

Covariates of HIV/AIDS Prevalence among Migrants and Non-migrants in India

Angad Singh
S. K. Singh

Abstract

Migration has been considered as an important marker of HIV epidemic in any community due to its potential to bridge the risk of STI/HIV infection among low, moderate and high-risk population irrespective of the places of origin or destination. This paper aims to analyze various contextual and behavioral factors influencing pathways linking migration and HIV/AIDS using data collected as part of the third round of Indian Demographic and Health Survey (2005-06, NFHS-3). The age-adjusted prevalence of HIV/AIDS among migrants was 1.4 times higher (44%) as compared to non-migrants (32%). Youth were more venerable to have HIV/AIDS irrespective of their migratory status. Frequent alcohol use and high-risk sexual behavior among migrants were other cofactors increasing the vulnerability of HIV infection. Lack of comprehensive knowledge and stigma about HIV/AIDS were found to have positive impact on the prevalence of HIV/AIDS among migrants. These findings demonstrate that the HIV prevention policy instruments should focus on addressing risky sexual behavior of migrants, especially among youth irrespective of their migratory status and they should be capacitated with knowledge and stigmas about HIV/AIDS.

Introduction

According to the Sustainable Development Goals, the world has committed to ending the AIDS epidemic by 2030. Annual HIV/AIDS-related deaths have decreased by 43%. The most affected region in the world is eastern and South Africa. Globally, 36.7 (34.0-39.8) million people were living with HIV/AIDS, 2.1 (1.8-2.4) million people newly infected with HIV/AIDS and 1.1 (94000-1.3) million people died from AIDS-related illnesses at the end of 2015. People infected with HIV/AIDS since the start of the end of 2015 is 78 million and 35 million people died from AIDS-related illnesses since the beginning to of the end of 2015 (UNAIDS, 2015-16). In Asia and Pacific region, 5.1 (4.4-5.9) million people were living with HIV/AIDS, 300000(240-380) new HIV infections in the region and 180000 (150000-220000) people died of AIDS-related causes at the end of 2015. New HIV infections declined by 5%, and the number of HIV/AIDS-related deaths decreased by 24% from 2010 to 2015 (UNAIDS, 2015-16).

In India, people living with HIV/AIDS have a share of 6% of total world HIV/AIDS patients and 8% of whole world HIV/AIDS-related deaths. India is the fourth largest country in the world that had persons living with HIV/AIDS and the third largest country for HIV/AIDS-related deaths. Indian contribution in Asia Pacific region is 43% of total persons living with HIV/AIDS, 51% of HIV/AIDS-related deaths and 38% of total new infection till 2013 (UNAID Gap report, 2014).

HIV prevalence among adults (15-49 years) in 2016 is estimated at 0.26% (0.22%-0.32%), among males 0.30% and among females 0.22%. The adult HIV prevalence at national level has continued its steady decline from an estimated peak of 0.38% in 2001-03 through 0.34% in 2007 and 0.28% in 2012 to a final low of 0.26% in 2015. However, some of the states show HIV prevalence has increased or is constant, for example, Bihar, Chhattisgarh, Gujarat, Mizoram, Rajasthan, and Uttar Pradesh have stable HIV/AIDS prevalence, but Assam Chandigarh, Delhi, Jharkhand, Punjab, Tripura, and Uttarakhand show increase HIV/AIDS prevalence (NACO, 2015-16). NACO shows that the annual new HIV/AIDS infections in India are estimated to be around 86(56-129) thousand in 2015, which shows 66% decline in new infections from 2000 and 32% decline from 2007 (NACO, 2015-16).

Migration leads to economic benefits or provides better opportunities to migrants and their households, but the negative impacts of migration on the HIV epidemic are well documented (Camlin et al., 2010). Initially, HIV/AIDS case erupted in developed countries and later in developing countries. The movement of individual and population remains an important factor in the spread of the virus (Haour et al. 1996). Migration is bridging the low and high-risk population. The problem of HIV/AIDS has profound social and economic roots, and hence its impact reaches far beyond the

health sector with several socio-economic consequences. Therefore, a comprehensive understanding of various pathways linking migration and HIV/AIDS is critical for devising a suitable programmatic response to curb the pace of HIV/AIDS epidemic and for changing its resources.

Migration is fuelling India's HIV epidemic. NACO latest figure shows that HIV/AIDS prevalence in high-risk population like FSW is 2.2 (1.8-2.6) percentages, MSM 4.3(3.7-5.1), IUD 9.9 (9.0-10.9) percentage and among the migrants is 0.99 percent. Prevalence among migrants is fourtimes higher than the general population (NACO, 2015-16). Prevalence among single men migrants is 2.4 percent, which is eight times higher than the general population (NACO, 2011-12). According to NACO, the risk of HIV infection for migrants seem to arise due to multiple factors such as risky sexual behavior, lack of social and economic security and involvement in peer-driven risk-taking activities. Return migrants continue to fuel the epidemic since most infected migrants tend to return to the source when they are sick. Recent spurts of increasing HIV/AIDS cases, especially in low HIV prevalence states of India such as Uttar Pradesh, Bihar, Odisha, Jharkhand, Madhya Pradesh, and West Bengal are assumed to be the result of return migration (NACO, 2010).

HIV/AIDS is about biological and medical concerns; it is not correct because HIV/AIDS is as much as social phenomena. Across the world, the global epidemic of HIV/AIDS has shown itself capable of triggering responses of compassion, solidarity, and support, bringing out the best in people, their families, and communities. However, the disease is also associated with stigma and discrimination. An individual affected by HIV/AIDS has fear to reject by their families, their loved ones and their communities. These rejections hold in India. All over the world, ignorance, lack of knowledge, fear and denial have arisen serious and often terrible consequence, denying people living with HIV/AIDS access to treatment, services, and support, as well as making it hard for prevention work takes places (Merson, 1993).

There are numerous studies on migration and HIV/AIDS-related risk behaviors, but most of them deal with a specific group of migrants. There is a dearth of studies explaining whether migration plays a significant role in the behavioral transition and turn, it enhances the risk of getting HIV/AIDS through risky sexual behaviors. Further, the link between HIV/AIDS and migration cannot be addressed efficiently without having a comparison group of non-migrants living in a similar context and environments, which of course requires a larger sample size. With this context, this study aims to analyze the various pathways linking migration and HIV/AIDS including the role of migrants in the transmission of HIV/AIDS from different high-risk groups to the general population, with this opportunity to adopt case-control study design to compare factors affecting HIV/AIDS among migrants as well as non-migrants.

Data and Methods

The basic data used in this study has been taken from the third round of National Family Health Survey (NFHS-3), conducted in 2005-06. NFHS-3 collected the blood sample of eligible women and men in selected households to provide community-based HIV estimates at the national level. This was a unique feature of NFHS-3. The forecast given separately for the National AIDS Control Organization (NACO) identified six high prevalence states and one low prevalence state. All women aged 15-49 and men aged 15-54 in the sample household were eligible for individual interviewing in the six high HIV prevalence states namely Andhra Pradesh, Karnataka, Maharashtra, Manipur, Nagaland, Tamil Nadu, and one low HIV prevalence state, i.e. Uttar Pradesh. Blood samples were collected for HIV testing from all consenting eligible women and men in all sample households. In Nagaland, because locals opposed, blood samples were not being collected. HIV tests for women and men were conducted in the remaining 22 states. Overall, more than 1,00,000 HIV tests were conducted throughout the country. All necessary national and international guidelines and protocols required for the ethical collection of blood samples were followed.

In addition to collecting information on several populations and health-related topics, NFHS-3 also gathered information from individual males about their migration and mobility status, alcohol use, sexual behavior and knowledge and awareness about HIV/AIDS. It also had a few questions that permit differentiation of migrants from non-migrants males. The survey also included questions regarding frequency of alcohol use, as well as few important aspects of HIV risk behavior such as a number of partners, partner type, paid sex, relation to sexual partners and use of protection. Respondents were also asked about stigma, discrimination, and HIV/AIDS testing related questions.

Thus, NFHS-3 provided a unique opportunity to study the linkages between migration and HIV/AIDS.

Variables

Independent variables

The study contains a set of predictor variables to understand the co-factors of HIV/AIDS-related risk behaviors, stigma, discrimination, prior HIV testing and HIV/AIDS prevalence among migrants and non-migrants. The study has a set of predictors divided into three categories, namely demographic, socioeconomic and behavioral variables.

Demographic, socioeconomic and behavioural characteristics: The demographic characteristics include Age groups (15-24, 25-34, 35-44, and 45-54), Education (no-education, primary, secondary and Higher), Marital status (never married and ever married), Religion (Hindu, Muslim, others), Caste/tribe (SC/ST, OBC, and other), Wealth index (poorest/poor, middle, richer and richest), Regular media exposure (yes. No), Alcohol use (not use, almost daily, about once a week, occasionally) and respondent's occupation (not working, service worker, agriculture worker and skilled-unskilled manual worker).

Dependent variables: The dependent variables used in the study, for Bivariate analysis are awareness, comprehensive knowledge, sexual behavior, stigma discrimination, HIV/AIDS testing and HIV/AIDS prevalence. Dependent variables were used to measure the HIV/AIDS-related risk behavior, level stigma discrimination and HIV/AIDS prevalence migrants and non-migrants. For defining migration from the NFHS-3 data set, we took the variable, "How long you have been continuously living at a current place." From this variable, we have taken years of continuously living at the current place and subtracted from "years completed at last birthday (respondent age)." If it was greater than one, then we have considered this person as migrants, else non-migrants.

Logistic regression

The study used logistic regression to find the probability of occurrence of dependent variable among migrants and non-migrants by an independent variable or background characteristics.

The logistic regression equation is –

$$\text{logit}(p) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_kX_k$$

The logit transformation was defined as the logged odds:

$$\text{odds} = (p / 1-p) \text{ hence } \text{Logit} (p) = \text{Ln}(p/1-p)$$

Where,

p : the probability of the presence of the characteristic of interest (Dependent variable).

$1-p$: the probability of non-occurrence of the characteristic of interest.

$X_1, X_2, X_3, \dots, X_k$ are predictor variables

b_0 : intercept when there is no effect of any predictor variable on the dependent variable.

$b_1, b_2, b_3, \dots, b_k$ are the coefficient of predictor variables.

Propensity score matching

The propensity score-matching technique has been used for finding the HIV/AIDS prevalence among migrants and non-migrants adjusting for all other background characteristics. PSM is the statistical technique that estimates the effect of a treatment or intervention by adjusting for covariates that predict receiving the treatment or intervention. In this case, PSM reduces the bias due to confounding variable that could be found in estimates for migration obtained from simply comparing outcomes for migrants and non-migrants. PSM is based on counterfactual modeling. For computing the average treatment effect (i.e., an estimate of migration), a counterfactual model is estimated. Counterfactual is the potential outcome that we would have obtained in case the people were migrant. With the help of the counterfactual model, the average treatment effect on treated (ATT) was estimated as

$$\text{ATT} = E(Y_1/D = 1) - E(Y_0/D = 1)$$

Where $E(Y_1/D=1)$ gives the outcome for migrated people and $E(Y_0/D=1)$ is the expected outcome if migrated people become non-migrants. Similarly, the average treatment effect on the untreated (ATU) is defined mathematically as

$$\text{ATU} = E(Y_1/D=0) - E(Y_0/D=0)$$

Where $E(Y_1/D=0)$ is the expected outcome if non-migrant become migrant and $E(Y_0/D=0)$ is the outcome for non-migrants. Average treatment effect (ATE) is the difference between the expected outcome for migrants and nonmigrants population. The common support, balancing property and quality of matching are three important issues in PSM. Common support improves the quality of estimates by excluding migration for which there is no matched sample. Balancing property tests whether the matching procedure is able to balance the distribution of relevant covariates. The quality of matching examines whether the distribution of the propensity score of migrants and non-migrants overlap. Statistical analysis was done using STATA 13.1.

Results

While substantiating the objectives of the paper, 50,093 men were interviewed which comprises migrants (12,798) and non-migrants (37,295) aged 15-54. It is worthwhile to mention that variation in prevalence of HIV/AIDS in any community largely depend on the intensity of HIV/AIDS related risk behaviour, their migratory status, socio-economic and demographic conditions. Therefore, it is highly desirable to pin-point the covariates of HIV/AIDS, which influence the risk of HIV/AIDS among migrants as well as non-migrants. Results presented in Table-1 portray the age-adjusted prevalence of HIV/AIDS among migrants and non-migrants by their socio-economic and demographic characteristics. It is evident that the age-adjusted prevalence of HIV/AIDS among migrants was almost 40 percent higher than their non-migrants counterparts. However, the pattern in prevalence was not uniform but varies considerably by their migratory status, which cuts across various age groups. The HIV/AIDS prevalence among migrants and non-migrants were continuously narrowing with increasing age groups, age group 15-24 (0.14% vs 0.08%), 25-34 (0.76% vs 0.46%), 35-44 (0.52% vs 0.45%) and 45-54 (0.44% vs 0.42%) .

Thus, the prevalence of HIV/AIDS was higher among migrants compared to non-migrants but as the age increases the gap between migrants and non-migrants were reduced. The results show the disproportionately higher prevalence of HIV/AIDS among the youth irrespective of their migration status. Compare to urban population rural population has less prevalence among both group migrants (0.50% vs 0.44%) as well as non-migrants (0.35% vs 0.31%). After adjusting the age, this prevalence is still high in an urban area. The prevalence of HIV/AIDS is 0.89% among primary level educated migrants, which is higher than their counterparts. Similar pattern has been observed for those having econdary or higher level of education, but in the case of non-migrated man, we have found that as the level of education increases the prevalence of HIV/AIDS age-adjusted and unadjusted both were decreases respectively. In case of marital status, ever married migrants (0.53%) have higher prevalence of HIV/AIDS as compared to never married migrants (0.34%) but after adjusting for the age the situation changes, where never married migrants (0.63%) show a higher prevalence than ever married migrants (0.46%). Similarly, ever-married non-migrants (0.42%) have higher prevalence compared to never married non-migrants (0.13%) but after adjusting the age results are different for never married non-migrants (0.40%), this shows a higher prevalence than ever-married non-migrants (0.34%).

This result portrays that the age-adjusted prevalence of HIV/AIDS was higher in never married population irrespective of their migratory status. Migrants and non-migrants, who belonged to richer and middle group family, have higher HIV prevalence as (0.78% vs 0.40%) and (0.57% vs 0.31%), which shows that migrant population has 26% higher prevalence for the middle class and 38% higher prevalence for richer class compared to non-migrants. Migrated and non-migrated person, who do not have regular media exposure, had (0.56% vs 0.29%) prevalence and those who had regular media exposure they had (0.45% vs 0.34%) prevalence of HIV/AIDS. The migrated ones, who consumed alcohol almost daily, had 1.19% unadjusted and 0.76% age-adjusted prevalence of HIV/AIDS. However, the non-migrated person who consumed alcohol almost daily had 0.46% unadjusted and 0.34% age-adjusted prevalence of HIV/AIDS. This result shows that daily consumption of alcohol is the one the measure determinant of HIV/AIDS. Migrated and non-migrated population, who do not have comprehensive knowledge about HIV/AIDS, they had (0.51% vs 0.25%) but who had comprehensive knowledge about HIV/AIDS they had (0.47% vs 0.39%) prevalence of HIV/AIDS. Therefore, we can say that comprehensive knowledge about HIV/AIDS may reduce the prevalence of HIV/AIDS.

Table 1. Adjusted and Unadjusted Prevalence of HIV/AIDS among migrants and non-migrants by their Background characteristics, NFHS-3 (2005-06) India

Background characteristic	Prevalence		Age-Adjusted Prevalence (C.I.)	
	Migrant	Non-migrant	Migrant	Non-migrant
Age				
15-24	0.14	0.08		
25-34	0.76	0.46		
35-44	0.52	0.45		
45-54	0.44	0.42		
Residence				
Urban	0.5	0.35	0.45 (0.32 - 0.64)	0.35 (0.26 - 0.49)
Rural	0.44	0.31	0.43 (0.27 - 0.68)	0.31 (0.25 - 0.38)
Education Completed				
No education	0.81	0.45	0.66 (0.39 - 1.14)	0.37 (0.26 - 0.53)
Primary	0.89	0.42	0.77 (0.44 - 1.32)	0.4 (0.28 - 0.57)
Secondary	0.4	0.27	0.39 (0.26 - 0.59)	0.3 (0.23 - 0.4)
Higher	0.11	0.13	0.09 (0.02 - 0.32)	0.1 (0.04 - 0.25)
Marital status				
Never married	0.34	0.13	0.63 (0.23 - 1.73)	0.4 (0.12 - 1.28)
Ever married	0.53	0.42	0.46 (0.29 - 0.72)	0.34 (0.28 - 0.43)
Religion				
Hindu	0.54	0.32	0.49 (0.37 - 0.65)	0.32 (0.27 - 0.39)
Muslim	0.11	0.22	0.13 (0.02 - 0.83)	0.25 (0.13 - 0.45)
Other	0.26	0.51	0.25 (0.06 - 1.05)	0.5 (0.28 - 0.91)
Caste/tribe				
SC/ST	0.46	0.31	0.42 (0.24 - 0.74)	0.33 (0.23 - 0.46)
Other backward class	0.53	0.35	0.47 (0.31 - 0.73)	0.35 (0.27 - 0.45)
Other	0.36	0.26	0.34 (0.2 - 0.57)	0.26 (0.18 - 0.37)
Wealth index				
Poorest/Poorer	0.45	0.32	0.47 (0.25 - 0.92)	0.32 (0.24 - 0.42)
Middle	0.57	0.31	0.49 (0.27 - 0.91)	0.32 (0.22 - 0.46)
Richer	0.78	0.4	0.72 (0.47 - 1.08)	0.41 (0.29 - 0.58)
Richest	0.25	0.24	0.23 (0.12 - 0.42)	0.24 (0.15 - 0.39)
Regular media exposure				
No	0.56	0.29	0.53 (0.32 - 0.88)	0.27 (0.2 - 0.36)
Yes	0.45	0.34	0.42 (0.3 - 0.57)	0.36 (0.29 - 0.45)
Alcohol use				
Not use	0.47	0.29	0.46 (0.33 - 0.65)	0.32 (0.25 - 0.39)
Almost daily	1.19	0.46	0.76 (0.28 - 2.1)	0.34 (0.15 - 0.8)
About once a week	0.57	0.36	0.46 (0.21 - 1.02)	0.31 (0.17 - 0.56)
Occasionally	0.35	0.38	0.33 (0.17 - 0.67)	0.35 (0.24 - 0.5)
Comprehensive knowledge				
No	0.51	0.25	0.5 (0.33 - 0.74)	0.26 (0.19 - 0.35)
Yes	0.47	0.39	0.42 (0.27 - 0.67)	0.39 (0.29 - 0.54)
Respondent's occupation				
Not working	0.11	0.05	0.43 (0.06 - 3.15)	0.44 (0.13 - 1.5)
Prof., Tech., Manag.	0.49	0.43	0.47 (0.29 - 0.76)	0.41 (0.3 - 0.57)
Clerical	0.14	0.35	0.11 (0.03 - 0.41)	0.31 (0.23 - 0.42)
Skilled & unskilled manual	0.71	0.32	0.61 (0.42 - 0.89)	0.29 (0.21 - 0.41)
Total	0.48 (12798)	0.32 (37295)	0.44 (12798)	0.32 (37295)

In the Table-2, we present the HIV/AIDS prevalence among migrants and non-migrants by their HIV/AIDS-related awareness, knowledge, perception, attitudes, and sexual behavior. Migrants and non-migrants who reported that HIV/AIDS cannot be reduced by always using a condom during sex have 0.99% and 0.31% HIV prevalence, and those who said that HIV/AIDS can be reduced by always using a condom during sex have 0.45% and 0.32% HIV/AIDS prevalence.

Table 2: Prevalence and age-adjusted prevalence of HIV/AIDS among migrants and non-migrants by their level awareness, knowledge about HIV/AIDS and sexual behavior, NFHS-3 (2005-06) India

Distinct characteristics of the respondent	Status	HIV/AIDS prevalence		Age-adjusted HIV/AIDS Prevalence (C.I.)	
		Migrants	Non-migrants	Migrants	Non-migrants
Awareness about HIV/AIDS	No	0.99	0.31	0.93 (0.42 - 2.02)	0.33 (0.16 - 0.7)
	Yes	0.45	0.32	0.42 (0.31 - 0.58)	0.33 (0.26 - 0.41)
Limiting sexual intercourse with one uninfected partner	No	1.61	0.08	1.43 (0.72 - 2.82)	0.1 (0.02 - 0.59)
	Yes	0.43	0.33	0.4 (0.29 - 0.55)	0.34 (0.27 - 0.41)
Using condoms and limiting sexual intercourse to one uninfected partner	No	0.97	0.21	0.89 (0.48 - 1.65)	0.24 (0.11 - 0.51)
	Yes	0.42	0.32	0.4 (0.28 - 0.56)	0.32 (0.26 - 0.4)
Abstaining from sexual intercourse	No	0.95	0.33	0.85 (0.46 - 1.57)	0.36 (0.2 - 0.67)
	Yes	0.43	0.3	0.4 (0.29 - 0.56)	0.31 (0.25 - 0.39)
The misconception about HIV/AIDS					
HIV can be transmitted by mosquito bites/hugging someone who has AIDS or sharing food with infected person	No	0.51	0.33	0.46 (0.32 - 0.66)	0.35 (0.26 - 0.46)
	Yes	0.43	0.25	0.45 (0.26 - 0.78)	0.25 (0.17 - 0.36)
Reject all three misconceptions and know how to prevent HIV/AIDS	No	0.5	0.26	0.49 (0.32 - 0.76)	0.27 (0.19 - 0.37)
	Yes	0.49	0.36	0.45 (0.29 - 0.68)	0.37 (0.27 - 0.5)
Healthy-looking person can have HIV/AIDS	No	0.72	0.13	0.67 (0.35 - 1.26)	0.15 (0.07 - 0.31)
	Yes	0.43	0.32	0.4 (0.28 - 0.56)	0.32 (0.25 - 0.4)
Comprehensive knowledge about HIV/AIDS	No	0.51	0.25	0.5 (0.33 - 0.74)	0.26 (0.19 - 0.35)
	Yes	0.47	0.39	0.42 (0.27 - 0.67)	0.39 (0.29 - 0.54)
Sexual Behaviour					
Multiple sex partners in the past 12 months	No	0.48	0.32	0.45 (0.34 - 0.59)	0.32 (0.27 - 0.38)
	Yes	0.35	0.3	0.85 (0.07 - 9.23)	0.27 (0.1 - 0.76)
Higher-risk intercourse in the past 12 months	No	0.5	0.4	0.42 (0.27 - 0.65)	0.33 (0.26 - 0.41)
	Yes	0.53	0.38	1.66 (0.14 - 17.27)	0.43 (0.11 - 1.61)
Not using a condom at last higher-risk intercourse	No	0.36	0.32	0.42 (0.27 - 0.64)	0.33 (0.26 - 0.41)
	Yes	0.64	0.3	2.05 (0.17 - 20.29)	0.34 (0.05 - 2.48)
Attitudes, Stigma, and Discrimination					
Are willing to care for a relative with HIV/AIDS in own home	No	0.83	0.36	0.71 (0.41 - 1.22)	0.36 (0.24 - 0.54)
	Yes	0.44	0.32	0.42 (0.3 - 0.58)	0.33 (0.26 - 0.42)
Would buy fresh vegetables from a shopkeeper who has HIV/AIDS	No	0.62	0.25	0.55 (0.35 - 0.86)	0.25 (0.17 - 0.35)
	Yes	0.41	0.35	0.39 (0.27 - 0.57)	0.38 (0.3 - 0.49)
Female teacher who has HIV/AIDS but is not sick should be allowed to continue teaching	No	0.92	0.18	0.85 (0.55 - 1.31)	0.17 (0.11 - 0.29)
	Yes	0.38	0.36	0.36 (0.25 - 0.52)	0.39 (0.31 - 0.49)
Not want to keep secret that a family member got infected with HIV/AIDS	No	0.5	0.26	0.47 (0.33 - 0.67)	0.27 (0.2 - 0.35)
	Yes	0.46	0.39	0.42 (0.25 - 0.7)	0.42 (0.31 - 0.57)
Men expressing accepting attitudes on all four indicators	No	0.55	0.28	0.51 (0.38 - 0.69)	0.28 (0.22 - 0.35)
	Yes	0.28	0.55	0.25 (0.1 - 0.63)	0.69 (0.45 - 1.05)

Further, those responded who reported that HIV/AIDS cannot be reduced by limiting sex with one uninfected partner had 1.61% and 0.08% prevalence HIV/AIDS among migrants and non-migrants respectively. However, migrants and non-migrants, who said that HIV/AIDS could be reduced by limiting sex with one uninfected partner they had 0.43 percent and 0.33 percent HIV/AIDS prevalence respectively. Migrants and non-migrants who reported that HIV/AIDS couldn't be reduced by abstaining from sexual intercourse have 0.95% and 0.33% respectively while who said that HIV/AIDS could be reduced by abstaining from sexual intercourse were 0.43% vs 0.30% prevalence of HIV/AIDS respectively.

Migrants and non-migrants, who did not reject all three misconceptions about HIV/AIDS, had 0.50% and 0.25% prevalence and those who rejected all three misconceptions about HIV/AIDS and had knowledge about how to prevent HIV/AIDS had 0.49% HIV/AIDS prevalence amongst migrants and 0.36% amongst non-migrants. Migrants and non-migrants who had multiple sex partners in past 12 months had (0.35% vs 0.30%) prevalence and those who did not have sex with multiple partners in past 12 months had (0.48% vs 0.32%) prevalence of HIV/AIDS. HIV/AIDS prevalence among migrants and non-migrants are (0.50% vs 0.40%) amongst those who did not have higher risk sexual intercourse in the past 12 months and (0.53% vs. 0.38%) among those who had higher risk sexual intercourse in the past 12 months. Persons who did not use a condom at last higher-risk intercourse have (0.64% vs. 0.30%) and who used a condom at last higher-risk intercourse they have (0.36% vs. 0.32%) prevalence of HIV/AIDS among migrants and non-migrants.

Migrants and non-migrants who said that they are willing to take care of a relative with HIV/AIDS in their own home they have (0.44% vs. 0.32%) prevalence of HIV/AIDS but those who said that they were not willing to take care of a relative with HIV/AIDS, they had (0.83% vs. 0.36%) prevalence of HIV/AIDS. Persons who said that they would buy fresh vegetables from a shopkeeper who has HIV/AIDS they had (0.41% vs. 0.35%) and who wouldn't buy fresh vegetable from a shopkeeper who has HIV/AIDS they have (0.62% vs. 0.25%) prevalence of HIV/AIDS among migrants and non-migrants. Migrants and non-migrants who said that a female teacher who has HIV/AIDS but is not sick should be allowed to continue teaching, they had (0.38% vs. 0.36%) and who said that a female teacher who had HIV/AIDS but was not sick should not be allowed to continue teaching they had (0.92% vs. 0.18%) prevalence of HIV/AIDS. People who did not want to keep secret that a family member got infected with HIV/AIDS had (0.28% vs. 0.55%), and those who wanted to keep the secret had (0.50% vs. 0.26%) prevalence of HIV/AIDS among migrants and non-migrants. Migrants and non-migrants who accepted to have all four attitudes towards discrimination had (0.28% vs. 0.55%) and who did not accept all four attitudes towards stigma discrimination they have (0.55% vs. 0.28%) prevalence of HIV/AIDS.

In the multivariate analysis, Table-3 portrays the adjusted odds ratios of HIV/AIDS among migrants and non-migrants by their socio-economic and demographic characteristics along with awareness, knowledge, attitudes perception and testing status. By considering the age groups, both migrants and non-migrants from higher age groups (25-34, 35-44 & 45-54) are more likely to have HIV/AIDS as compared to younger age group 15-24. In case of migrants who belonged to age group (25-34), (35-44) and (45-54) they had 4.9 times, 4.5 time and 2.7 times higher chances of HIV as compared to age group 15-24, respectively. However, the non-migrants who belonged to the age-groups (25-34), (35-44) and (45-54) had 9.1 times, 10.9 times and 5.3 times higher chances of HIV/AIDS as compared to age group 15-24 respectively. Migrants, who had higher education, were 82% less likely to have HIV/AIDS as compared to no-education ones, but migrants who had only primary education they had 50% more chances to have HIV/AIDS. Migrants who did not have regular media exposure were 20% more likely to have HIV/AIDS compared to those migrants who had regular media exposure. Migrants who consumed daily alcohol were three times more likely to have HIV/AIDS compared to those migrants who did not consume alcohol daily. Non-migrants who had comprehensive knowledge were 1.9 times more likely to have HIV/AIDS prevalence compared to non-migrants who did not have comprehensive knowledge. Migrants and non-migrants who were ever tested for HIV/AIDS had 2.4 times and 3.8 times more chances to have HIV/AIDS compared to those who haven't been tested ever. This study has used a propensity score matching technique to see the effect of migration on the HIV/AIDS prevalence. This technique has matched all background characteristics. According to this technique, there is no significant effect of migration on the prevalence of HIV/AIDS.

Table 3: Adjusted odds ratio for HIV/AIDS among migrants and non-migrants by their background characteristics, NFHS-3 (2005-06) India

Background characteristic	Migrants (AOR)		Non-migrants (AOR)	
	Model 1	Model 2	Model 1	Model 2
Age				
15-24	1	1	1	1
25-34	4.9***(1.8 - 13.7)	2.8*(1 - 8.3)	9.1***(5 - 16.5)	10.6***(5.2 - 21.7)
35-44	4.5***(1.5 - 13.7)	2.8*(0.9 - 9)	10.9***(5.6 - 21.1)	15.1***(6.9 - 32.9)
45-54	2.7 (0.8 - 9)	1.8 (0.5 - 6.4)	5.3***(2.5 - 11.1)	7.2***(3 - 17.5)
Residence				
Urban	1	1	1	1
Rural	1.3 (0.8 - 2.2)	1.6 (0.9 - 2.8)	0.7 (0.5 - 1.1)	0.8 (0.5 - 1.2)
Education Completed				
No education	1	1	1	1
Primary	1.5 (0.7 - 3.1)	1.2 (0.5 - 2.8)	1.2 (0.7 - 1.9)	1.2 (0.6 - 2.2)
Secondary	0.9 (0.4 - 1.7)	0.7 (0.3 - 1.6)	0.9 (0.6 - 1.5)	0.8 (0.4 - 1.5)
Higher	0.2**(0.1 - 0.8)	0.2**(0 - 0.6)	0.7 (0.4 - 1.3)	0.5*(0.2 - 1.1)
Marital status				
Never married	1	1	1	1
Ever married	0.8 (0.4 - 1.6)	0.8 (0.3 - 2)	0.7*(0.5 - 1)	0.6*(0.4 - 1)
Wealth index				
Poorest/Poorer	1	1	1	1
Middle	1.2 (0.6 - 2.7)	1.1 (0.4 - 2.9)	0.8 (0.5 - 1.2)	0.6*(0.4 - 1)
Richer	1.4 (0.6 - 3)	1.7 (0.7 - 4.2)	0.8 (0.5 - 1.3)	0.7 (0.4 - 1.2)
Richest	0.7 (0.3 - 1.8)	0.8 (0.3 - 2.3)	0.6*(0.4 - 1.1)	0.5**(0.3 - 0.9)
Regular media exposure				
Yes	1	1	1	1
No	1.2 (0.6 - 2.1)	1.1 (0.6 - 2.3)	1.5**(1 - 2.1)	1.3 (0.8 - 2)
Alcohol use				
Not use	1	1	1	1
Almost daily	3***(1.5 - 6.1)	3.8***(1.8 - 8.3)	1.3 (0.7 - 2.4)	1.3 (0.6 - 2.7)
About once a week	1.4 (0.7 - 2.6)	1.3 (0.6 - 2.7)	1.2 (0.8 - 1.9)	1 (0.6 - 1.6)
Occasionally	1 (0.5 - 1.7)	1.1 (0.6 - 2.1)	1.5**(1.1 - 2.1)	1.6***(1.1 - 2.3)
Respondent's occupation				
Not working	1	1	1	1
Prof., Tech., Managers	1.9 (0.4 - 8.6)	3.9 (0.5 - 30.9)	0.8 (0.4 - 1.4)	0.6 (0.3 - 1.2)
Clerical	0.6 (0.1 - 3.5)	1 (0.1 - 10.8)	0.6 (0.3 - 1.1)	0.5*(0.2 - 1.1)
Skilled & unskilled manual	1.6 (0.3 - 7.2)	3.2 (0.4 - 25.6)	0.6 (0.3 - 1.2)	0.5*(0.2 - 1)
Comprehensive knowledge				
No		1		1
Yes		1 (0.6 - 1.7)		1.9***(1.3 - 2.7)
Sex with multiple partners				
No		1		1
Yes		0.5 (0.1 - 3.9)		1.7 (0.8 - 3.5)
Accept all indicator of stigma discrimination				
No		1		1
Yes		0.6 (0.3 - 1.3)		1 (0.6 - 1.5)
Ever tested for HIV/AIDS				
No		1		1
Yes		2.4**(1.2 - 5.1)		3.8***(2.5 - 5.7)
Log likely hood	-443.0	-344.1	-1188.2	-871.5
*p<0.1, **p<0.05, ***p<0.01				

The results presented in the following Table-4 portray the average treatment effect on treated. It is evident from the findings that the prevalence of HIV has slightly been enhanced (0.67 from 0.61) when treatments were treated as controls, a consistent finding to the issues emerged in case of HIV related risk behavior. Further, the result of ATU suggests that HIV prevalence remains the same (declined to 0.54 from 0.55) if controls are treated as treatment. Thus, findings from PSM suggest that non-migrants had a relatively higher but insignificant effect on HIV prevalence in India when migrants were derived from the community based national level household surveys.

Table 4: Prevalence of HIV/AIDS among migrants and non-migrants after adjusting all other background characteristics of men, NFHS-2005-06, India

Migrants against non-migrants	Treated	Controls	Difference	S.E.	confidence interval
HIV/AIDS score					
Unmatched	0.61	0.55	0.06	0.09	-
ATT	0.61	0.67	-0.06	0.33	(0.01, 1.32)
ATU	0.55	0.54	-0.01	-	-
ATE	-	-	-0.02	-	-

Discussion and Conclusions

There is growing evidence of declining prevalence of HIV/AIDS in the country as whole but recent spurts of emerging HIV epidemic with increasing prevalence in low HIV prevalence states, such as Uttar Pradesh, Bihar, Odisha, Jharkhand, Madhya Pradesh, and West Bengal are assumed to be the result of rural urban migration and return migration (NACO, 2010). Therefore, results emerging from the analytical approaches applied in this paper using the unit level data from NFHS-3 (2005-06), have focused at the factors associated with HIV/AIDS prevalence among migrants and non-migrants. Overall, the HIV/AIDS prevalence among migrants and non-migrants were 0.48 percent and 0.32 percent respectively. These findings were consistent with some of the findings of many other studies in India s, which highlighted that the prevalence of HIV/AIDS was higher among migrants as compared to non-migrants (Gupta et al. 2010).The existing differentials in the age prevalence of HIV among migrants than among the general population are true even for other countries in South-East Asia. HIV prevalence among migrants in Thailand, who migrated from Cambodia, Myanmar, southern China, and Vietnam is up to four times higher as compared to the general population (UNAIDS, 2014-15). Most of studies linking migration and HIV have focused at migrants as an important risk population for HIV infection in the context of bridging the infection from the high-risk group to low-risk population (Bidun et al. 2015).

The HIV/AIDS prevalence among migrants as well as non-migrants was higher among youth irrespective of their migratory status. As age increases, the gap in HIV prevalence among migrants and non-migrants is continuously narrowing, for example in the age group, 15-24 the prevalence of HIV was approximately two times higher in migrants as compared to non-migrants. Similarly, in the age group, (25-34) 1.7 times, (35-44) 1.2 times and in (44-54) approximately equal prevalence of HIV among migrants and non-migrants. The study by Shisana et al.(2016) portray that respondents from older ages have greater odds of being HIV positive compared to younger respondents aged 16-24. In the multivariate analysis after adjusting for socio-economic characteristics, comprehensive knowledge and awareness about HIV/AIDS, the result shows that the youth migrants had higher chances of HIV/AIDS compare to younger and older migrants. In the case of non-migrants, chances of HIV/AIDS among youths were higher as compared to young and old non-migrants. Youth migrant's population were more vulnerable to have risky sexual behaviors. The study by Singh and Chakraborty (2009) also portrayed that the majority of the young male migrants visiting their hometown reported having sex with a paid or unpaid sexual partner, which may be one of the reasons of the higher prevalence of HIV among the young male migrants in India.

The prevalence of HIV/AIDS is higher among migrants who had no-education or had a primary level of education compared to the secondary or higher level of education. Migrated men who had a secondary or higher level of education had relatively lower prevalence of age adjusted

HIV/AIDS, but in case of non-migrants, the age adjusted prevalence of HIV/AIDS decreases with increasing level of education. The multivariate results show that as the level of education increased, chances of HIV/AIDS decreases, irrespective of their migratory status. A study by Singh et al. 2017 stated that migrants who had no education or education up to the fifth standard have a higher prevalence of HIV. Therefore, education has emerged as one of the key catalyst in intensifying the effectiveness of programmes and services to reducing HIV/AIDS.

In the case of a place of residence of migrants and non-migrants, the result portray that urban population those living in urban areas are relatively more vulnerable to HIV infection than their rural counterparts irrespective of their migratory status. After adjusting for the age, this prevalence is still high in urban areas, but the gap between urban and rural has been reduced. This is primarily due to the fact that India has substantially larger proportion of migrants as single male migrants migrated leaving wife and children in rural areas. Most of them have living arrangements with peers and friends and hence lack of chaperon ship from elder members of family, leading to various forms of experimentations with peers and friends. These behaviours are mostly justified within the context of fun, freedom and friendship.

The marital status of men is an important predictor of HIV/AIDS, though unmarried and married men may have different reasons for their indulgence in to risk behaviours and vulnerability to HIV/AIDS. Married male migrants staying away from family leaving them at their home places, are found to increase their vulnerability to STI/HIV through unsafe sexual practices during home visits. A study by Singh et al. (2009) portrayed that the majority of the men visiting their hometown had paid or non-paid sexual partner. The study showed that ever-married migrants, had higher prevalence compared to never married migrants but after adjusting for age characteristics the situation changed, here never married migrants showed higher prevalence than ever-married migrants. Similarly, ever-married non-migrants had higher prevalence compared to never married non-migrants, but after adjusting for age, results were different, here never married non-migrants showed higher prevalence than ever-married non-migrants. This result portrays that age-adjusted prevalence of HIV/AIDS was higher in never married population irrespective of their migratory status. Being married and living apart was significantly associated with increased odds of being HIV positive compared to being married and living together (Shisana et al. 2016).

Findings of this study have rejected the hypothesis of poverty-HIV relationship. It is evident from the findings of this study that migrants as well as non-migrants, who belongs households from richer and middle wealth index, had relatively higher HIV prevalence compared to their counterparts. The migrant population had 26 percent higher prevalence of HIV among those in the middle class and 38 percent prevalence of HIV among those in the richer class of wealth quintiles compared to their non-migrant counterparts. These differentials might have been the resultant effect of their disposable income in their hand, which make them more prone to alcoholism and extended exposure to sexual avenues and opportunities in urban areas. Amongst the non-migrants who belonged to the middle-income category, they had higher chances to have HIV infection (Singh et al. 2017). Another study stated that low socio-economic status combined with the poor condition in informal areas might increase the risk of HIV (Shisana et al. 2016). Our multivariate result also satisfied these results, where migrants who belonged to the middle and richer wealth category had more chances to get HIV/AIDS, but it was found to be insignificant.

Amongst the behavioral characteristics, we have analyzed the frequency of alcohol consumption among migrants and non-migrants, and the study results showed that the migrated person who consumed alcohol almost daily had a higher prevalence of HIV/AIDS compared to non-migrants who consumed alcohol daily. Alcohol use had a positive relationship with the prevalence of HIV/AIDS. The result showed that daily alcohol consumption was the one the measure determinant of HIV/AIDS. The chances of HIV/AIDS prevalence among migrants was three times higher as compared to migrants who did not consume alcohol. Some of the studies showed that there is a positive relationship between alcohol use and high-risk sexual intercourse. Non-migrants, who consumed alcohol almost daily, were more prone to have multiple partners, high-risk sexual intercourse and paid sex (Gupta et al. 2010). These findings were also consistent with the studies, which portrayed that prevalence of HIV/AIDS was higher among migrants who reported to consume alcohol, especially amongst those who had a higher frequency of alcohol consumption (Singh et al. 2017).

Comprehensive knowledge about HIV/AIDS is another important predictor of HIV/AIDS in the community. It is quite evident from the analysis that the migrants, who did not have comprehensive knowledge about HIV/AIDS, had higher chances of getting HIV/AIDS compared to non-migrants. However, migrants who had comprehensive knowledge about HIV/AIDS also had a higher prevalence of HIV/AIDS compared to the non-migrants, but the gap between them was narrowing. Therefore, we can say that comprehensive knowledge about HIV/AIDS may reduce the prevalence of HIV/AIDS. The prevalence of HIV/AIDS was higher among the migrants who did not have comprehensive knowledge about HIV/AIDS (Singh et al. 2017). In the multivariate analysis, the result showed that non-migrants who had comprehensive knowledge were approximately two times more likely to have HIV/AIDS compared to non-migrants who did not have comprehensive knowledge.

There are growing evidence suggesting that the intricacies of HIV transmission and prevention have been better understood in the recent years through enhancing the extent of knowledge, and continuous decline in misconceptions. However, stigma and discrimination about HIV/AIDS are another pervasive problems arising in a variety of contexts and hence works as precursor of HIV related risk behavior as well as the prevalence of HIV/AIDS. The results from analysis on knowledge and misconception show that both migrants as well as non-migrants said that HIV/AIDS cannot be reduced by consistent condom use, but migrants had a higher prevalence of HIV compared to non-migrants. However, migrants who said that HIV/AIDS can always be reduced by using a condom during sex, also have a higher prevalence of HIV than non-migrants. Similarly, migrant people who said that HIV/AIDS could not be reduced by limiting sex with one uninfected partner had a higher prevalence of HIV compared to non-migrants who stated the same. However, among the migrants, who said that HIV/AIDS could be reduced by limiting sex with one uninfected partner had a higher prevalence of HIV/AIDS compared to those non-migrants who stated the same but the prevalence gap is reduced. Migrants who did not reject all three misconceptions about HIV/AIDS had a higher prevalence of HIV compared to non-migrant who not denied all the three misconceptions about HIV/AIDS. In case of migrants, those who denied all three misconceptions about HIV/AIDS and had knowledge of how to prevent HIV/AIDS had higher HIV/AIDS prevalence compared to those non-migrants who denied all three misconceptions about HIV/AIDS. Therefore, from the above finding, we can conclude that migrant and non-migrant who reported that they had a misconception about HIV/AIDS and they may not aware about HIV/AIDS in this case migrant population has a relatively higher risk of HIV/AIDS compare to the non-migrant population.

In view of stigma and discrimination being one the most pervasive problem arising in a variety of situation ranging from Individual level to the societal level, this paper has thrown light on the relationship between these two attributes i.e. relationship between prevalence of stigma and prevalence of HIV/AIDS among migrants and non-migrants. Migrants and non-migrants who said that they are willing to take care of a relative with HIV/AIDS in own home had less prevalence of HIV/AIDS compared to those who said that they are not willing to take care of a relative with HIV/AIDS. People who said that they would buy fresh vegetables from a shopkeeper who had HIV/AIDS had less prevalence of HIV as compared to those who wouldn't buy fresh vegetables from a shopkeeper who had HIV/AIDS among both migrants and non-migrants. Migrants who admitted to having all four attitudes towards discrimination had less prevalence of HIV compared to those who denied it. However, in the case of non-migrants who did not accept to having all four attitudes towards stigma discrimination had less prevalence of HIV/AIDS compared to non-migrants who denied it.

Recommendations

1. There is an urgent need to break the troika of the social network, alcohol use, and risky sexual behavior, especially among migrant youth in the country through community-based programmes and interventions focusing on peer lead approach.
2. Youth irrespective of their migratory status should be capacitated with positive messaging about the sexual rights of women with the effective enabling environment for behavior change. On the other hand, left behind women need to be capacitated with their sexual rights, especially control over own sexuality within a larger context of enhancing their negotiation capacity for safe sex with husband visiting place of origin

3. Despite the declining prevalence of HIV/AIDS in the country, the level of comprehensive knowledge of HIV/AIDS is stagnant around one-third of men and women age 15-49. Therefore, efforts should be made to enhance comprehensive knowledge of HIV/AIDS with special focus at migrants workers engaged in organized as well as unorganized sectors

4. Addressing stigma and discrimination to PLHIV may encourage HIV testing and many of the infected people to disclose their HIV status, which may enhance the effectiveness of care and programme.

Limitations

Extracting data on migration from a large-scale survey like NFHS/DLHS may have some selection bias and hence may not reflect a true relationship between migration and HIV.

References

- Ahsan Ullah, A. K. M. (2011). HIV/AIDS-related stigma and discrimination: A study of health Care providers in Bangladesh. *Journal of the International Association of Physicians in AIDS Care*, 10(2), 97-104.
- Babalola, S., Awasum, D., & Quenum-Renaud, B. (2002). The correlates of safe sex practices among Rwandan youth: a positive deviance approach. *African Journal of AIDS research*, 1(1), 11-21.
- Beyene, M. B., & Beyene, H. B. (2015). Predictors of late HIV diagnosis among adult people living with HIV/AIDS who undertake an initial CD 4 T cell evaluation, Northern Ethiopia: a case-control study. *PloSone*, 10(10), e0140004.
- Bharat, S. (2011). A systematic review of HIV/AIDS-related stigma and discrimination in India: current understanding and future needs. *SAHARA-J: Journal of Social Aspects of HIV/AIDS*, 8(3), 138-149.
- Bharat, S., Aggleton, P., Tyrer, P., Rau, B., Forsythe, S., Dallabetta, G., & Diul, M. Y. (2001). India: HIV and AIDS-related discrimination stigmatization and denial.
- Bharat, S., Aggleton, P., Tyrer, P., Rau, B., Forsythe, S., Dallabetta, G., & Diul, M. Y. (2001). India: HIV and AIDS-related discrimination stigmatization and denial.
- Brockerhoff, M., & Biddlecom, A. E. (1999). Migration, sexual behavior and the risk of HIV in Kenya. *International migration review*, 833-856.
- Camlin, C. S., Hosegood, V., Newell, M. L., McGrath, N., Bärnighausen, T., & Snow, R. C. (2010). Gender, migration, and HIV in rural KwaZulu-Natal, South Africa. *PloSone*, 5(7), e11539.
- Fakoya, I., Álvarez-del Arco, D., Woode-Owusu, M., Monge, S., Rivero-Montesdeoca, Y., Delpech V., & del Amo, J. (2015). A systematic review of post-migration acquisition of HIV among migrants from countries with generalized HIV epidemics living in Europe: implications for effectively managing HIV prevention programmes and policy. *BMC Public Health*, 15(1), 561.
- FHI/NEW ERA (2002 November) HIV/AIDS prevalence and risk factors among migrant and non-migrant males of Achham District in Far-Western Nepal (Volume -1 Main Text), Nepal
- Gupta, K., Vaidehi, Y., & Majumder, N. (2010). Spatial mobility, alcohol use, sexual behaviour and sexual health among males in India. *AIDS and Behavior*, 14(1), 18-30.
- Haour-Knipe, M., & Rector, R. (1996). *Crossing borders: Migration, ethnicity, and AIDSTaylor & Francis*.
- India, H. I. V. Estimations 2015 technical report. NACO & National Institute of medical statistics ICMR, Ministry of Health & Family Welfare, Government of India.
- Joint United Nations Programme on HIV/AIDS (UNAIDS), & Joint United Nations Programme on HIV/AIDS (UNAIDS). (2016). *Global AIDS update 2016*. Geneva, Switzerland.
- Joint United Nations Programme on HIV/AIDS (UNAIDS), & Joint United Nations Programme on HIV/AIDS (UNAIDS). (2016). *Global AIDS update 2016*. Geneva, Switzerland.
- Merson, M. H. (1993). *The HIV/AIDS pandemic: global spread and global response*.
- NACO Annual report 2010-11; available from [HTTP://naco.gov.in/sites/default/files/NACO%20Annual%20Report%202010-11.pdf](http://naco.gov.in/sites/default/files/NACO%20Annual%20Report%202010-11.pdf)
- NACO Annual report 2011-12; available from http://www.aidsdatahub.org/sites/default/files/documents/NACO_Annual_Report_2011_12.p

- dfhttp://www.aidsdatahub.org/sites/default/files/documents/NACO_Annual_Report_2011_12.pdf
- NACO Annual report 2015-15; available from HTTP://naco.gov.in/sites/default/files/Annual%20Report%202015-16.pdf
- Saggurti, N., Mahapatra, B., Swain, S. N., Battala, M., Chawla, U., & Narang, A. (2011). Migration and HIV in India: Study of select districts. New Delhi: UNDP, NACO, and Population Council.
- S.K., and V.L. Singh (2009) Socio-economic and Cultural Correlates of Spousal Violence and Sexually Transmitted Infections among Young Women in India: Evidence from NFHS-3 in Demography India, Vol. 39, No. 2, ISSN 0970-454X.
- Shisana, O., Risher, K., Celentano, D. D., Zungu, N., Rehle, T., Ngcaweni, B., & Evans, M. G. (2016). Does marital status matter in an HIV hyperendemic country? Findings from the 2012 South African National HIV Prevalence, Incidence and Behaviour Survey. *AIDS care*, 28(2), 234-241.
- Singh, S. K., & Chakraborty, S. (2009). How safe is our workplace with respect to HIV/AIDS—A study of diamond industry of Surat. *The Journal of Family Welfare*, 55(1), 11-17.
- Singh, S. K., Das, A., & Vishwakarma, D. Decoding Migration-HIV Links Using Gender Lens: An Application of Modified Case-Control Design.
- Singh S.K., Gupta K., Lahiri S., Nangia P. (2002) “Knowledge about HIV/AIDS and Risk Behaviour among migrants in Mumbai and Surat.” Summary Report, IIPS, Mumbai.
- Singh, S.K., Jean.J. Schensul. Kamla Gupta, Barsarani Maharans and Marlene Berg (2010). Determinants of Alcohol Use, Risky Sexual Behaviour, and Sexual HealthVault. 14, pp.48-60. ISSN: 1090-7165. Problems among Men in Low-Income Community of Mumbai, India, in *AIDS and Behaviour*.
- Steward, W. T., Herek, G. M., Ramakrishna, J., Bharat, S., Chandy, S., Wrubel, J., & Ekstrand, M. L. (2008). HIV-related stigma: adapting a theoretical framework for use in India. *Social science & medicine*, 67(8), 1225-1235.
- UNAIDS The Gap Report-2014. Beginning of the AIDS Epidemic (page. 17, 19, and 58-64). http://files.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2014/UNAIDS_Gap_report_en.pdf (04/04/2017; 01:16).
- Vaidya, N. K., & Wu, J. (2011). HIV epidemic in Far-Western Nepal: effect of seasonal labor migration to India. *BMC Public Health*, 11(1), 310.

Angad Singh
Ph. D. Student
International Institute for Population Sciences, Mumbai, India

Dr. S. K. Singh
Professor
Department of Mathematical Demography and Statistics
International Institute for Population Sciences, Mumbai, India

Corresponding author: Angad Singh
Email: angadsingh219@gmail.com