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Pre-publication history

The pre-publication history for this paper can be accessed here:

http://www.biomedcentral.com/1471-2458/9/111/prepub

BMC Public Health

Research article

HIV-related risk behaviours and the correlates among rickshaw pullers of Kamrangirchar, Dhaka, Bangladesh: a cross-sectional study using probability sampling

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Abstract

Background: National HIV serological and behavioural surveillance of Bangladesh repeatedly demonstrated a very high proportion of rickshaw pullers in Dhaka city, having sex with female sex workers (FSWs) and using illicit substances. However, no study has been conducted to identify the correlates of having sex with FSWs among this population. This study aimed to describe behavioural profile of rickshaw pullers in Dhaka city using probability samples and to identify the correlates for having sex with FSWs in order to focus HIV prevention intervention.

Methods: Six hundred rickshaw pullers were randomly selected from rickshaw garages in the Kamrangirchar area, the single largest slum cluster of Dhaka, Bangladesh, during March–April 2008 using the Proportion Probability to Size method. Participants were interviewed, with a response rate of 99.2% (n = 595), using a structured questionnaire and asked about illicit substance use, sexual behaviour and risk perception for HIV and sexually transmitted diseases. Independent predictors of having sex with FSWs were analysed by multivariate analysis. A qualitative study was subsequently conducted with 30 rickshaw pullers to supplement the findings of the initial survey.

Results: The proportion of survey respondents who had sex with FSWs and those who used illicit substances in the previous 12 months period were 7.9% and 24.9%, respectively, much lower than the results achieved in the 2003–04 behavioural surveillance (72.8% and 89.9%, respectively). Multivariate analysis revealed the characteristics of younger age, being never married, living alone with family remaining in other districts and using illicit substances in the previous 12 months were significantly associated with having sex with FSWs.

Conclusion: HIV-related risk behaviour of our study population of the rickshaw pullers was lower than what has been suggested by the results of behavioural surveillance. While this discrepancy should be addressed in further studies, our study emphasizes the importance of focused HIV prevention programs for rickshaw pullers as high-risk behaviour is displayed at an unacceptable level and concentrated in identifiable sub-populations.

Background

Among the developing countries in Asia, Bangladesh still has a low level HIV epidemic status, where the adult prevalence of HIV infection is estimated to be below 0.1% [1]. However, the overall prevalence of HIV infection among most at-risk populations is increasing with each subsequent round of national HIV serological and behavioural surveillance (from 0.2% in the 2nd round of surveillance to 0.9% in the 7th round of surveillance), mostly due to increased HIV prevalence among injecting drug users (IDUs) [2-7]. According to the results from the recent round of surveillance, the HIV epidemic appears to have reached to a concentrated level (7%) among IDUs in Dhaka city, the capital of Bangladesh [1,2].

In order to explore the future course of the HIV epidemic and to develop the most appropriate prevention programs, it is important to monitor the prevalence of HIV-related risk behaviours among high risk groups, the behaviour networks within and between the high risk groups and their changes over time, which is the role of behavioural surveillance. In 1998, Bangladesh adopted one of the world's most comprehensive behavioural surveillance systems [2]. Updated surveillance has revealed the presence of close sexual networks of IDUs with other high risk groups, especially female sex workers (FSWs) [3,5-7]. FSWs were, on the other hand, shown to have close sexual links with multiple male client groups, not restricted to IDUs. According to recent rounds of behavioural surveillance, rickshaw pullers in Dhaka city are among the client groups of street and brothel based FSWs. The report shows as many as 50% and 72.8% of the rickshaw pullers having sex with FSWs in the last month and 12 months, respectively, mostly without consistently using a condom [5]. As more than 2 million rickshaws are estimated to be operating nationwide [8] and with 0.3 million in Dhaka city (pulled by more than 0.5 million rickshaw pullers) [9], the HIV-related risk behaviours of the rickshaw pullers may have a substantial impact on the future course of the HIV epidemic in Bangladesh. However, one study conducted by Population Council in 6 areas of Dhaka division including 2 areas of Dhaka city demonstrated only 2.69% of married pullers having sex with FSWs in the last 3 months[10]. In addition, in spite of such a potential importance of this population in the context of the HIV epidemic in Bangladesh, there is little intervention activities toward this population; even the correlates of the HIV-related risk behaviours which are critical for a focused intervention program have never been identified. We therefore decided to conduct a cross-sectional study on the HIV-related risk behaviour of rickshaw pullers of Dhaka city in a specified geographical area to accurately describe the HIV-related risk behaviour profile of this population and its correlates using probability samples.

Methods

Study design

This study was undertaken using a cross-sectional quantitative design, utilizing structured interviews and complementary qualitative studies before and after the survey. The qualitative investigation undertaken prior to conducting the survey collected information necessary to develop the questionnaire and plan the interview structure. On the other hand, the qualitative investigation after the survey was conducted to supplement and/or reinforce the findings of the survey.

Study population

The target population for the study was rickshaw pullers renting rickshaws from rickshaw garages, and included rickshaw pullers who kept their own rickshaws in the garages of Kamrangirchar in Dhaka, Bangladesh. This population was targeted because: all of the rickshaw pullers pulled rickshaws inside the city; most of the rickshaw pullers rent carts from the rickshaw garages; most of the garages are concentrated in slum areas; and Kamrangirchar is the single largest slum area bordered with Dhaka city, with approximately 265,000 slum residents [11].

Sampling procedures

In March 2008, due to the fact that no detailed property-usage map for the Kamrangirchar region was available, the garages in the region were mapped by interviewing local inhabitants and visiting each garage to confirm the location. At the time of the location confirmation, garage information (number of carts for rent and number of rickshaw pullers who rented or kept carts) was collected from the garage owners or managers.

After the list was compiled with information from 213 garages, completeness of the list was further confirmed by three random visits to several locations. Using this list of garages, probability samples of rickshaw pullers were prepared according to the Probability Proportional to Size (PPS) method considering each garage as a cluster [12,13]. Eight pullers were sampled for interview from each cluster. The PPS procedure was used to select 75 garages, in order to obtain the sample size of 600 required for the study, as determined by the method described below. In each chosen garage, a list of the rickshaw pullers who had worked in the previous day was obtained from garage owners or managers and eight rickshaw pullers were randomly selected from the list. Replacement of a selected rickshaw puller was considered when the selected person was not available on the day of the interview.

Sample size calculation

Considering drug use as a main predictor and having sex with a FSW in the previous 12 months as a main outcome, the sample size was calculated based on previous data on

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truckers in Dhaka city in which the prevalence of drug use with and without the experience of having sex with FSW in the last 12 months was 67% and 50%, respectively [14]. Assuming expected prevalence of drug use among the rickshaw pullers with and without the experience of having sex with FSW in the previous 12 months to be 70% and 50%, respectively, the sample size required to detect a difference with probability $\alpha = 0.05$ (two-tailed) and power of 80%, was 206 in total. Taking into consideration the effect of the study design, the expected 88% rate of ever experienced sex among the rickshaw pullers in the last 12 months (extrapolated from the trucker results) and the necessity of adjusting possible confounders, we determined a sample size of 600 was required for the study.

Interviewing procedures and quality assurance
An explanation of the interview was provided to the owners of the garages selected for participation. Particular efforts were paid to establish good relationship with the owners because the cooperation of them was critical for the success of sampling. The owners were requested to invite the nominated rickshaw pullers to the interviews. In most of the garages, the interviews were carried out early in the morning, according to the owners' preferences. Verbal consent was obtained from each interview participant after an explanation of the nature and purpose of the study. Respondents were also explained about anonymity of the study as their name and address will not be recorded and that they can refuse or stop the interview at any time. The interviews were conducted at a place designated by the participants, in most cases sitting in a rickshaw inside the garage. Fifty taka (US $0.70) was provided for their time for each participant.

The interviews were conducted by nine graduate and undergraduate students from Dhaka University. All interviewers were provided with a one-day training session where they were informed of the study design and purpose and how to conduct the structured interviews. Practice sessions were also provided with discussion of any problems identified during the interviews to determine how the problems should be resolved. One graduate student and the main investigator supervised the interviews to ensure quality was maintained.

Instrument development
The questionnaire used in the survey was developed on the basis of the Family Health International (FHI) questionnaire [12] and the findings of focus group interviews (FGIs) conducted prior to the survey. Two FGIs with groups of five rickshaw pullers were conducted in a location (Mohammadpur) outside the study area to obtain information on the occupation, lifestyle, sexual behaviour, sensitivity about sexual behaviour queries, and appropriate wording for different behaviours and knowl-

edge. A draft questionnaire was pre-tested on eight rickshaw pullers to verify the wording and face validity. The questionnaire consisted of four fields of questions: demographic characteristics including job experience; illicit substance use; sexual behaviour including condom use; and knowledge and risk perception regarding HIV/sexually transmitted diseases (STDs). The reliability of the instrument was assessed in a test-retest design on 48 independent samples of rickshaw pullers in five Kamrangirchar garages which were not selected for the main survey and with three-day intervals between the tests. Overall, a high test-retest correlation was observed among the continuous variables (Pearson $r = 0.86 - 1.00$) and among dichotomous variables (Kappa = 0.67 - 1.00).

Post-survey qualitative study
Immediately after the main survey, in-depth interviews using semi-structured questionnaires were conducted in the streets among 30 rickshaw pullers living in Kamrangirchar and/or renting rickshaws from garages in that area. The purpose of the post-survey qualitative study included gaining detailed information on having sex with FSWs and drug use practices and to evaluate the possible influence of the interview location on the responses to sensitive questions. Interviews were conducted on the street and tape-recorded after obtaining verbal informed consent from the participant. Data were transcribed and analyzed using content analysis.

Statistical analysis
All statistical analysis was conducted using SPSS Complex Samples 13.0 (SPSS Inc. Chicago, Illinois, USA) to adjust for the effect of clustering. After univariate analysis, bivariate analysis was conducted to assess the association between the experience of having sex with FSWs ('never had sex', 'had sex but not in the last year' and 'had sex in the last year') with predictor variables. Subsequently, multiple logistic regression analysis was performed using a compulsory entry procedure with the presence or absence of having sex with FSWs in the last 12 months as an outcome and other predictor variables that showed crude odds ratios for the outcome with a statistical level of $P < 0.1$.

Ethical approval
The study protocol was approved by the Ethical Review committee of Kyoto University, Japan and the Bangladesh Medical Research Council, Dhaka, Bangladesh.

Results
Demographic characteristics of the participants
In the study 595 respondents were interviewed, including 50 replacement samples. The response rate was 90.8% for the original samples and 99.2% when replacements were included. Only two rickshaw pullers from the original list

of interview candidates and none of the replacement samples refused to participate in the interview. As shown in Table 1, 90.6% of rickshaw pullers were from districts outside Dhaka city. The mean age of the participants was 32.1 years (SE 0.40) and 89.6% were or had been married. Among the married participants, though not shown in Table 1, 13.7% had been married more than once. In terms of formal education, 62.5% of the participants did not attend formal schooling and only 14.8% completed primary school (Class I to class V). Among the participants 45.4% periodically came to Dhaka to work and 42.5% were living alone in Dhaka, apart from their families. The average time spent in the rickshaw pulling profession was 8.6 years and the mean income of the respondents in the previous month was 6332 taka (~USD 90). Of the participants, 99.0% nominated Muslim as their religion.

Table 1: Sociodemographic characteristics of rickshaw pullers in Kamrangirchar area of Dhaka, Bangladesh (n = 595)

	n	% of total	95% CI
Age			
≤ 20 years	39	6.6	4.6 – 9.3
21 to 30 years	296	49.7	45.7 – 53.8
31 to 40 years	153	25.7	22.4 – 29.4
41 to 50 years	85	14.3	11.7 – 17.4
> 50 years	22	3.7	2.5 – 5.4
Mean age (years)	32.12 (SE 0.40)		31.33 – 32.91
Marital status			
Ever married	533	89.6	86.6 – 91.9
Never married	62	10.4	8.1 – 13.4
Education			
No schooling	372	62.5	58.3 – 66.5
Up to primary school	135	22.7	19.2 – 26.6
Up to secondary school	81	13.6	11.0 – 16.7
More than secondary school	7	1.2	0.5 – 2.7
Mean years in education	2.03 (SE 0.13)		1.78 – 2.29
Religion			
Islam	589	99.0	97.2 – 99.6
Hinduism	6	1.0	0.4 – 2.8
Living arrangement			
With family	337	56.6	49.1 – 63.8
Alone, family apart	253	42.5	35.3 – 50.1
No family	5	0.8	0.4 – 2.0
Home district			
Other than Dhaka	539	90.6	86.9 – 93.3
Dhaka	56	9.4	6.7 – 13.1
Periodical to Dhaka			
Yes	270	45.4	38.4 – 52.5
No	325	54.6	47.5 – 61.6
Mean years in profession	8.64 (SE 0.33)		7.99 – 9.30
Mean income in last month (Taka)	6332 (SE 97)		6138 – 6527

CI, confidence interval incorporating cluster effect
SE, standard error

Sexual behaviour and related events

Table 2 illustrates the sexual behaviour of the participants. Most of the participants had experienced sex (95.8%), with the average age at sexual debut being 19.8 years. With regard to the type of sexual partners ever, 91.9% had experienced sex with regular female partners, 30.1% with FSWs and 19.8% with casual female partners.

Among the survey participants, 92.4% of the respondents were sexually active in the last year. With regard to the type of sexual partners in the last year, 89.2% of the respondents reported having sex with regular female partners, while only 1.3% had sex with casual female partners, 7.9% with FSWs and 0.8% with male sex partners. Among the participants who had sex with FSWs, seven people reported to having shared a single FSW with other male clients in the last year (group sex). Sexually active respondents reported that in the previous year, 10.5% have had more than one sex partner and 5.6% had five or more partners for all sex partners, whereas it was 7.7% and 5.1% respectively for FSW partners.

Consistent condom use was very low (2.1%) for those with regular female partners, low (25–30%) with FSWs and casual female partners and moderate (≥ 40%) in group sex or with male sex partners. The frequency of condom use in the last sexual experience was similar to or approximately 10–15% higher than the frequency of consistent condom use in the previous 12 months. Though not shown in the table, among the sexually experienced respondents, 96.1% (95% CI, 94.2 – 97.4) reported to having had vaginal sex in the previous year, 4.4% (95% CI, 3.0 – 6.5) oral sex, and 3.2% (95% CI, 2.0 – 4.9) anal sex.

Among all respondents, 12.3% reported to having ever suffered from STDs, while only 1.5% had ever been tested for HIV and only 7.7% exposed to AIDS/STI prevention services by any public agency or Non Government Organisation (NGO).

Illicit substance use

Of all respondents 45.7% (95% CI, 40.6 – 50.9) reported to having used illicit substances in their lifetime and 24.9% (95% CI, 20.3 – 30.1) had used them in the last 12 months. Cannabis was most common (94.6%; 95% CI, 89.4 – 97.3) illicit substance used by the respondents. Among the users, three quarters (73.5%, 95% CI 65.5 – 80.1) used illicit substances with a frequency of several days a week or more in the previous 12 months. No respondent claimed to have injected drugs.

Knowledge and risk perception

Among all participants, 92.8% (95% CI, 90.5 – 94.5) reported to having heard the word "AIDS", 33.1% (95%

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Table 2: Sexual behaviour profile and related events among rickshaw pullers of Kamrangirchar area of Dhaka, Bangladesh (n = 595)

Sexual experience		n	% of total	95% CI
Ever had sex		570	95.8	93.9 – 97.1
Had sex in the last 12 months		550	92.4	89.8 – 94.4
Age of first sex (mean)		19.78 (SE 0.16)		19.45 – 20.10
Sex with regular partners				
Ever had it		547	91.9	89.4 – 93.9
Had it in the last 12 months		531	89.2	86.3 – 91.6
Condom use in last 12 months (n = 531)	Every time	11	2.1	1.1 – 3.8
	Sometime	93	17.5	14.2 – 21.4
	Never	427	80.4	76.3 – 84.0
Used condom at last sex (n = 531)		33	6.2	4.3 – 8.8
Sex with casual partners				
Ever had it		118	19.8	17.0 – 23.0
Had it in the last 12 months		8	1.3	0.6 – 2.8
Condom use in the last 12 months (n = 8)	Every time	2	25.0	7.5 – 57.9
	Sometimes	0	0.0	
	Never	6	75.0	42.1 – 92.5
Used condom at last sex (n = 8)		2	25.0	7.5 – 57.9
Sex with female sex workers (FSW)				
Ever had it		179	30.1	26.1 – 34.4
Had it in the last 12 months		47	7.9	6.0 – 10.4
Had it in the last month		27	4.5	3.2 – 6.4
Condom use in the last 12 months (n = 47)	Every time	14	29.8	18.2 – 44.7
	Sometime	15	31.9	20.6 – 45.9
	Never	18	38.3	25.3 – 53.2
Used condom at last sex (n = 47)		19	40.4	26.5 – 56.1
Group sex with female sex workers				
Ever had it		28	4.7	3.1 – 7.0
Had it in the last 12 months		7	1.2	0.6 – 2.4
Condom use in the last 12 months (n = 7)	Every time	3	42.9	13.9 – 77.6
	Sometimes	2	28.6	6.9 – 68.2
	Never	2	28.6	6.9 – 68.2
Used condom at last sex (n = 7)		4	57.1	22.4 – 86.1
Sex with male partners				
Ever had it		13	2.2	1.3 – 3.8
Had it in the last 12 months		5	0.8	0.4 – 2.0
Condom use in the last 12 months (n = 5)	Every time	2	40.0	9.6 – 80.6
	Sometimes	1	20.0	2.6 – 70.2
	Never	2	40.0	9.6 – 80.6
Used condom at last sex (n = 5)		2	40.0	9.6 – 80.6
Number of sex partners in the last 12 months among who ever had sex (n = 570)				
All partners	0	20	3.5	2.3 – 5.4
	1	490	86.0	83.2 – 88.3
	2 to 4	28	4.9	3.4 – 7.0
	≥ 5	32	5.6	4.0 – 7.8
Female sex workers	0	523	91.8	89.1 – 93.8
	1	3	0.5	0.2 – 1.6
	2 to 4	15	2.6	1.6 – 4.3
	≥ 5	29	5.1	3.6 – 7.2
Ever diagnosed with sexually transmitted diseases		73	12.3	9.6 – 15.6
Ever tested for HIV		9	1.5	0.7 – 3.0
Exposure to prevention services		46	7.7	5.9 – 10.0

CI, confidence interval incorporating cluster effect; SE, standard error
Denominators (n) are shown in parentheses for condom use and the number of sex partners

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CI, 28.4 – 38.1) believed that AIDS can be cured by treatment, and only 57% (95% CI, 52.9 – 61.0) believed that using condom could provide protection from getting AIDS. Regarding AIDS risk perception, only 4.5% (95% CI, 3.1 – 6.5) of respondents considered themselves at risk of getting the infection whereas 68.1% (63.0 – 72.7) considered themselves at no risk.

Correlates of having sex with FSWs

Table 3 compares demographic or behavioural characteristics among three subgroups of the pullers having different sexual experience with FSWs: never had sex with FSWs; had sex with FSWs but not in the last 12 months; and had sex with FSWs in the last 12 months. In Table 3, data are shown in two rows for each variable where the upper row represents the prevalence of the answer indicated in the upper row (e.g. Age ≤ 30 years) among each subgroups while the lower row represents odds ratio and 95% confidence interval referred to the category shown in the parenthesis (eg. Aged > 30 years) with the subgroup of "Never had sex with FSWs" as a baseline. Most of the variables showed an association in terms of crude odds ratio becoming stronger or strongest with the category of "Had sex with FSWs in the last 12 months" except for schooling and income in the last month. Based on these analyses, "Never had sex with FSWs" and "Had sex with FSWs but not in the last 12 months" were merged to create a dichotomous outcome variable representing the presence or absence of having sexual intercourse with FSWs in the last 12 months.

Table 4 illustrates the results of bivariate and multivariate analyses using the dichotomous outcome variable. In the multivariate analysis, all variables were compulsorily entered except for the variables which do not correlate with the outcome at a significance level of $P < 0.1$ by bivariate analyses. Variables that showed extremely biased response distribution and the variable of "periodical pulling" that are highly ($r > 0.8$) interrelated with the variable of "living alone" were excluded. Multivariate analysis showed that participants who are aged 30 years or below, never married, living alone, used illicit substances in the last 12 months, or had oral or anal sex in the last 12 months were significantly more likely to have had sex in the previous 12 months with FSWs, while the number of years in the profession, experience of STD in lifetime and the exposure to HIV prevention services did not show significant association. The association with the outcome was strong (adjusted odds ratio [AOR]>10) for marital status and anal sex, moderate (AOR>5) for oral sex and perceived risk of HIV infection, and mild (AOR>3) for living arrangement and illicit substance use.

Results of the post survey qualitative study

Content analysis of the in-depth interview data from the 30 rickshaw pullers showed similar demographics and behavioural profiles to the main survey. On average, more than a third (40%) of participants had sex with FSWs in their lifetime but only 3.3% did so in the previous 12 months. Illicit substance use in the previous 12 months was reported by only a third (33.3%) of the participants.

Discussion

This is the first study applying the PPS method to the survey of rickshaw pullers in Dhaka, Bangladesh, in an attempt to describe more accurate profile of this population in regards with HIV-related risk behaviours and the correlates. Our findings, in contrast to what was previously reported by the HIV surveillance program in Dhaka, showed much lower proportion of rickshaw pullers reported having sex with FSWs in the previous 12 months. Multivariate analyses also showed that the characteristics of younger age, being never married, living alone and using illicit substances in the previous 12 months were significantly associated with having sex with FSWs in the previous 12 months.

Since 2000, the rickshaw pullers of Dhaka city have been one of the sentinel groups of the national HIV serological and behavioural surveillance survey (BSS) and have been classified as one of the important bridging populations for HIV infection. Data from behavioural surveillance in 2003-04 showed that 90% of the rickshaw pullers were identified as using illicit substances (Cannabis) and more than 70% as having sex with FSW in the previous 12 months.

However, the profile of HIV-related risk behaviour of our study population is very different from that of the surveillance program in Bangladesh. In our survey, the frequency of having sex with FSWs and illicit substance use in the previous 12 months was only 7.9% and 24.9%, respectively, both results much lower than those reported in the surveillance (72.8% and 89.9%). Frequency of sex with FSWs of our study population appeared to be close to that of general male population. The proportion of the pullers who ever had sex with FSWs in our study (30.1%) was almost equivalent to that (32%) of the married male population as observed in a randomized survey of the Health and Demographic surveillance in Bangladesh conducted in 2004 in 2 rural areas of southern part of Bangladesh[15]. Not only sexual behaviour, differences also existed in the demographic profiles between our study and the surveillance. Compared to the 2003–04 BSS data our samples were older (32.1 vs. 28.4 years), in the profession longer (8.6 vs. 6.1 years), more likely to have been married (89.6 vs. 76.5%) and more lacking formal education (62.5 vs. 33.3%).Reasons for such a discrepancy

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Table 3: Bivariate association of demographic and behavioural variables with having sex with female sex workers (FSWs) among sexually active rickshaw pullers in Kamrangirchar area of Dhaka, Bangladesh (n = 570)

	% of referred answer, odds ratios and 95% CI		
	Never had sex with FSWs (n = 391)	Ever had sex with FSWs but not in the last 12 months (n = 132)	Had sex with FSWs in the last 12 months (n = 47)
Demographic variables			
Aged ≤ 30 years	51.9	52.3	80.9
(referred to >30 years)	I	1.01 (0.68 – 1.51)	3.91 (1.84 – 8.30)
Never married	2.8	9.1	29.8
(referred to married)	I	3.46 (1.31 – 9.14)	14.66 (6.35 – 33.84)
No schooling	65.0	63.6	63.8
(referred to with schooling)	I	0.94 (0.61 – 1.47)	0.95 (0.48 – 1.87)
Living alone	38.9	40.2	72.3
(referred to living with family)	I	1.06 (0.72 – 1.55)	4.11 (2.09 – 8.09)
Came from other district	90.8	87.1	97.9
(referred to from Dhaka)	I	0.69 (0.35 – 1.35)	4.67 (0.57 – 38.27)
Coming periodically to Dhaka	43.2	42.4	66.0
(referred to not coming periodically)	I	0.97 (0.63 – 1.49)	2.55 (1.39 – 4.66)
Year in profession ≤ 6 years	44.8	38.6	61.7
(referred to > 6 years)	I	0.78 (0.50 – 1.21)	1.99 (1.04 – 3.80)
Income in last month > 6000 taka	52.4	53.0	53.2
(referred to ≤ 6000 taka)	I	1.02 (0.70 – 1.50)	1.03 (0.54 – 1.97)
Behavioural variables			
Used substance in last 12 months	16.4	40.2	61.7
(referred to did not use)	I	3.43 (2.14 – 5.48)	8.23 (4.27 – 15.89)
Hadn't sex with wife in last 12 months	1.1	0.8	6.1
(referred to had)	I	0.79 (0.08 – 7.41)	6.07 (1.21 – 30.36)
Had sex with casual partner in last 12 months	1.0	0.8	6.4
(referred to did not have)	I	0.74 (0.08 – 7.13)	6.60 (1.03 – 42.46)
Had sex with male in the last 12 months	0.3		8.5
(referred to did not have)	I		36.28 (3.88 – 339.14)
Had oral sex in the last 12 months	1.3	8.3	21.7
(referred to did not have)	I	6.78 (2.17 – 21.12)	20.89 (6.65 – 65.59)
Had anal sex in the last 12 months	0.8	3.3	23.9
(referred to did not have)	I	4.31 (0.91–20.32)	39.60 (9.71 – 161.53)
Ever suffered from STDs	7.7	20.5	34.0
(referred to never/do not know)	I	3.09 (1.69 – 5.67)	6.21 (2.96 – 13.03)
Perceived risk for HIV infection	1.3	6.8	25.5
(referred to did not perceive/ don't know)	I	5.65 (1.78 – 17.95)	26.47 (9.29 – 75.39)
Ever exposed to intervention	6.9	8.3	17.0
(referred to never)	I	1.23 (0.56 – 2.69)	2.77 (1.18 – 6.50)

CI, confidence interval
STDs, sexually transmitted diseases

Table 4: Bivariate and multivariate association of demographic and behavioural variables with having sex with female sex workers (FSWs) among sexually active rickshaw pullers in Kamrangirchar area of Dhaka, Bangladesh

			Bivariate analysis (n = 570)					Multivariate analysis (n = 548)		
			% distribution of answers in subpopulations							
	n	% of total	Haven't had sex with FSWs in the last 12 months	Had sex with FSWs in last the 12 months	Crude odds ratio	95%CI	P	Adjusted odds ratio	95%CI	P
Age group										
≤30 years	310	54.4	52.0	80.9	3.90	1.88 – 8.07	0.000	2.46	1.03 – 5.91	0.044
> 30 years (ref)	260	45.6	48.0	19.1						
Ever married										
Never married	37	6.5	4.4	29.8	9.22	4.40 – 19.35	0.000	11.44	2.97–44.00	0.001
Married (ref)	533	93.5	95.6	70.2						
Schooling										
No schooling	368	64.6	64.6	63.8	0.97	0.50 – 1.87	0.917			
Schooling (ref)	202	35.4	35.4	36.2						
Living arrangement										
Alone	239	41.9	39.2	72.3	4.06	2.09 – 7.88	0.000	3.11	1.45 – 6.66	0.004
With family (ref)	331	58.1	60.8	27.7						
Home district										
Other districts	516	90.5	89.9	97.9	5.19	0.64 – 42.21	0.122			
Dhaka (ref)	54	9.5	10.1	2.1						
Periodical pulling										
Yes	256	44.9	43.0	66.0	2.57	1.42 – 4.65	0.002			
No (ref)	314	55.1	57.0	34.0						
Years in profession										
≤ 6 years	255	44.7	43.2	61.7	2.12	1.10 – 4.06	0.025	0.99	0.42 – 2.36	0.983
> 6 years (ref)	315	55.3	56.8	38.3						
Monthly income										
> 6000 taka	300	52.6	52.6	53.2	1.03	0.53 – 1.98	0.941			
≤ 6000 taka (ref)	270	47.4	47.4	46.8						
Substance used in last 12 months										
Yes	146	25.6	22.4	61.7	5.59	2.98 – 10.51	0.000	3.12	1.30 – 7.52	0.012
No (ref)	424	74.4	77.6	38.3						
Had sex with wife in last 12 months										
No	7	1.3	1.0	6.1	6.39	1.36 – 30.11	0.020			
Yes (ref)	526	98.7	99.0	93.9						
Had sex with NRNC partner in last 12 months										
Yes	8	1.4	1.0	6.4	7.06	1.17 – 42.84	0.034			
No (ref)	562	98.6	99.0	93.6						

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Table 4: Bivariate and multivariate association of demographic and behavioural variables with having sex with female sex workers (FSWs) among sexually active rickshaw pullers in Kamrangirchar area of Dhaka, Bangladesh (Continued)

Had group sex in last 12 months										
Yes	7	1.2	0.0	14.9						
No (ref)	563	98.8	100.0	85.1	NA					
Had sex with male in last 12 months										
Yes	5	0.9	0.2	8.5						
No (ref)	565	99.1	99.8	91.5	48.56	5.17–456.49	0.001			
Oral sex										
Yes	25	4.6	3.0	21.7	9.02	3.65 – 22.28	0.000	5.06	1.58–16.23	0.007
No (ref)	523	95.4	97.0	78.3						
Anal sex										
Yes	18	3.3	1.4	23.9	22.22	7.48 – 66.00	0.000	18.75	4.44–79.14	0.000
No (ref)	530	96.7	98.6	76.1						
Ever experienced STD										
Yes	73	12.8	10.9	34.0	4.22	2.14 – 8.34	0.000	2.52	0.88–7.21	0.084
No/do not know (ref)	497	87.2	89.1	66.0						
Perceived risk of HIV infection										
At risk	26	4.6	2.7	25.5	12.47	5.74 – 27.07	0.000	7.26	1.79–29.43	0.006
Not at risk/ do not know (ref)	544	95.4	97.3	74.5						
Exposure to prevention services										
Yes	46	8.1	7.3	17.0	2.62	1.17 – 5.85	0.020	1.81	0.55–5.94	0.324
No (ref)	524	91.9	92.7	83.0						

95% CI, 95% confidence interval; ref, reference category in the calculation of odds ratio

between our study and the surveillance could include the difference in geographical area covered by each study, the difference in the year when the studies were conducted, difference in methodologies such as sampling methods, the difference in the places where the interviews were conducted, and the possible selection bias introduced in the process of sampling.

Regarding the geographical coverage, our study population, though all operate in the city, represents only Kamrangirchar area, while the surveillance covers entire Dhaka city. It may be that the pullers residing in Kamrangirchar may be different in demographic and behavioural profiles from the rest of the pullers operating in the city area. But similar demographic and behavioural profiles of the pullers in Dhaka city were reported from 2 other recent studies. One is the survey by the Population Council conducted in 2004–05 as a baseline survey (n = 973) of community intervention study for HIV prevention. The other is the survey by Rahman et al in 2003 (n = 1000) to investigate the smoking behaviour of the pullers[16]. The former adopted a garage-based sampling in the six different high risk locations of Dhaka division including two

locations within Dhaka city other than Kamrangirchar. The later study recruited the pullers from all 10 blocks of the Dhaka city by approaching from four different corners of each block to the centre recruiting one puller in each waiting spot along the way. Population Council survey indicated only 2.69% of married pullers reported having sex with FSWs during the last 3 months among all respondents, similar to our results (4.5% in the last one months). Participants of these studies were older (35 and 32.5 years, respectively) and more lacking formal education (62 and 60%, respectively), also consistent with the results of our survey. Interpretation of these studies however requires some caution because response rate was low in the Population Council survey (45%) and because samples were not selected in an equal probability in Rahman's study. More studies are clearly needed to accurately describe the characteristics of the entire population of the pullers in Dhaka city.

Difference in the year of survey could be another reason for the difference since our survey was conducted in 2008, more than 3 years later the last surveillance (fifth round in 2003–04). It may be that radical changes in both demo-

graphic and behavioural profiles of the pullers operating in the city area may have occurred during such a short period of time. But this is difficult to assume because Rahman's survey which reported the similar demographic profiles of the pullers to our survey, was conducted in 2003. Moreover, there was little intervention among this group as only 1.5% of our participants were ever tested for HIV and only 7.7% were ever exposed to prevention services by government or NGO health worker.

Difference in the methodologies employed in each survey could be the cause of discrepancy. While our survey used the list of pullers registered at a garage as a cluster for the second stage random sampling, group of pullers at a waiting spot that is more mobile in number or membership over time was used in the surveillance. Such a difference in the nature of sampling frame may have somehow influenced the characteristics of the samples.

Difference in the places for interview might have influenced the pattern of responses. Our interview was conducted mostly inside garage but it was on the street in the surveillance. Because of the lower anonymity of garage environment compared to the street, participants of our survey might have responded in a socially desirable way in terms of sexual activities or substance use. This is however unlikely because results of content analysis of our qualitative study conducted immediately after the survey among 30 pullers of Kamrangirchar recruited on the street were almost identical to the survey results.

Finally, difference could be due to the bias introduced in the process of sampling. Though we could achieve high response rate over 90%, response rate has not been described in the last round of behavioural surveillance (2003–04) report of Bangladesh. If the response rate in the surveillance was low, it is possible that pullers who were younger and more open to talk about sexual experience or substance use, responded selectively to the interview more than those who were not.

Though our study population showed much less HIV-related risk behaviour compared to the surveillance, there is no room for complacency in view of the context of the HIV epidemic in Bangladesh. Of the rickshaw pullers who had sex with FSWs in the last 12 months, more than 70% did not consistently used condoms. Two thirds of those rickshaw pullers were married and rarely (2.1%) used condoms with their regular partners. It is therefore possible that with the advancing HIV epidemic among IDUs and FSWs in the future, rickshaw pullers may be involved in the epidemic and bridge the epidemic into the general population.

It is also important to note that one quarter of the participants knew little about HIV/AIDS and in our survey only 7.7% of the participants reported having ever been exposed to HIV/AIDS intervention by the government or NGO health workers. If this situation remains unchanged, it would be difficult for rickshaw pullers to comprehend the real risk of HIV infection and to take preventive actions. As the HIV infection is yet to be concentrated among the FSW, there is still opportunity for Bangladesh to prevent the HIV epidemic among rickshaw pullers by providing correct knowledge and information.

The factors correlated with having sex with FSWs identified in our survey may be helpful in this respect. It was shown that rickshaw pullers who never married, those who were younger and those who were living apart from family were likely to buy sex. Though small in number, pullers who never married (n = 37) are of particular concern since 37.8% compared to 6.2% of married pullers reported sex with FSWs in the previous 12 months (calculated from Table 3). Younger pullers ($\leq$ 30 years) or those living apart from families are also important because they represent around half of the entire puller population and 12–15% of them reportedly had sex with FSWs in the previous 12 months. Prevention programs toward rickshaw pullers could be multifaceted including the use of opinion leaders or peer counselling. Garage may also be an excellent place for intervention. These programs however should include a clear focus on unmarried and younger subpopulations and particularly those living apart from families to prevent the possible bridging of the HIV infection to their families. In view of the strong association of oral and anal sex with having sex with FSWs, it is important to inform rickshaw pullers who participating in anal sex about the risk of direct HIV infection; and the pullers who participating in oral sex about the increased risk of contracting STDs that indirectly enhances the risk of HIV infection.

Our study has limitations. We conducted the survey with rickshaw pullers in the Kamrangirchar area which may not represent the entire population of rickshaw pullers in Dhaka city. Sampling only considered rickshaw pullers who pulled rickshaws on the previous day, which may have reduced the number of rickshaw pullers in the sampling framework.

Conclusion

Our study, using probability samples of the rickshaw pullers by PPS method portrayed a different HIV-related risk behaviour profile from that had been suggested by the national BSS in Bangladesh. Our results suggest that a segment of rickshaw pullers are at risk for HIV infection and there is still opportunity of preventing HIV epidemic

among them and their family by swiftly crafting and expanding the prevention program.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
All authors contributed to the design of this study. EH conduct the field survey and performed analysis. MOK design the qualitative part of the study including designing the procedure for qualitative survey and guided overall study procedure including revised manuscript. MK guided overall study procedure including analyzing data and drafting and revising manuscript. SZ designed statistical procedures in the field and statistical analysis including revision of manuscript. SMR performed analysis of qualitative data. All authors read and approved the final manuscript.

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Pre-publication history
The pre-publication history for this paper can be accessed here:

http://www.biomedcentral.com/1471-2458/9/80/prepub

Behavioral and psychosocial predictors of condom use among university students in Eastern China

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In China the HIV epidemic has started to infiltrate into a broader population through heterosexual contact and particularly to impact young people. The purpose of this study was to identify behavioral and psychosocial correlates of condom use among Chinese university students. A self-administered questionnaire survey with cross-sectional design was conducted among all classes of undergraduate students at two universities in one municipality of Eastern China, 2003. Data obtained from 1850 sexually active students who answered the question on condom use during the previous year were used for analysis. Frequent (always/often) condom use during the previous year was reported by only about 40% of both men and women. Multivariate analysis revealed that condom use during the first sexual experience, oral contraceptive use in the previous year and higher condom self-efficacy score in both genders were potent predictors of frequent condom use, while frequent condom use was less likely practiced by men who ever had non-vaginal sex, by those with higher risk-awareness for pregnancy/HIV/sexually transmitted diseases and by women with lower scores for perceived condom benefits. Safe sex education for Chinese students should be urgently introduced and should not be limited to knowledge provision but should also address psychosocial factors, such as condom self-efficacy and gender differences adequately to effectively encourage safer behavior.

Keywords: condom use; STDs/HIV/AIDS; gender differences; students

Introduction

According to a report in 2006 by China Ministry of Health, the Joint United Nations Programme on HIV/AIDS and the World Health Organization (Ministry of Health et al., 2006), 650,000 people are living with HIV/AIDS on mainland China, where 70,000 new infections occurred in 2005. Due to the large population, HIV prevalence among adults remains very low (0.05%); however, the epidemic has already spread widely across the country, concentrating in high-risk groups, such as injecting drug users, female sex workers and men who have sex with men. It has been suggested that the epidemic will expand further, fueled by increases in risky sexual behaviors and rising sexually transmitted disease (STD) rates in many areas, as well as by large-scale population mixing due to the migration of an internal labor force, currently estimated to exceed 120 million people. Emerging evidence has suggested that the HIV epidemic has already started to infiltrate into a broader population through heterosexual contact (Ministry of Health et al., 2006; State Council AIDS Working Committee Office and UN Theme Group on HIV/AIDS in China, 2004; UNAIDS-WHO, 2005).

The epidemic particularly impacts young people. People aged 20–29 years and 30–39 years account for 56 and 25% (81% total), respectively, of the cases reported to the HIV/AIDS case surveillance in China (Grusky, Liu, & Johnston, 2002). An estimate made in 2003 suggests that 60% of new infections occur in young people aged 15–29 years (Xinhua News Agency, 2003). Despite such a disproportionate involvement of young people in the HIV epidemic, information on the HIV infection risk profile of Chinese youths has remained quite limited. Although previous studies have suggested that premarital sex has become widely accepted among young people since the introduction of the Open Door policies in the 1970s and economic reforms in the 1980s (Gil, 1994; Zhang, Li, Li, & Beck, 1999) and that about 5–20% of university/college students reportedly engage in premarital sex (Higgins, Zheng, Liu, & Sun, 2002; Jiang, Huang, Huang, & Ling, 2000; Li & Zhang, 1998), little detailed information has been available on the HIV/STD-related risk of sexually active

university/college students or specifically on condom use. This is probably because previous studies in China have been mostly sexology-oriented or mainly focused on HIV/AIDS-related knowledge and attitudes and/or because the limited sample size of these studies did not allow detailed analysis among the sexually active subpopulation. Studies on condom use and its correlates for the prevention of HIV/STD transmission in China have so far been limited to high-risk groups, such as commercial sex workers (Cheng et al., 2004; Zhu & Sun, 2003), gay (Wang et al., 2005; Zhang, Zhao, Wu, Li, & Shi, 2004) and attendees of STD clinics (Cai, Sun, Zheng, Zhong, & Chen, 2004).

The purpose of the present study was to evaluate the prevalence of condom use and its behavioral and psychosocial correlates among a group of sexually active university students in China in order to provide information useful for developing an effective prevention program.

The present study was conducted in Ningbo municipality in Zhejiang Province of Eastern China. It involved the entire population of university students in the city, which homes two universities. Ningbo municipality is one of the most developed cities in Zhejiang Province and all China. The reported incidence of STDs in Zhejiang Province is among the highest in China (Ministry of Health, 2006) and reported HIV cases have been rapidly increasing (Zhejiang Provincial Health Bureau, 2004–2006).

Methods

Participants and data collection

The participants in the present study were derived from a cross-sectional survey conducted among all classes (Year I through Year IV) of undergraduate students at two universities in Ningbo municipality in November–December, 2003. Of all possible 29,409 participants, 22,940 (78.0%) actually responded and 447 were eliminated from the analysis due to apparent invalid responses, therefore, 22,493 validly responded with a response rate of 76.5%. All participants were single due to the prohibition for marriage among university/college students by Ministry of Education at the time of the survey.

Of all participants, 1981 (17.6%) of men, 963 (8.6%) of women were sexually active, of them, 1416 men and 599 women were sexually active during the previous year. Sexually active students during the previous year who completed the question on the condom use in the same year were included in

the analysis of this paper, resulting in a sample size of 1326 men and 524 women (in total, 1850).

The research procedures were introduced somewhere (Ma et al., 2006), in brief, the questionnaire was developed through reviews of domestic and international literature, modified using the results of qualitative studies conducted prior to the survey to ensure cultural appropriateness and pilot-tested among a group of 50 undergraduate students in one of the two universities to validate the meaning and clarity of the wording, then confirmed for test-retest reliability in 89 students by linking the results of two tests with a 1-week interval. The final questionnaire was composed of 7 sections with questions of 15, 37, 12, 31, 4, 13, 6, from its begining to the end, respectively. The questionnaires were self-administered and anonymous and were collected by field teams of trained staff during November and December 2003.

Ethical considerations

Those responsible for institutional review at Zhejiang Province's Center for Disease Control and Prevention, the two universities involved, and the Ningbo Education Board approved the study protocol. All students were advised of the study's purpose and were told that non-participation would cause no disadvantage to them. The students were assured that their privacy and confidentiality would be strictly protected, because no personal names or other identifiers were to be included in the questionnaire and the data were to be presented only in an aggregate manner.

Measures

Students who engaged in any of oral, anal or vaginal sex were defined as sexually active. Condom use during the previous year was used as a dependent variable in the analysis, since we found the correlates of "often/always" condom use were consistent with the correlates of "always" condom use in the previous year in this study, in both bivariate and multivariate analysis, to make the analysis more stable, especially among women, we classified students who reported their condom use to be "often/always" in the previous year as frequent users, and those who used condoms "never/rarely/sometimes" as infrequent users.

The independent variables used included year of study, demographic variables, variables related to sexual behavior and scales of psychosocial constructs. For each psychosocial scale, Cronbach's alpha coefficients for internal consistency and range of scores were computed. Participants were categorized into two or three groups with different levels of scores

based on the distribution of total scores for each scale.

The perceived condom benefits scale included three statements about whether condom use is effective in preventing pregnancy, HIV or STDs. The scores for this scale ranged from 0–3, with 3 reflecting a high perception of condom benefits. The Cronbach's alpha coefficient for this scale was .68. The perceived STD consequences scale included three statements about whether STDs can result in cervical cancer, ectopic pregnancy or infertility if left untreated. The score for this scale had a Cronbach's alpha of .70, ranging from 0–3, with scores of 2 and 3 recognized as high perception of STD consequences. The HIV transmission knowledge scale consisted of ten statements including whether HIV can be transmitted through casual contact with HIV-positive people (swimming, having dinner, sharing a toilet, talking, working together), sexual contact without a condom, syringe or needle sharing, injection-drug use, blood transfusion and mother-to-child transmission. The scale ranged from 0–10, with 8 points classified at the middle level, and 9–10 at the high level. The Cronbach's alpha coefficient for this scale was .69. All statements involved in the three scales mentioned above were answered with "correct", "incorrect" and "not sure" responses.

The risk awareness scale assessed participants' perceived possibility of pregnancy or contracting HIV or STD infections through sexual intercourse. These three statements were endorsed with a 7-point Likert-type scale ranging from "impossible" to "quite highly possible". This scale had scores that ranged from 0–18, with 5–18 points considered as having high risk-awareness. Cronbach's alpha for the scale was .62. The condom self-efficacy scale, which includes three statements (Table 3) was separately analyzed in bivariate analyses due to an inadequate Cronbach's alpha (.46).

Data analysis

Data were analyzed using SPSS for Windows (Version 12.01; SPSS Inc., Chicago, IL). Frequency distributions of the independent variables and the prevalence of frequent condom use were determined by univariate analysis. Associations between the dependent variable and each independent variable were computed using an odds ratio (OR) with corresponding 95% confidence interval (95%CI) and a p-value based on a chi-square test of proportions.

Variables identified as significantly associated with condom use in the bivariate analyses were then entered into a multivariate logistic regression model

Table 1. Demographic characteristics of participants.

Variables[a]	Men ($n = 1,326$)	Women ($n = 524$)	Total ($n = 1850$)
University			
A	54.8	44.7	51.9
B	45.2	55.3	48.1
Year of study			
I	22.3	18.7	21.3
II	25.8	25.8	25.8
III	35.9	35.5	35.8
IV	16.0	20.0	17.1
Age (years)			
16–19	13.7	20.6	15.7
≥20	85.7	79.0	83.8
Mean age (SD[b])	20.90 (1.32)	20.56 (1.34)	20.80 (1.33)
Residential area			
Rural area	21.9	16.2	20.3
Town/city	77.7	83.6	79.4
Perceived family economic status			
Rich	13.6	9.7	12.5
Between	79.6	85.5	81.2
Poor	6.6	4.8	6.1

Notes: [a]Data are all in percentages except for mean age, and the percentages of some items may not add up to 100 due to missing data; [b]SD = standard deviation.

to determine the independent contribution of each factor in predicting frequent condom use. A backward elimination procedure was adopted with p-value > 0.10 as the removal criterion. University, faculty, year of study, residential area and perceived family economic statuses were fixed in the model to control for their possible confounding effects. A p-value of less than 0.05 was considered statistically significant for these analyses.

Results

Characteristics of study participants

The participants were distributed approximately evenly between universities (Table 1). Seventy-two percent were men, 61.6% were in their second or third year of university study and 83.8% were aged 20 years or over, with women being significantly younger than men ($p < 0.001$). The majority of students (around 80%) came from town/city area and economically classified their families at mid-level.

Condom use rate and related awareness

The mean age for the first sexual experience was 19.45 (SD, 1.82) for male and 19.60 (SD, 1.68) for female students, with a significant gender difference ($p < 0.001$). Three-quarters of the sexually active students in this study had used condoms in the previous year (Table 2). Frequent (always/often) condom use was reported by 42.2% of men and 39.1% of women, 41.3% in total. Of those who ever used condoms

during the previous year, the main purpose for use was contraception, accounting for 95.1%, while only 30.6% and 41.3% reported that they used condoms to prevent HIV and STD infections, respectively. A total of 86.6% of men and 30.6% of women reported that they had bought a condom in the previous year, with a significant difference by gender ($p < 0.001$).

Of those condom users who did not buy condoms in the previous year, only 3.8% in total reported that condoms were expensive for them. Regarding knowledge about STD transmission, 68% of men and 57% of women responded correctly to the question about whether STDs could be transmitted through anal sex, while only 48% of men and 35% of women correctly responded about the possibility of orogenital transmission of STDs.

Condom use and sexual behaviors

Among men, but not women, those in the second or later years of study were more likely to report frequent condom use than those in the first year (Table 3). Among men, but not women, those who became sexually active early (before age 20 years) were less likely to have frequently used condoms than those who became sexually active later. Among both men and women, those who used a condom during their first sexual experience were much more likely (OR = 4.23 for men and 4.95 for women) to have frequently used condoms during the previous year. With regard to the type of sex in a lifetime, participants were classified into three groups; those

Table 2. Sexual behaviour of the participants.

Variables[a]	Men ($n = 1,326$)	Women ($n = 524$)	Total ($n = 1,850$)
Mean age at first sexual experience (SD[b])	19.45 (1.82)	19.60 (1.68)	19.49 (1.78)
Condom use last year			
Always	14.6	17.2	15.3
Often	27.6	21.9	26.0
Sometimes	20.4	20.6	20.4
Rarely	13.7	14.5	13.9
Never	23.8	25.8	24.3
Purpose of condom use[c]			
Preventing pregancy	92.6	96.1	95.1
Preventing STDs	41.3	41.1	41.3
Preventing HIV	33.0	24.4	30.6
Others	43.3	46.5	44.2
Ever bought condoms[c]			
Bought	86.6	30.6	71.1
Did not buy	11.0	66.8	26.5

Notes: [a]Data are all in percentages except for mean age at first sexual activity, and the percentages of some items may not add up to 100 due to missing data; [b]SD = standard deviation; [c]among those who ever used condoms, men = 1011, women = 389.

Table 3. Bivariate correlations of frequent condom use in the previous year with sexual behaviors, psychosocial variables by gender.

Variable	Men ($n = 1326$)				Women ($n = 524$)			
	n (%)[a]	Frequent use (%)	Crude OR (95%CI)	P value	n (%)[a]	Frequent use (%)	Crude OR (95%CI)	P-value
Year of study								
I	296 (22.3)	26.7	1.00		98 (18.7)	35.7	1.00	
II	342 (25.8)	44.4	2.20 (1.57–3.07)	0.000	135 (25.8)	38.5	1.13 (0.66–1.93)	0.658
III	476 (35.9)	45.2	2.26 (1.65–3.10)	0.000	186 (35.5)	40.9	1.24 (0.75–2.06)	0.750
V	212 (16.0)	53.3	3.14 (2.16–4.55)	0.000	105 (20.0)	40.0	1.20 (0.68–2.12)	0.680
Age at first sexual experience (years)								
16–19	562 (42.4)	36.1	1.00		202 (38.5)	40.6	1.00	
≥20	700 (52.8)	47.6	1.61 (1.28–2.01)	0.000	311 (59.4)	37.9	0.90 (0.62–1.29)	0.547
Condom use during first sexual experience								
Did not use	872 (65.8)	31.8	1.00		376 (71.8)	29.3	1.00	
Used	392 (29.6)	66.3	4.23 (3.28–5.45)	0.000	131 (25.0)	67.2	4.95 (3.23–7.59)	0.000
Forgot	58 (4.4)	37.9	1.31 (0.76–2.27)	0.332	13 (2.5)	30.8	1.08 (0.32–3.56)	0.906
Types of sex in lifetime								
Vaginal sex	1223 (92.2)	43.7	1.00		481 (91.8)	41.4	1.00	
Ever anal sex	56 (4.2)	21.4	0.35 (0.18–0.67)	0.002	15 (2.9)	20.0	0.35 (0.10–1.27)	0.112
Oral sex only	38 (2.9)	21.1	0.34 (0.16–0.76)	0.008	19 (3.6)	5.3	0.08 (0.01–0.60)	0.014
Partner types in the previous year								
Regular partner only	1113 (83.9)	44.3	1.00		492 (93.9)	40.0	1.00	
Ever casual partner	157 (11.8)	29.3	0.52 (0.36–0.75)	0.000	20 (3.8)	25.0	0.50 (0.18–1.40)	0.185
Ever commercial partner	45 (3.4)	37.8	0.76 (0.41–1.41)	0.389	8 (1.5)	25.0	0.50 (0.10–2.50)	0.398
Number of partners in the previous year								
1	992 (74.8)	44.2	1.00		429 (81.9)	39.2	1.00	
≥2	253 (19.1)	37.5	0.76 (0.57–1.01)	0.058	70 (13.4)	44.3	1.24 (0.74–2.06)	0.417
Oral contraceptive use in the previous year								
Sometimes/rarely/never	1018 (76.8)	31.9	1.00		366 (69.8)	24.3	1.00	
Often/always	300 (22.6)	77.3	7.28 (5.39–9.83)	0.000	155 (29.6)	74.8	9.26 (6.00–14.29)	0.000
Perceived condom benefits[b]								
Low (0–2)	413 (31.1)	35.4	1.00		205 (39.1)	31.7	1.00	
High (3)	906 (68.3)	45.1	1.51 (1.18–1.91)	0.001	318 (60.7)	44.0	1.69 (1.17–2.45)	0.005

Table 3 (*Continued*)

Variable	Men (n = 1326)				Women (n = 524)			
	n (%)[a]	Frequent use (%)	Crude OR (95%CI)	P value	n (%)[a]	Frequent use (%)	Crude OR (95%CI)	P-value
Perceived STD consequences[b]								
Low (0–1)	637 (48.0)	38.3	1.00		267 (51.0)	37.8	1.00	
High (2–3)	663 (50.0)	45.7	1.36 (1.09–1.69)	0.007	251 (47.9)	41.0	1.14 (0.80–1.63)	0.455
HIV transmission knowledge[b]								
Low (0–7)	334 □25.2□	35.6	1.00		145 (27.9)	39.3	1.00	
Middle (8)	410 (31.3)	42.9	1.36 (1.01–1.83)	0.043	181 (34.8)	36.5	0.89 (0.57–1.39)	0.598
High (9–10)	565 (43.2)	45.0	1.48 (1.12–1.95)	0.006	194 (37.3)	41.2	1.08 (0.70–1.68)	0.721
Risk awareness for pregnancy/HIV/STD[b]								
Low (0–4)	721 (54.4)	47.4	1.00		259 (49.4)	44.8	1.00	
High (5–18)	573 (43.2)	36.1	0.63 (0.50–0.79)	0.000	247 (47.1)	32.4	0.59 (0.41–0.85)	0.004
Condom self-efficacy								
Assertiveness about using condom before sex								
Can not/maybe assert	459 (34.6)	17.9	1.00		130 (24.8)	10.0	1.00	
Can assert	825 (62.2)	55.5	5.74 (4.36–7.56)	0.000	376 (71.8)	49.2	8.72 (4.75–16.01)	0.000
Intention to use condom with an important partner								
Does not/maybe intend	452 (34.1)	15.9	1.00		152 (29.0)	13.8	1.00	
Intends	826 (62.3)	56.1	6.73 (5.05–8.97)	0.000	352 (67.2)	50.0	6.24 (3.76–10.35)	0.000
Confidence in buying condoms								
Not/maybe confident	137 (10.3)	16.8	1.00		267 (51.0)	34.5	1.00	
Confident	1134 (85.5)	44.7	4.01 (2.52–6.37)	0.000	232 (44.3)	44.8	1.55 (1.08–2.22)	0.018

Notes: [a]Percentages may not add up up to 100 due to missing data; [b]Participants were categorized into two or three groups from low to high scores based on the distribution of total scores for each scale; OR = odds ratio; CI = confidence interval.

Table 4. Results of multivariate analyses.

Variables	Men		Women	
	Adjusted OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
Year of study				
I	1.00			
II	1.91 (1.20–3.06)	0.007		
III	1.81 (1.15–2.85)	0.010		
IV	2.67 (1.50–4.77)	0.001		
Condom use during first sexual experience				
Did not use/forgot	1.00		1.00	
Used	2.98 (2.15–4.13)	0.000	3.73 (2.16–6.44)	0.000
Types of sex in lifetime				
Vaginal sex	1.00			
Ever anal sex/oral sex only	0.28 (0.13–0.60)	0.001		
Oral contraceptive use in the previous year				
Sometimes/rarely/never	1.00		1.00	
Often/always	5.92 (4.07–8.61)	0.000	8.96 (5.18–15.48)	0.000
Risk awareness for pregancy/STD/HIV				
Low (0–4)	1.00			
High (5–18)	0.58 (0.43–0.79)	0.000		
Condom self-efficacy				
Low (0–6)	1.00		1.00	
High (7–9)	6.53 (4.74–9.00)	0.000	4.03 (2.46–6.60)	0.000
Perceived condom benefits				
Low (0–2)			1.00	
High (3)			1.85 (1.10–3.12)	0.021

Notes: OR = odds ratio; CI = confidence interval.

who ever had anal sex with or without vaginal/oral sex (ever-anal sex group), those who had oral sex only (only-oral sex group), and those who had vaginal sex with or without oral sex (vaginal sex group). It was shown that both the ever-anal sex and the only-oral sex groups were significantly less likely to use condoms frequently in both sexes except for the ever-anal sex group in women. Although anal sex was practiced only by 4.2% of men and 2.9% of women, a history of a diagnosed STD was highly over represented in this group compared to the vaginal sex group (OR = 14.09, 95%CI: 5.41–36.69 for men and OR = 13.17, 95%CI: 2.41–72.06 for women). Regarding the type of sexual partners, participants were categorized into three groups: those who had only regular partners (regular partner only group), those who ever had a casual but not a commercial partner (ever-casual partner group) and those who ever had a commercial partner (ever-commercial partner group). The type of partner in the previous year was unrelated to condom use in both genders except for male students in the ever-casual partner group, who

were significantly less likely than those who had only regular partners to use condoms. Multiple partnerships were not associated with frequent condom use. Participants who frequently (often/always) used oral contraceptives in the previous year were very much more likely (OR = 7.28 for men, and 9.26 for women) to have used condoms frequently in the previous year than those who used oral contraceptives infrequently (sometimes/rarely/never).

Condom use and psychosocial variables

Among both men and women, those who perceived high condom benefits in preventing pregnancy, HIV and STDs were more likely than those with a low perception to have frequently used condoms in the previous year. Among men, but not women, those who recognized the consequences of contracting STDs were more likely to have used condoms than those who did not. High and middle levels of knowledge for HIV transmission were related to frequent condom use in men but not in women. Risk awareness for getting pregnant and contracting HIV and

STDs through sexual intercourse was inversely associated with frequent condom use in the previous year, with students who had high risk-awareness being less likely to have used condoms than those having low risk-awareness.

Regarding condom efficacy, over 60% of the participants of both genders responded to each question that they had high efficacy except for the question on condom purchase by women. Students who responded that they can be assertive about using a condom before sex or that they intend to use condoms with important partners were much more likely (OR = 5.7–8.7 in both genders) to have used condoms frequently in the previous year than those who responded otherwise. Students who felt confident about buying condoms were more likely to use condoms than those who did not; this association was strong in men but moderate in women.

Multivariate analysis

Table 4 illustrates the results of multiple logistic regression analyses. After compulsory control for university, faculty, year of study, residential area and perceived family economic status, condom use during the first sexual experience, the practice of vaginal sex with or without oral sex, frequent oral contraceptive use in the previous year, lower risk-awareness for pregnancy/STD/HIV and higher condom self-efficacy remained as significant predictors in men, while condom use during first sexual experience, frequent oral contraceptive use in the previous year and higher condom self-efficacy and perceived condom benefits did so in women.

Discussion

The unprecedented scale of this survey yielded large subsamples of sexually active Chinese university students and allowed for detailed analyses of the factors related to condom use, with separate analyses for men and women.

Our study revealed that though sexual experience rates were still low, the sexual practices of sexually active university students were poorly protected in both men and women. Only around 15% of sexually active students reported that they always used condoms in the previous year and only about 40% of sexually active students of both genders frequently used condoms, even when the definition of "frequent" included those who "often" used them. Younger males and their partners are more at risk as those at lower years of study than higher ones were less likely to use condoms during sexual intercourse. Furthermore, the proportion of students who re-

ported the prevention of HIV/STD as a reason for condom use was much lower than that for pregnancy prevention (30–41% versus 95%), suggesting that condom use for HIV/STD prevention has not yet been established as a norm among our study participants. In view of the 2005 lift of the ban on university student's marriages in China (Ministry of Education, 2005), a prevention program should be urgently introduced since the sexually active subpopulation among university students may grow rapidly.

Several important behavioral and psychosocial correlates with frequent condom use that have been identified in our study might be useful for developing an effective HIV/STD-prevention program among Chinese university students. Our study suggested that condom use during the first sexual experience was low (about 25–30%) but was a potent predictor of frequent condom use in the previous year in both men and women. This finding is consistent with previous studies in other countries that showed that condom use during the first sexual experience was one of the important determinants of subsequent condom use (Klavs, Rodrigues, Wellings, Weiss, & Hayes, 2005; Shafii, Stovel, Davis, & Holmes, 2004). In view of the relatively low current levels of sexual activity in Chinese university students, this information is especially important since it may suggest that an early education program encouraging youth to use condoms during their first sexual experiences may have a major impact on the prevention of HIV/STD infection among Chinese university students.

In our survey, multiple partners were identified among 19.1% of men and 13.4% of women, without significant correlation with frequent condom use in the previous year. Although the literature is at variance with this association (Brien, Thombs, Mahoney, & Wallnau, 1994; Meekers & Klein, 2002; Prince & Bernard, 1998), our finding suggests that a possible sexual network among university students was structured in such a way that students experiencing multiple partners are unlikely to be more protective than others. This finding, together with the bivariate association of significantly lower condom use with casual partners than regular partners in men, contrary to the findings in western countries where condoms were more likely to be used with casual than regular partners (Anderson, Wilson, Doll, Jones, & Barker, 1999; De Visser & Smith, 2001; Roberts, 1998) suggests that the possible sexual network among our study participants may be vulnerable to HIV/STD transmission. This phenomenon may be related to the fact that condoms are not used for HIV/STD prevention by many sexually active university students. An education program