

The difference in food and nutrient intake between smokers and non-smokers in an elderly Chinese population in Beijing, China

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This study examined variations in dietary intake, which were associated with differences in education, lifestyle and health behaviours of elderly men and women (n=305) in Beijing. Twenty-four-hour dietary recalls were obtained through in-home interview. Nutrient analyses of the reported diets were carried out using the Chinese nutrient data base. It was found that more men than women smoked and that alcohol consumption was associated with smoking. Smokers had a lower intake of vitamin C ($P<0.01$), carotenoids ($P<0.05$) and calcium ($P<0.05$) than non-smokers in both genders. Female smokers also showed a lower intake of fruits, vegetables and milk compared with female non-smokers.

Introduction

Smoking has been documented as a single health habit that contributes significantly to various preventable chronic diseases including cancer and heart disease. It accounts for more than 30% of all cancer deaths and 87% of lung cancer deaths in the United States¹⁸. Male smokers were at three times the risk of heart disease compared with non-smokers¹. Studies documented that the cessation of smoking is associated with a substantial reduction in risk by about 50% within 5 years^{2,3}. Apart from smoking itself, characteristics of smokers such as dietary habits, both in food pattern and in nutrient intake, may also contribute to the increased risk of diseases compared with non-smokers. Studies have demonstrated that the intake of dietary fibre and a number of minerals and vitamins, notably vitamin C, are lower in smokers than non-smokers⁴⁻⁸. However, most investigations have been conducted in populations of developed countries where the prevalence of smoking has been on the decline in recent years. Little is known about the effects of smoking on the dietary intake of individuals in the developing world, where the prevalence of smoking is noticeably higher, particularly in men⁹.

The purpose of this study was to present food and nutrient intakes in elderly smokers and non-smokers living in Beijing, China.

Subjects and methods

The study was conducted during October 1990 to February 1991 in Beijing, China. The sampling frame was the population of elderly aged 55 and above, registered as the current urban residents of city of Beijing. Three-hundred and thirty-three elderly individuals were selected from two urban districts of Beijing. Three-hundred and thirteen agreed to participate in the study. Eight individuals were excluded from the study because of a physical or mental disability. The final number of study participants, therefore, was 305; 123 men and 182 women. The participants were grouped on the basis of gender and self-reported smoking status.

Each participant provided information or medical history,

socio-economic status, health behaviour and lifestyle including smoking and drinking status during a home visit interview.

Dietary intake was estimated using the 24-hour recall method. Subjects were asked to recall all foods and beverages eaten in the last 24 hours. Interviews were conducted on weekdays. Energy and nutrient intake were calculated using the Chinese Food Composition Tables¹⁰. Anthropometric measurements including body weight, height, mid-arm circumference (MAC), triceps skinfold thickness (TSP), as well as blood glucose and blood pressure were taken at the interview.

'Smokers' were defined as current cigarette smokers, who smoked at least one cigarette per day for at least one year. Lifelong non-smokers and ex-smokers were classified together as 'non-smokers'.

Statistical analyses were carried out using SAS Statistical Software package¹¹. Data were logarithmically transformed where appropriate and the analysis of covariance (ANCOVA) was performed controlling age and education levels. Food and nutrient intakes and body composition values were presented by smoking status using absolute means.

Results

The characteristics of the study population are summarised in

Table 1. Characteristics of study participants by smoking status.

	Smokers (n=91)	Non-smokers (n=214)
Sex		
Male	52(42.7%)	71(57.3%)
Female	38(21.0%)	143(79.0%)
Age (years)	66.9 ± 7.3	67.3 ± 7.4
Alcohol drinking (g/day)		
Male	29.3 ± 48.0	5.9 ± 16.5 ^b
Female	14.7 ± 28.7	6.7 ± 20.9 ^b
Skipping breakfast	12(13.2%)	14(6.4%) ^a

Significant difference from smokers ^a $P<0.01$; ^b $P<0.001$.

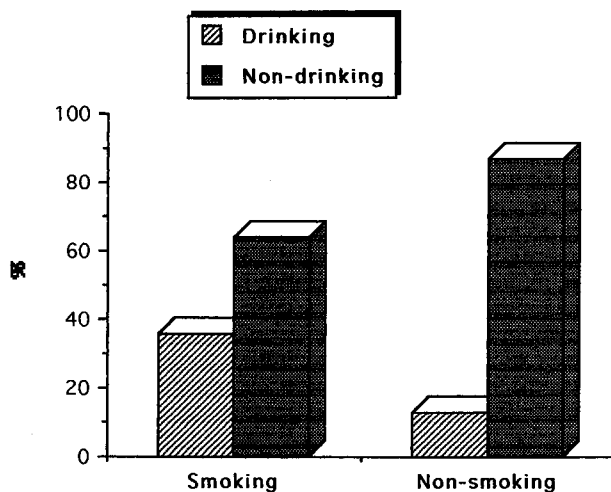


Figure 1. Percentage of alcohol drinking among smokers and non-smokers

Table 1. There were 91 (30 %) smokers and 214 (70 %) non-smokers. The prevalence of smoking was 42.7 % (53) for men and 21.0 % (38) for women. The average age was 67.4 ± 6.7 years. There was no difference in mean age between smokers and non-smokers.

Health behaviour

There were marked differences in health behaviour between smokers and non-smokers. Smokers had significantly higher intake of alcohol than non-smokers in both genders (Table 1). Among the smokers, 30 % drank alcohol regularly while only 13 % of non-smokers reported the same (Figure 1).

In addition, smoking was associated with the habit of skipping breakfast in this elderly population. Thirteen per cent of smokers reported skipping breakfast regularly, while 6 % of non-smokers reported skipping breakfast (Table 1). There was no difference in skipping breakfast between sexes in each smoking status.

Food and nutrient intake

Food was divided to seven major food groups as cereals, fruits, vegetables, meat (including pork, beef, lamb and poultry), eggs, milk (plus other dairy foods), and seafood. In women, non-smokers had a higher intake of fruits, vegetables and milk than smokers, adjusting for age and educational level (Table 2). In men, non-smokers also had a high intake of fruits and milk compared to smokers, but this was not statistically significant.

Table 3 describes the mean nutrient intake between smokers

Table 2. Daily food intakes by smoking status among females.

Food (g)	Smokers (n=38)	Non-smokers (n=143)
Cereals	249.9 ± 111.1	272.3 ± 106.8
Fruits	96.5 ± 115.1	130.1 ± 131.9 ^a
Vegetables	227.7 ± 173.5	258.7 ± 164.4 ^a
Meat	73.7 ± 60.8	89.6 ± 79.5
Eggs	34.8 ± 39.0	40.9 ± 42.1
Milk	89.2 ± 140.9	118.8 ± 139.5 ^a
Seafood	15.5 ± 40.4	17.2 ± 55.6
Alcohol	14.7 ± 28.7	6.7 ± 20.9

Significant difference from smokers ^a $P < 0.05$.

ers and non-smokers for men and women. Smokers had a significantly lower intake of vitamin C, carotenoids and calcium than non-smokers. In women, smokers had a marginally lower intake of vitamin A intake compared to non-smokers. Additionally, non-smokers in general had higher intakes of micronutrients than smokers. The total energy intake did not differ between smokers and non-smokers for both men and women.

Anthropometric measurements

Mean anthropometric measurements by smoking status are presented in Table 4. There are no differences in body weight, mid-arm circumference, and triceps skinfold thickness between smokers and non-smokers, for both men and women. In women, the smokers had a lower body mass index (BMI) than the non-smokers.

Discussion

Studies have shown that dietary intakes between smokers and non-smokers⁴⁻⁸, suggesting unhealthy dietary patterns tend to appear more frequently among the smokers. Thompson¹² summarized that cigarette smoking is associated with a high saturated fat, less polyunsaturated fat and a lower consumption of antioxidant vitamins. It has been reported that smokers generally consume less vitamin C or fruits than non-smokers. This is consistent with our findings.

A low intake of antioxidant vitamins, carotenoids and vitamin C, has been found in smokers compared to non-smokers. This possibly resulted from the fact that smokers had lower intake of vegetables and fruits which are the major source of those vitamins. These findings may be of clinical and preventive importance since epidemiological research has suggested that increased intakes of vegetables and fruits are

Table 3 Daily nutrient intakes by smoking status in females.

Nutrient	Male		Female	
	Smokers (n=53)	Non-smokers (n=71)	Smokers (n=38)	Non-smokers (n=143)
Energy (kcal)	2321.1±623.0	2332.6±689.4	1784.1±437.4	1829.2±568.9
Protein (g)	72.4±23.7	75.3±23.3	55.3±17.6	60.0±22.4
Fat (g)	89.4±35.3	85.4±34.3	69.0±25.2	72.5±29.9
Fat energy (%)	34.7±13.7	33.1±13.3	34.8±12.7	35.7±14.7
Carbohydrate (g)	286.7±97.6	297.1±100.3	232.0±71.4	232.3±86.0
Fibre (g)	101.1±5.2	10.9±5.1	8.3±4.5	8.9±6.4
Thiamin (mg)	1.2±0.5	1.3±0.6	0.9±0.3	1.0±0.4
Riboflavin (mg)	1.0±0.5	1.0±0.3	0.7±0.3	0.8±0.5
Vitamin A(RE)	189.7±110.9	197.1±108.4	172.1±135.1	221.7±485.3
Carotenoids (RE)	218.3±268.4	282.2±372.2 ^a	144.9±169.6	217.3±222.8 ^a
Vitamin C (mg)	66.8±51.9	88.4±63.3 ^b	61.7±37.1	76.4±47.6 ^b
Niacin (mg)	14.6±6.3	15.5±5.8	11.5±5.8	12.3±5.8
Calcium (mg)	441.4±253.7	500.6±261.7 ^a	369.1±260.8	449.8±363.2 ^a
Iron (mg)	18.8±6.1	20.9±9.4	15.2±5.7	15.7±5.8

Significant difference from smokers ^a $P < 0.05$; ^b $P < 0.01$.

Table 4 Anthropometric measurements by smoking status in male subjects.

Nutrient	Male		Female	
	Smokers (n=53)	Non-smokers (n=71)	Smokers (n=38)	Non-smokers (n=143)
Weight (kg)	66.4±12.9	65.2±8.8	57.8±11.7	60.3±11.5
Mid-arm circumference (cm)	27.2±3.1	27.2±2.5	27.4±3.8	28.0±3.2
Triceps skinfold (mm)	10.1±4.8	12.2±6.4	20.14± 8.9	22.7±9.1
Body mass index (kg/cm ²)	24.9±4.3	25.2±3.4	23.9±4.7	25.0±4.7 ^a

Significant difference from smokers ^a $P < 0.05$.

consistently associated with reduced risk of lung cancer and possibly other cancers as well¹³⁻¹⁶. However, the protective factor is difficult to identify and the role of β -carotene in cancer prevention remains unclear. The lower intake of vitamin C in smokers could also be of importance since this vitamin is thought to protect against cancer through reduction functions which serve both to prevent carcinogens from forming and to decrease the carcinogenic effects of certain chemical agents and through the enhancement of host resistance¹⁹. Several studies have shown that smokers have lower serum vitamin C levels than non-smokers. It has been suggested, therefore, that smokers have increased vitamin C requirements¹⁷. On the basis of this argument, the intake of vitamin C in the smokers in this study may be not high enough to counteract the increased vitamin C turnover from their smoking habit, although the mean vitamin C intake of the smokers in this study reached the requirement of Chinese RDA (60 mg/day). Researchers have estimated that a daily intake of at least 140 mg is required for smokers to offset the adverse effect of smoking on serum vitamin C levels^{9,17}.

Differences in nutrient intakes were also reflected in the various food sources that contributed most to a particular nutrient. Unlike in Western countries, where dietary vitamin C and β -carotene are mainly supplied by fruits, the major source of vitamin C in this elderly Chinese population was mainly from vegetables (77%), whereas only 21% of vitamin C was from fruits. Similarly, β -carotene was mainly derived from vegetables (78%), followed by fruits (11%). Results in Table 2 show that both vegetable and fruit intake of smokers were significantly lower than non-smokers in female subjects. Frey et al.²⁰ have suggested that observed differences in diet between smokers and non-smokers may arise from cigarette smoking directly influencing dietary choices through such mechanisms as alterations in taste or olfaction.

There are many factors that may interact with smoking effect when examining the association of dietary intake with smoking status. Social class is one of the most influential factors and was found to be inversely associated with smoking behaviour^{21,22}. In this study, the effects of smoking on nutrient intake was analysed by controlling for educational levels – an indicator of social economic status. The study results revealed that smoking status had great effect on the intake of dietary vitamin C after education level was adjusted. Alcohol consumption is another factor that may complicate the diet and smoking association. It was reported that alcohol consumption has its own independent effect on food intake and is similar to that of smoking⁷. A number of cross-sectional studies found that alcohol consumption is positively associated with smoking^{23-26,29}. The same relationship was identified by the present study. Smokers were more likely to consume alcohol than the non-smokers.

Smokers and non-smokers also differed in meal pattern. It has been reported that smokers tend to skip their breakfast more frequently than non-smokers^{27,28}. The same observation was made in this study. Among those who skipped breakfast, a majority of them were smokers. Although the mechanism for the high prevalence of skipping breakfast is not clear, it has been suggested that nicotine, known to have appetite-suppressant effects on the central nervous system activity, may be acting as a breakfast 'replacement'²⁷. The 'altered taste' due to intensive smoking is thought to result in changes in meal pattern.

Anthropometric data showed that the smokers were slimmer and had a lower BMI than the non-smokers. In spite of the fact that the energy intake was almost the same as that of non-smokers, this is in agreement with other studies⁵. The only known mechanism that can be used to explain the lower body weight and body fat among smokers is the increased metabolism theory²⁸. Metabolic rate is an important and often overlooked variable in energy imbalances. Seventy-five per cent of total energy expenditure comes in the form of metabolism³⁰. However, this study was not able to perform the dose-response analysis in order to provide conclusive evidence for the relationship between smoking and body weight.

In conclusion, this study demonstrates that current smokers have a diet that is low in micronutrient intakes, especially vitamin C and carotenoid, and a high alcohol intake. Smokers appear to have different dietary habits and health behaviour. Given the prevalence of cigarette smoking is high in this Chinese elderly population, these observations should be considered in future studies where the diet-related diseases in Chinese population.

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中國北京吸煙與不吸煙的老年人 飲食和營養素的差異

摘要

作者在北京研究了 306 位老年男女的飲食差異，這些差異與不同教育、生活方式和健康狀況是有關的，通過家訪獲得了 24 小時膳食回憶數據，然後用中國營養素數據基礎進行分析。結果發現吸煙者男多於女，飲酒與吸煙有輕度相關。吸煙男女較不吸煙男女進食維生素 C ($p < 0.01$)、葫蘆素 ($p < 0.05$) 和鈣 ($p < 0.05$) 為低。女性吸煙者進食水果、蔬菜和牛乳亦較不吸煙者為低。