Predictors for HIV testing among Chinese workers in infrastructure construction enterprises in Kenya

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Abstract

Background: There are more and more Chinese migrants in sub-Saharan Africa currently. Most of them engaged in infrastructure construction. Their risk of infection with high-incidence diseases in sub-Saharan Africa, such as the risk of HIV infection, is not researched among them by now. This study aimed to describe recent HIV test behaviour and related factors among those Chinese workers in Kenya.

Methods: A cross-sectional survey was conducted among 110 male Chinese workers from six different Chinese infrastructure construction enterprises in Kenya. And a two-stage cluster random sampling method was used to select participants. We used a structured questionnaire that includes HIV testing behavior in the recent one year, demographic and socioeconomic characteristics, HIV-related knowledge and cognition, HIV-related perceptions and attitudes, utilization of HIV testing. Logistic regression was used to explore the predictors of recent HIV test behaviour among Chinese construction workers in Kenya.

Result: Of the 110 participants, 30 (27.27%) were tested for HIV in the recent one year. All participants were male, and the majority were married (73.2%). The mean age was 37.49 years (SD=9.725; range: 23 to 63), and a considerable proportion refused to answer questions about transactional sexual behaviors (83.6%) in recent one year. Most were able to obtain HIV-related information (91.8%) and exposed to HIV related information in recent one year (68.2%), but only 47.6% had sufficient HIV knowledge. More than one-fifth of participants held positive attitudes toward paying for sex, and nearly one-fifth believed that selling sex was acceptable. Multiple logistic regression analysis indicated that participants who said they were acceptable to pay for sex (OR: 4.51; 95% CI: 1.18, 17.34) and exposed to HIV related information (OR: 3.82; 95% CI: 1.28, 11.41) in the recent one year were more likely to test for HIV in the past one year.

Conclusion: Higher recent HIV test rates were associated with the open sexual attitude towards paying for sex and exposed to HIV related information in the recent one year among Chinese workers in Kenya. More specific attention about HIV should be offered to this unique population to increase the rate of HIV testing among them.

Background

According to United Nations AIDS agency (UNAIDS), 37.9 million people are living with the human immunodeficiency virus (HIV) worldwide by 2019, and more than two-thirds of these cases are in sub-Saharan Africa[1]. Kenya, located in eastern Africa, which is one of the most stable political and economically sound countries in sub-Saharan Africa, and is also a country seriously affected by the HIV epidemic [2]. Since China and Kenya formally established diplomatic relations in 2013, and with the implementation of the One Belt One Road policy and the deepening of China-Africa economic and trade cooperation[3], there are more and more Chinese migrants in Africa and Kenya. By the end of 2019, there were more than 200,000 Chinese migrants in Africa and nearly 10,000 Chinese migrants in Kenya, the majority of them are workers on infrastructure construction[4]. As reported by the International Labor Organization, migrants, especially migrating construction laborers, are more likely to be infected with HIV.
than other industrial sectors because of their special socio-economic vulnerability \cite{5-8}. However, there has been a little epidemiological survey on HIV risk among overseas Chinese migrant construction workers, only two studies suggest this group faces a higher risk of sexually transmitted diseases in Korea and Southeast Asia \cite{14,15}.

There is no doubt that HIV testing has significant public health implications in HIV risk control and other health services \cite{16,17}. It is the entry point for HIV treatment, care, and support services \cite{18}, and low uptake of HIV testing is associated with higher rates of transmission \cite{7,19}. Evidence has been supplied to support that it is meant to increase uptake of HIV testing among key populations as sex workers, truck drivers, and labor migrant workers \cite{7,20}. Many factors can affect HIV testing behavior in key populations. Previous studies among them have found some factors including demographic factors as age, marriage, educational level \cite{16}; structural factors as routine medical check-ups, accessibility of HIV testing, affordable health care \cite{12,21}; previous experiences like HIV related educational attainment, HIV related cognition, previous HIV testing experience \cite{22,23}; HIV risk perception and other factors as sexual attitudes, risky sexual behaviours \cite{23,24,25}.

Unfortunately, little is known about the factors associated with HIV testing behavior among Chinese migrant construction workers in Kenya despite they face disproportionate HIV risk. This study aims to describe recent HIV testing behavior and possible factors associated with recent HIV testing in this special group.

**Methods**

*Design, settings, and sample*

This cross-sectional study was conducted among male Chinese labor workers (rare female workers) in Kenya from six different Chinese infrastructure construction companies. A two-stage cluster sampling method was used to select participants. In the first stage, we randomly selected six companies from the online list of 63 Chinese infrastructure construction enterprises in Kenya. All six construction companies have contracted for major infrastructure projects in Kenya such as the construction of railways, roads and bridges. In the second stage, we obtained information about projects of each selected enterprise by inquiring about the enterprise website and randomly selected 1-2 projects out of them. The anonymous investigation was completed by all qualified Chinese employees of the selected projects. To be eligible, a participant must have Chinese nationality, be sexually active, and work in Kenya for at least six months. The data were collected after the researcher explained the purpose of the study to the respondents and obtained informed consent from them. The questionnaires were issued, filled in, and withdrawn on the spot. In the end, 124 Chinese workers who worked for six different Chinese infrastructure construction enterprises in three different regions of Kenya (Nairobi, Machakos, and Mombasa) were eligible and 110 of them submitted valid questionnaires.
Measures

HIV Testing behavior

The key outcome variable of this study was whether they had any form of HIV testing in the past year. The following questions were asked: “Did you take an HIV test in the last year?”

Correlates of Testing behavior

Demographic and socioeconomic characteristics

Demographic and socioeconomic data regarding the workers’ enterprises, age, marriage, education, area of residence, work position (the position determines the status within the organization and the income level, but all of them earn more than $ 20,000 per year), the experience of working away from home in China, and experience of working abroad were collected.

HIV knowledge and cognition

The HIV knowledge and cognition questionnaire is adapted from the sentinel testing questionnaire issued by UNAIDS[26] and other literature[27]. There are 13 items in this questionnaire, and one point will be awarded for each correct answer and a total score of 10 or higher indicates sufficient HIV knowledge. The internal reliability (KR-20) of this HIV knowledge questionnaire is 0.64.

HIV-related perceptions and attitudes

Information was obtained about participants' perceived risk to HIV and other STIs. We also collected data on sexual attitudes and sexual behaviours (number of sexual partners, frequency of condom use, engaging in exchange/transactional sex) of the participant. To assess the perceived risk to HIV and other STIs, participants were asked, “Do you think you might be infected with HIV or other STIs?” with responses ranging from 1 (Possible) to 3 (Not Possible). Sexual attitudes were assessed with a 5-item questionnaire which is adapted from the brief sexual attitudes scale[28]. The sexual attitudes questionnaire included attitudes toward extramarital sex, selling sex, paid sex, one-night stand, and attitudes toward multiple sex partners.

Cues to action

We obtained information about participant exposure to HIV related information in recent one year by asking participants “Have you exposed to HIV Related Information in recent one year?”. 

utilization of HIV testing
We collected data related to an individual's previous relevant experience and information linked to HIV testing including participant experience of obtaining HIV-related information, information about sites for receiving HIV test.

**Analyses**

The software SPSS23.0 was used to analyze the data. The measurement data were expressed as mean ± standard deviation and the counting data as cases and percentages. Logistic regression analysis was used to analyze the relationship between HIV testing behaviour and various factors in the past year. In univariate logistic regression analysis, \( p < 0.1 \) is the variable with statistical significance, and the stepwise forward modeling method was adopted to enter the multivariate logistic regression model. All statistical analyses were double-tailed, with a mean level of 0.05 indicating statistical significance.

**Result**

*Demographic and socioeconomic characteristics*

The demographic characteristics of the participants are shown in Table 1. These participants were from 23 to 63 years old (mean=37.49 years; SD=9.725), and most of them were married (73.2%). About 5.7% of them had completed primary education, 25.7% had secondary education, 19% had completed technical secondary school, 13.3% had diploma education, 28.6% had undergraduate education, and only 7.6% had graduate education. As for their work position, 34.9% were administrative staff, 27.4% were technical personnel, 26.4% were ordinary workers and 11.3% were logistical personnel. Nearly one-third of them were from rural districts. About 27% of our participants received HIV tests in last year.
| Item                  | Category       | Number | Percent |
|----------------------|----------------|--------|---------|
| Enterprises          |                |        |         |
| A                    |                | 29     | 26.4    |
| B                    |                | 22     | 20      |
| C                    |                | 19     | 17.3    |
| D                    |                | 15     | 13.6    |
| E                    |                | 9      | 8.2     |
| F                    |                | 9      | 8.2     |
| G                    |                | 7      | 6.4     |
| Age Group            |                |        |         |
| 30                   |                | 35     | 33      |
| 31-45                |                | 46     | 43.4    |
| 45                   |                | 25     | 23.6    |
| Marriage             |                |        |         |
| unmarried            |                | 26     | 24.1    |
| married              |                | 79     | 73.2    |
| cohabitation         |                | 2      | 1.9     |
| divorced             |                | 1      | 0.9     |
| Education Group      |                |        |         |
| primary school       |                | 6      | 5.7     |
| secondary school     |                | 27     | 25.7    |
| technical secondary school |            | 20     | 19      |
| diploma education    |                | 14     | 13.3    |
| undergraduate education |             | 30     | 28.6    |
| graduated education  |                | 8      | 7.6     |
| Work Position        |                |        |         |
| administrative staff |                | 37     | 34.9    |
| technical personnel  |                | 29     | 27.4    |
### Table 2: HIV-related perceptions and attitudes and sexual behaviors (n=110)

|                           |          |      |
|---------------------------|----------|------|
| ordinary workers          | 28       | 26.4 |
| logistical personnel      | 12       | 11.3 |
| **Residency**             |          |      |
| urban                     | 28       | 27.2 |
| sub-urban                 | 20       | 19.4 |
| town                      | 19       | 18.5 |
| rural                     | 36       | 35   |
| **Experience of working away from home in China** | | |
| <5 years                  | 74       | 67.3 |
| ≥5 years                  | 36       | 32.7 |
| **Experience of working abroad** | | |
| <5 years                  | 86       | 78.2 |
| ≥5 years                  | 24       | 21.8 |

**HIV-related perceptions and attitudes**

Table 2 reports descriptive statistics on HIV-related perceptions and attitudes. Merely 1.9% of the participants thought that they are possible to infect HIV, 1.0% of the participants thought that they are possible to infect other STIs. As for sexual attitudes, our participants demonstrated highly unacceptable attitudes towards extramarital sex and multiple sex partners (respectively 83.5% and 89.0%). However, they showed relatively tolerant attitudes towards paying for sex and selling sex which was reported acceptable by nearly 20% of the participants. Even a one-night stand won 25.0% acceptance among our participants. Most participants (71.6%) were acceptable to premarital sex.

**sexual behaviors and condom use**

Most participants (83.6%) refused to answer the question related to pay money for sex in Kenya, and in the rest, only 5.4% of them reported that they had transactional sex in Kenya. More than half of the participants reported only one sex partner in the last one year, half of them used condoms at last intercourse, 22.7% of them always used condoms in the last 12 months. (Table 2)

Table 2: HIV-related perceptions and attitudes and sexual behaviors (n=110)
| Item                      | Category     | Number | Percent |
|---------------------------|--------------|--------|---------|
| Perceived risk to HIV     | Possible     | 2      | 1.9     |
|                           | Little possible | 23    | 21.5    |
|                           | Not possible  | 82     | 76.6    |
| Perceived risk to Other STIs | Possible   | 1      | 1.0     |
|                           | Little possible | 38    | 36.5    |
|                           | Not possible  | 65     | 62.5    |
| Sexual attitude           | Acceptable   | 78     | 71.6    |
| premarital sex            | Not          | 31     | 28.4    |
| Extramarital sex          | Acceptable   | 18     | 16.5    |
|                           | Not          | 91     | 83.5    |
| Paying for sex            | Acceptable   | 24     | 21.8    |
|                           | Not          | 86     | 78.2    |
| Selling sex               | Acceptable   | 20     | 18.5    |
|                           | Not          | 88     | 81.5    |
| Multiple sex partners     | Acceptable   | 12     | 11.0    |
|                           | Not          | 97     | 89.0    |
| One-night stand           | Acceptable   | 27     | 25.0    |
|                           | Not          | 81     | 75.0    |
| Sexual behaviors          | Paying money for sex | Yes | 6     | 5.4 |
|                           |              | No    | 12    | 11.0 |
|                           |              | Refuse to answer | 92   | 83.6 |
| No. of sex partners in last one year | 0  | 23 | 20 |
|                           | 1            | 60    | 54.5 |
|                           | 2-5          | 9     | 8.1    |
Refuse to answer 9 8.1

| Frequency of condom use in the last 12 months | 5  | 9  | 8.1 |
|---------------------------------------------|----|----|-----|
| never                                       | 20 | 18.2 |
| sometimes                                   | 19 | 17.3 |
| often                                       | 23 | 20.9 |
| always                                      | 25 | 22.7 |
| Refuse to answer                            | 23 | 20.9 |

| condom use at last intercourse              | 55 | 50.0 |
|---------------------------------------------|----|-----|
| Yes                                         | 55 | 50.0 |
| No                                          | 39 | 36.5 |
| Refuse to answer                            | 16 | 14.5 |

**HIV knowledge and cognition**

In HIV knowledge and cognition questions, only 47.6% of the participants had sufficient knowledge (Table 3). Two questions with the lowest correct rates were “HIV was equal to death” and “whether HIV antibody could be detected within one week after the infection” (respectively 24.3% and 34.0%). The following two questions with low correct rates were “whether one could be infected by kissing HIV-positive people” and “whether you can tell if someone has HIV by looking at them” (respectively 52.4% and 56.1%).

**Cues to action**

In terms of cues to action, more than half of the participants (68.2%) exposed to any form of HIV related information in recent one year. (Table 3)

**Utilization of HIV testing**

The majority of the participants were capable to obtain HIV-related information (91.8%) and information about sites for receiving HIV testing (95.5%). As for migration experiences, 32.7% of them worked away from home in China for more than 5 years and 21.8% worked abroad for more than 5 years. (Table 3)
Table 3: Descriptive Statistics of Other Variables (n=110)

| Item                                           | Category | Number | Percent |
|------------------------------------------------|----------|--------|---------|
| Received HIV test in recent one year           |          |        |         |
| Yes                                            | 30       | 27.3   |         |
| No                                             | 80       | 72.7   |         |
| HIV knowledge                                  |          |        |         |
| Sufficient                                     | 49       | 47.6   |         |
| Insufficient                                   | 54       | 52.4   |         |
| Cues to action                                 |          |        |         |
| Exposure to HIV Related Information in recent one year | Yes | 75 | 68.2 |
|                                               | No       | 35     | 31.8    |
| Utilization of HIV testing                     |          |        |         |
| The capability of obtaining HIV-related information | Yes | 101 | 91.8 |
|                                               | No       | 9      | 8.2     |
| Information about sites for receiving HIV test |          |        |         |
| Yes                                            | 105      | 95.5   |         |
| No                                             | 5        | 4.6    |         |

Factors associated with recent HIV testing

By univariate logistic regression, we identified five variables that had a P value of less than 0.1. They were education (OR=0.48; P=0.07), exposure to HIV related information in recent one year (OR=6.00; P=0.006), enterprises(OR=1.43; P=0.062), experience of working away from home in China (OR=2.49; P=0.065) and acceptable attitudes towards paying for sex (OR=3.78; P = 0.006). The above variables were incorporated into multivariate logistic regression using the stepwise forward modeling method, and P < 0.05 was considered significant. After adjustment for other covariates, the results showed that people who were more open about paid sex (OR=3.82;P = 0.016) and expose to HIV related information in the past one year (OR=4.51;P = 0.029) were more likely to have HIV test in the last year (table 4).

Table 4. Factors associated with recent HIV testing (n=110)
| Variable | Category | Univariate logistic regression | Multivariate logistic regression |
|----------|----------|-------------------------------|--------------------------------|
|          |          | OR (95% CI) | P | OR (95% CI) | P |
| Enterprises | | | | | |
| A | | 1.43 | 0.36 | 5.61 | 0.062 | — |
| B | | 9.00 | 1.53 | 52.80 | |
| C | | 4.00 | 0.38 | 42.18 | |
| D | | 2.34 | 0.36 | 15.29 | |
| E | | 2.34 | 0.36 | 15.30 | |
| F | | 0.60 | 0.15 | 2.36 | |
| G | | Ref | | | |
| Education | | | | | |
| Primary | | 0.48 | 0.17 | 1.33 | 0.07 | — |
| Middle | | 1.80 | 0.54 | 6.03 | |
| High | | Ref | | | |
| Experience of working away from home in China | | | | | |
| yes | | 2.49 | 0.94 | 6.56 | 0.065 | — |
| no | | Ref | | | |
| Exposure to HIV Related Information | | | | | |
| yes | | 6.00 | 1.68 | 21.45 | 0.006 | 4.51 | 1.18 | 17.34 | 0.029 |
| no | | Ref | | | Ref | |
| Attitudes toward paid sex | | | | | |
| Acceptable | | 3.78 | (1.46,9.81) | 0.006 | 3.82 | (1.28,11.41) | 0.016 |
| Not | | Ref | | | Ref | |

Ref reference, OR odds ratio, CI confidence interval, NS not significant in the multivariate analysis, — variables were not included in the multivariate analysis

**Discussion**

To our knowledge, this is the first research that tried to describe HIV testing behavior and identify possible associated factors among Chinese migrant construction laborers in Kenya. This study demonstrated that 27% of them had been tested for HIV in the past year. It is lower than 36% to 47% found in population-
level in Kenya\textsuperscript{29} and 73\% in local construction workers in South Africa by Bowen et al\textsuperscript{30}. Thus, it is essential to know the factors associated with HIV testing behaviour among them and comprehend the reasons averting them from taking the test.

The great majority of participants were under the age of 45 years old\textsuperscript{76.4\%} which is a sexually active segment and usually had to work continuously for more than one year in Africa. Previous research has revealed that sexually active young adults who separated from their stable sexual partners for a long time may increase the likelihood of HIV/sexually transmitted diseases\textsuperscript{10,11,25}. With the scale-up HIV prevention services among key populations all over the world, most participants were accessible to obtain HIV-related information (91.8\%) and information about sites for receiving HIV test (95.5\%) in our study, which was reported to be facilitators to uptake of HIV testing in many studies\textsuperscript{31}. However, more than half of our sample didn’t have sufficient HIV knowledge and cognition. The gap between their capability of obtaining HIV-related information and HIV-related cognition may be related to low education levels among them. Most participants were from rural areas and only had primary education (e.g. elementary, middle school) which may limit their capability of understanding HIV-related information\textsuperscript{32}.

Among a set of sex attitudes, open attitudes toward paying for sex was most influential with recent HIV testing behavior. It has been shown among domestic Chinese migrant construction laborers that people who are more open to paying for sex are more likely to have transactional sex\textsuperscript{9}. Although we collected information about workers’ sexual behavior in recent one year, up to 83.6\% of them refused to answer the question about sex partners including commercial sex. Their resistance to this question could due to their sensitive identity as workers of oversea Chinese companies and conservative culture to sex. Previous studies have demonstrated a clear relationship between risky sexual behaviors (e.g., having paid sex) and recent HIV testing\textsuperscript{33-37,38}. It can be inferred that participants of our study who have open attitudes of paid sex are more likely to have risky sexual behavior which can lead to increased perception of HIV risk and attribute to an increased likelihood of HIV testing. Therefore, we need more exploration among this special population to obtain more information about the risks of sexually transmitted diseases.

Also, we observed an association between recent exposure to HIV related information and HIV testing behaviors. This positive association has been described in previous studies among youth in Sub-Saharan Africa\textsuperscript{39}. According to Health Belief Model (HBM), cues to action refer to the enabling factors for people to take preventive measures, including media campaigns, medical staff reminders, others’ advice, family and friends’ disease information, etc\textsuperscript{40}. All of the above which expose the workers to HIV-related information will remind them about the risk of HIV and the needs of taking action as a test for HIV to mitigate the risk\textsuperscript{41-43}. This suggests a need for continuous HIV related information targeted toward transnational migrant construction workers at their working sites as well as their leisure sites to improve HIV knowledge and uptake of HIV testing.

\textbf{Conclusion}
This study reported recent HIV testing behavior and related factors among the unique group of Chinese migrant construction workers in Kenya who have not been fully studied but faced disproportionate HIV risk currently. We found that the open sexual attitude among them, which maybe predict the possibility of risky sexual behaviors (e.g., having paid sex), will further influence their HIV testing behavior. Various HIV/AIDS information will also inform them about their risk of STIs/HIV and increase their HIV testing rates.

**Abbreviations**

HIV: Human immunodeficiency virus; UNAIDS: the Joint United Nations Program on HIV/AIDS; STIs: sexually transmitted diseases

**Declarations**

- **Ethics approval and consent to participate**

Ethical approval was obtained from the Institutional Review Board of Xiangya School of Nursing, Central South University (Changsha, China). The essential information of the study, including its purpose and procedures, the benefits and risks for participants, and their right to decline participation in the study were clearly explained on the first page of the questionnaire. Therefore, the submission of the questionnaire was regarded as consent to participate in the study. The Institutional Review Board approved the form of assumed consent on receipt of completed questionnaires.

- **Consent for publication**

Not applicable.

- **Availability of data and materials**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

- **Competing interests**

The authors declare that they have no competing interests.

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- **Authors’ contributions**

ZWJ, DWY, and WHH conceived, designed the study. ZWJ, LJF, BY, and HZY collected the data. ZWJ, DWY, and WHH analyzed the data. ZWJ, DWY, and WHH wrote the paper. LJF, BY and HZY reviewed and edited the manuscript. All authors read and approved the manuscript.

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