

Pre-exposure prophylaxis: awareness, acceptability and risk compensation behaviour among men who have sex with men and the transgender population

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Objectives

This exploratory study examined the facilitators of and barriers to acceptance of pre-exposure prophylaxis (PrEP) and potential risk compensation behaviour emerging from its use among men who have sex with men (MSM) and transgender individuals (TGs) in India.

Methods

A questionnaire was administered to 400 individuals registered with a targeted intervention programme. Logistic regression models were used to identify facilitators of and barriers to PrEP acceptance.

Results

The respondents consisted of 68% MSM and 32% TGs. Risk behaviour categorization identified 40% as low risk, 41% as medium risk and, 19% as high risk for HIV infection. About 93% of the respondents were unaware of PrEP, but once informed about it, 99% were willing to use PrEP. The facilitators of PrEP acceptance were some schooling [odds ratio (OR) 2.16; $P = 0.51$], being married or in a live-in relationship (OR 2.08; $P = 0.46$), having a high calculated risk (OR 3.12; $P = 0.33$), and having a high self-perceived risk (OR 1.8; $P = 0.35$). Increasing age (OR 2.12; $P = 0.04$) was a significant barrier. TGs had higher odds of acceptance of PrEP under conditions of additional cost (OR 2.12; $P = 0.02$) and once-daily pill (OR 2.85; $P = 0.04$). Individuals identified as low risk for HIV infection showed lower odds of potential risk compensation, defined as more sexual partners (OR 0.8; $P = 0.35$), unsafe sex with new partners (OR 0.71; $P = 0.16$), and decreased condom use with regular partners (OR 0.95; $P = 0.84$), as compared with medium-risk individuals. The associations, although not statistically significant, are nevertheless important for public health action given the limited scientific evidence on PrEP use among MSM and TGs in India.

Conclusions

With high acceptability and a low likelihood of risk compensation behaviour, PrEP can be considered as an effective prevention strategy for HIV infection among MSM and TGs in India.

Keywords: HIV, men who have sex with men, pre-exposure prophylaxis, transgender

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Introduction

With 2.1 million people living with HIV and 86 000 new infections in 2015, India has the third largest HIV epidemic in the world [1]. Unlike other high-burden

countries, the HIV epidemic in India continues to be primarily concentrated among high-risk groups (HRGs) which include female sex workers (FSWs), men who have sex with men (MSM), transgender individuals (TGs) and injecting drug users (IDUs) [2]. While the overall HIV prevalence among antenatal clinic (ANC) attendees (considered a proxy for prevalence among the general population) continues to decline, the prevalence among MSM and TGs remains high, at 4.3 and 8.8%, respectively [2].

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The epidemic is characterized by a high degree of inter-state variability, with the state of Andhra Pradesh (undivided) having the highest burden among MSM, with a prevalence of 10.1% [2].

Key HIV prevention strategies for HRGs in India have been targeted intervention (TI) encompassing behaviour change communication (BCC), condom promotion, and HIV testing and counselling [3]. Significant gains have been achieved in the past, but recent data have shown evidence of ongoing transmission of HIV among MSM/TGs [4,5]. This can be attributed, in part, to high-risk sexual behaviour among MSM/TGs in India [6,7]. Nondisclosure of HIV status remains high and is associated with high-risk behaviours such as having multiple sexual partners and unprotected anal intercourse [8]. Consistent condom use is low overall in self-identified MSM/TGs [6,9–11]. MSM in India also frequently report having both male and female sexual partners, and increased incidences of condom breakage and substance abuse (consumption of alcohol before or during sex) [12–15]. This underscores the need for additional and novel prevention strategies to help halt and reverse the epidemic in India.

One such recent advancement in combatting the epidemic is pre-exposure prophylaxis (PrEP) [15–18]. The efficacy of PrEP has been demonstrated in multiple randomized controlled trials across different geographical settings and among different HRGs [19–22]. The World Health Organization (WHO) recommends oral PrEP containing tenofovir disoproxil fumarate (TDF) as an additional prevention choice for people at substantial risk of HIV infection [23].

Despite the demonstrated efficacy of PrEP as a new HIV prevention strategy, guidance for its use among HRGs in India remains unclear. Past experience of HIV prevention in India suggests that advocacy for PrEP can be successful only by ensuring effective community engagement and by remaining sensitive to beliefs [24]. To improve uptake of PrEP among HRGs, it is vital to understand existing knowledge of and attitudes towards use of PrEP and the anticipated change in risk behaviour pattern that may follow adoption of PrEP as an HIV prevention tool.

Currently, there is a paucity of literature on the acceptability of PrEP among the MSM/TG population in India. This study aimed to understand the facilitators of and barriers to PrEP uptake among MSM/TGs in a high HIV prevalence state in India and to determine whether there was an increase in high-risk sexual behaviour (risk compensation behaviour) after PrEP use. The evidence derived from this study will aid the national programme in designing tailored, efficient and high impact-driven

prevention strategies required for control of the epidemic in India.

Methods

Setting

The study was conducted among MSM and TGs enrolled in the targeted intervention (TI) programme of the National AIDS Control Programme (NACP) in the districts of Hyderabad and Ranga Reddy, Telangana State (erstwhile undivided Andhra Pradesh), India.

Study population

Participants were recruited from July to September 2015. Eligibility for inclusion in the sample was defined as: self-identifying as MSM or TG, being 18 years of age or older, self-reporting a negative or unknown HIV serostatus, and being registered in the NACP-supported TI programme. The term “transgender” in this study refers to individuals who prefer to live in the gender role different from that assigned to them at birth [25]. All the participants in the study were male-to-female (MTF) transgendered individuals.

Protection of human subjects

We explained the objectives, methods, benefits and risks of participating in our study to the participants and obtained written informed consent. We used unique identification numbers for each participant to maintain confidentiality. Institutional review board approval for the study was provided by the Medi Citi Institute of Medical Sciences in Hyderabad, India.

Sampling

Although this was an exploratory study, we used the probability sampling technique to select respondents to achieve unbiased recruitment of the required sample. A cluster sampling method was used with TIs as clusters, which were selected using probability proportional to size (PPS). One nongovernment organization (NGO)-led TI in the Ranga Reddy district and two in Hyderabad were selected using the PPS method. As the sampling frame was available as a list of all individuals registered in the TIs, a simple random sample without replacement of 400 individuals was selected from the three TIs using the random number generation function in Microsoft Excel.

Data collection

Data were collected using a structured questionnaire administered to the respondents by trained medical social workers after obtaining written informed consent from each participant. The data collection tools were paper based. The questionnaire recorded information pertaining to demographic and socio-economic characteristics, sexual behaviour, knowledge of PrEP, acceptability of PrEP and possible changes in sexual behaviour after using PrEP.

Information on socio-demographic covariates included age, gender, level of education archived, employment status, income and religion. The variable gender had two categories: MSM and TG. Data regarding the individuals' predominant sexual behaviour – classified as “predominantly insertive/top/*panthi*”, “predominantly receptive/bottom/*kothi*” and “versatile/*double decker*” as per locally accepted colloquial terms – were collected. To assess high-risk sexual behaviour, information regarding number of sexual partners in the last 3 months, history of transactional sex, frequency of anal intercourse, frequency of condom use during anal intercourse, consumption of alcohol or drugs before sex, symptoms of sexually transmitted infections (STIs) in the past 12 months, self-perceived risk of HIV infection, and willingness to discuss HIV/AIDS with sexual partners was collected.

Respondents were provided with basic educational information regarding PrEP using flipcharts prior to administering the final part of the questionnaire. Knowledge of PrEP was assessed by asking “Have you heard of PrEP before?” Willingness to use PrEP was ascertained by asking “Would you be interested in taking a medicine, like PrEP, which has been shown to reduce the chance of HIV transmission?” and “What are some reasons why you would use PrEP?” Potential barriers to uptake of PrEP and compliance were assessed by obtaining information regarding willingness to use PrEP if it was known to cause mild side effects, if it cost 1000–1500 INR/month (approx. US\$ 15–23), if it required adherence to a once-daily pill regimen for efficacy, if it required concurrent condom use, if it required regular HIV testing, and if it did not protect against other STIs. To assess the effect of social stigma on PrEP uptake, respondents were asked whether the thought of taking PrEP made them anxious or embarrassed, and if the fear of legal action, stigma or discrimination kept them from asking their health care provider about PrEP.

To assess potential change in sexual behaviour after PrEP uptake, respondents were asked if using PrEP would change their sexual decision-making in terms of having more sexual partners, being less willing to use a condom

with their regular partner, being more likely to have sex without a condom with a new sexual partner and taking more risks in sexual decision-making. The responses were recorded on a Likert scale.

The questionnaire was administered in Telugu or English, according to the indicated preference of the participant, by a social worker trained and experienced in research data collection and fluent in both languages. All data collection instruments were developed in English, translated into Telugu, and then back-translated to ensure validity.

Statistical analysis

Descriptive analysis

We examined the socio-demographic characteristics and sexual practices of the participants categorized by sexual identity (MSM/TG). Continuous variables such as age were dichotomized at the median value. Information on current sexual behaviour, including location for soliciting sexual partners, history of transactional sex, number of sexual partners, alcohol and drug use, frequency of condom use and willingness to discuss HIV/AIDS with a sexual partner, was used to ascertain a “calculated risk score” for each respondent [26,27].

Responses to each question pertaining to current sexual behaviour were scored on a scale of 1 (low-risk behaviour) to 3 (high-risk behaviour). The scores from each question were then added to create a summated risk score for each participant. We then stratified the risk score distribution from our sample to create three categories, namely low, medium and high risk of HIV infection based on the tertiles of the summated risk score distribution. The tertiles of a distribution are two cut-off points (in this case risk scores) that divide the score distribution into three equal parts so that approximately 33% of the subjects are in each of the lower, middle and upper tertiles. Each respondent in our sample was categorized as “low risk” if his score was less than or equal to the first cut-off point, as “medium risk” if his score was between the first and second cut-off points, and as “high risk” if his score was greater than or equal to the second cut-off point.

Similarly, “self-perceived risk” of HIV infection was assessed using the question ‘To what extent do you feel yourself at risk of being infected with HIV/AIDS?’ The degree of agreement between ‘calculated risk’ and ‘self-perceived risk’ was estimated using the kappa coefficient of agreement.

A descriptive analysis was performed to identify significant differences in sexual behaviour between MSM and TGs. A χ^2 test was used to examine the significance of

associations between sexual identity and sexual behaviour. *P*-values were considered significant at a level of < 0.05.

Inferential analysis

The association between STI risk category and participants' awareness and acceptability of PrEP was examined using a χ^2 test. Estimates of odds ratios (ORs) and accompanying 95% confidence intervals (CIs) were calculated using binomial logistic regression with willingness to use PrEP as the outcome variable and sexual behaviour-related attitudes and practices as independent variables. ORs were also adjusted for age, sex, income, marital status and risk group. The difference in PrEP acceptance between MSM and TGs was examined by calculating ORs of PrEP use when accompanied by other conditions, such as a once-daily pill regimen, regular HIV testing, an additional monthly cost of 1000–1500 rupees, embarrassment and anxiety about revealing PrEP use and fear of legal action, for TGs vs. MSM. A descriptive analysis was performed for risk compensation behaviour stratified by calculated HIV risk group. The OR of the outcome of each risk compensation behaviour and HIV risk group as an independent variable was calculated and adjusted for the sexual identity of the respondents. The risk compensation analysis was performed on a subsample ($n = 397$) of respondents who said that they would be highly willing to take PrEP if it was made available to them.

Data entry and statistical analyses were carried out using SPSS version 16 (SPSS Inc., Chicago, IL, USA). All statistical tests of hypotheses were two-sided.

Results

Of the 400 respondents, 271 self-identified as MSM (67.8%) and 129 (32.3%) as TG. The mean age of participants was 27 years with a standard deviation (SD) of 6.7 years, with almost 88% of respondents being ≤ 35 years. The majority of them were single (60%), had received some schooling (86%), and were employed (77%). The majority of the participants were receivers/*kothis* (58%). Age ($P = 0.09$), education ($P = 0.04$), marital status ($P = 0.002$), occupation ($P < 0.001$) and sexual role ($P < 0.001$) were significantly associated with gender identity.

Based on current sexual behaviour responses, the “calculated risk” distribution was as follows: 159 (39.75%) respondents were low risk, 163 (40.75%) were medium risk and 78 (19.50%) were high risk (Table 1). We found a low agreement between the “self-perceived risk” for

Table 1 Socio-demographic characteristics and sexual practices of the participants stratified by sexual identity

Exposure variable	MSM (<i>n</i> = 271) <i>n</i> (%)	TGs (<i>n</i> = 129) <i>n</i> (%)	Total (<i>n</i> = 400) <i>n</i> (%)	<i>P</i> -value
Age				
≤ 35 years	243 (89.7)	108 (83.7)	351 (87.8)	0.09
> 35 years	28 (10.3)	21 (16.3)	49 (12.2)	
Education				
Illiterate	34 (12.5)	20 (15.5)	54 (13.5)	0.04
Some schooling	237 (87.5)	109 (84.5)	346 (86.5)	
Marital status				
Single	177 (65.3)	63 (48.8)	240 (60.0)	0.002
Married/live-in	94 (34.7)	66 (51.2)	160 (40.0)	
Occupation				
Unemployed	38 (14.0)	12 (9.3)	50 (12.5)	< 0.001
Student	39 (14.4)	3 (2.3)	42 (10.5)	
Employed	194 (71.6)	114 (88.4)	308 (77.0)	
Sexual role				
Receptive partner (<i>kothil</i> /bottom)	103 (38.0)	129 (100.0)	232 (58.0)	< 0.001**
Insertive partner (<i>panthil</i> /top)	101 (37.3)	0 (0.0)	101 (25.2)	
Versatile partner (<i>double decker</i>)	67 (24.7)	0 (0.0)	67 (16.8)	
Self-assessed risk of HIV/AIDS				
Low	133 (49.1)	49 (38.0)	182 (45.5)	0.11
Medium	37 (13.7)	20 (15.5)	57 (14.2)	
High	101 (37.2)	60 (46.5)	161 (40.3)	
Calculated risk of HIV/AIDS				
Low	132 (48.7)	65 (50.4)	197 (49.3)	0.94
Medium	77 (28.4)	30 (23.3)	107 (26.7)	
High	62 (22.9)	34 (26.3)	96 (24.0)	
Access to sexual partners				
Bars/discotheques/ cruising sites	189 (69.8)	107 (82.9)	296 (74.0)	0.02
Online dating/ networking sites	28 (10.3)	8 (6.2)	36 (9.0)	
Referred by friends	54 (19.9)	14 (10.9)	68 (17.0)	
Transactional sex (lifetime)				
Yes	228 (84.1)	122 (94.6)	350 (87.5)	0.003
Never	43 (15.9)	7 (5.4)	50 (12.5)	
Transactional sex (last 3 months)				
Yes	238 (87.8)	123 (95.3)	361 (90.2)	0.02
No	33 (12.2)	6 (4.7)	39 (9.8)	
Number of partners (paid/unpaid) in last 3 months				
≤ 5	63 (23.2)	42 (32.6)	105 (26.3)	0.13
6–9	4 (1.5)	1 (0.8)	5 (1.2)	
≥ 10	204 (75.3)	86 (66.7)	290 (72.5)	
Anal sex in last 12 months				
Several times a week	64 (23.6)	48 (37.2)	112 (28.0)	0.04
About once a week	91 (33.6)	32 (24.8)	123 (30.8)	
About once a month	51 (18.8)	25 (19.4)	76 (19.0)	
Less often than once a month	39 (14.4)	15 (11.6)	54 (13.5)	
Never	26 (9.6)	8 (6.2)	34 (8.5)	
Use of condom during anal sex in last 12 months				
All the time	201 (74.2)	105 (81.4)	306 (76.5)	0.08
None of the time	58 (21.4)	16 (12.4)	74 (18.5)	
Some of the time	12 (4.4)	8 (6.2)	20 (5.0)	

MSM, men who have sex with men; TGs, transgender individuals.

HIV/AIDS and “calculated risk” categories ($\kappa = 0.1140$; $P < 0.05$).

The majority of respondents had had transactional sex in the past 3 months (MSM, 87.8%; TGs, 95.3%), and had had more than 10 sexual partners in the past 3 months (MSM, 75.3%; TGs, 66.7%) (Table 1). Consistent condom use during anal sex was reported by 74.2% of MSM and 81.4% of TGs. The comparison between MSM and TGs with respect to sexual behaviour (Table 1) indicated that there were significant associations between gender identity and the place in which they solicited sexual partners ($P = 0.02$), transactional sex in lifetime ($P = 0.003$) and in the past 3 months ($P = 0.02$), and the frequency of anal sex in the past year ($P = 0.04$).

The majority (93%) of the participants were not aware of or had never heard about PrEP (Table 2). However, once informed about PrEP, their willingness to use PrEP was extremely high (99%). There was no association between calculated HIV risk and PrEP awareness or acceptability. The level of nonawareness of PrEP was highest in the low (40.1%) and medium (40.3%) risk groups. When informed about it, the willingness to take up PrEP was high in the low (39.4%) and medium (40.9%) risk groups.

The facilitators for PrEP acceptance were education (some schooling) (OR 2.16; $P = 0.51$), being married or in a live-in relationship (OR 2.08; $P = 0.46$), having a high calculated risk (OR 3.12; $P = 0.33$), and having a high self-assessed risk (OR 1.8; $P = 0.35$) (Table 3). The barriers were identified as increasing age (OR 0.13; $P = 0.05$), higher income (OR 0.73; $P = 0.6$) and being the insertive partner/*panthi* (OR 0.43; $P = 0.56$) or versatile/*double decker* (OR 0.14; $P = 0.11$) in sexual behaviour.

In the analysis of the deterrents to PrEP uptake by sexual identity, TGs had higher odds of using PrEP despite having to incur a monthly cost (OR 2.12; $P = 0.02$), and needing to adhere to a once-daily pill regimen (OR 2.85; $P = 0.04$). There was no statistically significant difference in the willingness to use PrEP among MSM and TGs in the event of mild side effects, the requirement for

Table 2 Pre-exposure prophylaxis (PrEP) awareness and acceptance stratified by calculated risk categories for risk of HIV infection/sexually transmitted infection

Exposure	Low n (%)	Medium n (%)	High n (%)	Total n (%)	χ^2 P-value
PrEP awareness					
No	149 (40.1)	150 (40.3)	73 (19.6)	372 (93)	0.41
Yes	10 (35.7)	13 (46.4)	5 (17.9)	28 (7)	
PrEP acceptance					
No	3 (75.0)	1 (25.0)	0 (0)	4 (1)	0.81
Yes	156 (39.4)	162 (40.9)	78 (19.7)	396 (99)	

Table 3 Facilitators of and barriers to pre-exposure prophylaxis (PrEP) use

Exposure	Odds ratio	95% CI	P-value
<i>Facilitators</i>			
Education			
Illiterate	1		
Some schooling	2.16	(0.22–21.12)	0.51
Marital status			
Single	1		
Married/live-in	2.08	(0.30–14.47)	0.46
Calculated risk			
Low	1		
High	3.12	(0.32–30.27)	0.33
Self perceived risk			
Low	1		
High	1.8	(0.52–6.23)	0.35
<i>Barriers</i>			
Age in years			
≤ 35 years	1		
> 35 years	0.13	(0.018–0.98)	0.05
Income (INR/month)*			
≤ 18 498	1		
> 18 498	0.73	(0.25–2.1)	0.56
Sexual behaviour			
Receptive partner	1		
Insertive partner	0.43	(0.03–6.99)	0.56
Versatile partner	0.14	(0.01–1.58)	0.11

CI, confidence interval.

*18 498 INR = US\$ 286.80.

concurrent condom use, the requirement for regular HIV testing, and the requirement for once-daily dosing even during periods of sexual inactivity. TGs reported higher odds of anxiety at the thought of using PrEP (OR 1.92; $P = 0.03$) as compared with MSM (Table 4).

The main reason cited by the respondents for using PrEP was that it will lead to lower dependence on a sexual partner for protection (64%). One-fourth of TGs (26.4%) and 23.6% of MSM cited protection from HIV in the case of condom breakage as a reason for willingness to use PrEP (Fig. 1).

Based on the “calculated risk” score, low HIV risk individuals showed lower odds of potential risk compensation behaviour (increased high-risk sexual behaviour after PrEP uptake) for various outcomes such as the tendency to have more sexual partners (OR 0.8; $P = 0.35$), the tendency to have unsafe sex with a new partner (OR 0.71; $P = 0.16$), and a decrease in willingness to use condoms with a regular partner (OR 0.95; $P = 0.84$) as compared with medium HIV risk individuals (Table 5). However, those who were categorized as high risk were more likely (OR 1.3; $P = 0.28$) to have more sexual partners if they took PrEP as compared with those at medium risk. Although these ORs suggest clinical significance, the findings of this exploratory study, with its small sample size, did not approach statistical significance.

Table 4 Deterrents to pre-exposure prophylaxis (PrEP) uptake by sexual identity [transgender individuals (TGs) or men who have sex with men (MSM)]

Determinants of PrEP uptake	MSM (n = 271)	TGs (n = 129)	Odds ratio	P-value	95% CI
Mild side effects					
No	45	19	1		
Yes	226	110	1.15	0.63	(0.64–2.06)
Incur monthly expenses					
No	59	15	1		
Yes	212	114	2.12	0.02	(1.15–3.89)
Concomitant use of condom					
No	19	6	1		
Yes	252	123	1.55	0.36	(0.60–3.97)
Once-daily dosing schedule					
No	28	5	1		
Yes	243	124	2.86	0.03	(1.08–7.58)
Daily use of PrEP during periods of sexual inactivity					
No	44	15	1		
Yes	227	114	1.47	0.22	(0.79–2.76)
PrEP use along with regular HIV testing					
No	31	10	1		
Yes	240	119	1.54	0.26	(0.73–3.24)
PrEP use even if there is no protection from other STIs					
No	40	11	1		
Yes	231	118	1.86	0.08	(0.92–3.75)
Telling partner about PrEP use					
No	24	17	1		
Yes	247	112	0.64	0.18	(0.33–1.24)
Embarrassment in telling about PrEP use					
No	197	103	1		
Yes	74	26	0.67	0.12	(0.40–1.12)
Anxiety about PrEP use					
No	58	16	1		
Yes	213	113	1.92	0.03	(1.06–3.49)
Fear of legal action preventing access to PrEP					
No	162	83	1		
Yes	109	46	0.82	0.38	(0.54–1.27)
Stigma of admitting sexual activity to health workers preventing access to PrEP					
No	174	85	1		
Yes	97	44	0.93	0.74	(0.59–1.44)
Criminality of nonheterosexual intercourse in India preventing access to PrEP					
No	212	108	1		
Yes	59	21	0.7	0.21	(0.40–1.21)

CI, confidence interval; STI, sexually transmitted infection.

Discussion

This study examined sexual behaviour patterns, and level of awareness and acceptability of PrEP among MSM and TG populations in India. The prevalence estimate of high-risk sexual behaviours in this study population is in agreement with those of other studies conducted in similar South Asian populations [28,29]. Our study population was exposed to prevention services such as counselling and education about safe sexual practices and had access to other prevention services such as HIV testing, condom promotion and BCC. The high prevalence of sexual risk behaviour in our study population therefore suggests

lacunae in the existing prevention efforts to halt HIV transmission and indicates the need for additional prevention options, such as PrEP, to supplement ongoing efforts to stem the epidemic [30–32].

In the subgroups reporting high-risk sexual behaviour, MSM and TGs in our study population differed significantly in terms of certain high-risk sexual behaviours such as places in which sexual partners were solicited, engagement in transactional sex and frequency of anal sex. This indicates a need for specific preventive services for these groups based on the identified behaviour patterns, which is in line with the current national policy to include TGs as a separate category in HRGs for STIs, whereas in the past they had been clubbed together with MSM. Our study sample was also characterized by a high degree of deviation of the self-assessed risk for HIV/AIDS from the calculated HIV risk, making these individuals even more vulnerable to infection.

Awareness of PrEP was found to be low. As the population was regularly accessing targeted HIV prevention services, the low awareness of PrEP suggests a gap in dissemination or a lack of information about PrEP provided through established national prevention service delivery mechanisms. On informing the participants about PrEP, their willingness to use PrEP as a potential preventive tool increased significantly. This is in agreement with several studies [15–19] in other settings with similar HRGs. As our study population consisted of individuals enrolled in existing prevention services, they had had access to health care providers. Encouraging community leaders and health care professionals working in the community to educate people about PrEP will help to raise awareness in this key target population.

The findings of our study are in general agreement with known facilitators of and barriers to the acceptance of PrEP [33,34]. Older individuals were less likely to accept PrEP; individuals who were literate, employed, married or in a live-in relationship, individuals with a high self-perceived risk of HIV infection, and individuals with a high calculated risk for HIV infection were more likely to accept PrEP; and those with higher incomes and those who were the insertive sexual partner were less likely to accept PrEP, although these associations did not reach statistical significance in our study. This was possibly attributable to a small sample size of participants who were not willing to use PrEP. Reduced dependence on a partner for HIV protection and protection from HIV infection in the case of condom breakage were the main reasons cited for willingness to use PrEP by both MSM and TGs. The willingness to use PrEP remained high in both groups when they were informed about the need for regular HIV testing, concurrent condom use, and possible

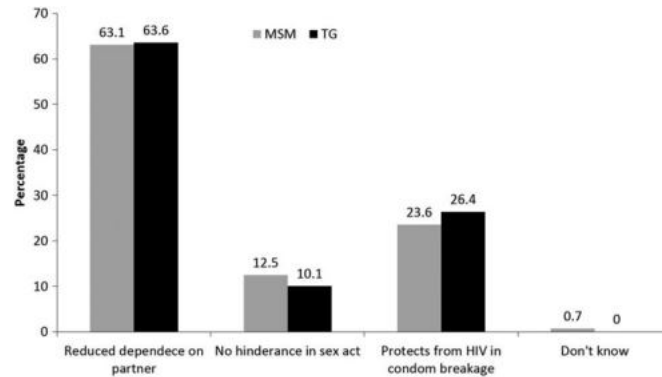


Fig. 1 Reasons for pre-exposure prophylaxis (PrEP) use stratified by sexual identity [men who have sex with men (MSM)/transgender individuals (TGs)].

side effects of PrEP. TGs were more likely to use PrEP than MSM when informed about the need for daily dosing, and the possibility of incurring a small monthly cost for the pills, but were also more likely to suffer from anxiety about using PrEP. Thus, advocacy for PrEP in each group will need to be sensitive to the specific concerns of that group for maximum uptake.

There is mixed evidence [30,35–39] regarding possible shifts in sexual behaviour after PrEP uptake among HRGs. Hence it was important to survey participants' perceptions about potential risk compensation behaviour if they were to start using PrEP. We found that individuals who were calculated to be low risk for HIV/AIDS were less likely to show an increase in any risk compensation behaviour, such as the tendency to have more partners, the tendency to have unsafe sex with a new partner and a decrease in willingness to use condoms with a regular partner. Moreover, individuals who were calculated to be high risk based on their self-reported sexual behaviour were also less likely to stop using condoms with a regular partner after PrEP uptake. Thus, in our study population, risk compensation behaviour after PrEP uptake was less

likely to occur. However, further studies will be needed to study the risk compensation behaviour following PrEP initiation in other groups and in the real-world setting. Assessment for high-risk behaviour and behaviour change counselling should continue to be an integral part of comprehensive prevention services alongside PrEP.

Currently, there is limited focus on attitudes of TGs towards PrEP in South Asia. As TGs constitute a significant HRG for HIV infection, this is a major deficit in knowledge about the viability of introducing PrEP into existing prevention services for HIV. By including this key group in our study population, we found that TGs differed from MSM not only in patterns of high-risk behaviour, but also in their attitude towards PrEP. In this study, TGs were more likely to use PrEP as a once-daily pill even if they had to incur a small monthly cost for the pills. However, TGs were also more likely to suffer from anxiety about using PrEP. Further research is therefore warranted to study the existing attitudes of TGs towards PrEP so that advocacy efforts for maximum uptake can be better tailored to the needs of the community.

Table 5 Potential risk compensation behaviour among respondents

Outcome of risk compensation behaviour	Calculated HIV risk category	Odds ratio	P-value	95% CI
Tendency to have more partners	Low	0.8	0.35	0.50–1.28
	Medium	1	–	–
	High	1.3	0.28	0.78–2.33
Tendency to have unsafe sex with new partner	Low	0.71	0.16	0.45–1.15
	Medium	1	–	–
	High	0.79	0.4	0.46–1.36
Decrease in willingness to use condoms with regular partner	Low	0.95	0.84	0.59–1.53
	Medium	1	–	–
	High	0.5	0.01	0.29–0.87

CI, confidence interval.

Limitations of the study

This was an exploratory study, the first of its kind in the Indian subcontinent, and the findings of the study are subject to a few limitations. The study population was derived from individuals enrolled in national TI programmes in India and may be different from the general population of MSM and TGs in India. The demographic and sexual behaviour data were self-reported and may suffer from social desirability bias and recall bias.

Despite limitations, the study has important implications for PrEP use among MSM and TGs in India. The results of the study are encouraging, with high

acceptability of PrEP and a low likelihood of risk compensation behaviour. PrEP could be critical to bridge the prevention gap among MSM and TGs in India. The study also examined the attitudes of TGs towards PrEP, highlighting differences from MSM and emphasizing the need to study this group, which is currently underrepresented in the existing literature on PrEP in India. Further research and policy changes will be key to successful integration of PrEP into existing prevention services in India.

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Author contributions

CK, DM, OG and YV conceived the research. CK, RR and SP designed and carried out the research. RP, SP, CK and RR analysed data. All authors were involved in writing the paper and had final approval of the submitted and published versions.

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