

Sexual risk behaviours among factory workers in Shenzhen, China: a cross-sectional study

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ABSTRACT

Background. Factory workers are a key population for HIV transmission in China, as they often engage in sexual risk behaviours. This study aims to evaluate sexual risk behaviours and associated factors among factory workers in Shenzhen, China. **Methods.** A cross-sectional study was conducted by using multi-stage stratified cluster random sampling. Full-time workers aged ≥ 18 years were eligible to participate in the study. A self-administered questionnaire was used to collect information. Univariate and multivariable logistic regression were applied to assess factors associated with sexual risk behaviours. **Results.** A total of 2029 factory workers were included. Mean age was 37.2 (± 4.4) years; 48.5% were men. Two-thirds (64.9%) had had vaginal intercourse. Their sexual risk behaviours included condomless sex with casual partners in the last sex episode (23.6%), multiple sex partners (11.5%) and engaging in commercial sex (8.4%), in the past year. Having HIV/AIDS knowledge (adjusted odds ratio (AOR) 0.41, 95% confidence interval (CI) 0.24–0.70) and using a condom at sexual debut (AOR 0.08, 95% CI 0.05–0.13) were factors associated with condomless sex with casual partners in the last sex episode. Males (AOR 3.03, 95% CI 1.96–4.69 and AOR 2.19, 95% CI 1.33–3.60), local workers (AOR 2.11, 95% CI 1.01–4.42 and AOR 3.42, 95% CI 1.63–7.21), being single (AOR 2.04, 95% CI 1.39–3.01 and AOR 2.49, 95% CI 1.61–3.87), having sexual debut aged < 18 years (AOR 5.98, 95% CI 3.28–10.89 and AOR 3.34, 95% CI 1.74–6.39), and substance use (AOR 2.01, 95% CI 1.38–2.93 and AOR 4.43, 95% CI 2.85–6.87) were associated with both having multiple sex partners and engaging in commercial sex in the past year. **Conclusions.** Sexual risk behaviours were prevalent despite most participants having basic HIV/AIDS knowledge. Future workplace-based prevention programs should target factory workers and there should be a focus on enhanced sexual education to reduce HIV transmission in China.

Keywords: China, commercial sex, condomless sex, factory workers, HIV, knowledge, multiple sex partners, sexual risk behaviours.

Introduction

HIV/AIDS imposes considerable challenges to global public health, with high morbidity and mortality rates. According to the data from the Joint United Nations Programme on HIV and AIDS (UNAIDS), approximately 1.5 million new infections occurred globally and 680 000 people died of HIV-related causes in 2020.¹ In China, there were 1.053 million people living with HIV (PLWH) and 351 000 cumulative reported deaths by the end of 2020.² Although needle sharing used to be the major source of HIV transmission in the past, heterosexual and homosexual transmission has rapidly increased and become the dominant route among new infection cases in China.³ The proportion of newly reported HIV/AIDS cases with sexual transmission increased from 33.1% in 2006 to 96.7% in 2019.^{4,5} Having sexual risk behaviours, including condomless male homosexual sex, sex

with casual partners, and engaging in commercial sex, continues to be a contributing factor to the increase of HIV and other sexually transmitted infections (STIs).³

Factory workers are a key population for HIV transmission in China, as many often engage in sexual risk behaviours.⁶ The nationwide population of workers reached 285.6 million in 2020, of whom 169.59 million were migrants.⁷ Previous studies have shown that factory workers had limited knowledge of HIV/AIDS prevention and a weak sense of self-protection.^{8,9} Most factory workers are young and sexually active, and live apart from their family. They may develop new sexual relationships and engage in high-risk sexual behaviours, placing them at high risk of HIV/STI transmission.^{10,11}

With economic reform and continuous development, Shenzhen, as a first-tier city of manufacturing and industry in China, has attracted massive labour forces. Of the 13 million residents in Shenzhen in 2018, 34.3% were factory workers.¹² While facilitating Shenzhen's economical advance, factory workers also pose a challenge to HIV control and prevention. Factory workers accounted for 35.2% of people living with HIV/AIDS reported in Shenzhen from 2002 to 2016.¹³ Prior surveys on HIV/AIDS knowledge and practices in China have been focused on subpopulations such as men who have sex with men (MSM),¹⁴ migrant female sex workers,¹⁵ or workers only from specialised industries like mining and construction.^{16,17} However, these studies either had a small sample size or focused only on workers in one industry, which restricted their representativeness of factory workers. To our knowledge, data about sexual risk behaviours among factory workers in Shenzhen are scarce, and there is a lack of research covering the entire factory worker population from various industries. It is critical to examine behaviours and their associated risk factors among this population so that appropriate intervention measures can be implemented to control and prevent the transmission of HIV/AIDS. Therefore, we aimed to assess sexual risk behaviours and their associated factors among a large sample of factory workers from seven industries, different districts and age groups in Shenzhen, China.

Methods

Study setting and participants

This was a cross-sectional survey conducted from November 2019 to April 2020 in Shenzhen, China. A multi-stage stratified cluster random sampling method was used to recruit participants. First, 16 factories with more than 50 employees were randomly selected from seven occupational clusters in Shenzhen. Factories with more than 50 employees would organise routine medical examinations, and our study was conducted during the medical examination. Three to four workshops were randomly chosen from all selected factories. Trained investigators then approached all workers from the

selected workshops. Eligibility included: (1) full-time workers; and (2) workers aged ≥ 18 years. Part-time employees were excluded for their job instability and possibility of leaving Shenzhen. The distribution of occupation for recruited participants was similar to that for the whole factory worker population in Shenzhen. Participants were asked to complete a self-administered questionnaire in a separate room at their workplace, which took about 20 min and trained interviewers provided explanations and instructions. A cash coupon of RMB 20 (~USD 3.1) and small gifts were given to all participants as their work loss allowance, and HIV/AIDS consultation services were also provided.

Ethics approval for the study was obtained from the Ethics Review Board of the School of Public Health (Shenzhen), Sun Yat-sen University (2019/3). Informed consent was obtained from all individual participants in the study.

Measures

A structured questionnaire was developed by joint discussions between epidemiologists and experts working in HIV/AIDS prevention and control. Then we revised it based on a pilot test among factory workers. There were four main sections: socioeconomic status (gender, age, education, marital status, monthly income, years of staying in Shenzhen, etc.), HIV/AIDS knowledge, sexual experience, and sexual risk behaviours.

HIV/AIDS knowledge was measured by using an adapted eight-item questionnaire from Chinese Center for Disease Control and Prevention:¹⁸ (1) Is AIDS incurable?; (2) Are men who have sex with men the most seriously affected by HIV/AIDS in China?; (3) Can HIV-infected individuals be recognised from their appearance?; (4) Can infection with other STIs increase the risk of HIV infection?; (5) Can consistent and correct use of condoms reduce the risk of HIV infection and transmission?; (6) Can the use of new-type drugs (such as methamphetamine) increase the risk of HIV infection?; (7) Should people seek HIV testing and counselling after condomless sexual behaviours?; and (8) Is it illegal for intentional transmission of HIV?. Providing six or more correct answers was defined as having basic HIV/AIDS knowledge (yes/no).

In terms of sexual experience and sexual risk behaviours, participants were asked to recall their sexual debut experience (the age and condom use at the time) and the use of substances (alcohol or recreational drugs) before or during sexual intercourse. Three types of sexual risk behaviours were evaluated: condomless sex with casual partners in the last sex episode (not using a condom with non-regular/non-marital sex partners); having multiple sex partners (≥ 2 sex partners) in the past year, and engaging in commercial sex (purchasing or selling sex) in the past year. Considering that condomless sex would not be a risk factor if factory workers are living with their spouse/stable partner and only have sex with them, we have specified our analysis of condomless sex only among factory workers who had sex with casual partners in the

last sex episode. In our study, subjects who had multiple sex partners in the past year and used condoms all the time were still considered as being at risk of HIV.

Statistical analysis

Numeric variables were converted to categorical variables, and descriptive statistics (relative frequency) were calculated for participants' characteristics. Mean and standard deviation were reported for age. Sexual risk behaviours between males and females were compared using univariate logistic

Table 1. Socioeconomic and demographic characteristics of the factory workers in Shenzhen, China ($N = 2029$).

Variables	<i>n</i>	%
Gender		
Female	1044	51.5
Male	985	48.5
Mean age (s.d.) (years) ^A	37.2 (±4.4)	
Age (years)		
<26	400	19.7
26–30	409	20.1
31–35	537	26.5
>35	683	33.7
Ethnicity		
Minority	131	6.5
Han	1898	93.5
Registered residence		
Shenzhen	91	4.5
Other places	1938	95.5
Marital status		
Married/cohabitating	1236	60.9
Single	752	37.1
Divorced	41	2.0
Education		
Middle school or below	649	32.0
High school	586	28.9
Bachelor or above	794	39.1
Total monthly income (RMB)		
<4000	449	22.1
4000–5999	1093	53.9
>5999	487	24.0
Duration of stay in Shenzhen (years)		
<2	217	10.7
2–4	848	41.8
5–10	444	21.9
>10	520	25.6

^AMean age and (standard deviation of age) in years.

regression. Univariate and multivariable logistic regression analyses adjusted for potential confounders were then performed to assess associations between independent variables (socioeconomic status, HIV/AIDS knowledge and sexual experience) and three types of sexual risk behaviours (yes/no) among factory workers. Variables in univariate logistic regression with $P < 0.1$ were selected for multivariable analysis. The final set of variables were introduced into multivariable logistic regression models using a forward stepwise regression method. The significance level was defined as $P < 0.05$. All statistical analyses were performed using the SPSS version 26.0 for Windows (IBM Inc, Armonk, NY, USA).

Results

Participant characteristics

A total of 2340 factory workers were enrolled in this study and 2029 completed the questionnaire, giving a response rate of 86.7%. Their sociodemographic characteristics are summarised in Table 1. Among all participants, 48.5% were male; 66.3% were aged <35 years and 60.9% had an educational level of high school or below. A majority (60.9%) of all participants were married or cohabitating with partners; 37.1% were single; 2.0% got divorced. Most (95.5%) were migrant workers from other cities in China, and 89.3% had stayed in Shenzhen for > 2 years.

HIV/AIDS-related knowledge

As shown in Table 2, 59.9% of all factory workers had basic HIV/AIDS knowledge. Most (88.6%) believed that it was illegal for intentional transmission of HIV and 83.3% perceived that consistent and correct condom use could reduce the risk of

Table 2. HIV/AIDS knowledge among study participants ($N = 2029$).

Items	No. correct answers	%
(1) Is AIDS incurable?	1375	67.8
(2) Are men who have sex with men the most seriously affected by HIV/AIDS in China?	1017	50.1
(3) Can HIV-infected individuals be recognised from their appearance?	1310	64.6
(4) Can infection with other STIs increase the risk of HIV infection?	1147	56.5
(5) Can consistent and correct use of condoms reduce the risk of HIV infection and transmission?	1690	83.3
(6) Can the use of new-type drugs (such as methamphetamine) increase the risk of HIV infection?	1326	65.4
(7) Should people seek HIV testing and counselling after condomless sexual behaviours?	1603	79.0
(8) Is it illegal for intentional transmission of HIV?	1797	88.6
No. correct items (≥ 6)	1215	59.9

HIV infection and transmission. However, only 50.1% knew that men who have sex with men were the most seriously affected by HIV/AIDS in China. Further, when asked about the relationship between new-type drugs and HIV, one-third (34.6%) failed to realise that the use of new-type drugs could increase the risk of HIV infection.

Sexual experience and sexual risk behaviours

Table 3 presents the reported percentages of sexual experience and sexual risk behaviours among factory workers. It was found that 1317 (64.9%) had ever engaged in vaginal intercourse in their lifetime. Among those, 61 (4.6%) had

Table 3. Sexual experience among factory workers in Shenzhen, China (N = 2029).

Variables	n	%
History of vaginal intercourse ^A		
No	712	35.1
Yes	1317	64.9
Age at sexual debut (years) ^B		
≥18	1256	95.4
<18	61	4.6
Used a condom at sexual debut ^B		
No	544	41.3
Yes	773	58.7
Substance use before or during sexual intercourse ^B		
No	965	73.3
Yes	352	26.7

^ATotal number of workers (N = 2029).

^BWorkers who had experienced vaginal intercourse (n = 1317).

their sexual debut before age 18 years and 544 (41.3%) did not use a condom at their sexual debut. In terms of substance use, 352 (26.7%) sexually active participants reported substance use before or during intercourse.

Sexual risk behaviours were common among factory workers and the study found significant associations with gender (Fig. 1). Of them, 23.6% (104/441) reported condomless sex with casual partners in the last sex episode (male 19.4% vs female 33.3%, odds ratio (OR) 0.48, 95% confidence interval (CI) 0.30–0.76); 11.5% (151/1317) had multiple sex partners in the past year (male 17.3% vs female 5.0%, OR 3.99, 95% CI 2.65–6.02); and 8.4% (110/1317) engaged in commercial sex in the past year (male 12.4% vs female 3.9%, OR 3.53, 95% CI 2.21–5.63).

Factors associated with sexual risk behaviours

The results of logistic regression analysis are presented in Table 4. Among participants who had their last non-regular/non-marital sex, having condomless sex with casual partners in the last sex episode was associated with having HIV/AIDS knowledge (compared to not having HIV/AIDS knowledge, adjusted odds ratio (AOR) 0.41, 95% CI 0.24–0.70) and using a condom at sexual debut (compared to not using a condom at sexual debut, AOR 0.08, 95% CI 0.05–0.13). For those who had ever engaged in vaginal intercourse in their lifetime, having multiple sex partners in the past year was associated with being male (compared to female, AOR 3.03, 95% CI 1.96–4.69), being local workers (compared to migrant workers, AOR 2.11, 95% CI 1.01–4.42), being married/cohabitating (compared to single status, AOR 2.04, 95% CI 1.39–3.01 and divorced status, AOR 3.63, 95% CI 1.52–8.67), having a sexual debut at age <18 years (compared to having a sexual debut at age ≥18 years, AOR 5.98, 95% CI 3.28–10.89),

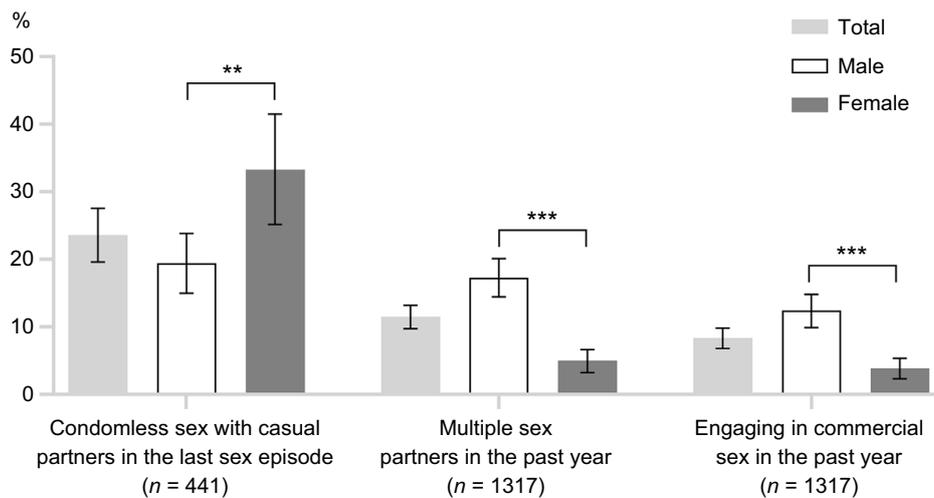


Fig. 1. Percentage of heterosexually experienced factory workers who demonstrated sexual risk behaviours, by gender, in Shenzhen, China. Statistical differences were evaluated using univariate logistic regression. *P < 0.05, **P < 0.01, ***P < 0.001.

Table 4. Correlates of condomless sex, multiple sex partners and commercial sex among factory workers in Shenzhen, China.

Variables	Condomless sex with casual sex partners in the last sex episode, AOR (95%CI)	Multiple sex partners in the past year, AOR (95%CI)	Engaging in commercial sex in the past year, AOR (95%CI)
Gender			
Female	–	Ref.	Ref.
Male	–	3.03 (1.96–4.69)***	2.19 (1.33–3.60)**
Registered residence			
Other places	–	Ref.	Ref.
Shenzhen	–	2.11 (1.01–4.42)*	3.42 (1.63–7.21)**
Marital status			
Married/cohabitating	–	Ref.	Ref.
Single	–	2.04 (1.39–3.01)***	2.49 (1.61–3.87)***
Divorced	–	3.63 (1.52–8.67)**	1.04 (0.23–4.65)
HIV/AIDS knowledge			
No	Ref.	–	–
Yes	0.41 (0.24–0.70)***	–	–
Age of sexual debut (years)			
≥18	–	Ref.	Ref.
<18	–	5.98 (3.28–8.89)***	3.34(1.74–6.39)***
Used a condom at sexual debut			
No	Ref.	–	–
Yes	0.08 (0.05–0.13)***	–	–
Substance use before or during intercourse			
No	–	Ref.	Ref.
Yes	–	2.01(1.38–2.93)***	4.43 (2.85–6.87)***

Condomless sex with casual partners in the last sex episode ($n = 441$). Multiple sex partners in the past year ($n = 1317$). Engaging in commercial sex in the past year ($n = 1317$).

AOR, adjusted odds ratio; CI, confidence interval; Ref., reference.

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

–, variables were not introduced into multivariable logistic regression model, for they were excluded using the forward stepwise regression method or their P -value > 0.1 in univariate logistic regression.

and substance use before or during intercourse (compared to not using substances before or during intercourse, AOR 2.01, 95% CI 1.38–2.93). And factors associated with engaging in commercial sex in the past year were being male (compared to female, AOR 2.19, 95% CI 1.33–3.60), being local workers (compared to migrant workers, AOR 3.42, 95% CI 1.63–7.21), being single (compared to being married/cohabitating, AOR 2.49, 95% CI 1.61–3.87), having a sexual debut at age < 18 years (compared to having a sexual debut at age ≥ 18 years, AOR 3.34, 95% CI 1.74–6.39), and using substances before or during intercourse (compared to not using substances before or during intercourse, AOR 4.43, 95% CI 2.85–6.87).

Discussion

This cross-sectional study examined sexual risk behaviours and associated factors among factory workers in Shenzhen, China. We reported a comparatively high proportion of workers

in the sampled factories who demonstrated sexual risk behaviours. Several characteristics that were associated with these sexual risk behaviours included having lower educational levels, having first sexual intercourse at age < 18 years, not using a condom at sexual debut, and consuming drugs or alcohol before or during intercourse.

We observed common condomless sex among factory workers with casual sex partners in the last sex episode (23.6%). This was similar to the finding of a study in Chongqing where male migrant workers reported not using a condom during their last commercial sex encounter (27.9%) and during the last non-regular sex encounter (28.9%).¹⁹ This low proportion of condom use suggests that increased vulnerability to HIV/STIs may exist among factory workers in Shenzhen. Previous studies have explored the reasons for using and not using condoms among migrant workers. He *et al.* explained that condoms were used primarily for contraception rather than disease prevention.²⁰ With respect to the obstacles to condom use among migrant workers, various

factors include that using a condom would diminish physical pleasure; some consider condoms unnecessary in a serious relationship; some believe condoms usually break anyway; not knowing where to get a condom; not using condoms when they were drunk; and economic reasons.^{21–23} Yang *et al.* found that perceived norms of condom use, and the condom policy and availability in the establishments, would also influence decisions about condom use.²²

Further, intentions do not always translate into actions. Although consistent and correct use of condoms was considered a measure of protecting oneself against HIV/AIDS by most respondents in our study, a considerable number of factory workers were reluctant to use a condom. According to the Health Belief Model (HBM), people may not be motivated to change their behaviours because of the perceived benefits of condom use alone.²⁴ Further analysis of the underlying factors of condom use preference may provide important insights for more effective promotion of condom use among this high-risk population.

Engaging in commercial sex and sex with multiple partners were common among factory workers in our study, which may imply potential HIV/STI transmission. Factory workers are apart from their families and spouses, and are often faced with poor living conditions and physically demanding jobs. They may develop new sexual relationships and engage in sexual risk behaviours, such as alcohol abuse, multiple sex partners, or engaging in commercial sex.^{10,11,25–27} Several factors are associated with multiple sex partners, as well as with commercial sex. Single and male factory workers were more likely to have multiple sex partners and engage in commercial sex. One of the possible explanations was that unmarried males tended to be more permissive and held more liberal attitudes toward premarital and extramarital sex, and any form of sexual activity than females.^{28,29} In addition, early age of sexual debut was a risk factor for having both multiple sex partners and engaging in commercial sex, highlighting the importance of improving sex education targeting young people. We also found that alcohol and substance use were associated with increased commercial sex engagement among factory workers, which was consistent with studies among sexually experienced migrants in China^{30,31} and migrant workers in other countries.^{32–35} The reason may be that drinking alcohol increases sexual desire, impairs decision-making, and leads to reduced fear of negative effects related to sexual risk behaviours.^{6,36}

Our study has several limitations. First, the design of the cross-sectional study made it hard to determine causal associations between sexual behaviour outcomes and risk factors. Second, considering the participants' social desirability and recall bias, it can be difficult to obtain accurate information. Self-reporting sensitive content, such as drug and alcohol use, sexual experience, and sexual risk behaviours, may be underreported due to participants' fear of being fired or because of privacy disclosure, despite this survey's confidentiality and anonymity. Finally, the participants were only from factories

in Shenzhen, which may impact the generalisability of results due to regional discrepancies, despite the large sample.

Our study found that sexual risk behaviours, including having condomless sex, multiple sex partners and engaging in commercial sex, were prevalent among participants. The findings point to an urgent need to engage factory workers in HIV prevention measures. Policies tailored to this group and long-term, routine strategies are highly recommended to strengthen sexual health education and promote safer sexual behaviours.

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Data availability. The data that support this study will be shared upon reasonable request to the corresponding author.

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