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Original Article

Erectile dysfunction's prevalence and risk factors in floating population in Dongguan, China: a cross-sectional study

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Abstract: Objective: A cross-sectional study to survey the prevalence of erectile dysfunction (ED) and associated factors in male registered residents of rural areas living and working in the city (that is, a floating population, FP) in Dongguan City, China. Methods: Between June 2013 and July 2013, 3167 FP men from 25 factories in Dongguan city were enrolled. Data were collected through an anonymous self-administered questionnaire that included broad epidemiological information, attitudes towards sexual life, sexual function, and sexual activity about masturbation, desire, sexual difficulties, and satisfaction. The 5-item International Index of Erectile Function (IIEF-5) score was used to determine the severity of ED and logistic regression analysis was performed to investigate the risk factors of ED. Results: Among the 3167 enrolled men, 2661 completed the questionnaire, most of which (77.4%) were between 18 and 35 years of age. Of the 2661, 1885 (70.8%) reported a problem with ED; most of them (92.5%) were with mild ED. No association was determined between ED and hypertension, diabetes mellitus, or cerebrovascular disease, but ED was associated with fear of sexually transmitted disease. Univariate logistic regression analysis showed that high monthly income, good education, cohabiting with a sexual partner, and sexual pleasures from intercourse were protective factors against ED. Conclusion: The high prevalence of ED in this FP may have psychological components, among other associated factors. Solving the public health challenges presented by FPs in China will require coordinated efforts by the government, enterprises, and individuals.

Keywords: Erectile dysfunction, ED, floating population, migrant, cross-sectional study, sex

Introduction

The fast-growing economy of China that began with investment and trade liberalization in 1979 has encouraged many workers to move from rural to urban areas [1]. These people generally migrate to cities for job opportunities, higher income, or a more comfortable life. While their household registrations remain listed at the areas of their origin, they are not part of the official census count in the city and therefore referred to as the floating population (FP) [2]. According to a 2010 report, by the year 2050, the increase China's FP could reach 350 million at the current rate [3]. The FP is crucial to the economic development of urban areas, but most of them are poorly educated with few professional skills, and medical services for them are not adequate. Thus the social and health problems presented in the FPs are a big challenge in China [4].

FP consists predominately of young and adult men. According to a 2013 large-scale survey, men account for up to 66% of the FP, 80% of which are between 16 and 40 years of age [5],

and thus are in the most active phase of their sexual lives. These men face adversities that negatively affect their health such as unsafe work conditions, low income, poor health care services, and stresses associated with adjusting to a new social environment, including lack of sexual partners. Their health problems have become a major public health issue [3].

Erectile dysfunction (ED) could result in unsuccessful sexual intercourse because of the inability of penile erection or insufficient penile erection [6]. Epidemiologically, erectile function may be considered as a reflection of men's overall health. Worldwide, many diseases such as hypertension, hyperlipidemia, diabetes, and heart disease have been shown to be risk factors for ED [7]. The 5-item International Index of Erectile Function (IIEF-5) is a valid and reliable means of assessing ED [8]. An IIEF-5 score <22 is considered as mild ED or worse.

At present there are few studies of the prevalence of ED in Chinese FPs. Guangdong province in China has a FP of over 28 million, or up to 12% of the entire FP in China [9] and Dongguan City hold more FP than other cities in Guangdong province because of its advanced labor intensive industry. The present cross-sectional study investigated the erectile function of male migrant workers in Dongguan city, Guangdong province, and factors associated with ED among these people.

Methods

The Ethics Committee of Dongguan Taiping People's Hospital and First Affiliated Hospital, Sun Yat-sen University approved the study protocol. Data collection was done in accordance with the principals of the Declaration of Helsinki. All participants signed written consent form agreeing to provide their information for this study.

Subjects

A total of 3067 FP men from 25 factories in Dongguan city were enrolled between June and July 2013 and investigated using an anonymous self-administered questionnaire. Of these, 2661 completed the entire questionnaire and the response rate was 86.8%. All subjects fulfilled the following eligibility criteria: men >18 years of age; officially registered as a permanent resident of a rural area; had worked in Dongguan city for ≥6 month; heterosexual orientation; able to read, understand and independently complete the questionnaire.

Study design and procedure

Workplaces were defined as sampling units. The research team communicated with the employer to get a free access to perform this survey when the workplace was selected in accordance with the pre-established sampling method. None of the employers declined the request. Eligible migrants were approached randomly. Finally, a sample of 3167 migrant workers was yielded from 25 workplaces across 10 large geographic locations in Dongguan.

Because of the subjective and sensitive nature of the personal questions included in this study, and in order to ensure that the purpose of the questionnaire was easily understood, a pre-survey was given to a representative sample of workers. Modifications were made to the original items as required. The study investigators collected comments from worker representatives and factory administrators for refining the study procedures.

To better accurately understand the questionnaires, participants were given detailed explanations of each item in questionnaires by investigators. Then participants filled out the questionnaires anonymously to achieve better compliance. No participants reported coercion during the study.

Each man filled out a detailed questionnaire of 3 sections, namely (i) broad epidemiological information including age, weight, height, education, marital status, and living conditions; (ii) sexual attitudes and behaviors regarding how to express the urge for sex to a sexual partner; (iii) sexual function and sexual practices such as masturbation, desire, sexual difficulties, and satisfaction.

Statistical analysis

All data forms were scrutinized to exclude unqualified forms including missing critical values or logical inconsistencies. EpiData 3.1 was used to code the data and double-entered into a relational database. Results were recorded with built-in functions to avoid logical errors

Table 1. Basic demographic features of the study population

		n (%)
Subjects		2661
Age, y	≤25	1033 (38.8)
	<25 and ≤35	1026 (38.6)
	>35	602 (22.6)
BMI, kg/m^2		
	≤18.5	257 (9.7)
	<18.5 and ≤24.0	1705 (64.1)
	<24.0 and ≤28.0	580 (21.8)
	>28.0	119 (4.5)
Education, y		
	≤9	1603 (60.2)
	>9	1058 (39.8)
Monthly income, Chinese yuan		
	<3000	2116 (79.5)
	≥3000	545 (20.5)
Health insurance		
	Yes	1100 (41.3)
	No	1561 (58.7)
Marital status		
	Unmarried	1271 (47.8)
	Married	1390 (52.2)

Table 2. Complicating diseases in FP men with and without ED

	ED, n (%)			
	With	Without	Total, n	*P*
Subjects	1885 (70.8)	776 (29.2)	2661	
Hypertension	51 (4.7)	19 (3.3)	75	0.228
Diabetes mellitus	5 (0.5)	2 (0.3)	8	1
Hyperlipidemia	15 (1.4)	7 (1.2)	22	0.962
Cerebrovascular disease	5 (0.5)	2 (0.3)	9	1
Sleep disorders	139 (12.7)	73 (12.7)	219	1
Penile disease	7 (0.6)	2 (0.3)	9	0.667
Prostatitis	52 (4.8)	19 (3.3)	74	0.198
STD* anxiety	24 (2.2)	2 (0.3)	26	0.007**
Surgery	8 (0.7)	5 (0.9)	15	0.997

*STD: sexual transmitted disease. **P<0.05.

and missing items. SPSS (13.0.1) software was conducted for all analyses and a P<0.05 was considered as a statistical difference.

Results

Demographic features of the enrolled FP

In this study, sociological features, sex-related attitudes, behaviors, erectile dysfunction, and likely associated factors in FP men in Dongguan city were investigated through a self-reported questionnaire. Most of the enrolled subjects were young (**Table 1**). Men ≤ 25-years-old constituted 38.8% of the enrollees, while those aged 26-35 years accounted for 38.56%. Most of the men (95.5%) had BMIs of 18.5-28, suggesting that overall they were healthy. However, in general they were poorly educated; 60.2% had received <9 years of education. Their income was also very low, with the monthly income of most (79.5%) being <3000 Chinese yuan (~500 USD). Their available medical care was inadequate, and only 41.3% had health insurance. About a half of the enrolled population in this study was not married. Since a high proportion of the married men did not live with their wives, a high proportion of the study population did not have stable sexual partnerships.

Among the 2661 men enrolled, 1885 reported a problem with ED, a prevalence of 70.8%, which was much higher than that reported in an epidemiological investigation of a FP in the neighboring region of Guangzhou [2], and was also much higher than that of the general population of the country in a large sample survey [10].

Because hypertension, hyperlipidemia, diabetes and heart disease are risk factors for ED in men in the general population, we wondered whether the male FP of our study were especially prone to conditions (work-related or otherwise) that could lead to these diseases (**Table 2**). However, we compared men with or without ED for rates of various diseases which were self-reported by the subjects, and found that they were similar for hypertension, diabetes mellitus, hyperlipidemia, cerebrovascular disease, sleep disorders, penile disease, prostatitis, and varied surgeries. Only anxiety regarding sexually transmitted disease was significantly higher in the men

Table 3. Single factor analysis of ED in floating population

		No ED, n (%)	ED, n (%)	x^2	*P*
Subjects		776	1885		
Age, y	≤25	231 (22.4)	802 (77.6)	39.899	<0.001
	(25, 35)	355 (34.6)	671 (65.4)		
	>35	183 (31.9)	390 (68.1)		
BMI, kg/m^2	<18.5	53 (20.6)	204 (79.4)	13.647	0.003
	(18.5, 24.0)	514 (30.1)	1191 (69.9)		
	(24.0, 28.0)	176 (32.3)	369 (67.7)		
	≥28	29 (24.4)	90 (75.6)		
Education, y	≤9	380 (23.7)	1223 (76.3)	57.115	< 0.001
	>9	390 (37.4)	654 (62.6)		
Monthly income, yuan	<3000	549 (25.9)	1567 (74.1)	56.812	<0.001
	≥3000	224 (42.7)	301 (57.3)		
Housing	Own	37 (30.3)	85 (69.7)	7.869	0.049
	Rent	362 (31.2)	800 (68.8)		
	Joint rent	42 (21.6)	152 (78.4)		
	Dormitory	329 (28.5)	827 (71.5)		
Health insurance	Yes	259 (23.9)	826 (76.1)	25.73	<0.001
	No	515 (33.0)	1046 (67.0)		
Hyperthermia	Yes	608 (28.9)	1495 (71.1)	0.234	0.629
	No	158 (30.0)	369 (70.0)		
Long sitting	Yes	3949 (28.0)	1013 (72.0)	1.847	0.174
	No	372 (30.4)	851 (69.6)		
Long standing	Yes	568 (30.6)	1289 (69.4)	6.538	0.011
	No	198 (25.6)	575 (74.4)		
Noises	Yes	571 (28.7)	1419 (71.3)	0.739	0.390
	No	195 (30.5)	445 (69.5)		
Radiation	Yes	702 (28.4)	1774 (71.6)	12.249	<0.001
	No	64 (41.6)	90 (58.4)		
Social pressure	A little	27 (25.5)	79 (74.5)	26.241	<0.001
	Fair	389 (25.8)	1121 (74.2)		
	Great	297 (35.6)	537 (64.4)		
	Very great	57 (31.1)	126 (68.9)		
Marital status	Unmarried	275 (21.7)	993 (78.3)	66.106	<0.001
	Married	501 (36.0)	889 (64.0)		
Cohabiting	No	292 (21.9)	1043 (78.1)	73.696	<0.001
	Unmarried cohabiting	400 (37.9)	655 (62.1)		
	Married cohabiting	72 (30.0)	168 (70.0)		
Importance of sex	Very important/important	664 (32.0)	1412 (68.0)	35.125	<0.001
	Fair	102 (19.5)	421 (80.5)		
	Not important	6 (15.4)	33 (84.6)		
Sexual pleasure	Frequent	454 (45.6)	541 (54.4)	227.955	<0.001
	Sometimes	261 (22.3)	910 (77.7)		
	Seldom	14 (38.0)	215 (93.9)		
	Never	38 (17.9)	174 (82.1)		
Communication with a partner	Frequent	255 (39.3)	394 (60.7)	51.209	<0.001
	Sometimes	382 (28.1)	976 (71.9)		
	Seldom	57 (19.9)	229 (80.1)		
	Never	71 (22.5)	244 (77.5)		
Sexual needs expression	Active telling	445 (33.1)	901 (66.9)	22.421	<0.001
	Hinting	270 (26.8)	738 (73.2)		
	No expression	53 (20.3)	208 (79.7)		

Table 4. Multiple-factor analysis of ED

	ED*				
	b	SE	Wald	OR (95% CI)	*P*
Constant term	1.783	0.202	77.957	—	<0.001
Education ≥9 y	-0.380	0.101	14.156	0.684 (0.561-0.833)	<0.001
Monthly income ≥3000 yuan	-0.306	0.119	9.082	0.698 (0.552-0.882)	0.003
Cohabiting	—	—	24.666	—	<0.001
No	1 (ref)				
Unmarried	-0.527	0.106	24.630	0.591 (0.480-0.727)	<0.001
Married	–0.311	0.169	3.398	0.732 (0.526-1.020)	0.065
Sexual pleasure	—	—	151.181	—	<0.001
Never	1 (ref)				
Seldom	1.352	0.360	14.074	3.866 (1.908-7.837)	<0.001
Sometimes	-0.015	0.217	0.005	0.985 (0.644-1.508)	0.946
Frequent	-1.051	0.216	23.062	0.350 (0.229-0.534)	0.003

*IIEF score ≤21 points, n=1804.

with ED relative to men without ED. This indicated that organic disease was not a contributing factor to the high prevalence of ED in our study population, but for most of them ED was due to psychological reasons.

Factors associated with ED

The men were stratified by age as ≤25, 26-35, and over 35 years. Surprisingly, the prevalence of ED in the men <25 years was 77.6%. The study population was also stratified by other factors potentially associated with ED such as BMI, education level, monthly income, health insurance, working conditions, and marital status (**Table 3**). Single-factor analysis showed that there were multiple factors linked to ED including age, BMI, education level, exposure to radiation, social stress, marital status, cohabiting with a sexual partner, importance of sex by self-assessment, sexual pleasure from intercourse, verbal communication frequency with sexual partner, and sexual need expression (**Table 3**).

The men were stratified by ED severity based on IIEF-5 scores (mild ED, IIEF-5 scores 12-21; moderate/severe ED, IIEF-5 scores 5-11). It was determined that 92.5% (1804/2661) had mild ED, and only 7.47% (81/2661) had moderate or severe ED. All the variables (factors associated with ED) except for the working conditions, hyperthermia, long sitting, and noises, with $P<0.15$ in univariate analysis, were used to perform multivariate logistic regression analysis after adjustments for age and confounding factors.

In the multivariate logistic regression analysis, only education level, income, cohabiting with partner, and sexual pleasure from intercourse had a statistical difference ($P<0.05$; **Table 4**). The results showed that monthly income >3000 yuan and education >9 years were probably protective factors for ED in this population (OR<1). Compared with FP men without a cohabiting partner, those cohabiting with an unmarried partner had a reduced risk of ED and this was probably a protective factor for ED. Compared with men who never had sexual pleasure from intercourse, frequent sexual pleasure was a protective factor for ED, whereas rare sexual pleasure was a probable risk factor (**Table 4**).

Based on the results of the multivariate logistic regression analysis, education level, income, cohabiting with a partner, and sexual pleasure from intercourse were factors associated with ED.

Discussion

The FP in China is huge and has specific characteristics. These migrant workers are, in general, poorly educated and lack professional skills. Therefore, they cannot compete in many fields of employment. On the whole, they have unskilled jobs that pay little, while the jobs are dangerous, dirty, and tiring. The working condi-

tions may affect their health. The majority of the FP is young or middle-aged men, according to our present study and previous reports [9, 11]. In China, unmarried individuals in the FP are usually not covered by the reproductive health care in medical health insurance. Simultaneously, with the increasing size of the FP, sexual attitudes have become more liberal and premarital sexual activities among the youth has increased in the last few decades [12]. Compared with the rural origins of the FP, the sexual norms of urban areas are more permissive and allow easier access to casual or commercial sex activity [9]. Altogether, this has meant that as the FP increases in size, the public health problem increases, especially regarding sexual behaviors.

In this cross-sectional study, we investigated ED's prevalence and associated factors in a FP of men in Dongguan city. Most of them were young. We found the prevalence of ED to be unexpectedly high (70.84%), with no association to organic diseases such as hypertension, diabetes mellitus, or cerebrovascular disease. We concluded that the underlying causes of ED in most of this FP were probably psychological or related to sociological factors, because these men are predominantly young. The great majority has only mild ED, and the only factor found associated with ED is fear or anxiety regarding sexually transmitted disease. In addition, the univariate and multivariate logistic regression analyses showed that high monthly income, good education, cohabiting with a sexual partner, and frequent sexual pleasure from intercourse were protective factors for ED.

While ED is exceedingly common, it is a detriment to the quality of life of men, including migrant workers. Our study found that ED is more prevalent in male migrants than that has been reported previously [13], although in most of our study population the condition was mild, with IIEF-5 scores of 12 to 21 points. Furthermore, this high prevalence of ED is probably attributable to psychological and sociological factors. Migrant worker often attenuates or losses his accustomed social network and support in the original living place. The loss of social support, stress of the move, difference between expectations and achievements, low income level, poor live condition, and poor medical care can result in depression, poor self-esteem, and anxiety invulnerable individuals. Migrant workers in China also commonly experience stress on the job that contributes to dissatisfaction and physical and mental health problems such as low salary, wages in arrears, bad labor condition, overtime work, and high work intensity, especially in labor-intensive industry. Poor health in migrant workers can contribute to depressive symptoms, and the duration of migrant was positively associated with depression according to previous study [14]. In younger migrants with erection disorders, a psychogenic component is often the major causative factor. This may be because mild ED can lead to slight depression, or because ED may be a side effect of severe depression. Whichever direction this association takes, practitioners should be aware of the link between ED and mental status.

In the present study we found that high monthly income, good education, cohabiting with a sexual partner and frequent sexual pleasures were protective factors for ED in FP men in Dongguan city. These results indicated that the erectile function of migrant men is affected by multiple factors. Therefore, it may be unwise to rely on any one factor for resolving ED in the FP.

Rural migrant workers in China are vulnerable in the urban society, facing with various dislocations and difficulties and limited abilities or resources to surmount these problems. FP could benefit from China's continued urbanization and industrialization and get opportunities to achieve better qualities and abilities. Various education resources, such as pre-migration training that focuses on effective coping skills, should be a priority target of public expenditure. It is critical to protect the physical and mental health of these workers by improving the conditions of living and work, providing sufficient medical services, and the implementation of labor protection laws and regulations [15]. Programs to promote the health of the migrant population are required, including those related to erectile function. Migrant population with mental health disorders such as depressive symptoms should be involved in professional services and counseling of psychological support.

Several limitations should be considered in this study. First, the study may contain a social desirability bias because not all sexual behaviors may have been reported, since in China

certain practices and commercial sex work is stigmatized. Secondly, there may be a participation bias, as data on height and weight were self-reported on a voluntary participation basis. Thirdly, since participants were required to remember their past sexual activities, recall bias also possibly contributed to the inaccuracy of survey results. Another source of limitation is that, because of the diversities of regional linguistics and culture in China, our results may not be general to other FPs outside of the several towns of Dongguan, China that we sampled. Nonetheless, our study provides unique and reliable information about a FP in China at a time of rapid economic and social change, as well as a reference for future comparative work investigating similar situations in other regions of China. In addition, the cross-sectional design of the present study does not provide the inferences of temporal or causal relations between variables. Importantly, the migrant work's transient nature may contribute to this limitation. For example, participants who reported not engaging in masturbation may do so later. Therefore, a longitudinal study is needed in future research. In this study, we failed to obtain comprehensive information about sexual events that the men may have engaged in with paying or non-paying partners, characteristics of primary and casual partners, or other psychological and social-cognitive factors potentially related to erectile problems, because of the time and space limitations. What is more, our data did not include issues of anxiety or the quality or nature of the men's sexual relationships, and it could be hypothesized that such variables could have added to the understanding of our results. Furthermore, we used non-probability sampling strategies and selected mostly popular construction sites and factories for researchers. By using this sampling strategy, younger migrant workers were more likely to be enrolled in our selected construction sites and factories, while dispersed migrant workers, the self-employed, unemployed, or those engaged in contract work were less likely to be include. Finally, selection bias existed; inclusion of short-term sexual relationships would have led to the inclusion of men with transient ED. For example, such abnormal erectile function may be more likely to occur at the beginning of a new sexual relationship.

The high prevalence of ED is one of public health problems in rural FP and may have psychological components, among other associated factors. Solving this public health challenge presented by FPs in China requires coordinated efforts by the government, enterprises, and individuals.

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Disclosure of conflict of interest

None.

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