Large-scale investigation on healthy status of teachers in Jiangsu Province, China

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Summary. *Objective:* We conducted this cross section study to investigate the basic health status of teachers in Jiangsu. *Design:* Healthy data of teachers from Chinese Teacher Cohort were collected by an online questionnaire and scored by a diet behavior system with maximum score of 28. *Setting:* The health of teachers is not only a sociopolitical topic, but also an interdisciplinary challenge, while few researches focused on the basic healthy information of above teacher population. *Subjects:* A total of 22,956 teachers aged 20-65 year registering in Jiangsu Province Education System completed the questionnaire survey. *Results:* The average Dietary habits score of participants was 14.0±3.0 based on a full score of 28, which is the worst. The Dietary habits score increased with age (*P*<0.001). A worse score was detected in males compared with females, in the subjects with abnormal BMI (<18.5 or >25) compared with the ones with normal BMI (18.5-23.0) (*P*<0.001), in the subjects with smoking or drinking history compared the ones without such history (both *P*<0.001), and in the subjects from South of Jiangsu (vs Central region, *P*<0.05; vs North region, *P*<0.01). A higher score (21-28 scores vs. 7-13 scores) was significantly negatively associated with high blood pressure, high serum glucose, hyperlipidemia, and sleeplessness (all *P* were <0.001), after adjusted for sex, age, smoking and drinking status. *Conclusion:* The results indicate baseline healthy data of teachers in Jiangsu, and provide reliable evidences for future feasible strategies making on prevention of occupation related chronic diseases including high blood pressure, high serum glucose, hyperlipidemia, and sleeplessness. Knowledge of healthy habits and nutritional knowledge in the teacher population needs significant improvement. Developing age/gender-specific program for promoting healthy lifestyle among teachers is recommended.

Key words: teacher population, healthy status, Dietary habits, high blood pressure, high serum glucose, hyperlipidemia, sleeplessness

Introduction

Teachers occupy a privileged position in society, playing an important role in human development and the educational process. The health of teachers is not only a sociopolitical topic, but also an interdisciplinary challenge. The current health status of teachers is not optimistic. For example Seibt *et al* reported that 18% of full time teachers had impaired mental health, 53% of full-time teachers suffered from high blood pressure, and low physical fitness was observed in only 6% of full-time teachers in an occupational health screening in German (1).

Jiangsu locates in eastern China, and plays an important role in the education system of China, containing 137 colleges and universities, 2,885 second-

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ary schools, 4,068 primary schools, and 106 special education schools. Totally 696,600 full-time teachers serve in Jiangsu education system (2). Till now, few researches focused on the basic healthy information of above teacher population, the understanding of healthy status in this population is critical for sustainable development of local education system, corresponding performance of control and prevention strategies of chronic non-infectious diseases. Therefore we conducted this cross section study by online questionnaire to investigate the basic health status of teachers in Jiangsu and its relationship with their dietary habits and knowledge reserve on health.

Materials and Methods

Study Population

Teachers certified in Jiangsu Province register in the Teacher Management Information System and are managed by Jiangsu Provincial Department of Education. We distributed a designed questionnaire to all registered teachers using the online Teacher Training Management System of Jiangsu from July 10 to Aug 20, 2015. A total of 22,956 teachers aged 20-65 year registered and completed the questionnaire survey. After excluding subjects who were pregnancy, aged less than 20 years old, and missing data, the analysis enrolled 22,179 participants, yielding a participation rate of 96.6%. All the participants were from 89 local schools in primary, high school or colleges in Jiangsu province.

Questionnaire survey

In Chinese Teacher Cohort (CTC), the standardized questionnaire was constructed based on the Adult Dietary Behavior Scale (3). The questionnaire contains: 1) basic social information: including age, gender, height, body weight, and region; 2) dietary habit including breakfast, lunch, and supper diets, and snacks, dietary structure of three meals; 3) healthy habit including smoking status, drinking status, sleep quality, exercise situation, and occupational stress; 4) healthy condition including blood pressure, blood lipid, blood glucose, chronic disease history, use habit of health care products.

In our questionnaire instructions, Using BMI scores, this study further classified the participants as

underweight (under 18.5 kg/m²), normal weight (between 18.5 kg/m² and 23.0 kg/m²), overweight (between 23.0 kg/m² and 25.0 kg/m²), obese(>25.0 kg/m²) based on the World Health Organization's classifications suggested and revised for the Asia-Pacific region (4). Hypertension was defined as blood pressure>140/90 mmHg; Hyperlipidemia was defined as serum triglyceride >1.7mmol/L; Hyperglycemia is defined as blood glucose >6.1; Sleeplessness is defined as sleep time <6 hour. The nighttime snacking was defined as any food consumption after 09:00 PM. The night snack consumption time period examined was at least a week before the subjects filled out the questionnaire.

The study was approved by IRB of local institutes of authors and informed consent was signed by each participant before questionnaire.

Dietary habits score

We analyzed the frequency of 1) breakfast, 2) coarse food grain (corn, wheat, sorghum, buckwheat, oat), 3) bean products, 4) dairy product, 5) vegetables or fruits, 6) midnight snack, and 7) fat meal taken by subjects in one week. The 7 items derived from the questionnaire survey and their respective scoring criteria are presented in Supplemental Table 1. Healthy diet behavior including breakfast, coarse food grain, bean products, dairy product, and vegetables or fruits taken contains four options, 7 times taken per week got 1 score; 4-6 times/week got 2 scores, 1-3 times/week got 3 scores, 0 times/week got 4 scores. Unhealthy diet behavior including midnight snack and fat meal taken contains four options, 7 times taken per week got 4 scores; 4-6 times/week got 3 scores, 1-3 times/week got 2 scores, 0 times/week got 1 score. The dietary habits score was defined as the summary of above 7 diet behaviors.

Statistical analysis

The total dietary habits score was a summation of scores from the 7 items and ranged from 0 to 28. A greater total score represents a dietary pattern reflective of unhealthier dietary habits. We used mean±standard deviation (SD) and frequency (percentage) to describe general characteristic. Chi-square test was analyzed to compare difference between categorical variables. The association between the various variables and total dietary habits score was evaluated through linear regres-

Table 1. Characteristics of the subjects

	Participants, n (%)	Dietary habits score	P-values
Total	22,179 (100%)	14.0±3.0	
Gender			<0.001
Male	10,547	14.7±3.0	
Female	11,612	13.5±2.9	
Age (Years)			< 0.001
<30	4,166	13.8±3.0	
30-50	16,539	14.1±3.0	
>50	1,474	13.8±2.8	
BMI (kg/m²)			<0.001
<18.5	6,601	14.4±2.9	
18.5-24.99	11,896	13.6±3.0	
25-28	3,083	14.7±2.9	
>28	599	15.3±3.2	
Smoking status			<0.001
Never	19,175	13.8±2.9	
Ever	3,004	15.2±3.1	
Drinking status			<0.001
Never	15,624	13.6±3.0	
Ever	6,555	15.0±2.8	
Region			0.087
South of Jiangsu	5,559	14.1±2.8	
Central of Jiangsu	7,604	14.0±3.0	
North of Jiangsu	9,016	14.0±3.1	

sion models. Furthermore multiple logistic regression models adjusted for gender, age, BMI, smoking status, and alcohol use were used to explore the relationship between dietary habits and human health condition. SPSS software version 19.0 (SPSS Inc, Chicago, IL, USA) were performed to analyze all statistical analyses in our study. We regarded P-value less than 0.05 as the cut-off for statistical significance.

Results

Study participant characteristics

A total of 22,179 participants comprising 11,763 female teachers (53.03%) and 10,416 male teachers (46.96%) were surveyed in this study. The mean age of participants was 37.68 years, with standard deviation of participants was 37.68 years, with standard deviation

(SD) of 8.49, and 30-50 years old people were major subjects, accounting to 74.57% (Table 1).

Of the participants, body mass index (BMI) of 12,313 subjects (55.51%) was normal (18.5-23.0), 19,847(89.48%) reported no smoke history, and 16,171(72.91%) reported no drink history. Based on a full score of 28, which is the worst score of Dietary habits, the average Dietary habits score was 14.0±3.0.

Dietary habits score analysis of the enrolled population

Table 2 presents factors associated with Dietary habits score. There was significant difference in the mean score according to age, gender, BMI, smoking and drinking status (all P<0.001). The score decreased with age (P<0.001). The male teachers had a higher score on Dietary habits than females (P<0.001). Compared with the subjects with normal BMI (18.5-23.0),

Table 2. Factors associated with Dietary habits score

Parameter	Estimate	SE	t	P value
Intercept*	14.86	0.12	16576.47	<0.001
Age	-0.03	0.003	108.08	<0.001
Gender				
Male	0	0	-	-
Female	-0.67	0.05	185.78	<0.001
BMI (kg/m²)				
<18.5	0.69	0.04	252.92	<0.001
18.5-23.0	0	0	-	-
23.0-25	0.82	0.06	203.64	<0.001
>25	1.27	0.12	114.77	<0.001
Smoking status				
Never	0	0	-	-
Ever	0.62	0.06	100.45	<0.001
Drinking status				
Never	0	0	-	-
Ever	0.80	0.05	246.05	<0.001
Region				
South of Jiangsu	0	0	-	-
Central of Jiangsu	-0.12	0.05	5.96	0.015
North of Jiangsu	-0.25	0.05	26.53	<0.001

*Never smoking: smoking <100 cigarettes in the past years; ever smoking: smoking ≥20 cigarettes in the last year; Never drinking: no drink in the past years; Ever drinking: at least once drink in the last year. *Adjusted by age, gender, BMI, smoking status, drinking status, region.*

Table 3. Relationship between dietary habits with chronic non-infectious disease

Health condition	Healthy dietary habits (7-13 points)	Average dietary habits (14-20 points)	Unhealthy dietary habits (21-28 points)	P-trend
Blood pressure High blood pressure vs normal	Reference value	1.12 (0.77, 1.61)	3.44 (1.71, 6.92)	0.001
Blood glucose >6.1 mmol vs normal	Reference value	0.88 (0.79, 0.99)	1.00 (0.67, 1.50)	<0.001
Serum lipid Hyperlipidemia vs normal	Reference value	1.26 (1.17, 1.36)	1.65 (1.28, 2.14)	<0.001
Sleeplessness <6 hour *vs* ≥6 hour	Reference value	1.69 (1.55, 1.84)	4.27 (3.35, 5.44)	<0.001

High blood pressure is defined as blood pressure >140/90 mmHg; hyperlipidemia is defined as serum lipid >1.7mmol/L. is defined as blood glucose >6.1. Sleeplessness is defined as sleep time <6 hour. Data were adjusted by gender, age, BMI, smoking and drinking status

the subjects with abnormal BMI (<18.5 or >25) had higher scores on Dietary habits (both $P<0.001$), which means a worse score on dietary habits. The increase of score is significant ($P<0.001$). The Dietary habits score of subjects with smoking or drinking was higher than that of the population without such habits (both $P<0.001$). The subjects from South of Jiangsu had a higher score on Dietary habits than the people from Central of Jiangsu and North of Jiangsu ($P<0.05$).

We further performed the association analysis between dietary habits score with chronic non-infectious diseases including hypertension, hyperglycemia sleeplessness, and hyperlipidemia after adjustment of gender, age, BMI, smoking and drinking status , and the results showed that above diseases were all significantly related to the increase trend of dietary habits score (all $P<0.01$), which indicated the important of normal diet habits on chronic non-infectious diseases incidence.

Discussion

The teaching profession is with a high prevalence of work-related stress, which may lead to sustained physical and mental health problems in teachers. Current few studies on the health status of teachers were conducted, and little was known about this baseline of such population, which is the reason why we conducted this investigation.

For all subjects, more than 50% have normal BMI

without smoking and drinking history. We found that there is a trend of healthy diet habit with age increase ($P<0.001$).

The teachers aged from 30-39 had the highest score on diet habit, which means such a group had a most unhealthy diet habit in normal life. The teachers aged from 30-39 are the rock of social, on the one side they are in the critical stage of career, facing heavy tasks in teaching and research, and on the other side they need to support the elderly and raise children. The double pressure from family and career make it difficult for the population to develop a healthy diet habit. The group with age more than 50 years old has the best diet habit compared to other age groups because the subjects have a comparably stable life, and are more concern about health. Meng *et al* investigated the sub-health status of teachers in universities and colleges, and they found that the sub-health status was lowest detected in the sub-group with more than 51 years old, which was consistent with our results (5).

Our results showed that the females had a significant better diet habit compared with that of males, who had a significant worse score on smoking and drinking status, fruits and dairy products intake, whether or not to eat breakfast (data are not shown). And we get similar results on life style between genders compared with the report from Czech (6).

Reng *et al* investigated the health literacy among urban primary school teachers in 6 provinces in China, and the results showed that the level of health living

style and behavior was 44. 94%, but there is no difference between genders, and literacy level was decreased with the age growing (7). The difference may be caused by the various sources of subjects, in our study all investigated teachers were from Jiangsu Province, which is located southeastern coastal area with developed economy and culture, while Reng *et al* investigated six provinces of China covering eastern, central and western sections, including the developed and developing area with different diet habits (7).

Compared with the subjects with normal BMI (18.5-23.0), the subjects with abnormal BMI (<18.5 or >25) had higher scores on Dietary habits (all *P*<0.001), which means a worse score on dietary habits. The increase of score is significant (*P*<0.001). The Dietary habits score of subjects with smoking or drinking was higher than that of the population without such habits (both *P*<0.001).

The subjects from South of Jiangsu had a higher score on Dietary habits than the people from Central of Jiangsu and North of Jiangsu (*P*<0.05). The analysis showed that the difference mainly came from the various dietary models and structure. It is interesting to find that the abnormal rate of fasting blood-glucose was significantly higher in people from South of Jiangsu (7.7%) compared to the people from Central of Jiangsu (3.5%) and North of Jiangsu(3.5%) (χ^2=16.03, *P*<0.01) (8), diabetes incidences are various in different regions in China, which may be related to the dietary structure.

The life style including diet habit plays a critical role in the incidence of chronic non-infectious diseases including hypertension, hyperglycemia, sleeplessness, and hyperlipidemia. The multiple logistic regression results showed that hypertension, hyperglycemia, sleeplessness, and hyperlipidemia were all significantly associated to the dietary habits in the teacher population after adjustment of gender, age, BMI, smoking and drinking status, and the unhealthy trend of diet habits is significantly associated with the increasing incidence of chronic non-infectious diseases.

In conclusion, based on our results, we recommend that the conception of healthy diet should be emphasized for teachers by promotion of healthy education programs for teachers especially for 30-39 age group and males.

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