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ORIGINAL ARTICLE

Smoking and sexual dysfunction in Chinese males: findings from men's health survey

TH Lam[1], ASM Abdullah[1,2], LM Ho[1], AWC Yip[3] and S Fan[4]

[1]*Department of Community Medicine, Faculty of Medicine, The University of Hong Kong, Hong Kong, China;* [2]*Department of International Health, Boston University School of Public Health, Boston, MA, USA;* [3]*Department of Surgery, Kwong Wah Hospital, Hong Kong, China and* [4]*The Family Planning Association of Hong Kong, Hong Kong, China*

To describe the prevalence of erectile dysfunction (ED) and its association with smoking among the Chinese in Hong Kong, we conducted a cross-sectional study among 819 men (aged 31–60 years) who were randomly selected among the Hong Kong residents and interviewed by trained interviewers. A structured questionnaire was used for data collection. We found that current smokers who smoked 20 cigarettes or more daily had more dissatisfaction, erection difficulty and ED than never smokers. The prevalence of dissatisfaction, difficulty in erection and ED increased significantly ($P<0.05$) with increasing age. Compared with never-smokers, current smokers of more than 20 cigarettes daily had a greater risk of ED (age-adjusted odds ratio = 1.47, 95% confidence interval: 1.00–2.16). Our results support that there are association between ED and smoking among the Chinese and suggest linking ED with smoking in the antismoking campaign and promoting smoking cessation to reduce ED among smokers.
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Introduction

Erectile dysfunction (ED) is a common problem of middle aged and older men. In addition to causing personal dissatisfaction and low self-esteem among the sufferer, ED could be a cause for depression[1] and many other social consequences. Moreover, the ageing of the population will substantially increase the number of men at risk of ED, because ED is age related.[2] Information on the prevalence of ED and its correlates in a given population is essential to detect ED in an early phase and to design targeted interventions. Furthermore, periodic assessment of the prevalence of ED is considered an important adjunct surveillance tool to assess progress toward specific goals for the improvement of the quality of sexual life among men. There is some evidence that smoking increases the risk of vascular diseases, which are linked with ED.[3,4] There are controversies regarding the association between smoking and ED. Several epidemiological studies reported that both active and passive smoking is associated with ED.[5–7] In 2004, a review by the Board of Science and Education and Tobacco Control Resource Centre of the British Medical Association concluded that 'there is substantial evidence that smoking causes male sexual impotence'.[8] However, the 2004 US Surgeons General's Report[9] concluded that 'the evidence is suggestive but not sufficient to infer a causal relationship between smoking and ED'. Nevertheless, both reports recommend promotion of smoking cessation to prevent ED given its clinical appropriateness despite the inconclusive causal link. More research is warranted. Moreover, information on the relationship between smoking and ED from Asian populations, especially from the Chinese is lacking in the literature.

This paper describes the prevalence of ED and its association with smoking in Chinese in Hong Kong. The data for this study was obtained from the Men's

Correspondence: Dr ASM Abdullah, Department of International Health, Boston University School of Public Health, 85 East Concord Street, 5th Floor, Boston, MA 02118, USA.
E-mail: asma@bu.edu
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Health Survey of the Family Planning Association of Hong Kong conducted in 2001.[10]

Materials and methods

Study design and subjects

We conducted a cross-sectional survey among Hong Kong Chinese residents.

A two-stage random process was used to select Hong Kong male residents in the Men's Health Survey. In the first stage, the quarters in the sampling frame were stratified by districts and further by type of housing and then a sample of quarters was taken systematically from each stratum. In the second stage, visits were made to the households in the selected quarters and a male member aged between 26 and 70 years was randomly chosen for interview from each household. Agreement to be interviewed and to complete and return the questionnaire was considered as consent given to participate in the study.

Data collection

Most of the survey data were collected through face-to-face interviews during household visits using a structured questionnaire. The sensitive data on sexual life were collected using a self-administered questionnaire at the end of the interview. Upon completion, the participants put the self-administered questionnaire in a sealed envelope and returned to the interviewer immediately. All interviewers were trained, and the interviewing process was monitored by fieldwork supervisors. In addition, a sample of completed questionnaires was checked and validated independently afterwards.

Questionnaire

The questionnaire included demographic information (age, marital status, highest educational attainment, personal income), alcohol use, smoking habit, number of sex partners in the past 6 months, sexual satisfaction and erection difficulty. Smokers were classified into never smokers (have never smoked), ex-smokers (those who previously had a daily smoking habit for 6 or more months but had stopped smoking completely at the time of the interview) and current smokers (smokes daily or occasionally at the time of the survey). Current smokers were further divided into those who smoked less than 20 cigarettes a day, and 20 or more cigarettes a day. Number of sexual partners was assessed with the question 'How many sexual partners did you have within the last 6 months?' and the response categories were none, one, more than one, and not applicable/do not want to answer. Satisfaction during sexual intercourse was assessed with the question 'For your sex life in the past 6 months, did you feel satisfied during sexual intercourse?' and the response categories were 'satisfied every time/almost every time, satisfied most of the time, sometimes satisfied, seldom satisfied, not satisfied every time/almost every time'. Erection difficulty in sexual intercourse was assessed with the question 'For your sex life in the past six months, did you have any difficulty in maintaining erection throughout the entire process of sexual intercourse?' and the response categories were 'had very great difficulty, had great difficulty, somewhat difficult, and not difficult at all'. We derived these two questions from the definition of ED, 'the inability to attain and/or maintain an erection satisfactory for sexual intercourse'.[11]

Analysis

Owing to very few subjects in some categories, the categories in satisfaction with sexual intercourse 'seldom satisfied and not satisfied every time/almost every time' were collapsed to define '*dissatisfied*' and 'satisfied most of the time/sometimes satisfied' were collapsed to define '*satisfied*'. Similarly the categories in erection difficulty 'had very great difficulty/had great difficulty' were collapsed to define '*difficulty*' and 'somewhat difficult and not difficult at all' were collapsed to define '*no difficulty*'. We finally derived a composite variable for defining ED if subjects reported 'dissatisfied' and/or 'difficulty' in these two questions.

For those subjects who reported to have sex partners in the past 6 months, but refused to specify the number of partners, they were likely to have more than one partner because otherwise they would have specified one partner only. Therefore, they were treated as having more than one partner in the analysis. Subjects who were under the age of 31 years were unlikely to have ED and were excluded from the analysis.

All analyses were weighted by age on the basis of the figures from the Hong Kong Census and Statistics Department in 2001.[12] The associations between dependent and other relevant variables of interest were examined by χ^2 tests. For descriptive proportions of sexual dissatisfaction, erection difficulty and ED, we calculated 95% confidence interval (CI). The risks of dissatisfaction with sexual intercourse, difficulty in maintaining erection and ED due to smoking were estimated by logistic regression with the adjustment of age in 10 years. We reported odds ratios (OR) with 95% CI. A *P*-value of less than 0.05 was considered statistically significant (two-tailed).

Results

A total of 2049 living quarters were initially sampled for the survey. Among them, 108 were invalid because of nondomestic or demolished

quarters, or households not having the target persons. From the remaining living quarters, 1941 households were approached for interview and 1506 men (one from each household) were successfully interviewed. The response rate was 77.6%. We included here only subjects aged 31–60 years (432 outside this age range were excluded). A comparison of our sample aged 31–60 years with the Government Census and Statistics Department Thematic Household Survey,[12] a representative population survey on age, marital status, education, personal income and smoking status, showed effect size of 0.12, 0.09, 0.11, 0.10 and 0.33, respectively (effect size is a measure of the overall differences in proportions, with 0.1 indicates a small effect and 0.3 a medium effect)[13] (data not shown). Further excluded were those who quitted smoking for less than 1 year ($n=13$), those without any sexual partners ($n=87$) or those who refused to answer this question ($n=155$), leaving 819 subjects in the present analysis. Table 1 shows that 91.2% of the subjects were married, 23.7% aged 51–60 years, 14.0% attained education to tertiary level, 38.4% current smokers and 44.7% reported having ED.

Table 2 shows that current smokers who smoked 20 cigarettes or more daily had more dissatisfaction, erection difficulty and ED than never smokers. Current smokers of less than 20 cigarettes daily showed no excess problems. Ex-smokers had less dissatisfaction, erection problems and ED than current smokers who smoked 20 or more daily. Table 3 shows that ex-smokers were the oldest in the sample, while current smokers tend to be younger. The prevalence of dissatisfaction, difficulty in erection and ED increased significantly with increasing age.

Table 4 shows that the OR increased with increasing age. Compared with never smokers, current smokers of more than 20 cigarettes daily had a significantly increased risk of ED (OR = 1.47; $P=0.046$). Compared with current smokers who smoked 20 cigarettes or more daily, ex-smokers had a significantly reduced risk of dissatisfaction with sexual intercourse (OR = 0.48; $P=0.03$).

Discussion

Our sample should be quite representative of Hong Kong Chinese male population aged 31–60 years and the overall response rate was satisfactory. Our findings showed that ED, as defined by self-reported dissatisfaction with and/or erection difficulty during sexual intercourse is a common problem among the Chinese in Hong Kong, affecting about half (44.7%) of the population aged 31–60 years. Our prevalence is expectedly lower than that in an earlier study (63.6%) on Hong Kong Chinese diabetic patients,[14] as ED is particularly common among diabetic patients.[15] In the Massachusetts Male Aging Study, ED was three times more prevalent in diabetic subjects than their nondiabetic counterparts (28% vs 9.6%).[1] In a community-based

Table 1 Characteristics of 819 men in the Hong Kong men's health survey

	N	(%)
Age		
31–40	317	(38.7)
41–50	308	(37.6)
51–60	194	(23.7)
Marital status		
Married	747	(91.2)
Single	63	(7.7)
Other	9	(1.1)
Education		
Primary or below	162	(19.8)
Secondary	496	(60.6)
Matriculation	46	(5.6)
Tertiary	115	(14.0)
Personal income (US$1 = HK$7.80)		
Less than HK$10 000	193	(25.4)
HK$10 000–19 999	359	(47.2)
HK$20 000 or more	209	(27.5)
Smoking habit		
Never smoker	392	(47.9)
Ex-smoker	113	(13.8)
Current smoker (<20 cigs/day)	156	(19.1)
Current smoker (≥20 cigs/day)	158	(19.3)
Alcohol drinking habit		
Nondrinker	456	(55.7)
Ex-drinker	68	(8.3)
Occasional drinker (<1 time/week)	99	(12.1)
Regular drinker (≥1 time/week)	196	(23.9)
Number of sex partners in the past 6 months		
One	688	(84.0)
More than one	131	(16.0)
Regular medication on a long-term basis		
No	721	(88.0)
Yes	98	(12.0)
Dissatisfied with sexual intercourse[a]		
Yes	152	(19.7)
No	620	(80.3)
Had erection difficulty during sexual intercourse[b]		
Yes	283	(36.4)
No	495	(63.6)
Erectile dysfunction (dissatisfied and/or had erection difficulty[c]*)*		
Yes	350	(44.7)
No	433	(55.3)

[a]Dissatisfied with sexual intercourse if someone was seldom satisfied, not satisfied almost every time, or not satisfied every time.
[b]Had erection difficulty during sexual intercourse if someone had some, great, or very great difficulty.
[c]Dissatisfied with sexual intercourse and/or had erection difficulty during sexual intercourse.

Table 2 Adjusted prevalence (95% confidence interval)[a] of sexual dissatisfaction, erection difficulty and ED by smoking status

	Sometimes/seldom/never satisfied		*Had difficulty in erection*		*Erectile dysfunction*[b]	
	%	*95% CI*	*%*	*95% CI*	*%*	*95% CI*
Never smoker	19.1	15.4–23.4	32.9	28.3–38.0	42.5	37.5–47.7
Ex-smoker	12.7	7.7–20.2	38.1	29.3–47.9	40.8	31.8–50.5
Current smoker (<20 cigs/day)	18.3	12.8–25.5	34.8	27.4–42.9	43.0	35.1–51.2
Current smoker (⩾20 cigs/day)	25.2	18.8–32.9	41.5	33.9–49.6	52.1	44.0–60.0
Total	19.0	16.3–21.9	35.6	32.2–39.1	44.2	40.7–47.7

[a]Prevalence estimates were adjusted for age and were weighted by the Hong Kong population.
[b]Dissatisfied with sexual intercourse and/or had erection difficulty during sexual intercourse.

Table 3 Prevalence of smoking habit and ED by age[a]

	Age (in years)			P-*value*
	31–40	*41–50*	*51–60*	*For trend*
Smoking habit[b]	%	%	%	
Never smoker	48.8	49.0	45.8	NA
Ex-smoker	7.3	15.2	21.1	
Current smoker (<20 cigs/day)	25.0	14.5	16.3	
Current smoker (⩾20 cigs/day)	18.8	21.3	16.7	
Dissatisfied with sexual intercourse	15.6	21.9	21.5	<0.05
Had difficulty in erection during sexual intercourse	28.3	37.3	46.5	<0.001
Erectile dysfunction[c]	36.9	45.9	53.9	<0.001

[a]Estimates were weighted by the Hong Kong population.
[b]Column percentages were shown for smoking status.
[c]Dissatisfied with sexual intercourse and/or had erection difficulty during sexual intercourse.
NA = not applicable.

Table 4 Adjusted odds ratios (OR)[a] of dissatisfaction, erection difficulty and ED by age and smoking habit

	Sometimes/seldom/never satisfied		*Had difficulty in erection*		*Erectile disfunction*[b]	
	OR	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*
Age						
31–40	1		1		1	
41–50	1.56*	(1.03–2.37)	1.48*	(1.04–2.10)	1.45*	(1.04–2.02)
51–60	1.59	(0.99–2.57)	2.18***	(1.48–3.23)	2.05***	(1.40–3.00)
Never smokers as reference						
Never smoker	1		1		1	
Ex-smoker	0.61	(0.33–1.14)	1.25	(0.80–1.98)	0.93	(0.60–1.45)
Current smoker (<20 cigs/day)	0.95	(0.58–1.56)	1.08	(0.72–1.64)	1.02	(0.69–1.51)
Current smoker (⩾20 cigs/day)	1.43	(0.90–2.25)	1.45	(0.98–2.15)	1.47*	(1.00–2.16)
Current smokers (⩾20 cigs/day) as reference						
Current smoker (⩾20 cigs/day)	1		1		1	
Current smoker (<20 cigs/day)	0.64	(0.36–1.13)	0.77	(0.48–1.24)	0.70	(0.44–1.12)
Ex-smoker	0.48*	(0.25–0.93)	0.87	(0.52–1.47)	0.66	(0.40–1.10)

[a]Odds ratios were adjusted for age and were weighted by the Hong Kong population.
[b]Dissatisfied with sexual intercourse and/or had erection difficulty during sexual intercourse.
*$P<0.05$, **$P<0.01$, ***$P<0.001$.

study of 2226 Chinese men (aged 20–86 years) in mainland China, the age-adjusted prevalence of ED was 28.34%,[16] and ED was defined based on the composite scores of IIEF-5 questions.[17] In another study of 600 men aged 40–70 years, the age-adjusted prevalence of ED was 34.5% among Japanese and 22.4% among Malaysians,[18] but ED was assessed based on a single question about 'respondents' ability to achieve and maintain an erection sufficient for satisfactory sexual performance'. We used two questions: respondent's sexual satisfaction and sexual difficulty during intercourse. Moreover, cultural differences between the populations studied could be associated with different level of perceptions and attitudes towards ED, and, hence, under reporting or over reporting.[18] A systematic review by Prins *et al*.[19] found that prevalence rates of ED reported in several studies varied considerably (2% in men younger than 40 years to 86% in men 80 years or older) and they identified methodological differences (including definitions of ED, study design and age range of the subjects) between studies, making it difficult for direct comparison between studies.

Consistent with the findings among mainland Chinese[16] and Americans,[20,21] our results also confirm that ED was also associated with advancing of age in Chinese men. Many different factors were suggested as contributing factors for age-related ED.[22] These include organic, relational and intrapsychic components.

We found that smoking 20 or more cigarettes daily was associated with about 50% excess risk of ED. This is consistent with that in the UK British Medical Association review report which reported smokers are at least 50% more likely to suffer from ED.[8] In concurrence with our study, a cross-sectional study of 2115 Caucasian men aged 40–79 years in USA[23] reported a dose response relationship between smoking and ED. In another community-based cross-sectional study, among 1688 Dutch men aged 50–78 years, smokers had a higher occurrence of ED,[24] although smoking intensity was not quantified.

We found some evidence of reduced risk of ED by about one-third among ex-smokers compared with current smokers of 20 or more cigarettes daily, but our statistical power was not insufficient. We did not find excess risk in light smokers, and this suggests that there may be a threshold. However, we found no interaction effect of age and smoking on ED. It was argued that discontinuation of smoking results in a recovery of functional erection status,[9] which provide some evidence that the association between ED and smoking is likely to be causal. This inconsistent dose response effects between smoking pattern and ED suggests for further investigation.

There are some limitations of this study. First, there were some missing answers, and the symptoms could be under-reported due to the sensitivity of the questionnaire. To reduce such bias, the anonymous nature of the survey was emphasized to the subjects and they were asked to put the completed questionnaire in a sealed envelope. Second, our study was a cross-sectional survey, which tends to underestimate the strength of an association, if the association is causal and can be found in a cohort study. Third, we excluded those without sexual activity. As some of the sexually inactive men would have ED due to smoking, our OR could have been underestimated. Fourth, we did not record the presence of vascular disease in this study. As smoking increases the risk of vascular disease,[4] smoking in our sample might be a marker for vascular diseases rather than measuring its effect. Future study should examine it in details. Finally, we only used two questions on sexual satisfaction and erection difficulty. Although many other studies used a single question[2,25] or multiple questions[23,26] to measure ED, future studies should use the International Index of Erectile Function (IIEF) questionnaire (IIEF-15[27] or IIEF-5[17]) to allow for standardized comparison across studies.

In conclusion, this study is the first to describe the prevalence of ED in Hong Kong Chinese and to provide additional evidence that smoking can cause ED and quitting may be beneficial. Even though both the US Surgeon General's report[9] and the British Medical Association's report[8] recommended smoking cessation as a preventive strategy for reducing ED, there are lack of public health precautionary measures. The health warnings that smoking can cause impotence, which are currently used in different words in several countries including Canada (warning message: *tobacco use can make you impotent*),[28] Thailand (pack warning features: *Marlboro Man shivering in his pants*),[29] USA (warning message: *The Marlboro Man needs Viagra*),[30] European Community (warning message: *smoking may reduce the blood flow and causes impotence*)[31] and proposed by the Hong Kong Government (warning message: *smoking may cause impotence*)[32] are justifiable. As warning labels are an effective means of communicating the health effects of smoking and may serve as an effective smoking cessation intervention,[28] harder hitting health warnings should be promoted. In the service setting, smokers should be identified and informed about the association between smoking and ED, and should be provided with appropriate smoking cessation intervention. As the risk of developing ED was high among ex-smokers than nonsmokers,[25] quitting smoking might be beneficial. We suggest antismoking campaigns and health promotion message should link smoking with ED, which might discourage youth from taking up smoking habit and encourage many adult smokers to quit in order to preserve their sex lives.

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