CSW, then spread to the general population through their clients', (especially migrants') sexual contact with their wives or steady sexual partners (Bryan et al., 2001). This is evident in the recent high seroprevalence among married monogamous women attending STI clinics (Gangakhedar et al., 1997).

The rationale of the migrant-HIV association lies in the process of migration - majority of male migrants are within their sexually active age, travelling without wives or regular partners and families, thus creating a social milieu. This combined with poor living and working conditions in predominantly male settings predisposes migrants to take up RSB with non-CSW casual partners and with CSW in the several sex trade points available in Mumbai (Mukherjee and Danje, 2006). Literature in India has established the relationship between migrants and their RSB (Halli et al., 2007; Singh et al., 2006; Vemuri & Battacharya, 2004). One study found that 67% of the clients visiting red-light areas in Mumbai are migrants or visitors from other districts (Anil Kumar, 2005). Research suggests that those who migrate with their families often have less RSB such as sexual contact with CSW and unprotected sex, than those separated from their wives and families (Mishra, 2004; Saggurti et al., 2008; Singh et al., 2006). Studies also show that migrant men who drink alcohol are substantially more likely to engage in RSB. In addition to RSB, limited treatment access for STI exacerbates risk of contracting and transmitting the HIV virus as does limited knowledge of HIV transmission and prevention (Gupta & Mishra, 1999) and low perception of vulnerability to HIV/STI (Mishra, 2004).

The recognition of migrants as a vulnerable 'bridge group' has led to their targeted intervention from NACO and the India AIDS Initiative, Avahan. The interventions primarily involve raising awareness about the prevention and transmission of HIV and STI, in addition to facilitating easy access to condoms, STI treatment, and VCT services. For reaching migrant workers, NGOs identify active volunteers within the migrant group and train them as peer educators to spread the preventative messages among their fellow workers. In addition, employers such as factory owners and construction companies are also encouraged to undertake preventative HIV education activities for employees.

Despite the acknowledgement of this 'bridge population' and interventions taking place since the NACP II in 1999, the handful of available data on migrants asserts that levels of knowledge amongst them remains low. General migrants in Navi Mumbai

and Nepali migrants in all Mumbai are found to have very little knowledge of HIV/AIDS and STI prevention, transmission and symptoms, which tends to be incorrect, incomplete, or based on myths (Jadhav, 2004; Mukherjee & Danje, 2006). However, it is not that migrants do not have any HIV knowledge; it is simply that the knowledge they possess has serious deficits. On the one hand, majority of migrants know for example that it is unsafe to use a condom more than once (Bryan et al., 2001) and that sharing non-sterile syringes/needles with infected persons can lead to HIV transmission (Jadhav, 2004). On the other hand, very few can explain the relationship between STI and HIV/AIDS (Mukherjee and Danje, 2006) while others believe that sharing clothes and utensils with infected persons can cause HIV (Jadhav, 2004). According to models such as the information-motivation-behavioural skills (IMB) model (Fisher & Fisher, 1992; 1993; 2000), only well-informed individuals will apply and maintain HIV prevention behaviour therefore such serious knowledge deficits still do have great impacts on risky behaviours and HIV vulnerability.

One reason for this poor knowledge albeit interventions may be due to current research neglect in informing policies regarding migrants, particularly the segmentation of their vulnerability patterns. Migrants are not a homogeneous group and a lack of information on their within group differences, determinants and characteristics that may predict their HIV vulnerability may hinder interventions from achieving optimal results. As such PC in collaboration with TISS (2008) carried out a study describing the characteristics of vulnerable sub-populations among migrant men in Maharashtra and examining the determinants of high-risk behaviour among them. The authors found that in addition to the use of alcohol, pornography, and number of places moved to, SE-D subgroups of age, marital status, income, and occupation also predict RSB. Compared to married men, single men reported higher sexual behaviour whether with CSW or non-CSW. Regarding age differences, having sex with all partner types increased with age for currently unmarried men, while among currently married men extramarital sexual behaviour was reported to be higher among men below age 30 than men above 30 years old. Secondly, the possibility of having sex at multiple locations is slightly higher among those aged 20-24 years as compared to men in other age groups. Income differences were also observed whereby those earning Rs.2000 a month or less reported a considerably

higher level of sexual activity than those with higher income, which is in contrast to Jadhav (2004) who found that migrants working in Chinese food stalls earned well and therefore attended ladies bars to have sex. In the occupation subcategory, hamalis (loading/unloading), stonecutters and construction workers reported higher non-marital sex compared other occupations. Additionally, the share of those who engaged in sex at two of more places is higher among stonecutters and construction workers.

Determinants were also obtained for condom use where the extent of non- or inconsistent condom use was higher among men who are currently under a work contract. In Chennai truckers, Bryan et al. (2001) found that all demographic variables predicted condom use with one's wife, such that younger, more educated, non-Hindu, non-Lower caste men were more likely to use condoms. With the exception of education however, when these variables are put in a model together with information, motivation and perceived behavioural skills, their prediction becomes non-significant indicating their relationship is through the IMB facets. Regarding condom use with a CSW, again more educated, married, non-Hindu, non-Lower caste men were more likely to use condoms, of which the relationship with non-Hindu and married men (the strongest predictors) remained significant even when IMB variables were included.

Concerning STI prevalence, PC -TISS found that those migrants who moved to three or more places in the past two years, and those who commute between their residence and work place reported considerably higher percentage of STI like symptoms. Indicators of HIV knowledge of these male migrants in Maharashtra illustrates that HIV knowledge is insufficient. Regarding routes of transmission, less than half of participants reported sex with a HIV positive person (48%) as a route; a lower percentage reported sex without condoms (31%), sex with sex worker (27%), sex with multiple partners (25%) and use of infected needles (27%). Similarly, abstaining from pre/extramarital sex and avoiding people who are HIV positive was seen most commonly to prevent HIV transmission (49%), however, only 2% perceived consistent condom use and 20% perceived having only one partner as protective.

Recently, Avert society (2010) re-analysed the PC-TISS data from the Bhiwandi area of Thane District finding similarly that socio-demographic indicators could predict HIV knowledge. Relative to their comparator subgroups, factory workers, men above 25, married men, and migrants from high socioeconomic status (in terms of housing) reported higher levels of comprehensive knowledge. An income of less than Rs.3000 a month also came with significantly greater odds of comprehensive knowledge compared to those earning more than Rs.3000. Regarding RSB, as age increased by 5 years migrants had 1.8 times higher risk of having sex with CSW. Finally, the proportion of migrants who reported STI symptoms was higher amongst those with lower socioeconomic status.

Given that the HIV risk of male migrants in Mumbai remains high despite the targeted interventions by governmental and non-governmental organisations, it is important that policy makers look into SE-D determinants important to this group in order to better define prevention efforts. Therefore, the first objective of the present study was to investigate whether there are SE-D predictors for the migrants' HIV vulnerability in terms of HIV/AIDS knowledge (transmission and prevention), RSB i.e. extramarital sex, and STI symptoms – the dependent variables important for prevention. The independent SE-D variables were age, income, education, occupation and marital status. First, bivariate relationships were analysed followed by their combined multivariate relationship with each of the dependent variables. The second objective was to confirm whether an increase of HIV prevention and transmission knowledge does decrease HIV vulnerability in terms of RSB and STI. Finally, the influence RSB has on STI was also observed.

METHOD

Sources of Data

This study is based on empirical data gathered in five districts of Maharashtra in 2007 by the PC in collaboration with TISS. However the present analysis focuses on participants from Mumbai.

Study design, procedure and participants

The cross-sectional design involved three major steps. Based on the census 2001, Mumbai was chosen as one of the districts characteristic of large migrant worker concentration and high HIV prevalence rates. Sites were then selected using the following criteria: a high volume of male in-migration, evidence of HIV risk activity, diverse occupations of migrants, rural/ urban/ industrial setting and proximity to highways and railway stations. Some sites were selected randomly for qualitative and quantitative research.

The purpose of the qualitative data was to identify individual, community and structural factors determining migration and influencing their sexual risk vulnerabilities, and to inform the sampling frame for the survey. Collected in three stages, first local key informants were interviewed, second, in-depth interviews were conducted with selected migrant men; and third, group interviews with migrant men were carried out based on occupational grouping and places of origin. Twelve experienced and trained male investigators collected data after taking participants' consent.

To examine quantitatively the relationship between migration-related factors and RSB of men, which this study is based on, a two-stage systematic sample was used in residential areas where lanes and by-lanes were selected from a list and the required number of houses selected. For workplace recruitment, a facility-based procedure was used where men were systematically selected from lists and where they worked or loitered. Selected men were screened for eligibility based on a male migrant worker being defined as 'any person who had moved to current place for work in the previous two years and had visited two or more places for the purpose of work in the previous two years'. In the Mumbai sample, this resulted in 605 male migrant workers (18 years and above), who consented to participate in the extended survey, which employed a structured interview programme. Eighteen male interviewers carried out the surveys.

Variables

The survey included many items, however only certain pertinent variables were considered in the analysis and discussion. The SE-D profile included age - under 24 years and 25 and above; monthly income - less than Rs.3000 and above Rs.3000 (Avert, 2010); marital status - single or married; occupation type - factory workers, construction workers and other workers; and education - 0, 1-5, 6-7 and 8+ years of formal education.

HIV knowledge was derived from three items in the survey. For the question of *"how a woman gets infected with HIV*", mentioning of four responses was considered - sex with multiple partners, sex with someone having HIV, infected needles and infected blood. Mentioning of the six answers was observed when asked, *"how men get infected"* - sex with multiple partners, sex with someone having HIV, sex with sex worker, sex without condoms, infected needles and infected blood. When questioned "*how can HIV be prevented*?" the following responses were considered - having only one sex partner, abstaining from pre/extramarital sex, using condoms all the time, taking injections with clean needle/syringe/other injecting equipment, and not visiting sex workers. Therefore, participants received a score out of 15 depending on the number of correct responses given. With the exception of one analysis, this score was then converted into a categorical variable whereby a score of 0-4 signified 'low' knowledge, 5-9 as 'moderate' knowledge, and 10-15 as 'high' knowledge. Awareness of HIV/AIDS and source of information were also included.

RSB was derived from an item on whether respondents ever had a sexual relationship with any partner (male or female) outside marriage; or women/men, if single. This was a replacement of using sexual contact with CSW to represent RSB as this variable had data error and poor sample size. It is recognised that the chosen variable may contain error within single migrants who answered 'no' as this may not necessarily reflect no 'extramarital' sex but perhaps no consistent regular partner overall (N=158). Nevertheless, of those men having extramarital sex, 64.1% reported sex with CSW in the last 12 months, and 41% with non-CSW. A significant association was also found between extramarital sex and frequency of migrants

having visited a sex worker in their life (p<.001) demonstrating it is a reasonable RSB indicator. Finally, STI was recorded as the reporting of any of the following symptoms similar to STI in the last 12 months: swapna dosh (nocturnal emissions), pre-ejaculation, lack of erection, bent penis, premature/early ejaculation, poor quantity semen, poor quality semen, garmi (heat), phoda/phunsi (boils/ulcers), swelling in groin area, itching in genital area, frequent painful urination.

Statistical Analysis

SPSS 15.0 was used to carry out tests.

Bivariate analyses to examine the association between the independent SE-D variables with the dependent variables of HIV knowledge, RSB, and STI were conducted using Pearson's chi-square. A multiple regression was then applied to analyse SE-D prediction of continuous HIV knowledge. Two multivariate logistic regressions were then performed to quantify and compare the likelihood of RSB and STI among all SE-D subgroups in addition to HIV knowledge.

Hypotheses

Although, the majority of 'vulnerable' migrants in Mumbai are in the age group 20-24 years old it is nationally indicated that under 25 year old males have least HIV prevalence (0.19%) compared to 30-34 year old males who are at greatest risk of HIV (0.64%), followed by 35+ (0.47%), then 25-29 (0.43%) (NHFS, 2006). Based on these national statistics and previous findings, it was hypothesised that the subcategories of 25 years old and above, those earning more than Rs.3000, and single men would have significantly lower HIV knowledge compared to those 24 years and under, earning less than Rs.3001, and married, who would have higher HIV knowledge. Therefore, the knowledge categories would show that those 25 years and above, earning Rs.3001 and above, and single would have higher likelihood of '*low knowledge*' and lower likelihood of '*high knowledge'* compared to those 24 and under, earning Rs.3000 and less, and married. The *'moderate knowledge'* category was predicted to have similar numbers from each group. A linear relationship was hypothesised for education with HIV knowledge. It was hypothesised that an inverse

linear relationship would be observed with *'low knowledge'*, thus those with 0 years of education would have the highest frequency of '*low knowledge'*. For *'high knowledge'* there would be a linear relationship where those with 8 and above years of education have the highest frequency. Those with 1-5 years of education would have the highest frequency in '*moderate knowledge'*. For occupation, it was expected that there would be significant differences between HIV knowledge among different occupational groups.

Again, based on the national statistics and previous findings, it was hypothesised that men aged 24 and under, earning less than Rs.3000, married men, and those with higher years of education would have a lower frequency of RSB and STI reporting compared to those aged 25 and above, earning more than Rs.3000, single, and those with lower levels of education who would have higher frequency. For occupation it was hypothesised that there would be significant differences in the odds of RSB and STI between different occupation types. It was predicted that those with high HIV knowledge would have lower likelihood of RSB and STI, followed by moderate HIV knowledge and low HIV knowledge to have the highest likelihood. Finally, for RSB as a determinant of STI, it was hypothesised that the odds of having STI would increase with RSB.

RESULTS

Demographic Profile

The mean age of the participants was 25.07 (st dev: 4.80). Majority of participants were Hindu (75.7%) while the remaining were Muslim (23.6%). Forty point five percent were single whereas 57.5% were married. Thirty two percent of migrants had completed above 8 years of education, followed by 28.6% completing 1-5 years, 20.3% who had 0 years of formal education and finally 18.2% completing 6-7 years of education. Occupational data indicated that 44.8% of migrants are factory workers in the steel or small industries, followed by construction work (16.5%), and daily wage labourer (13.2%) – casual labourer such as carpenters.

Knowledge

The mean score of HIV knowledge was 6.17 (st. dev: 2.63). There were 30.6% with low knowledge, 55.9% with moderate knowledge and only 13.6% with high knowledge. Seventy five percent had heard of HIV/AIDS from the radio, 69.9% through friends, relatives and peers, and 63.8% through the television. Majority mentioned multiple partners as a route to transmission for women (89.1%) and men (72.7%), however, a very small proportion mentioned infected blood (women: 11.9%; men: 9.8%) and needles (women: 23.3%; men: 18.3%). Accordingly, high percentages mentioned having one sexual partner (74%) not visiting CSW as methods of prevention (69.3%) and consistent use of condoms as means to protect (49.4%), but only 16.5% mentioned taking injections with clean needles/syringes.

Bivariate Findings

Table 1 represents the percentage of migrants in each SE-D category possessing different levels of HIV knowledge, RSB and STI. Knowledge was significantly influenced by age, education, and marital status. Migrants aged 25 and above had a lower percentage in the low knowledge category and a higher percentage in high knowledge, relative to those 24 and under who showed the opposite trend as well as a higher percentage in moderate knowledge. Those with 0 years of education showed highest frequency of low knowledge, while 1-5 years showed highest frequency of moderate knowledge, and those with 8 and above years, followed by 6-7 years had significantly higher frequency in high knowledge. Single men were more likely to feature in the low HIV knowledge category than married men and vice versa. No significant relationship was found for income or occupation.

Altogether, 31.9% of migrants reported RSB, it is clear from table one that there are no vast differences between SE-D sub-populations and their relation to RSB. No significant relationship was found for age, education or occupation. Although, earning Rs.3001 and above led to a 6.3% increase and being single a 6.2% increase, the differences were at best marginally significant (p=.10). Findings on STI revealed that 76.4% of migrants reported symptoms, of which 83.3% did nothing about. The most common symptom was *swapna dosh* (70%) while the remaining were below 15%. Occupation, age and marital status had a significant influence on STI reporting.

STI reporting increased for migrants below 25 year olds by 26.8% compared to those 25 and above, and by 24.8% from married to single men. Daily wage labourers followed by construction workers, were also particularly vulnerable to STI. Income and education were not significantly related to STI.

Table 1: Percentage distribution of male migrants by SE-D characteristics according to HIV knowledge, RSB and STI prevalence

Characteristic (*N*)	**HIV Knowledge (%)**			**RSB (%)**		**STI (%)**	
	Low	**Moderate**	**High**	**Yes**	**No**	**Yes**	**No**
Age (605)							
24 and under	31.2	58.8	10 **	32.5	67.5	89.4	10.6****
25 and above	29.9	52.7	17.3	31.3	68.7	62.6	37.4
Income (604)							
Rs.3000 and under	30.4	56.6	13	28.8	71.2*	75.6	24.4
Rs.3001 and above	30.6	55.2	14.2	35.1	64.9	77.1	22.9
Education (605)							
0 years	39.3	57.3	3.4****	25.2	74.8	78.9	21.1
1-5 years	26.6	63.6	9.8	31.2	68.8	72.8	27.2
6-7 years	31.8	50.9	17.3	33.6	66.4	78.2	21.8
8+ years	27.1	51.8	21.1	35.7	64.3	76.9	23.1
Occupation (605)							
Construction workers	35	60	5	37	63	80	20***
Daily wage labourers	22.5	62.5	15	33.8	66.3	91.3	8.8
Factory workers	30.6	53.9	15.5	29.9	70.1	73.1	26.9
Other	31.8	53.2	14.9	31.2	68.8	71.1	27.9
Marital Status (593)							
Single	35.9	55.5	8.6***	35.5	64.5*	90.6	9.4****
Married	27.3	56.3	16.4	29.3	70.7	65.8	34.2

*p≤.10 **p≤.05 ***p≤.01 ****p≤.001

Multivariate Findings

The linear regression for HIV knowledge (table 2) with SE-D variables shows that a change from 24 years and under to 25 and above led to a shift of .06 in knowledge score, which did not reach significance. Further testing revealed that age operates through marital status as it only reaches significance when marital status is removed from the model. Education was found to have a significant linear relationship with HIV knowledge; relative to 0 years, those with 1-5 years had a .97 higher score, those with 6-7 years of education had 1.17 high score and those with 8 and above years had a 1.72 higher score. Being married led to a significantly higher score (4.45) of knowledge compared to migrants who were single. Differences in income and occupation did not significantly change HIV knowledge.

Table 2: Linear regression analysis of SE-D variables associated with changes in knowledge score (with 95% confidence intervals)

Characteristic (N=591)	HIV Knowledge (95% confidence intervals)
Age	
24 years and under vs. 25 and above	.06 (-.51 - .63)
Income	
Rs.3000 and under vs. Rs.3001 and above	.24 (-.18 - .67)
Education	
1-5 years vs. 0 years	.97*** (.37 - 1.56)
6-7 years vs. 0 years	1.17**** (.50 - 1.85)
8+ years vs. 0 years	1.72**** (1.13 - 2.32)
Occupation	
Construction worker vs. factory workers	-.43 (-1.03 - .16)
Daily wage labourer vs. factory workers	.28 (-.37 - .93)
Other vs. factory workers	-.03 (-.54 - .49)
Marital Status	
Single vs. married	4.45**** (.34 - 1.5)
R^2, F	*.091, F(9;582)=6.45****

*p≤.10 **p≤.05 ***p≤.01 ****p≤.001

Table 3 provides the regression results of the SE-D and knowledge characteristics predicting RSB. Most importantly, HIV knowledge was highly significant where, as knowledge increased from low to moderate, the odds of RSB (OR, 2.4) were over twice as likely. High knowledge also had a higher likelihood of RSB compared to low knowledge (OR, 1.74), albeit the figure being 66% lower than moderate knowledge. Within education, the difference in RSB odds increased progressively from 0 years till 6-7 years of education, however this did not reach significance. Those with 8 and above years of education had a slightly lower odds of RSB than those with 6-7 years (OR, 1.61), however this difference was at best only marginally significant relative to 0 years (p=.09). Nevertheless, as it was not significant in the bivariate analyses, testing of interactions indicated that its interaction with knowledge is what makes it significant (appendix, table I). Similarly, differences between the income groups were also marginally significant where those earning higher were more likely to uptake RSB (OR, 1.38). Single migrants also appeared to have significantly higher odds of RSB relative to married men (married OR, .52). As indicated the likelihood of RSB amongst different age and occupation groups was not significantly different.

Table 3: Odds ratio (and 95% confidence intervals) from logistic regression analysis showing the likelihood that male migrants have had RSB in their life by SE-D characteristics

Characteristic (N=592)	**RSB (95% confidence intervals)**
Knowledge	
Low	1.00
Moderate	2.40**** (1.56-3.69)
High	1.74* (.93 – 3.24)
Age	
24 and under	1.00
25 and above	1.5 (.90 – 2.51)
Income	
Rs.3000 and under	1.00
Rs.3001 and above	1.38 (.95 – 2.01)*
Education	
0 years	1.00
1-5 years	1.30 (.75 – 2.23)
6-7 years	1.66 (.90 – 3.04)
8+ years	1.61 (.93 – 2.78)*
Occupation	
Construction workers	1.00
Daily wage labourers	1.01 (.53 – 1.95)
Factory workers	.75 (.44 – 1.25)
Other	.87 (.50 – 1.52)
Marital Status	
Single	1.00
Married	.52 (.31 - .87)***
Constant	*.224*
-2 log likelihood (initial)	*740.026*
-2 log likelihood (estimated)	*709.507*

*p≤.10 **p≤.05 ***p≤.01 ****p≤.001

Table 4 reports the analysis of factors affecting odds of STI among migrants. It appears those with moderate HIV knowledge have a significantly higher chance of STI compared to low HIV knowledge (OR, 1.6). High-level knowledge also had higher odds of STI than low, however this result did not reach significance (OR, 1.4). Migrants who were 25 and above had a lower chance of STI compared to those 24 and under (OR, .32). Similarly, those earning higher had a higher likelihood of reporting STI compared to those earning lower (OR, 1.62). As this relationship was not significant in the bivariate analyses, interactions were tested and the effect of income predicting STI was found to be significant through its interaction with HIV knowledge (appendix, table II). Likewise, those with 8 and above years of education

had a 49% lower STI likelihood than those with 0 years; other educational groups did not reach significance. Further testing revealed that this relationship was most significantly explained by age (appendix, table III). Married migrants had a lower chance of STI than single migrants (OR, .35) and lastly, RSB uptake led to a double increase in the odds of STI (OR, 2.06).

Table 4: Odds ratio (and 95% confidence intervals) from logistic regression analysis showing the likelihood that male migrants have had STI in the past 12 months by SE-D characteristics

Characteristic (N=592)	**STI (95% confidence intervals)**
Knowledge	
Low	1.00
Moderate	1.60** (.99 - 2.57)
High	1.40 (.72 - 2.73)
Age	
24 and under	1.00
25 and above	.32**** (.18 - .58)
Income	
Rs.3000 and under	1.00
Rs.3001 and above	1.62** (1.05 - 2.51)
Education	
0 years	1.00
1-5 years	.61 (.33 - 1.14)
6-7 years	.83 (.40 – 1.69)
8+ years	.49 (.25 - .93)**
Occupation	
Construction workers	1.00
Daily wage labourers	3.15** (1.17 – 8.48)
Factory workers	.75 (40 - 1.4)
Other	.83 (.43 - 1.60)
Marital Status	
Single	1.00
Married	.35 (.18 - .68)***
RSB	
No	1.00
Yes	2.06 (1.25 – 3.39)***
Constant	*10.332****
-2 log likelihood (initial)	*652.294*
-2 log likelihood (estimated)	*545.032*

*p≤.10 **p≤.05 ***p≤.01 ****p≤.001

DISCUSSION

Just before the turn of the century, public health agencies declared India as high priority for HIV prevention due the explosion in infections spreading from high-risk groups to the general population. Based on a need for detailed understanding of risk behaviours amongst bridge groups in high HIV prevalent states (Chandrasekaran et al., 2006) the aim of this study was to help identify those SE-D male migrant groups in Mumbai who are most vulnerable to HIV in their knowledge, RSB and STI reporting. Furthermore, the second aim was to analyse the effect HIV knowledge and awareness has on RSB and STI.

HIV Knowledge

Various conceptualisations used to understand, predict, and intervene, assume that in order to initiate and maintain preventative behaviours, persons need to be well informed. However, majority of the participants in this study had incomplete knowledge of HIV/AIDS, which may explain migrants continuing vulnerability. Consistent with previous findings (Bryan et al., 2001; Avert, 2010) migrants in Mumbai have major deficits in their HIV knowledge with only 13.6% having a high level of knowledge. However, in comparison to Jadhav (2004) who found majority have low knowledge, here knowledge is of moderate level. Nevertheless, misconceptions and shortfalls in transmission and prevention knowledge are very similar with a low percentage informed on transmission through blood and less than half aware that consistent condom use can prevent HIV.

SE-D Predictors

Concerning predictors of knowledge, those aged 25 and above, with higher education, and married had higher reporting of high HIV knowledge. In concordance with the hypothesis and Jadhav (2004), a linear relationship was found with education, in which those with 0 years of education have the lowest level of knowledge, while most of those with 1-5 years of education have moderate knowledge, followed by 6-7 years and finally those with above 8 years having the highest knowledge. Likewise, and similar to migrants in Bhiwandi (Avert, 2010) single migrants in Mumbai have lower knowledge than those who are married. In contrast to hypotheses, it was found that those under 24 years old have lower knowledge than migrants who are above 25 years old. It was revealed that this

relationship is through the effect of marital status, whereby older participants are more likely married and thus have higher knowledge. Income and occupation were not significant predictors of HIV knowledge in male migrants in Mumbai.

Consistent with RSB hypotheses, income and marital status were significant predictors of RSB, such that single men and those on higher incomes reported higher proportions and likelihood of RSB. In reference to PC-TISS (2008), findings of marital status are similar, with single men more prone to RSB. Unlike PC-TISS, however those on higher incomes were more susceptible to RSB, thus present findings are in line with Jadhav (2004) and Avert (2010). This can be attributed to wealth and social interaction being inextricably linked, where "wealth might increase the number of opportunities for partnerships to develop" (Shelton et al., 2005). Unlike previous findings, age, occupation, and education per say were not significant predictors of RSB. Through its interaction with knowledge, only those with 8 and above years of education had significantly higher RSB and this unusual finding is discussed below. It is important to note that those with 6-7 years of education relative to 8 years had a higher likelihood in the logistic regression for RSB, however due to a low sample did not reach significance (N=37).

In contrast to Bhiwandi, the SE-D determinants of STI symptom reporting in Mumbai migrants were age, marital status, occupation, and RSB, as well as education and income to some extent. Relative to their subgroups, those 24 and under, daily wage labourers followed by construction workers, those who were single (in contrast to Jadhav, 2004) and those taking part in RSB were particularly vulnerable to STI. Therefore with the exception of age, all relationships were as hypothesised. Those with 0 years of education relative to 8 years had a higher reporting of STI through its interaction with age. Likewise, those earning Rs.3001 and above only had a higher likelihood of STI through its interaction with knowledge. Compared to national statistics, those who were 24 and under had a higher STI reporting than those 25 and above.

Knowledge Predictor

It is clear that HIV knowledge was a powerful determinant for both RSB and STI and its influence through other variables as well. However, the pattern found was contrary to that hypothesised and instead, improved knowledge increased HIV

vulnerability. Unexpectedly, those with higher knowledge relative to those with low knowledge had a significantly higher likelihood of RSB, particularly those with moderate knowledge whose RSB odds increased two times over. Similarly, migrants with moderate knowledge had significantly higher STI reporting than those with low knowledge. Migrants with high HIV knowledge had lower STI reporting than those with moderate knowledge but this was still higher than those with low HIV knowledge. Nevertheless, this relationship was not significant which may be a result of the sample size being comparatively lower in the high knowledge group.

According to the IMB model, information needs to be complete for HIV risk to decrease, here however, even those with moderate knowledge have specific but critical deficits in their information which could stop them practicing preventative behaviours, promoting risky behaviour instead. For example, regarding prevention, nearly 51% did not mention consistent use of condoms while only 22.5% mentioned abstaining from pre/extramarital sex. Secondly, preventative behaviour according to the IMB model, not only depends on information but also the motivation for decreasing risky behaviours. Although this was not studied here, it is possible that while knowledge is high, these migrants have low motivation and attitude towards preventative behaviours as found in other studies (Bryan et al., 2001; Jadhav, 2004). Abraham and Kumar (1999) have similarly found an inconsistent relationship between sexual knowledge and sexual behaviour amongst students in Mumbai. Even though most students had moderate knowledge, it was not reflected in their behaviour, with majority not adopting protective behaviour. Therefore, an explanation is still required and future research needs to address this relationship within Mumbai migrants further, in terms of its nature and the quality of HIV knowledge obtained.

Policy Implications

Based on the findings, especially incomplete knowledge and high STI prevalence (76.4%) it is not surprising that migrants in Mumbai remain at high risk for HIV. New prevention interventions need to be introduced and those in existence scaled up because at present HIV knowledge levels remain drowning in deficits. The main source of HIV information for this group comes from the radio, which may not necessarily be detailed or sufficient for migrants to develop a deep understanding of HIV/AIDS. Mukherjee and Danje (2006) found that Nepali migrants complained that

the information given to them was not descriptively adequate. Targeted interventions commissioned to NGOs in order to seek out and educate migrant groups may need to employ more creative policies to reach the groups in a way that improves the quality of the information being provided. Despite NACO aims, the fact that improved HIV knowledge increases STI in migrants, combined with poor health seeking behaviour where only 16.7% seek treatment, STI clinics may not be made accessible to migrants. It is found that social taboos and long waiting times may cause migrants to refrain from seeking treatment for STI (Mukherjee & Danje, 2006). Therefore, an understanding of other factors that may influence treatment-seeking behaviour in Mumbai needs to be developed, in addition to policy makers scaling up initiatives tackling these factors, making STI services more accessible.

Within the targeting of migrants, those who are single, earning more, youths, the less educated and daily wage labourers (only for STI) are particularly vulnerable to RSB, low HIV knowledge, and STI. Contrary to the national HIV prevalence for males, the results indicate that in Mumbai, instead of migrants 25 years and above, it may be those 24 years and under who are more vulnerable to HIV. New migrants who are likely to be younger are curious about sex workers and greatly influenced by their new peers (Mukherjee and Danje, 2006). Early intervention increasing knowledge and condom use for new migrants may help neutralize this influence for young and single migrants to prevent STI and HIV infection. Those earning higher also appear to be more vulnerable which indicates they maybe spending their money to indulge in RSB. Interventions could perhaps address this by informing migrants how best to use their earnings, e.g. to improve their living conditions, call their families etc. PC-TISS found great exposure to sex related materials and video parlours influencing sexual behaviour. Such aspects could be related to income and thus, need to be researched and targeted.

Research Implications

In addition to the aforementioned future research that needs to be explored, in order to further explain the results found in this study, it is important to note its limitations. As mentioned, RSB was explored here through a general variable that may contain some error. Therefore, future research may wish to look at the relationship between the SE-D and knowledge variables with specific forms of RSB such as CSW, non-CSW sexual partners or men who have sex with men. Likewise, the

relationship between such forms of RSB and STI should be explored. Secondly, due to sampling problems in the present study the determinant of condom use as a protective behaviour or lack of condom use as a risky behaviour could not be explored. Again, researching this would provide a more holistic picture for prevention programs in Mumbai. The HIV knowledge variable used in this study was based on answers to open-ended questions, which could be problematic for two reasons. First, participants not mentioning one factor in their answers may not mean that they do not know about it, but they simply may not have mentioned all the aspects due to other reasons such as forgetting, tiredness, and lack of time. Likewise, incorrect answers mentioned were also not included in the variable. A solution for future purposes would be to use affirmation of answers through tick box style questions to indicate exactly what an individual knows correctly and incorrectly. Now that knowledge and SE-D factors were observed in this study, researchers could begin analysing the determinants of motivation of preventative behaviours amongst migrants in Mumbai as well as the effect of cultural variables. Finally, one may wish to begin considering what the most effective content of programs would be for the different subgroups identified here, e.g. condom use, access, outreach etc.

Conclusion

Studies to ascertain the determinants of the knowledge and behaviours of HIV susceptible individuals are important to provide information for developing program strategies. Migrants in Mumbai assume great importance for the spread of the HIV epidemic in India and the present study has found that male migrants here remain vulnerable to HIV in their level of knowledge, practice of RSB, interlinked with their suffering from STI. Those who are young, single, earning more and have less education are particularly more vulnerable. It is important that the needs of the migrant subgroups identified here and those that may be revealed in future be assessed and addressed better by prevention efforts, as they are not a homogenous group. Deepening an understanding of different migrants' needs in Mumbai could lead to better evidence based interventions assisting the unfinished agenda in India.

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APPENDIX

Tables of Interactions

Table I: Odds ratio (and 95% confidence intervals) from logistic regression analysis showing the interaction between education and knowledge

Characteristic (N=592)	RSB (95% confidence intervals)
Education*HIV Knowledge	
0 years* Low knowledge	1.00
1-5 years* Moderate Knowledge	2.19 (1.34 – 3.59)***
1-5 years* High Knowledge	.81 (.22 – 3.01)
6-7 years* Moderate Knowledge	2.10 (1.10 – 4.01)**
6-7 years* High Knowledge	1.81 (.64 – 5.11)
8 Years* Moderate Knowledge	2.47 (1.5 – 4.09)****
8 years* High Knowledge	2.08 (1.02 – 4.28)**
Age	
24 and under	1.00
25 and above	1.51 (.90 - .2.54)
Income	
Rs.3000 and under	1.00
Rs.3001 and above	1.34 (.93 – 1.95)
Occupation	
Construction workers	1.00
Daily wage labourers	1.05 (.56 – 2.02)
Factory workers	.74 (.44 – 1.23)
Other	.85 (.48 – 1.49)
Marital Status	
Single	1.00
Married	.52 (.31 - .88)***
Constant	*.36****
-2 log likelihood (initial)	*740.026*
-2 log likelihood (estimated)	*711.160*

*p≤.10 **p≤.05 ***p≤.01 ****p≤.001

Table II: Odds ratio (and 95% confidence intervals) from logistic regression analysis showing the relationship of knowledge/income interaction and STI

Characteristic (N=592)	**STI (95% confidence intervals)**
Income*HIV Knowledge	
Rs.3000 and under*Low Knowledge	1.00
Rs.3001 and above*Moderate Knowledge	2.05 (1.23 – 3.43)***
Rs.3001 and above*High Knowledge	1.46 (.66 – 3.25)
Age	
24 and under	1.00
25 and above	.30 (.17 - .55)****
Education	
0 years	1.00
1-5 years	.64 (.35 – 1.18)
6-7 years	.83 (.41 – 1.68)
8+ years	.49 (.26 - .92)**
Occupation	
Construction workers	1.00
Daily wage labourers	3.26 (1.22 – 8.70)**
Factory workers	.75 (.40 – 1.41)
Other	.86 (.44 – 1.66)
Marital Status	
Single	1.00
Married	.37 (.19 - .72)***
RSB	
No	1.00
Yes	2.10 (1.28 – 3.44)***
Constant	*13.572****
-2 log likelihood (initial)	*652.294*
-2 log likelihood (estimated)	*545.472*

*p≤.10 **p≤.05 ***p≤.01 ****p≤.001

Table III: Odds ratio (and 95% confidence intervals) from logistic regression analysis showing the relationship of education/age interaction and STI

Characteristic (N=592)	**STI (95% confidence intervals)**
Education*Age	
24 and under* 0 years	1.00
25 and above* 1-5 years	.37 (.21 - .66)****
25 and above*6-7 years	.60 (.29 – 1.24)
25 and above*8+ years	.36 (.19 - .69)***
Income	
Rs.3000 and under	1.00
Rs.3001 and above	1.63 (1.05 – 2.52)**
HIV Knowledge	
Low Knowledge	1.00
Moderate Knowledge	1.68 (1.05 – 2.68)**
High Knowledge	1.39 (.72 – 2.69)
Occupation	
Construction workers	1.00
Daily wage labourers	3.62 (1.35 – 9.69)***
Factory workers	.82 (.45 – 1.52)
Other	.86 (.45 – 1.67)
Marital Status	
Single	1.00
Married	.28 (.15 - .49)****
RSB	
No	1.00
Yes	2.00 (1.22 – 3.28)***
Constant	*13.572****
-2 log likelihood (initial)	*652.294*
-2 log likelihood (estimated)	*545.472*

*p≤.10 **p≤.05 ***p≤.01 ****p≤.001