

Smoking and depressive symptoms in Chinese elderly in Hong Kong

Lam TH, Li ZB, Ho SY, Chan WM, Ho KS, Li MP, Leung GM.
Smoking and depressive symptoms in Chinese elderly in Hong Kong.
Acta Psychiatr Scand 2004; 110: 195–200. © Blackwell Munksgaard 2004.

Objective: To examine the association between smoking and depressive symptoms among Chinese elderly in Hong Kong.

Method: Cross-sectional data on smoking and depressive symptoms from 56 167 Chinese elderly aged 65 or over in Hong Kong were analysed using logistic regression.

Results: Current smokers and former smokers were more likely to have depressive symptoms than never smokers. The adjusted odds ratios (OR) and 95% confidence interval (CI) in males and females respectively were 1.62 (1.34–1.96) and 1.43 (1.20–1.70) for current smokers, and were 1.18 (0.99–1.40) and 1.29 (1.12–1.47) for former smokers. Former smokers were less likely to have depressive symptoms than current smokers (OR = 0.80, 95% CI: 0.70–0.92).

Conclusion: Smoking is positively associated with depressive symptoms in Chinese elderly. Health care workers should be vigilant about the detection of depressive symptoms in elderly smokers.

T. H. Lam¹, Z. B. Li¹, S. Y. Ho¹,
W. M. Chan², K. S. Ho², M. P. Li²,
G. M. Leung¹

¹Department of Community Medicine, The University of Hong Kong, Pokfulam and ²Department of Health, The Government of the Hong Kong Special Administrative Region, Hong Kong, China

Key words: smoking; depression; aged; cross-sectional studies

Tai Hing Lam, Department of Community Medicine, The University of Hong Kong, 21 Sassoon Road, Pokfulam, Hong Kong.

E-mail: commed@hkucc.hku.hk

Accepted for publication March 10, 2004

Introduction

Smoking is the single most preventable cause of morbidity and mortality (1). Depression is becoming an increasingly prevalent public health problem, and most prospective studies show that depression is predictive of all-cause mortality (2).

Most studies found cigarette smoking increased the risk of major depression and depressive symptoms in adults (3–5) and in adolescents (6), but there were some conflicting results (7). Major depression or depressive symptoms were associated positively with smoking initiation, smoking continuation, nicotine dependence, and more severe levels of dependence, and negatively with smoking cessation (3–5, 8, 9).

Such evidence in the elderly population is sparse and controversial. A cross-sectional study in Finns aged 60 years or over reported a positive relationship between depression and smoking in men, and a negative relationship in women, the latter contradicted the previous findings in women (10). A 3-year prospective study of the elderly in the United Kingdom found that current smoking predicted the development of depression, while a past history of smoking did not (11). However, the relationship was not examined separately for men

and women. Another longitudinal study in the United States reported that at baseline current smokers had the highest prevalence of clinically significant depression scores (11.2%), followed by never smokers (9.6%) and former smokers (7.1%); and women, but not men, who had depressive symptoms were more likely to quit smoking than non-depressed counterparts after 3 years of follow-up (12). Their findings challenged prior reports that depressed smokers were less likely to quit smoking than non-depressed smokers. A cross-sectional study of the oldest-old Finns aged 85 years or over showed that current smoking was associated with minor depression only in women but not in men, and smoking was not related to major depression in both sexes (13). A recent cross-sectional study of Medicare members aged 65–103 years in the United States showed that smoking and depression were linked in the elderly as in younger populations (14), but the authors did not separately analyse the association for men and women.

Most studies combined former smokers with current smokers, which may bias the results because the association with depression in these two groups may be different (15). Some reported that former smokers were similar to current smokers, being

more likely to suffer from depression than never smokers (16); while others reported no significant difference between former smokers and never smokers (17). It should also be noted that the relationship between smoking and depression was based on studies on Western populations, and no study in Chinese or other Asians was reported.

Aims of the study

To examine the association of depression with current and former smoking in a large sample of Chinese elderly men and women in Hong Kong, which is the most westernized Chinese city in which the tobacco epidemic is at a more advanced stage than China mainland.

Material and methods

Sample

This cross-sectional study included all 56 167 clients aged 65 or over, who first voluntarily enrolled in one of 18 Elderly Health Centres from July 1998 to December 2000 in Hong Kong. The centres were established by the Department of Health to deliver health examination and primary health care for the aged with an annual follow-up. Structured interviews and clinical examinations were carried out by trained nurses and doctors. Additional details have been reported previously (18).

Measures

Current smokers were persons who had ever smoked an average of at least one cigarette a day for at least 1 year and who were still smoking. Former smokers were ever smokers who had stopped smoking for at least 1 year. Never smokers were those who had never smoked as many as one cigarette a day or equivalent for at least 1 year.

Depressive symptoms in the previous 7 days were measured using the Chinese version of the 15-item Geriatric Depression Scale (GDS-15) (19), with one score for each positive symptom. The GDS is a widely used screening instrument for depressive symptoms in the elderly, and it has the advantage of a simpler response format than the Center for Epidemiologic Studies Depression Scale (CES-D) and Beck Depression Inventory (BDI). Some studies have shown good correlations between the GDS and the BDI, and between both of these scales and clinical diagnoses of depression (20). The Chinese version of GDS-15, with an optimum cutoff of ≥ 8 , has good sensitivity and specificity of 0.96 and 0.88, respectively (19).

Other information collected included (i) demographic characteristics: sex, age, educational attainment; (ii) socioeconomic factors: major source of income, monthly personal expenditure, regular contact with relatives; (iii) lifestyle habits: alcohol drinking, regular physical activity, nutritional problems such as eating difficulties, unintentional weight loss during past 6 months; (iv) physical health: (a) history of diagnosis of any common chronic diseases such as hypertension, diabetes mellitus, heart disease; (b) hospitalization during the past year; (c) history of fall; (d) taking regular medication; (e) self-rated health compared with peers in similar age groups (better, normal or worse); (v) functional abilities based on Activities of Daily Living (ADL) (Katz index) and Instrumental Activities of Daily Living (IADL) scales (21); (vi) cognitive ability based on the Abbreviated Mental Test (AMT)-Modified (22); and (vii) body mass index (BMI; weight in kg divided by height in meter squared) with height and weight measured by trained nurses, and the level of obesity was determined according to the World Health Organization guidelines for the Asian Pacific population (23).

Statistical analysis

All analyses were performed using SPSS version 11.0. Differences of proportions were tested by chi-square test. Mantel-Haenszel test was used for testing linear trend of proportions. Multivariable logistic regression was used to calculate adjusted odds ratios (OR) and 95% confidence intervals (CI) of depressive symptoms for smoking categories adjusting for age, education attainment, alcohol drinking, physical activity, eating difficulty, weight loss, common chronic diseases, regular medications, admission to hospital, regular contact with relatives, monthly personal expenditure, body mass index, functional disability, cognitive impairment, and self-rated health.

Ethics approval was obtained from the Ethics Committee of the Faculty of Medicine, the University of Hong Kong. The study complied with the Declaration of Helsinki.

Results

Among the 56 167 subjects, 37 416 (66.7%) were women. The mean age (\pm SD) of men and women were 72.8 years (\pm 5.4) and 73.1 years (\pm 5.8), respectively. A comparison of our sample with the Hong Kong population census 2001 showed that women and younger-old subjects were over-represented (Table not shown) (24).

Table 1 shows that men had higher levels of educational attainment, and were more likely to smoke and drink and less likely to exercise than women. Fewer men had functional disability, cognitive impairment, and common chronic diseases. Men had better self-rated health, but were more likely to have been admitted to hospital in the previous year. Men were significantly more likely than women to be current smokers (20.3% vs. 4.0%) and former smokers (40.8% vs. 7.9%), ($P < 0.001$). The prevalence of depressive symptoms was 4.9% in men and 7.9% in women ($P < 0.001$). All the other differences between men and women were statistically significant.

Table 2 shows that the prevalence of depressive symptoms increased with intensity of smoking (never smoker, former smoker, and current smokers) for both men and women, from 3.7 and 7.4% among never smokers to 7.0 and 11.3% among current smokers. Both tests for linear trend in men and in women were statistically significant ($P < 0.001$). The prevalence of depressive symptoms among male current smokers increased with daily cigarette consumption with a statistically significant linear trend, but such an association was not observed in women.

Table 3 shows that both male and female current smokers were significantly more likely to suffer from depressive symptoms compared with never smokers (for males OR = 1.62, 95% CI: 1.34–1.96; and females OR = 1.43, 95% CI: 1.20–1.70). A significant OR of 1.29 (95% CI: 1.12–1.47) was also observed in female former smokers, but that of 1.18 (95% CI: 0.99–1.40) in male former smokers was marginally non-significant. Former smokers were less likely to have depressive symptoms than current smokers (for male former smokers OR = 0.74, 95% CI: 0.62–0.88; and for female former smokers OR = 0.91, 95% CI: 0.73–1.13), although the association was significant only in men. Overall, with men and women combined, both current and former smokers were more likely to suffer from depressive symptoms than never smokers, with significant positive linear trends between depressive symptoms and intensity of smoking (never smokers, former smokers, and current smokers). Compared with current smokers, former smokers were less likely to have depressive symptoms. For current smokers, there was a significant positive linear trend between depressive symptoms and daily cigarette consumption only in men, but not in women. We have also tested the moderating effects of alcohol, physical exercise, and BMI on the association between smoking and depressive symptoms, but none of the interaction terms was statistically significant.

Table 1. Demographic characteristics, lifestyle habits, physical health and depressive symptoms of the clients of elderly health centres in Hong Kong

Characteristics	Men		Women		P-value
	n	%*	n	%*	
Age (year)					<0.001
65–69	6128	32.7	12 377	33.1	
70–74	6393	34.1	12 036	32.2	
75–79	3875	20.7	7709	20.6	
80–84	1689	9.0	3528	9.4	
85 or over	665	3.5	1767	4.7	
Sex	18 750	33.4	37 417	66.6	
Education					<0.001
Secondary or above	5674	30.3	3628	9.7	
Primary	9703	51.7	10 891	29.1	
Uneducated, can read and write	1939	10.3	7522	20.1	
Illiterate	1434	7.6	15 376	41.1	
Smoking					<0.001
Never smoker	7292	38.9	32 954	88.1	
Current smoker	3800	20.3	1506	4.0	
Former smoker	7657	40.8	2956	7.9	
Number of cigarettes consumed daily for current smokers					<0.001
1–9	1443	39.4	937	66.4	
10–20	1623	44.3	393	27.9	
More than 20	595	16.3	81	5.7	
Alcohol drinking					<0.001
Never drinker	9489	50.6	31 979	85.5	
Ever drinker	9259	49.4	5437	14.5	
Regular exercise					<0.001
Yes	15 579	83.1	31 986	85.5	
No	3170	16.9	5430	14.5	
Weight loss of about 4.5 kg or more in past 6 months					0.005
Yes	549	2.9	945	2.5	
No	18 200	97.1	36 470	97.5	
BMI (kg/m ²)					<0.001
<18.5 (underweight)	1101	5.9	1964	5.3	
18.5–22.9 (normal weight)	6282	33.6	11 526	30.9	
23.0–24.9 (at risk of obesity)	4475	23.9	8102	21.7	
25.0 or over (obesity)	6855	36.6	15 732	42.1	
Regular contact with relatives					<0.001
Yes	18 089	96.5	36 399	97.3	
No	660	3.5	1014	2.7	
Monthly personal expenditure (US\$1 = HK\$7.80)					<0.001
<HK\$1000	2253	12.0	6389	17.1	
HK\$1000–1999	6809	36.3	14 705	39.3	
HK\$2000 or over	9688	51.7	16 319	43.6	
Any common chronic disease†					<0.001
Yes	15 062	80.3	32 574	87.1	
No	3687	19.7	4841	12.9	
Any admission to hospital last year					<0.001
Yes	2660	14.2	4762	12.7	
No	16 090	85.8	32 655	87.3	
Functional disability (ADL and IADL > 12)					<0.001
Yes	996	5.3	3285	8.8	
No	17 754	94.7	34 126	91.2	
Cognitive impairment (AMT < 8)					<0.001
Yes	378	2.0	3076	8.2	
No	18 360	98.0	34 308	91.8	
Self-rated health (compared with peers in similar age groups)					<0.001
Better	5614	29.9	7803	20.9	
Normal	12 116	64.6	26 238	70.1	
Worse	1019	5.4	3372	9.0	

Discussion

We found that both male and female current smokers were about 50% more likely to suffer from

Table 1. Continued

Characteristics	Men		Women		P-value
	n	%*	n	%*	
Depressive symptoms (GDS \geq 8)					<0.001
Yes	917	4.9	2938	7.9	
No	17 823	95.1	34 441	92.1	

Subjects with missing data were excluded.

*Except for sex, all percentages are column percentage.

†Positive if the subject has the history of any diagnosis of the following common chronic diseases: hypertension, diabetes mellitus, heart disease, musculoskeletal diseases (including osteoarthritis, rheumatoid arthritis, gout, low back pain, frozen shoulder), chronic obstructive airways disease/asthma, hypercholesterolaemia, cerebrovascular accident, cataract, glaucoma, hearing loss, urinary incontinence, fecal incontinence, mental illness, or any other specific disease.

BMI, body mass index; ADL, activities of daily living; IADL, instrumental activities of daily living; AMT, abbreviated mental test-modified; GDS, Geriatric Depression Scale.

depressive symptoms than never smokers, which was consistent with most of the previous reports (11, 12, 16, 17). Former smokers were about 20% more likely to be depressed compared with never smokers, but they were 20% less likely to have depressive symptoms than current smokers, which was consistent with most of the previous reports (8, 16, 25). Salive et al. reported that depressed female elderly smokers were more likely to quit smoking than their non-depressed counterparts, which challenged most earlier reports on younger populations that depressed smokers were less likely to quit smoking than non-depressed smokers (12). The authors argued that the effect of depression on smoking cessation might differ by age and sex. Our results on Chinese elderly contradict Salive's report, which warrant further prospective studies about the effect of depression on smoking cessation.

To the best of our knowledge, significantly positive linear trends between depressive symptoms and intensity of smoking (never smoker, former smoker, and current smoker) observed in the present study for both male and female elderly have never been reported previously. For current smokers, there was a significant positive linear trend between daily cigarette consumption and depressive symptoms only in men, but not in women. The latter could be due to the small number of women who smoked more than 10 cigarettes daily. Some authors suggested that depression might have stronger associations with nicotine dependence rather than smoking *per se* (5, 26, 27). Our finding that depressive symptoms increase with daily cigarette consumption supports this suggestion as heavy smokers are more likely to be nicotine-dependent.

The main limitation of our study was the uncertainty about the temporal sequence of smoking and depression because of the cross-sectional design. As depressive symptoms were measured during interview, whereas among former smokers, quitting had occurred at least 1 year ago, our finding that former smokers had less depression than current smokers tended to suggest that quitting might reduce depressive symptoms. However, it was possible that depressive symptoms had already existed in some smokers before they quit smoking, and those who had less depressive symptoms could have less trouble in quitting. Another limitation could be selection bias. Because the Elderly Health Centres tend to attract clients who voluntarily come to the clinics, our results may not be generalized to those who have more severe depression or are home-bounded. In a previous survey of 877 male and 734 female

	Men			Women			Total		
	Total	n	%	Total	n	%	Total	n	%
Smoking									
Never smoker	7287	267	3.7	32 928	2447	7.4	40 215	2714	6.7
Former smoker	7653	384	5.0	2948	321	10.9	10 601	705	6.7
Current smoker	3800	266	7.0	1503	170	11.3	5303	436	8.2
Test for trend									
P-value		<0.001			<0.001			0.002	
Number of cigarettes consumed daily for current smokers									
1-9	1443	88	6.1	935	113	12.1	2378	201	8.5
10-20	1623	115	7.1	392	42	10.7	2015	157	7.8
More than 20	595	58	9.7	81	8	9.9	676	66	9.8
Test for trend									
P-value		0.006			0.390			0.593	

Table 2. Prevalence of depressive symptoms by smoking behaviour in the clients of elderly health centres in Hong Kong

Subjects with missing data were excluded.

Table 3. Adjusted odds ratios (OR) 95% confidence interval (CI) for depressive symptoms for smoking and quitting in the clients of elderly health centres in Hong Kong

	Men†	Women†	Total‡
Smoking			
Never smoker	1.00	1.00	1.00
Former smoker	1.18 (0.99–1.40)	1.29 (1.12–1.47)*	1.22 (1.10–1.36)*
Current smoker	1.62 (1.34–1.96)*	1.43 (1.20–1.70)*	1.54 (1.36–1.74)*
Test for trend			
OR§ (95% CI)	1.27 (1.15–1.40)*	1.22 (1.13–1.32)*	1.24 (1.17–1.31)*
P-value	<0.001	<0.001	<0.001
Quitting			
Current smoker	1.00	1.00	1.00
Former smoker	0.74 (0.62–0.88)*	0.91 (0.73–1.13)	0.80 (0.70–0.92)*
Number of cigarettes consumed daily for current smokers			
1–9	1.00	1.00	1.00
10–20	1.22 (0.90–1.65)	0.81 (0.53–1.22)	1.06 (0.84–1.34)
More than 20	1.61 (1.10–2.34)*	0.73 (0.32–1.67)	1.34 (0.97–1.85)
Test for trend			
OR¶ (95% CI)	1.26 (1.05–1.52)*	0.83 (0.60–1.14)	1.13 (0.97–1.33)
P-value	0.015	0.251	0.117

* $P < 0.05$ considered significant.

†Adjusted for age, education attainment, alcohol drinking, physical activity, eating difficulty, weight loss, common chronic diseases, regular medication, admission to hospital, regular contact with relatives, monthly personal expenditure, body mass index, functional disability, cognitive impairment, and self-rated health.

‡Adjusted for all variables above† and sex.

§Adjusted odds ratio for depressive symptoms per unit increase in smoking categories.

¶Adjusted odds ratio for depressive symptoms per unit increase in daily cigarette consumption categories for current smokers.

Chinese elderly aged 70 or over in Hong Kong selected by stratified random sampling with a response rate of 60%, the adjusted prevalence of depressive symptoms was 29.2% for men and 41.1% for women using the same screening instrument as ours (19). These prevalence ratios appeared to be much higher than those in our study, probably because of the different sampling methods and age distributions. Some suggested the relationship between smoking and psychiatric illness is more robust in the younger age groups than in the elderly (28), hence the relationships between smoking and depression in the elderly could be underestimated because of survivor effect. The strengths of our study include the large sample size, the adjustment of more potential confounders than previous studies, and stratified analysis across sex and different smoking status. As Hong Kong is at a fairly advanced stage of the epidemic of tobacco deaths than China mainland and most Asian countries (29), we had a higher proportion of former smokers, which allowed their comparison with current and never smokers.

The mechanism behind the association between smoking and depression was hypothesized that nicotine might predispose to depression via its effect on neurotransmission pathways implicated in affect disorders (3, 9, 15, 30). A second explanation is the notion of self-medication, as smokers use nicotine to medicate their depressed mood, and the reinforcing effects of nicotine's mood-altering characteristic are especially powerful in depressed

smokers (3, 9, 15, 30). Another explanation is that the association might support the plausibility of shared genetic or environmental predispositions that independently increase the risk of having both conditions (3, 9, 15, 30). More studies about the nature and the basis of these relationships between smoking and depression are warranted.

The results of this study have identified the effects of smoking on depression, which are not commonly recognized by most smokers especially those in China and in Asia. Most smokers believe that smoking can relieve the feelings of stress (31). Our results and others should be useful to warn smokers that cigarette smoking is detrimental not only to their physical health but also to their mental health. Another implication of our finding is the importance of screening smokers' vulnerability to depression. Some former smokers could still have more depression than never smokers and their symptoms need to be monitored. On the contrary, depression has also been implicated as a reason for failure at smoking cessation (5, 9). Smoking cessation rates could be improved by incorporating depression screening procedures and antidepressant treatment if depression is detected. A few randomized clinical trials of bupropion, an antidepressant, showed positive effects on quitting in smokers with a past history of depression (32). Further, research on the efficacy of screening for depression and antidepressant treatment on quitting in elderly smoker is warranted. A follow-up of the present cohort would be useful to study the

temporal relationship between baseline depressive symptoms and future smoking status, and between baseline smoking status and future depressive symptoms in Chinese elderly.

Acknowledgements

This project was funded by the Health Care & Promotion Fund Committee in Hong Kong (grant no.: HSRCS111016). Authors wish to thank the staff of the Elderly Health Centres for their assistance in data collection and entry, and would also thank Doctor ASM Abdullah for his advice.

References

1. US Department of Health and Human Services. Health consequences of smoking cessation. A report of the US surgeon general. Washington, DC, USA: US Government Printing Office, 1990.
2. KOENIG HG, GEORGE LK, LARSON DB, McCULLOUGH ME, BRANCH PS, KUCHIBHATLA M. Depressive symptoms and nine-year survival of 1,001 male veterans hospitalized with medical illness. *Am J Geriatr Psychiatry* 1999;**7**:124–131.
3. ANDA RF, WILLIAMSON DF, ESCOBEDO LG, MAST EE, GIOVINO GA, REMINGTON PL. Depression and the dynamics of smoking: a national perspective. *JAMA* 1990;**264**:1541–1545.
4. GLASSMAN AH. Cigarette smoking: implications for psychiatric illness. *Am J Psychiatry* 1993;**150**:546–553.
5. BRESLAU N, KILBEY MM, ANDRESKI P. Nicotine dependence and major depression: new evidence from a prospective investigation. *Arch Gen Psychiatry* 1993;**50**:31–35.
6. BROWN RA, LEWINSOHN PM, SEELEY JR, WAGNER EF. Cigarette smoking, major depression, and other psychiatric disorders among adolescents. *J Am Acad Child Adolesc Psychiatry* 1996;**35**:1602–1610.
7. FRERICHS RR, ANESHENSEL CS, CLARK VA, YOKOPENIC P. Smoking and depression: a community survey. *Am J Public Health* 1981;**71**:637–640.
8. GLASSMAN AH, HELZER JE, COVEY LS et al. Smoking, smoking cessation, and major depression. *JAMA* 1990;**264**:1546–1549.
9. BRESLAU N, PETERSON EL, SCHULTZ LR, CHILCOAT HD, ANDRESKI P. Major depression and stages of smoking: a longitudinal investigation. *Arch Gen Psychiatry* 1998;**55**:161–166.
10. KIVELA SL, PAHKALA K. Relationships between health behaviour and depression in the aged. *Aging (Milano)* 1991;**3**:153–159.
11. GREEN BH, COPELAND JRM, DEWEY ME et al. Risk factors for depression in elderly people: a prospective study. *Acta Psychiatr Scand* 1992;**86**:213–217.
12. SALIVE ME, BLAZER DG. Depression and smoking cessation in older adults: a longitudinal study. *J Am Geriatr Soc* 1993;**41**:1313–1316.
13. PAIVARINTA A, VERKKONIEMI A, NIINISTO L, KIVELA SL, SULKAVA R. The prevalence and associates of depressive disorders in the oldest-old Finns. *Soc Psychiatry Psychiatr Epidemiol* 1999;**34**:352–359.
14. GREEN CA, POLEN MR, BRODY KK. Depression, functional status, treatment for psychiatric problems, and the health-related practices of elderly HMO members. *Am J Health Promot* 2003;**17**:269–275.
15. KENDLER KS, NEALE MC, MACLEAN CJ, HEATH AC, EAVES LJ, KESSLER RC. Smoking and major depression: a causal analysis. *Arch Gen Psychiatry* 1993;**50**:36–43.
16. POMERLEAU CS, ZUCKER AN, STEWART A. Patterns of depressive symptomatology in women smokers, ex-smokers, and never-smokers. *Addict Behav* 2003;**28**:575–582.
17. PEREZ-STABLE EJ, MARIN G, MARIN BV, KATZ MH. Depressive symptoms and cigarette smoking among Latinos in San Francisco. *Am J Public Health* 1990;**80**:1500–1502.
18. LI ZB, HO SY, CHAN WM et al. Obesity and depressive symptoms in Chinese elderly. *Int J Geriatr Psychiatry* 2004;**19**:68–74.
19. WOO J, HO SC, LAU J et al. The prevalence of depressive symptoms and predisposing factors in an elderly Chinese population. *Acta Psychiatr Scand* 1994;**89**:8–13.
20. ANDRESEN E, ROTHENBERG B, ZIMES JG. Assessing the health status of older adults. New York: Springer Publishing Company, Inc., 1997.
21. GALLO JJ, REICHEL W, ANDERSEN LM. Handbook of geriatric assessment, 2nd edn. Gaithersburg: Aspen Publishers, Inc., 1995.
22. SWAIN DG, O'BRIEN AG, NIGHTINGALE PG. Cognitive assessment in elderly patients admitted to hospital: the relationship between the shortened version of the Abbreviated Mental Test and the Abbreviated Mental Test and Mini-Mental State Examination. *Clin Rehabil* 2000;**14**:608–610.
23. WHO/IASO/IOTF. The Asia-Pacific perspective. Redefining obesity and its treatment. Sydney: Health Communications, 2000.
24. Population Census Office. Population census in Hong Kong main report, Vol I. People's Republic of China: Census and Statistics Department, Hong Kong Special Administrative Region, 2001.
25. GLASSMAN AH, STETNER F, WALSH T et al. Heavy smokers, smoking cessation, and clonidine: results from a double-blind, randomized trial. *JAMA* 1988;**259**:2863–2866.
26. BRESLAU N, KILBEY MM, ANDRESKI P. Nicotine dependence, major depression, and anxiety in young adults. *Arch Gen Psychiatry* 1991;**48**:1069–1074.
27. BRESLAU N, KILBEY MM, ANDRESKI P. Vulnerability to psychopathology in nicotine-dependent smokers: an epidemiologic study of young adults. *Am J Psychiatry* 1993;**150**:941–946.
28. BLACK DW, ZIMMERMAN M, CORYELL WH. Cigarette smoking and psychiatric disorder in a community sample. *Ann Clin Psychiatry* 1999;**11**:129–136.
29. LAM TH, HO SY, HEDLEY AJ, MAK KH, PETO R. Mortality and smoking in Hong Kong: case-control study of all adult deaths in 1998. *Br Med J* 2001;**323**:361–366.
30. DIERKER LC, AVENEVOLI S, STOLAR M, MERIKANGAS KR. Smoking and depression: an examination of mechanisms of comorbidity. *Am J Psychiatry* 2002;**159**:947–953.
31. PARROTT AC. Does cigarette smoking cause stress? *Am Psychol* 1999;**54**:817–820.
32. COVEY LS, SULLIVAN MA, JOHNSTON JA, GLASSMAN AH, ROBINSON MD, ADAMS DP. Advances in non-nicotine pharmacotherapy for smoking cessation. *Drugs* 2000;**59**:17–31.