Knowledge, attitudes and practices concerning HIV/AIDS among Iranian at-risk sub-populations

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المعارف والمواقف والممارسات المتعلّقة بمرض الإيدز والعدوى بفيروسه، بين الفئات السكانية الفرعية المختطرة في إيران

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الخلاصة: تعرَّضت هذه الدراسة التي أجريت عام 2003 إلى المعارف والمواقف والسلوكيات المتعلّقة بفيروس العوز المناعي البشري في ثلاث فئات معرَّضة لعوامل اختطار مرتفعة (201 من سائقي الشاحنات العابرة للحدود، و50 من البغايا، و754 من الشباب)، في أربع مدن، بجمهورية إيران الإسلامية. وبيَّنت الدراسة انخفاض مستوى المعارف حول فيروس العوز المناعي البشري، على وجه العموم، لاسيَّما بين الأشخاص ذوي السلوكيات العالية الاختطار. وتبيَّن أن لدى سائقي الشاحنات، والبغايا معرفة بالعدوى المنقولة جنسياً أكثر مما لدى الشباب، إلا أن معرفتهم جاءت، بشكل مبدئي، من خلال التجربة الشخصية وليس من برامج التوعية العمومية. وكان موقف سائقي الشاحنات حول الزواج المؤقت، والجنس قبل الزواج وخارج إطاره، أكثر إيجابية من موقف الشباب. وأوضحت الدراسة أيضاً انخفاض نسبة استخدام العازل الذكري في كل الفئات. مما يبيِّن الحاجة إلى توفير توعية تستهدف الفئات المعرَّضة لمعدلات اختطار مرتفعة استهدافاً أفضل.

ABSTRACT This study in 2003 looked at knowledge, attitudes and behaviours concerning HIV among 3 high-risk groups (201 cross-border truck drivers, 50 female sex workers and 754 youths) in 4 cities in the Islamic Republic of Iran. The level of knowledge about HIV was low on average, especially among individuals with high-risk behaviours. Truck drivers and female sex workers had higher knowledge about sexually transmitted infections than youths but their knowledge came primarily from personal experience rather than public awareness programmes. Truck drivers had a more positive attitude to temporary marriage and pre- and extramarital sex than youths. Condom use was low in all groups. Better targeted education of high-risk groups is needed.

Connaissances, attitudes et pratiques face au VIH/sida dans les sous-populations à risque en République islamique d'Iran

RÉSUMÉ Cette étude, réalisée en 2003, avait pour objectif d'explorer les connaissances, attitudes et comportements vis-à-vis du VIH de 3 groupes à haut risque (201 chauffeurs routiers internationaux, 50 travailleuses du sexe et 754 jeunes) dans 4 villes de la République islamique d'Iran. Le niveau moyen des connaissances sur le VIH est médiocre, en particulier parmi les sujets à comportement à haut risque. Les chauffeurs routiers et les travailleuses du sexe étaient mieux informés des infections sexuellement transmissibles que les jeunes, mais ils devaient davantage leur savoir à leur expérience personnelle qu'aux programmes de sensibilisation du public. Les chauffeurs routiers affichaient une attitude plus positive que les jeunes à l'égard du mariage temporaire et des relations sexuelles pré- et extra-conjugales. Dans tous les groupes, l'usage du préservatif était très peu répandu. Une éducation mieux ciblée des groupes à haut risque s'avère indispensable.

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Introduction

Human immunodeficiency virus (HIV) spreads rapidly both within countries and across borders, without regard for gender, geography or sexual orientation [*1*]. According to the World Health Organization (WHO)/UNAIDS classification, the Islamic Republic of Iran has a low prevalence of HIV/AIDS infection of less than 1% among the general population. However, this rises to more than 5% among high-risk groups, mainly intravenous drug users [*1*].

The first case of HIV infection in the Islamic Republic of Iran was reported in 1986 and by the end of 2004 there were 9800 seropositive cases of HIV and 374 cases of acquired immune deficiency syndrome (AIDS) [*2*]. An estimate in 2004 indicated that more than 30 000 people with HIV/AIDS were living in the Islamic Republic of Iran [*3*]. More than half of the reported HIV-positive cases have been identified since 2002, which may reflect better surveillance and an introduction of pilot programmes such as voluntary counselling and testing centres, but it almost certainly also mirrors a recent escalation in the epidemic.

The HIV epidemic in the Islamic Republic of Iran is primarily fuelled by illegal drug use. HIV prevalence has reached 20% among intravenous drug users in some locations [*3*], and the mode of transmission is believed to be mostly through injecting drug use (51.3% in 2004). However, this perception is partly due to the manner in which data are collected and it has become apparent that heterosexual transmission of HIV has also risen in association with the rising rate of sexually transmitted infections (STIs) in the last few years, confirming the suspicion that the infection has indeed permeated into the community at large [*2*].

The Iranian government has launched a multi-pronged initiative to address the growing epidemic of HIV/AIDS through enhancing public awareness, reducing the vulnerability of high-risk groups through voluntary counselling and testing services, education via a mass media campaign and using a symptomatic approach to STIs since 1995. Due to the paucity of research on high-risk behaviours in the Islamic Republic of Iran, however, little is known about potential points of entry for HIV and about behaviours that may influence the rate at which HIV spreads within specific sub-populations. Nor has the HIV/AIDS awareness of at-risk groups been studied. Particular groups identified as being at high risk for HIV/STI have not been the focus of published research on the Islamic Republic of Iran, aside from a few studies on drug users [*4–8*]. Furthermore, the national HIV/AIDS awareness programme was a general programme, without considering the specific needs of different sub-populations.

In contexts where the general prevalence of HIV is very low, it is both necessary and cost-effective to target HIV prevention efforts at high-risk groups in the population, and it is crucial to learn more about the knowledge, attitude and behaviours of these groups. The present study focused on 3 groups who are considered to be vulnerable to HIV transmission worldwide: cross-border truck drivers and travellers, female commercial sex workers (FSWs) and youths [*9–14*]. No previous data are available on the HIV/AIDS knowledge and risk characteristics of the former 2 groups, only on the sexual reproductive health behaviour of youth in the Islamic Republic of Iran [*15,16*]. This study aimed to compare knowledge about HIV and STIs, high-risk sexual attitudes and behaviour and

illegal drug-related behaviour among these 3 groups.

Methods

Participants and setting

A cross-sectional study was conducted in 2003 among samples of young people aged 15–25 years from both sexes, cross-border truck drivers and FSWs. Saravan, Astara, Islamshahr and Kermanshah cities were chosen as the location for the study, as they have a higher HIV prevalence than the national average, a high rate of cross-border travelling (across the northern border of the Islamic Republic of Iran) and are near to a metropolitan city (Tehran) and because there was access to sex workers. Furthermore, Kermanshah was the first place in the Islamic Republic of Iran to establish a voluntary HIV counselling and testing centre and where local authorities acknowledge the existence of sex workers.

Sampling methods

The sample of youths was recruited from the list of total households of each city using a modified stratified, multistage cluster sampling approach (the segmentation method) [*17*]. Clusters were chosen using systematic random sampling with probability proportional to size. In each cluster, interviews attempted to obtain the information from 5 eligible households (households with at least 1 resident 15–25 years of age) within that segment. If a household had more than 1 eligible subject, the person whose name was first in alphabetic order was selected.

For cross-border truck drivers, a randomized sample of individuals could not be recruited due to the impossibility of obtaining a comprehensive list of the approximately 40 000 drivers who pass the Astara border annually and the difficulty in locating those individuals. The most rigorous and viable sampling strategy was to randomly select registration numbers and then recruit truck drivers present with those numbers on the recruitment days. As all drivers needed to go to the registry office to obtain the relevant permissions and receive a confirmation number in the early morning, it was unlikely that any systematic bias was introduced by recruiting men present in the registration office on the days of recruitment.

For FSWs a modified respondent-driven sampling method was selected [*18*]. An unofficial network of FSWs exists in Kermanshah, and we obtained access to this network through some of the sex workers who had been seeking advice from a voluntary counselling and testing centre and had built up trust in the centre in terms of preservation of their confidentiality. The women were asked to write the name of as many sex workers as they knew, and, after omitting duplicate names, a comprehensive list was prepared and samples were randomly selected from the list.

Data collection

Questionnaire

An anonymous questionnaire including closed questions was used. Its validity was confirmed by 15 experts and its reliability was assessed by re-interviewing 10 respondents from each group after 3 days in the pilot phase of the study. After obtaining written informed consent, each respondent was asked to complete the questionnaire themselves, while illiterate or low literate respondents were interviewed in confidence by an experienced interviewer of the same sex as the respondent. The FSWs who had cooperated by introducing their colleagues were also asked to assist with the sex worker's data collection team. The completed questionnaires were placed in a sealed box

with the National Research Centre for Reproductive Health stamp.

The questionnaire collected demographic data (age, sex, marital status and education level), and asked about access to the mass media. Four sections of the questionnaire covered: knowledge about STIs in general (symptoms and signs, previous history of STIs and how they dealt with STIs), knowledge about HIV/AIDS (modes of transmission and use of condoms), attitudes to sexual practices (pre- and extramarital relationships, homosexual relationships, temporary marriage) and susceptibility to illegal drug use (exposure to illegal drug use and number of friends and family using drugs). No questions concerning sexual activity or condoms were included in the questionnaire to youths (girls and boys) younger than 20 years old, because this was not permitted by the National Ethical Committee of Medical Research. Drug use is illegal in the Islamic Republic of Iran and the likelihood of getting accurate responses about personal drug habits was low. The strategy therefore was to assess respondents' susceptibility to drug use by asking about their friends' or relatives' drug use behaviour on the assumption that somebody who is in contact with drug users is more susceptible to drug use themselves.

Scoring

The STIs knowledge index was computed by adding the scores of 11 related questions, and a score ≥ 6 was assumed to be high STIs knowledge. The HIV knowledge index was calculated by adding the scores of 13 true–false items and an index ≥ 9 was considered as high HIV/AIDS knowledge. The sexual attitude index was estimated by summing the scores of 6 items with 3-point Likert scales (disagree, no idea, agree), with 0, 1 and 2 scores accordingly. A score ≥ 5 was considered as a positive sexual attitude. The susceptibility to drug use index was calculated by adding the scores of 5 related questions. A score of 1 was given for each drug user friend out of 5 close friends and a score ≥ 4 was considered as high susceptibility for drug use.

Data analysis

Statistical analysis was performed using *SPSS*, version 11. Univariate analysis was conducted to assess the association between the outcome measures (STIs knowledge, HIV/AIDS knowledge, sexual attitude, susceptibility to drug use and pre/extramarital sex) and potential covariates. Statistical tests for equality of means (*t*-test or 1-way ANOVA) were used for quantitative variables. Univariate logistic analysis was conducted to determine which predictor variables were significantly associated with pre- or extramarital sex. Then multivariate analysis was conducted using backwards stepwise regression. Tests for multi-colinearity were conducted and, according to the variance inflation factor and the tolerance statistic, colinearity between variables in the models was not a problem, so were not considered in the final module. The initial multivariate module included all of the variables utilized in univariate logistic regression analysis.

Ethical issues

The study was approved by the Research Review Board of the Deputy Ministry for Research and Technology and the National Ethical Committee of Medical Research. Informed consent was obtained from all participants and no personal identifier was recorded on the questionnaires.

Results

A total of 754 young people, 201 cross-border truck drivers and 50 commercial FSWs were enrolled in the study. The response rate for sensitive topics related to sexual or drug behaviour was 75% among youths and truck drivers but 100% among the FSWs, reflecting the strong trust and cooperation between this group and the research team.

Table 1 shows the sociodemographic characteristics of the 3 groups. Many of the differences can be explained by the eligibility criteria for each group, e.g. the significant difference in mean age. The educational level of these groups was significantly different and because educational level has an important influence on the outcome measures (HIV/AIDS knowledge, STIs knowledge, sexual attitude and susceptibility to drug use), it was considered to be a confounding variable and all of the mean index values were adjusted for it.

HIV/AIDS knowledge

FSWs were significantly less knowledgeable about HIV/AIDS compared with youths for almost all of the questions. In addition, we found that HIV/AIDS misinformation in the areas of transmission and prevention was higher among FSWs compared with other groups (Table 2). The adjusted mean (standard deviation) HIV knowledge index was significantly lower among low literacy FSWs in comparison to other groups: 6.50 (SD 3.89) versus 8.15 (2 SD.86) for truck drivers and 8.80 (SD 2.44) for youths (Table 3). Almost half of FSWs (42%) were not aware about the sexually transmitted pattern of HIV and 62% of them did not know about condoms or had not been in-

Table 1 **Sociodemographic characteristics of the different groups of respondents**

Characteristic	Female sex workers (*n* = 50) %	Truck drivers (*n* = 201) %	Youths (*n* = 754) %	*P*-value (χ^2 test)
Educational level				
Illiterate/primary	48.0	3.5	9.1	0.003
Incomplete secondary	48.0	47.0	29.5	0.01
Complete secondary/ higher	4.0	49.5	61.4	0.001
Access to mass media				
Television	94.0	92.5	95.5	NS
Videotape	25.0	47.8	38.3	0.03
Satellite television	2.0	7.5	7.3	0.05
Internet	2.0	4.5	7.6	0.05
Marital status				
Married	98.0	71.1	37.8	0.01
Single	2.0	28.9	62.2	0.001
Age (years)				
15–19	10.0	2.5	30.5	0.01
20–25	6.0	34.8	69.5	0.01
> 25	84.0	62.7	–	0.03

NS = not significant.

Table 2 **Frequency distribution of response to questionnaire about knowledge, sexual attitude and susceptibility to illegal drug use among the different groups**

Item	Female sex workers (*n* = 50) %	Truck drivers (*n* = 201) %	Youths (*n* = 754) %	*P*-value (FSWs versus youths) (χ^2 test)	*P*-value (truck drivers versus youths) (χ^2 test)
STIs knowledge					
Heard about STIs	76.0	71.6	73.5	NS	NS
Named gonorrhoea	52.0	34.3	26.3	< 0.001	NS
Named HIV/AIDS	38.0	65.7	59.7	0.002	NS
Named syphilis	26.0	17.4	9.6	< 0.001	0.05
Named genital warts	4.0	6.0	6.1	NS	NS
Named genital herpes	28.0	2.5	5.2	< 0.001	NS
Abnormal vaginal discharge is a symptom of STI	68.0	35.3	25.9	< 0.001	NS
Burning pain on urination is a symptom of STI	52.0	44.8	28.1	< 0.001	0.04
Genital ulcers/sores are a symptom of STI	62.0	26.4	21.5	< 0.001	NS
Swelling in groin area is a symptom of STI	20.0	8.0	5.6	< 0.001	NS
Lower abdominal pain is a symptom of STI among women	38.0	21.4	18.1	0.002	NS
HIV/AIDS knowledge					
A healthy looking person could be infected with HIV	34.0	65.7	71.1	< 0.001	NS
HIV can be transmitted through sexual intercourse with unknown person	58.0	77.6	80.3	0.01	NS
HIV can be transmitted through infected mother to her fetus	38.0	45.8	53.2	0.03	NS
HIV can be transmitted through sharing shaving equipment	50.0	63.7	76.9	< 0.001	0.05
HIV cannot be transmitted through kissing or shaking hands	42.0	92.0	87.8	< 0.001	NS
HIV can be transmitted through blood transfusion	64.0	69.7	74.7	NS	NS
HIV can be transmitted through breastfeeding	22.0	19.4	27.9	0.04	0.04
HIV can be transmitted through needle or syringe sharing	60.0	66.2	73.5	0.02	0.05
HIV can be transmitted through unsterile dental instruments	46.0	50.2	56.0	NS	NS
HIV cannot be transmitted through sharing meals with infected person	40.0	87.6	87.8	< 0.001	NS
HIV cannot be transmitted through mosquito bite	60.0	80.2	79.6	0.02	NS
Condoms can prevent HIV transmission	38.0	42.8	58.8	< 0.001	0.001
Condoms cannot be used more than once	45.0	54.8	61.7	< 0.001	0.001

Table 2 **Frequency distribution of response to questionnaire about knowledge, sexual attitude and susceptibility to illegal drug use among the different groups *(concluded)***

Item	Female sex workers (*n* = 50) %	Truck drivers (*n* = 201) %	Youths (*n* = 754) %	*P*-value (FSWs versus youths) (χ^2 test)	*P*-value (truck drivers versus youths) (χ^2 test)
Sexual attitude (not having negative attitude)					
Boys having sexual relationship before marriage	–	36.4	20.4	–	< 0.001
Girls having sexual relationship before marriage	–	30.4	15.8	–	< 0.001
Homosexual relationship	–	31.4	15.3	–	< 0.001
Having temporary marriage before marriage	–	61.7	33.8	–	< 0.001
Having temporary marriage alongside marriage	–	43.3	27.1	–	< 0.001
Having extramarital sex	–	37.8	36.9	–	0.04
Susceptibility to illegal drug use					
Ever seen somebody use inhaled drugs	100.0	21.4	33.5	< 0.001	0.001
Ever seen somebody use injected drugs	84.0	10.4	15.3	< 0.001	0.05
Have family member who uses drugs	100.0	48.5	41.6	< 0.001	0.05
Mean (SD) number of close friends out of 5 who use inhaled drugs	2.72 (0.73)	0.66 (1.24)	0.49 (1.06)	< 0.001	0.001
Mean (SD) number of close friends out of 5 who use injected drugs	2.42 (1.11)	0.29 (0.86)	0.16 (0.59)	< 0.001	0.001

STI = sexually transmitted infection; HIV= human immunodeficiency virus; AIDS = acquired immune deficiency syndrome; SD = standard deviation; NS = not significant.

formed about their preventive effect on HIV transmission (Table 2). Truck drivers were less knowledgeable about HIV/AIDS than were the youths, but the difference was not statistically significant for the majority of the questions (Table 2).

STIs knowledge

Although STIs knowledge was generally low and almost one-third of respondents (27.2%) had never heard about STIs, it was higher among FSWs compared with youths or truck drivers (Table 2). Mean scores were 4.54 (SD 3.05) for FSWs, 3.32 (SD 2.51) for truck drivers and 2.79 (1.95) for youths (Table 3). HIV/AIDS and gonorrhoea were the 2 most commonly mentioned STIs (59.7% and 29.4% respectively). All of the FSWs had a previous history of STIs, 60% frequently, while the rate was 31.9% among truck drivers and 27.9% among youths (Table 4). Abnormal vaginal discharge and genital ulcer were the 2 most common symptoms of STIs among all subjects with a previous history of STIs (40.2% and 19.3% respectively). Self-treatment or seeking advice from friends was mentioned by 57.2% of FSWs or truck drivers as their usual approach to STI symptoms, but youths had sought treatment from a health personnel or a physician (59.3%). However, the majority of respondents with a previous history of STIs from all of these 3 groups were not aware about the need to treat sexual partners (Table 4).

Table 3 **Comparison of the mean score of knowledge, sexual attitudes and susceptibility to illegal drug use among the different groups by educational level**

Item	Female sex workers		Truck drivers		Youths		*P*-value	*r*
	Mean	SD	Mean	SD	Mean	SD		
HIV/AIDS knowledge score								
Primary education	4.38	3.64	5.86	2.79	7.90	2.90	< 0.0001	0.19
Secondary education	8.17	2.96	7.10	2.92	8.22	2.62		
Diploma/higher	12.0	0.0	9.30	2.30	9.21	2.17		
Total	6.50	3.89	8.15	2.86	8.80	2.44		
STIs knowledge score								
Primary education	4.38	3.03	1.0	1.82	2.15	2.08	< 0.0001	–0.19
Secondary education	4.42	3.08	2.66	2.42	2.07	1.73		
Diploma/higher	8.00	0.0	4.12	2.37	3.23	1.90		
Total	4.54	3.05	3.32	2.51	2.79	1.95		
Sexual attitude score								
Primary education	–		1.86	2.85	1.40	1.98	< 0.0001	–0.47
Secondary education	–		2.94	2.77	1.27	2.20		
Diploma/higher	–		2.67	2.33	2.53	2.67		
Total	–		2.80	1.56	2.06	2.56		
Illegal drug susceptibility score								
Primary education	8.79	1.31	2.0	4.0	1.63	2.53	0.002	–0.11
Secondary education	7.42	1.41	2.11	3.34	1.61	2.28		
Diploma/higher	5.0	2.82	2.92	2.94	1.55	2.29		
Total	7.98	1.66	2.47	3.17	1.58	2.30		

HIV= human immunodeficiency virus; AIDS = acquired immune deficiency syndrome; STI = sexually transmitted infection; SD = standard deviation.

Sexual attitudes

The responses to the 6 items about sexual attitudes are also shown in Table 2. The scales demonstrated good internal consistency (Cronbach $\alpha = 77.2\%$). The results revealed that truck drivers had a more positive attitude to all the items—sexual relationship before marriage, homosexual relationships, temporary marriage and extramarital sex—than youths. Means scores for sexual attitudes were 2.80 (SD 1.56) and 2.06 (SD 2.56) respectively and this difference was significant after adjustment for educational level (Table 3). Premarital sexual relationships were considered less acceptable for girls than boys (Table 2). Truck drivers had a less negative attitude regarding polygamy in the form of temporary marriage compared with the youths (43.3% and 27.1% respectively) and temporary marriage was more acceptable than extramarital sex (Table 2).

Susceptibility to illegal drug use

There was a significant difference in the susceptibility to illegal drugs index among the different groups; means scores were 7.98 (SD 1.66), 2.47 (SD 3.17) and 1.58 (SD 2.30) for FSWs, truck drivers and youths respectively. This difference was also significant after adjusting for educational level (Table 3). The mean number of their close friends, out of 5, who used inhaled or injected drugs respectively was

Table 4 **History of sexually transmitted infection (STI) and its approach among the different groups**

Question	Female sex workers (*n* = 50) %	Truck drivers (*n* = 754) %	Youths (*n* = 201) %
Have you had a previous history of STI?			
Yes, frequently	60.0	11.9	8.0
Yes, sometimes	40.0	20.0	19.9
No, never	0.0	68.1	72.1
What have you usually done when you had an STI?			
Self-treatment/seek advice from friend or relatives	57.2	57.2	40.7
Treated by medical professional/health provider	42.8	42.8	59.3
Is it necessary that partner is treated whenever STI is diagnosed?			
Yes	30.0	28.4	31.0
No/don't know	70.0	71.6	69.0

2.72 and 2.42 among FSWs, 0.66 and 0.29 for truck drivers and 0.49 and 0.16 for the youth group (Table 2). A high proportion of the FSWs (60%) reported that they had used drugs, 2.5% had used them intravenously.

Sexual practices

No questions concerning sexual activity or condoms were included in the questionnaire to girls and boys younger than 20 years old, so there were 812 responses to these questions: 12.4% of male youths had a previous history of extramarital or premarital sex and 38.3% of truck drivers. More than one-third of sexually active truck drivers and male youths (35.2%) had never used condoms. Reduction of sexual pleasure was acknowledged as the most common reason (42%) for not using condom among youths. Among the FSWs 48% had never used a condom; the cost and disagreement of their partners were mentioned as the 2 main reasons for not using condoms by 58% and 26% of the women respectively.

Very few youths (14.2%) and truck drivers (9.9%) were concerned about HIV infection and less than 1% of them had been tested for HIV before, but there was no significant difference based on their previous history of extramarital sex and their personal risk perception. Only 16% of FSWs were concerned about HIV infection and 8% of them had been tested.

Risk factors

In multivariate analysis comparing truck drivers and youths, the major factor associated with having pre- or extramarital sex was being a truck driver (adjusted odds ratio = 4.6, 95% CI: 3.04–6.96). Access to the Internet and/or satellite television, high level of knowledge about STIs and/or HIV, a positive sexual attitude and a high susceptibility to illegal drug use were the other risk variables. Educational level was not a significant predictor of pre- or extramarital sex in this model (Table 5).

Table 5 **Multivariate analysis of the associated risk factors for pre- or extramarital sex among truck drivers and youths**

Variable	Odds ratio	95% CI	*P*-value
Risk group			
Youths	1	–	< 0.0001
Truck drivers	4.60	3.04–6.96	
Access to satellite television			
No access	1	–	0.001
Access	2.87	1.53–5.36	
Access to Internet			
No access	1	–	0.04
Access	1.98	1.04–3.78	
STIs knowledge			
Low	1	–	
High	2.07	1.24–3.46	0.006
HIV/AIDS knowledge			
Low	1	–	0.05
High	1.53	1.01–2.32	
Sexual attitude			
Negative	1		0.0003
Positive	2.20	1.44–3.37	
Susceptibility to illegal drug use			
Not susceptible	1	–	0.0001
Susceptible	2.59	1.63–4.13	

STI = sexually transmitted infection; HIV= human immunodeficiency virus; AIDS = acquired immune deficiency syndrome.
CI = confidence interval.

Discussion

The present study had some limitations in the study design. Our participants were unlikely to be fully representative of these groups nationwide as they were recruited from only 4 cities. The use of a non-randomized sampling method for truck drivers and FSWs limits the generalizability of the sample. Our study was based on self-reported information, which could be biased by the participants' recall. The apparent social desirability bias, specifically in subjects' responses to sensitive issues such as sexual attitudes and practices is also a potential limitation. The results, therefore, regarding these sensitive issues should be interpreted with this possibility in mind. Details of extra- or premarital sex in terms of different types of partners, homosexual and heterosexual sex and condom use require further investigation.

The impediments facing countries with low HIV prevalence affect their response to the problem at all levels, from policy formulation to prevention planning, implementa-

tion strategies and individual behaviour change [*19*]. Accurate knowledge regarding possible routes of transmission is not only critical for decreasing the infection rate, it also important to dispel persistent myths; partial knowledge can further perpetuate the risk of infection [*20*]. Poor knowledge and misconceptions about HIV/AIDS are key factors in people's lack of efforts at prevention and it has been shown that people need a solid factual understanding of HIV and its transmission, access to relevant services and the confidence and social power to initiate and sustain behaviour change in order to prevent the spread of HIV/AIDS [*21*]. Although knowledge alone does not change behaviour and there is no significant relationship between sexual knowledge and safe sex, knowledge of the facts of HIV transmission plays an obvious role in increasing the likelihood of safer sex through perceptions of individual risk [*22,23*]. However, poor knowledge and low risk perception among groups with high-risk behaviours, as in this study, may lead to acquisition of HIV/AIDS in our community.

Even though we are more than 2 decades into the HIV/AIDS epidemic and a decade of the Iranian national HIV prevention programme, this study indicates that the average level of HIV/AIDS knowledge is low and it is even lower among people with high-risk behaviours. A majority had heard of AIDS, but many did not know its transmission pattern properly or had misconceptions, had not been informed about the preventive effects of condoms and had a low perception of their individual risk. There was no formal HIV/AIDS prevention programme in Iranian schools when this study was conducted, and television, which almost all of our population has access to, was the most popular mass media source of HIV/AIDS knowledge. Therefore, it seems that the difference between HIV knowledge of youths and of other groups is not related to HIV/AIDS awareness programmes in schools and may be related to our generalized HIV/AIDS prevention programmes, which is not appropriate for these sub-populations. It has been shown that informing high-risk groups such as FSWs requires an informal approach, and public awareness programmes are less effective in improving their knowledge [*24,25*]. It is unrealistic to assume that the HIV/AIDS campaigns targeting the general population will have the same impact and effectiveness for high-risk groups; particular programmes should be designed to target these groups, including appropriate examples relevant to their subculture [*26*].

Knowing about STIs and their early diagnosis and prompt and effective treatment is an essential component of HIV prevention because STIs increase individuals' susceptibility to HIV infection [*27–31*]. However, the knowledge about STIs among respondents in this study was low on average, and the higher STIs knowledge of FSWs came primarily from their personal experience rather than public awareness programmes. However, most of them had not been treated appropriately or had not been informed about the necessity of treating partners or the preventive effect of condoms. It seems that STIs and the sexually transmitted pattern of HIV/AIDS have not been addressed properly due to the social and cultural barriers in our community that restrict a frank and open dialogue on issues related to sexual practices.

Although pre- or extramarital sex is reported less in our study in the Islamic Republic of Iran than in other countries [*32*], a positive attitude regarding temporary marriage, especially among truck drivers, was shown. Multiple sexual partners among men in the form of temporary marriage may be becoming socially sanctioned and allow

men to be an important route of spread of HIV infection in the general population. While the prevalence of HIV infection in Islamic countries is low, recent studies have shown that among 38 sub-Saharan countries, the percentage of Muslims within the countries negatively predicted HIV prevalence [*33–35*]. However, the positive attitude to polygamy may be associated with sexual permissiveness and an increased tendency to engage with multiple sexual partners, and may be considered as an explanation for higher rate of HIV among some Muslims [*36,37*]. In the Islamic Republic of Iran most HIV-infected women were infected through their spouses, who are engaged with multiple-partner sex or injecting drug use, especially in parts of the country where polygamy is more common [*38*].

This study illustrates that people who engage in behaviours that carry a high risk for HIV transmission often engage in other risky behaviours, as had been demonstrated in other Asian countries [*39*]. Almost all of the FSWs in out study had been in contact with illegal drugs, directly or indirectly, and having a higher illegal drug use index was positively associated with a higher risk of pre- or extramarital sex among truck drivers and young males. The link between drug use and risky sexual behaviour has been mentioned before in the literature [*40–42*].

It is recommended that more comprehensive and reliable information is needed about attitudes, beliefs and practices of the community at risk in the Islamic Republic of Iran, particularly sexual and drug-taking behaviour, in order to respond promptly and effectively to the HIV/AIDS epidemic. In a concentrated epidemic setting, behavioural data is critical to determine the link with the general population and to design appropriate interventions. Experiences from North America, Europe and countries such as Senegal confirm that the cheapest and most cost-effective way to maintain a low prevalence of HIV/AIDS is to provide effective prevention to the population group with the highest risk behaviour early in the epidemic [*43*].

Involving FSWs in this project enhanced the response rate in this sub-population to 100%. This strong effect has also been shown in the other studies [*13,42*], and it reveals that their participation can strengthen the effectiveness of prevention programmes and has to be taken into account in further programme planning. Obviously FSWs are unlikely to cooperate with programme planning in an atmosphere of stigmatization and victimization [*44*], so the stigma of sex workers needs to be addressed in our community.

While providing moral guidance about sexual abstinence and mutual fidelity will be the cornerstone of the Iranian HIV prevention programme, there will always be people who are unwilling or unable to conform to these standards of behaviour. Therefore it is necessary to provide clear and accurate information regarding the importance of condoms. Improving the negotiation and decision-making skills for their use and making them easily available are other aspects that have to be taken in to account in condom promotion programmes.

The need to create a supportive environment through a multi-sector religious, political and programmatic approach is recommended for the implementation of effective prevention activities among high-risk groups and the general population. Working together, Iranians can overcome the HIV epidemic, but there is a need to act quickly and to act in effective ways so that the devastating effects can be reduced.

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Vulnerable and risk groups for HIV infection

- At-risk groups: People are said to be at risk of acquiring the HIV infection if what they are doing, or what they might do if placed in a facilitating situation, is associated with a high risk of HIV transmission. Examples of those groups are injecting drug users, men and women engaging in paid sex and men engaging in homosexual relations.
- Vulnerable groups: People are said to be in a state of vulnerability if their living conditions are prone to shifting factors which would place them at risk of contracting HIV. Examples of those groups are young people, women, migrants, long-distance drivers, displaced populations, men in uniform and others.

Working with such groups is important because the HIV epidemic is usually heightened by the transmission of the virus among populations with high-risk behaviour, and then propagating to the general populations via so-called bridging groups. Evidence shows that expanding awareness, prevention and behaviour change interventions among vulnerable and risk groups can slow, even curb, the epidemic.

Source: http://www.emro.who.int/asd/programmeareas-RiskGroups.htm