Original article

Prevalence and predictors of sub-health among senior intellectuals in Beijing

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Background: The health of senior intellectuals has been thought to be less than optimal. Therefore, assessing the prevalence of sub-health in this population is important. Few studies of sub-health among senior intellectuals have been conducted. The purpose of this study is assessing the prevalence of sub-health among senior intellectuals with a view to inform subsequent health services interventions. **Methods:** 2473 senior intellectuals and 497 controls ("ordinary citizens") were interviewed using a sub-health standardized questionnaire in 2005. **Results:** The prevalence of sub-health among senior intellectuals was 37.5%, among controls 35.6% - this difference was not significantly different, there were no significant differences between the two groups ($P > 0.05$). Among senior intellectuals, females and those with low-income, who were smoking, did not get physical exercises, or were stressed at home and work, had not taken holidays, and the bad health-seeking behavior were more likely to report sub-health ($P < 0.05$). **Conclusion:** Senior intellectuals are not at higher risk of sub-health than ordinary citizens. However, the subgroup reporting poor habits were more likely to report sub-health. Healthy lifestyle behaviors should be encouraged, regular health checks should be attended and regular vacations should be encouraged.

Key Words: Senior intellectuals; Sub-health; Risk factors; Beijing

INTRODUCTION

The Sub-health concept was first introduced in the 1980s by the Soviet scholar N. Berkman. He proposed that there is a middle stage, "sub-health", between health and diseases. A person in this state often feels discomfort but there is little evidence of disease by clinical examination. If reasonably dealt with, a return to health is possible, otherwise further deterioration towards illness is likely.¹ Subsequently, scholars from various countries have studied this unhealthy, but non-disease intermediate status, and proposed such as latent disease status, sub-clinical status, sub-disease status, and minor health. Chinese scholar Wang Yuxue first proposed the concept of "sub-health" in the 1990s. Later, the Chinese Medicine Association of China issued the "Sub-health Clinical Guide for Chinese Medicine" in 2006, further clarifying the definition, scope and clinical manifestations of sub-health and its classification.²

Sub-health is a low-quality health state, which can harm people's physical, psychological and social adaptation. If they are not taken seriously, the sub-health state is very likely to be transformed into a certain disease state. Sub-health problems have seriously affected people's lives and work. It has become a universal social problem.³

Sub-health issues can also cause huge direct and indirect economic losses to individuals and the whole society.⁴ According to a global health survey conducted by the World Health Organization, really healthy in the world accounts for only 5 percent of the world's population, 20 percent are ill and the remaining 75 percent are in a sub-health condition. About 70 percent of Chinese are the sub-health population as to the report of the International Seminar of Academic Achievement. Another study found that prevalence was high and similar in different large cities: Beijing 75.1%, Shanghai 73.5% and 73.4% in Canton.² Xie conducted a sub-health

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questionnaire survey on 3,866 residents in Tianjin, and found that 66.37% of the residents were in a sub-health state.⁵ Lian conducted a survey on the sub-health distribution and its composition factors of Guangzhou residents. The results showed that the total sub-health rate of the respondents was as high as 76.74%.⁶ Qian conducted a sub-health questionnaire survey on physical examinations received by a hospital in Nanjing, Jiangsu Province. The results showed that 61.1% of the respondents were identified as sub-health status.⁷ These survey data show that the health status of Chinese residents is not optimistic. There is an urgent need to pay more attention to and improve the sub-health problems of residents.

Some studies have focused on the sub-health status of residents of different ages. Some scholars have also paid attention to the sub-health status of different occupational groups. It showed that there are differences in sub-health status in different occupations.⁸ Wang Huaiyu and others explored the sub-health status of five categories of occupational groups, including civil servants, technology practitioners, enterprises and administrators, teachers, and manual workers. The results showed that the health status of primary and secondary school teachers was relatively poor.⁹ Wang Cuifang and others paid attention to the sub-health problem of the teacher group. The research results show that the sub-health rate of the faculty and staff in more than 30 colleges and universities in Henan Province surveyed is 70.65%.¹⁰ Some studies have also paid attention to the sub-health status of medical staff. Due to the high-load working status of medical staff and the tension between doctors and patients, medical professionals are elementary to lead to sub-health status, which needs serious attention.¹¹⁻¹² In addition, the research on the sub-health of civil servants is also highly regarded by scholars.¹³⁻¹⁴ In general, regardless of occupation and age, residents are faced with high risks of sub-health. Some experts even predicted that the sub-health would be the crucial disease of our human health in the 21st century.

The Chinese government is increasingly concerned about sub-health among intellectuals, especially among senior intellectuals between 45 to 60 years. To better understand the extent and predictors of sub-health in this population, a particular survey was conducted in Beijing in 2005.

MATERIALS AND METHODS

Study population

The survey was conducted within the government and enterprises administrated by the city of Beijing in the Zhongguancun Science and Technology Park in the Haidian district.

Specifically the survey was conducted in four areas: ①in the Chinese Academy of Sciences and The National Research organizations under the jurisdiction of the various ministries or commissions of the state; ②the colleges and universities under the jurisdiction of various ministries or commissions of the state council; ③ the New high-tech enterprise Haidian Park in f Zhongguancun Science Park; ④All enterprises and institutions under the administration of Beijing city (including universities and colleges, scientific research institutions and hospital).

The study was approved by the Human Research Ethics Committee of China, and informed consent was obtained prior to collecting survey data. The study was exempted from full review by the Institutional Review Board of Duke University Medical Center.

Study Participants

The survey was conducted among both e senior intellectuals and a comparison group of ordinary citizens. Participants were characterized as senior intellectuals if they: ① were between the ages of 45 to 60 years old; ② had the senior professional designation (Associate professor, professor, or senior technical supervisor). Those with recent stressful events, acute physical illness or alcohol dependence were excluded; The ordinary control group, were of the same age group and should also not have experienced a stressful event, have physical illness or be dependent on alcohol: ①Between the ages of 45 to 60 years old; ②Recently, no stressful events, no acute body diseases, and no any alcohol dependence.

Sampling method

A list of all departments, with the total number of senior intellectual persons in each, was generated. Given differences in the proportion of senior intellectual population from departments, a probability proportional to size (PPS) sampling method was applied to achieve a representative sample.¹⁵ If an individual refused participation, an alternate subject was selected from the same department. From a list of all potential participants, r 2500 senior intellectuals were selected for this study (700 from research institutions; 500 from the colleges and universities; 300 from the new high-tech enterprises and 1000 from the; city of Beijing enterprises and institutions. Of the 2500 questionnaires distributed, 2473 were recovered (recovery rate: 98.92%).

For our control sample "ordinary citizens", we randomly selected 10 streets Beijing city and chose 2 resident committees in the street. Twenty-five individuals were selected from each resident committee for a total of 500 study subjects. Of these 497 questionnaires were returned (recovery rate 98.4%).

The sub-health standard scale and evaluations scores

A validated (REFS) 16 item scale was used to assess sub-health. The survey was established on the basis of reliable statistics and at the references of a large amount of the information both from domestic and abroad and the sub-health standard was evaluated by self-rated sub-health measurement scale version (16-questions). The sub-health scale ranges from 0 (perfect health) to 100 (very serious sub-health condition). Higher the comprehensive scores are, more serious of the sub-health condition is. i.e. 0 scores are marked the health and 100 scores are marked very serious sub-health condition and the higher scores predicting the emergence of disease. The comprehensive scores under 30 from the questionnaire table are clarified to the no sub-health status and the scores over 30 are divided into sub-health status.¹⁶

Statistical analysis

Epidata3.1 was used for data entry, checking, and processing. Consistency and range checks were made and errors were corrected before the data were exported to SPSS 11.5 for analysis. Analyses include descriptive statistics, cross-tabulations between sub-health and the various predictor variables as well as multivariate analyses using logistic regression with sub-health as dependent variable. All statistical tests were two-sided, and $P < 0.05$ indicated significant differences.

Table 1 The sub-health scale and evaluation standard

Evaluation index	Standard scores	
	yes	No
1.While getting up in the morning, too much hair drops	5	0
2. Mood is depressed, often stare blankly	3	0
3.Things planned well yesterday can't be remembered today, and this kind of situation often occurs recently	10	0
4. Fear to come into the office, think the work is boring	5	0
5. Do not want to face the colleague and superior, tend to be autistic	5	0
6. The superior has already demonstrated the discontent to you for your working efficiency dropping	5	0
7.Feeling tired and uncomfortable in the chest to breathe after working for some time	10	0
8. Working mood is unable to run high all the time, the nameless internal anger is very great, but there is no energy to break out	5	0
9. Appetite is reduced for no reason at all, there is no appetite	5	0
10. Because energy is not good, look forward to fleeing from the office early	5	0
11. Be very sensitive to pollution and noise of the city	5	0
12.No longer be long for the party among friends as before	2	0
13.Insomnia or sleep quality is very poor	10	0
14.There are obvious downward trends in body weight	10	0
15.Immunity weakens, often catch a cold	5	0
16.Sex ability weakens	10	0

RESULTS

Characteristics

Among the senior intellectuals, 1365 were male (55.2%), and 1108

female (44.8%); Most were married (93.7%). In the ordinary control group, there were 223 males (44.9%), and 274 females (55.1%); 89.3% were married (Table 2). There were fewer women among the senior intellectuals, they were less likely to be married. ($P<0.05$). There were no significant differences by age.

Table 2 The social demography characters of the senior intellectuals and the ordinary [n/(%)]

Basic characters		Senior intellectuals	Ordinary crowd group	χ^2	P
Gender	Male	1365(55.2)	223(44.9)	17.74	<0.01
	Female	1108(44.8)	274(55.1)		
Age group(years)	45~	1278(51.7)	250(50.3)	0.63	>0.05
	51~	734(29.7)	147(29.6)		
	56~60	461(18.6)	100(20.1)		
Marital status	Being married	2318(93.7)	444(89.3)	12.28	<0.01
	Not being married	155(6.3)	53(10.7)		

Sub-health

We divided the samples into two groups, i.e. non sub-health and sub-health group according to the comprehensive evaluation scores getting from the sub-health evaluation standard table. The prevalence of sub-health among senior intellectuals was 37.5%, for the comparison group 35.6%, with no significant differences between two groups ($\chi^2=0.62$, $P>0.05$). It is illustrated that the sub-health situation of the senior intellectuals is not so serious than the ordinary crowd.

Owing to the above analysis, there was obviously gender difference between the senior intellectuals and the ordinary crowd. For the reason that our health often exists the gender differences, therefore, in order to get rid of the influences on the research results causing by the different genders, we have analyzed hierarchically according to the genders.

The prevalence of sub-health among male senior intellectuals

(35.3%) among was not significantly different from that of male controls (34.1%); nor was there a difference between female senior intellectuals (40.2%), and among female controls (36.9%). No matter male or female, there are no significant differences in the distribution of the sub-health between two groups ($\chi^2=0.13$, $P>0.05$). It was indicated that removing the gender influences, there was not so big differences as compared their sub-health between two groups.

Bivariate relationships between covariates and sub-health

We analyzed the factors, that are possibly influenced the occurrences of the sub-health of the senior intellectuals (Table 3). We acknowledged that, there are significant differences of the sub-health occurrences between the different gender, ages, occupation, the average monthly incomes, physical exercises, the life stress and work pressure, the vacation regulation, the regulation of the health

examination, the health-seeking behavior ($P<0.05$).

The prevalence of sub-health was higher among females (40.2%) than among males (35.3%); the prevalence was higher among the young (38.7%) than among the old (32.1%). The prevalence among medical personnel was highest (43.3%) and teachers (41.0%), among the scientific and technical personnel (34.9%) and management personnel (32.2%). Those with higher incomes had a higher prevalence (43.7%) than those with lower incomes (25.3%).

The sub-health prevalence was higher among those having stress pressures at home and at work; the prevalence was lower among those reporting regular physical exercise and having well health-seeking behavior as well as among those taking regular vacations and receiving regular health examinations; The ratio of the sub-health is 48.9% of the people who go to hospital when their disease becomes serious. Sub-health was not related to drinking or smoking ($P>0.05$).

Table 3 The result of the univariate analysis on sub-health of the senior intellectuals [n/(%)]

Influence factors		Sub-healthy group	Non sub-healthy group	χ^2	P
Gender	male	883(64.7)	482(35.3)	6.142	0.013
	female	663(59.8)	445(40.2)		
Age group(years)	45~	784(61.3)	494(38.7)	7.007	0.030
	51~	449(61.2)	285(38.8)		
	56~60	313(67.9)	148(32.1)		
Occupation	administrator	261(67.8)	124(32.2)	15.795	0.003
	the scientific and technical personnel	579(65.1)	311(34.9)		
	teacher	530(59.0)	369(41.0)		
	medical personnel	132(56.7)	101(43.3)		
	others	44(66.7)	22(33.3)		
Average monthly incomes(Yuan)	<3000	491(56.3)	381(43.7)	25.808	0.000
	3000~	742(64.2)	414(35.8)		
	5000~	224(68.3)	104(31.7)		
	≥8000	65(74.7)	22(25.3)		
Smoking	yes	307(60.6)	200(39.4)	1.321	0.250
	no	1202(63.3)	696(36.7)		
Drinking	yes	359(63.5)	206(36.5)	0.167	0.683
	no	1146(62.6)	685(37.4)		
Regular physical exercises	yes	975(67.0)	480(33.0)	30.478	0.000
	no	571(56.1)	447(43.9)		
Life pressure	yes	757(53.1)	669(46.9)	137.483	0.000
	no	746(76.7)	227(23.3)		
Work pressure	yes	1191(59.0)	828(41.0)	57.176	0.000
	no	319(79.0)	85(21.0)		
Have health examinations in two years	yes	1333(63.8)	755(36.2)	11.120	0.001
	no	199(54.7)	165(45.3)		
Vacation	yes	823(66.1)	423(33.9)	13.450	0.000
	no	664(58.8)	466(41.2)		
Health seeking behavior (when feeling uncomfortable)	go to hospital	325(66.6)	163(33.4)	20.324	0.000
	take the medicine himself	873(62.9)	516(37.1)		
	go to the hospital when they feel badly	145(51.1)	139(48.9)		
	don't care, waiting for self-curing	189(65.2)	101(34.8)		

Multivariate relationships between covariates and sub- health

From the results of the above analysis, we found the fact that many factors can influence the occurrence of the sub-health of the senior intellectuals. In order to dominate the confounding factors that may influence the results, herewith, we will analyze the influencing factors that course the occurrences of the sub-health by the Binary

Logistic Regression Model.

With presence of sub-health as the dependent variable(no sub-health is 0, sub-health is 1), and gender, age, occupation, income, smoking, drinking, physical exercise, the life stress, work stress, whether the respondent had health examination or holiday in the last year, and health-seeking behavior as independent variables, the logistic regression model is shown in the table 4.

Table 4 The Logistic regression analysis results on sub-health of the senior intellectuals

Covariates	B	Wald	P	OR (95% CI for OR)
Gender (vs. Male)				
Female	0.302	7.543	0.006	1.352 (1.090, 1.677)
Average income per month (Yuan) (vs.<3000)				
3000-	-0.262	6.065	0.014	0.769 (0.625, 0.948)
5000-	-0.398	6.343	0.012	0.671 (0.492, 0.915)
≥8000	-0.631	4.866	0.027	0.532 (0.303, 0.932)
Smoking (vs.No)				
Yes	0.278	4.596	0.032	1.320 (1.024, 1.702)
Regular physical exercises (vs. No)				
Yes	-0.386	15.923	0.000	0.679 (0.562, 0.821)
Life pressure (vs. No)				
Yes	0.820	62.373	0.000	2.271 (1.853, 2.784)
Work pressure (vs. No)				
yes	0.666	20.001	0.000	1.947 (1.454, 2.607)
vacation (vs. No)				
yes	-0.237	5.836	0.016	0.789 (0.651, 0.956)
Health seeking behavior (vs. go to hospital)				
Take the medicine himself	0.024	0.034	0.853	1.024 (0.797, 1.315)
Go to hospital when they feel badly	0.389	4.971	0.026	1.475 (1.048, 2.076)
Don't care, waiting for self-curing	0.124	0.505	0.477	1.133 (0.803, 1.597)
Constant	-1.432	25.199	0.000	0.239

Sub-health was more common among females, those of low income, those who smoke or lack physical activity, those with life or work stress, without holidays or had bad health-seeking behavior ($P < 0.05$). There were no obvious differences by age, occupation, drinking behavior or health examinations ($P > 0.05$).

DISCUSSION

The senior intellectuals are not at higher risk of sub- health

Although it has been thought that senior intellectuals are not so healthy as other Chinese, our study suggests that there are no significant differences between the two groups.¹⁷ This research results have shown that the sub-health percentage of the senior intellectuals is 37.5%, the sub-health percentage of the ordinary crowd is 35.6%, there are no significant differences between the two groups. The results of this study are close to those of Guolin Li's research on sub-health in central area of China. The study found that 36.6% of the respondents were in sub-health status.¹⁸ However, the results of the research with Pang are quite different. The results of sub-health research on five occupational groups in six provinces and cities nationwide show that the sub-health of the respondents is only 10.51%, which may due to sub-health definition standards and evaluation tools are not the same.¹⁹

The prevalence of sub-health among teachers was 41.0%, which is lower than those reported by Cao (54.5%) and Fan (43.9%). The

prevalence among the ordinary citizens in our study is higher than that reported among the citizens at Chongwen district of Beijing (22.48%), but lower than what has been reported from Guangzhou and Wuhan. These differences may be real, but may also be influenced by different survey methods used.^{16,20-22}

The sub-health is more common among easily occurred among the crowd of the females, those with low-income, those who smoke or lack physical exercises, have stress at home or at work, do not take holidays or bad health-seeking behavior

The odds of sub-health among women are 1.35 relative to men, and those with lower income are also more likely to report sub-health, the results are similar to the results of the mass studies.^{16,20-21,23} Many other studies have shown that smoking and drinking are risk factors for poor health, which physical activity is a protective factor.²⁴⁻²⁵ In our study sub-health 1.32 times more likely in smokers than non-smokers and 0.68 times as likely among those who exercise compared to those who do not. The study also illustrated that those with more home or work stress have more

sub-health, and these routine medical checkups may reduce sub-health. Finally, those who take holidays are less likely to report sub-health.

From the study results we realized that, the good lifestyles are very important to health. The life stress and working pressure are really influential to the sub-health. The sub-health occurrence probability of the people having life stress is 2.271 times against the figures of the people of free of life stress. Meanwhile, the sub-health occurrence probability of the people with the work pressure is 1.947 times as compared to the people without the work pressure. The study illustrated that the people who had life stress and work pressure are the crowd close related to the sub-health, their sub-health risk is much more increased. The results of this study also show that, the good health seeking behavior may decline the occurrence of the sub-health. The study results also marked that the sub-health occurring probability of the people who have the holidays is 0.789 times as compared to the people without holidays. The results of the survey are also shown that the people who have enjoyed the vacations are the crowds that are uneasy to catch the sub-health.

Building up a healthy lifestyle, cultivating well life habits and behaviors, promoting the conversion of the sub-health to the health

Estimates from WHO suggest that health and longevity health and longevity are about 15% based on genetic factors, 10% on social factors, 8% on medical conditions and 60% on lifestyle factors. The sub-health state may also be a warning signal, it reminds us to pay more attention to one's health. We recommend that, to reduce their high prevalence of sub-health, senior intellectuals pay more attention to their health, improve their lifestyle and health behaviors, take holidays and try to reduce stress at home and at work.²⁶⁻²⁷

Shi Zhan preliminarily explored the health management model of sub-health populations. They suggested studied health needs in the three types of health facilities, including life-based communities, functional communities and physical examination centers by population characteristics, sub-health risk factors, and service orientation. In order to explore health management models suitable for sub-health people in China from different perspectives.²⁸ Some scholars have explored different intervention methods, such as aerobic exercises and music relaxation, which have improved health states of sub-healthy residents. The results show a positive effect on them.²⁹ In addition, health promotion lifestyles, such as self-realization, exercise, stress management, etc. is negatively correlated to sub-health state.³⁰ Some scholars have also paid attention to the improvement of sub-health in dietary adjustment and utilization of medical resources.³¹⁻³³ Future research should continue to pay attention to the improvement of sub-health status of residents.

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