Original Article

Salt intake assessed by spot urine on physical examination in Hunan, China

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Background and Objectives: Excessive salt intake is a major public health problem in several countries, especially in China. However, few people are aware of their salt intake. The purpose of this study is to carry out salt intake test in routine physical examination, and to explore the salt intake of different populations and their correlation with diet. **Methods and Study Design:** Spot urine sample was collected to test urinary sodium and creatinine excretions for each participant recruited from physical examinations at the Third Xiangya Hospital. The Tanaka formula was used to estimate 24-h urinary sodium excretion, which reflects salt intake. In addition to physical and laboratory examination, information including personal details, health-related habits, and self-reported disease histories was obtained from the National Physical Examination Questionnaire. **Results:** In total, 26,406 people completed the salt intake evaluation. After data cleansing, the average salt intake was 8.39±1.80 g/d. Male, middle-aged, overweight and obese, hypertensive, and dyslipidaemic populations, as well as those with non-cardiovascular diseases were more likely to have excessive salt intake. Dietary sources had an effect on salt intake. Salt intake was lower in those who consumed more milk and fruit (both p and p trend<0.01) but was higher in those who consumed more lean meat (both p and p trend<0.05), fatty meat (both p and p trend<0.01) and animal organs (both p and p trend<0.01). **Conclusions:** The salt intake in this population far surpasses the recommended amount. We strongly recommend salt intake assessment as routine test into physical examination center.

Key Words: salt intake, routine physical examination, Tanaka method

INTRODUCTION

Salt refers to sodium chloride. Sodium is an essential nutrient for organisms and is involved in many physiological processes. Too much or too little sodium intake is not good for health. A great deal of evidence has illustrated that excess sodium consumption is associated with many adverse health effects, including hypertension,[1-4] cardiovascular disease,[5,6] kidney stones,[7] gastric cancer,[8] osteoporosis[9] and other conditions. According to the Global Burden of Disease Study 2015,[10] high sodium intake in diets was listed among the top 10 risk factors contributing to global disability-adjusted life years (DALYs).

The joint World Health Organization (WHO) and Food and Agriculture Organization (FAO) report on diet, nutrition, and the prevention of chronic diseases stated that the population nutrient intake goal for salt should be <5 g/day,[11] and the Chinese Nutrition Society recommends salt intake should be no more than 6 g/day for Chinese adults.[12] However, Chinese residents traditionally have a high-salt diet. The INTERMAP research showed that the salt intake of Chinese residents was approximately 13.3±5.9 g/day.[13] In the Chinese Nutrition and Health Surveillance survey in 2010-2012, the average intake of salt was 9.6±0.3 g/d,[14] which was far above the recommended salt intake amount. In view of this, the General Office of the State Council issued a National Nutrition Plan (2017-2030) that regards "Three Reductions" as the focus of the national nutrition work over the next 13 years,

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including salt intake reduction.

The WHO suggested estimating salt intake level as the first objective in reducing salt intake.[15] Unfortunately, few people are aware of their salt intake.[16] Hence, it is very important to establish a simple, convenient and relatively accurate method of assessing salt intake.

China is entering a new era. More enterprises, institutions and individuals choose to carry out routine physical examinations every year. Physical examination plays an important role in the early diagnosis, prevention and control of chronic diseases and health promotion. According to incomplete statistics, the number of annual physical examinations in China is approximately 500 million.

To explore the feasibility of salt intake evaluation and investigate the salt intake level and correlation with food in populations undergoing routine physical examination, the Department of Health Management of The Third Xiangya Hospital jointly carried out this study with Fuwai Hospital. Based on previous PURE-China and other research,[17,18] spot urine samples were collected to test urinary sodium. The Tanaka formula was used to estimate 24-h urinary sodium excretion, which reflects salt intake, in patients undergoing physical examinations starting in August 2017.

METHODS

Study design

This is a physical examination institution-based cross-sectional study that collected information from The Third Xiangya Hospital, Changsha City. Our study utilized health physical examination registry system data without random sampling to control the potential sources of bias.

Salt intake evaluation

In general, two approaches are typically used to assess dietary sodium intake: questionnaires and urinary sodium excretion. While questionnaires are inexpensive and have a relatively low participant burden, they may not accurately capture true dietary sodium intake. The 24-h urinary sodium excretion value is the reference gold standard for sodium intake estimation, on the premise that the vast majority (90-95%) of sodium ingested is excreted in the urine.[20] However, collecting 24-h urine samples is time intensive and has a high participant burden in individuals undergoing a physical examination. Numerous studies have explored methods for estimating 24-h urinary sodium excretion from spot urine samples. These include the Kawasaki method,[21] the INTERSALT method,[22] and the Tanaka method,[19] which are the most commonly used methods at the present time. Our pilot study assessed the validity of these three methods in a Chinese sample, and the results illustrated that 24-h urinary sodium excretion could not be estimated accurately using the three equations，while the Tanaka equation provided the highest correlation coefficient and the lowest mean difference.[17,18] Therefore, we ultimately chose the Tanaka method to estimate salt intake in the current study. The calculation formula was as follows:[19] Estimated 24-h urinary sodium excretion

$=23*21.98*(\text{Naspot}/\text{Crspot}*\text{PrUCr}_{24h})^{0.392}$.

$\text{PrUCr24h}=14.89*\text{weight}+16.14*\text{height}-2.04*\text{age}-2244.45$. Naspot=spot urinary sodium (mmol/l); Crspot=spot urinary sodium (mmol/l); Salt=NaCl= Estimated 24-h urinary sodium excretion*2.55. The urinary sodium tests were examined by an ion selective electrode method. The total test cost was 26 RMB (approximately 4 dollars).

Data collection

We carried out the current study from August 2017 to November 2018 in the Department of Health Management, The Third Xiangya Hospital. The participants who visited for the purpose of health check-up programmes were included. When multiple salt intake tests were conducted for the same person, we included only the first set of results. The inclusion and exclusion criteria are shown in Supplementary figure 1. A physical examination was conducted for each participant to collect data on weight, height, systolic blood pressure (SBP), and diastolic blood pressure (DBP) by trained physicians. Some of these participants had other physical examinations and laboratory tests.

Questionnaire information

In addition to the physical and laboratory examination, the information included personal details, health-related habits, family history, and self-reported disease history (such as hypertension, diabetes, stroke, cancer, coronary artery diseases and other conditions), which were obtained from the National Physical Examination Questionnaire (see detail at Supplementary table 1). Dietary intake items were in the IXth section of the questionnaire. This questionnaire is recommend in all physical examination institution in China.

Quality assurance of the clinical and laboratory data

Physicians in the hospitals performed the physical examinations and laboratory tests. All examinations were carried out by qualified physicians after standardized training under the guidance of the Health Management Department.

Hypertension was defined as having SBP ≥140 mmHg or DBP ≥90 mmHg, having a history of hypertension, or taking antihypertensive drugs. Following Chinese Guidelines for the Prevention and Treatment of Hypertension, seated blood pressure (BP) was measured by a mercury sphygmomanometer or electronic sphygmomanometer at least two times.

Body mass index (BMI) was classified into four grades: BMI <18.5 was defined as underweight, BMI 18.5-23.9 was defined as normal weight, BMI 24.0-27.4 was defined as overweight, and BMI >27.5 was defined as obese.

All blood and urine samples were measured using a Hitachi automatic biochemical analyser 7600 and 7170. Fasting blood samples were collected to test fasting serum glucose (FSB), total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C) using LEADMAN test kits (Beijing LEADMAN Biochemical Co., Ltd. China), as well as serum creatinine (SCr) using Wako L-Type Creatinine M kits (Wako Pure Chemical Industries, Ltd. Japan).

Dyslipidemia was defined to meet any one criteria as below: 1) TC ≥6.22 mmol/L, 2) LDL-C ≥4.14 mmol/L, 3)

HDL-C <1.04 mmol/L, 4) TG ≥2.26 mmol/L, 5) having a history of dyslipidemia, or taking use of lipid-lowering medications.

Diabetes was defined to meet any one criteria as below: 1) FSB ≥7.0 mmol/L, 2) having a history of diabetes, or taking use of antidiabetic medications.

Ethics statement

All subjects gave their informed consent before they participated in the study. We acquired the available data without sensitive personal information, such as name or personal identification. This study complied with the Declaration of Helsinki, and we guaranteed that the data would be used only for scientific research. The Institutional Review Board (IRB) of The Third Xiangya Hospital, Central South University (No. 2018-S393), approved the study. The IRB membership included community representatives and medicine and law experts.

Statistical analyses

All statistical analyses were performed with SAS 9.4 (SAS Institute Inc., Cary, North Carolina, USA). Continuous variables are shown as the mean ± standard deviation (SD), and categorical variables are shown as percentages (%) and numbers (n). Differences across groups were compared by analysis of variance (ANOVA)/nonparametric tests and x^2 tests, as appropriate. All *p* values were 2-tailed.

RESULTS

General characteristics

In total, 27,837 participants completed salt intake evaluations from the Department of Health Management, The Third Xiangya Hospital, over nearly 16 months. According to the annual physical examinations of 100,000 people, approximately 1/4 of individuals are concerned about their salt intake level and want to know their salt intake through testing.

A total of 1,265 of these examinations were deleted because the data were from the same person. A total of 26,572 participants were included in the study. Data from the 26,406 participants between 18 and 80 years old were collected for further analysis. We organized the data to ensure the validity and veracity of the results. Participants who had outliers (salt intake <2.0 g/d and >20.0 g/d) were removed. Ultimately, 26,385 participants were included in the analyses (Supplementary Figure 1). A total of 2,308 participants failed to complete the questionnaire. Eight participants lacked a BP record. Ninety, seventy-three and seventy participants failed to complete the FBS, SCr and blood lipids tests, respectively.

The characteristics of the study participants are shown in Table 1. The average age was 43.6±11.8. Males constituted 57.1% of the participants. The average BMI was 24.2±3.3 kg/m^2, 24.3% of the participants were smokers, and 31.4% were current alcohol users.

Salt intake levels in individuals undergoing physical examinations

The estimated salt intake level was 8.39±1.80 g/d in the population surveyed. With salt intake of no more than 6.0 g/d as the criterion, 24,054 (91.2%) of the population exceeded the standard. A total of 63 (0.2%) persons had salt intake levels ≤3.0 g/d, while 9,330 (35.4%) individuals had salt intake higher than 9.0 g/d, and 696 (2.6%) of these individuals had salt intake higher than 12.0 g/d.

Salt intake in males was significantly higher than that in females (8.39±1.80 and 8.17±1.80 g/d, respectively, $p<0.01$). Salt intake also differed by age group. Salt intake levels were 8.27±1.85, 8.44±1.77, and 8.15±1.89 g/d for people younger than 35, 35-65 and ≥65 years old, respectively ($p<0.01$).

Salt intake in different sexes and ages is shown in Figure 1A. Male salt intake decreased gradually with increasing age (8.62±1.81, 8.55±1.76, and 8.20±1.83 g/d for people <35, 35-65 and ≥65 years old, respectively, $p<0.01$). Salt intake levels were higher in middle-aged women (8.29±1.78 g/d) than young females (7.80±1.81 g/d, $p<0.01$) and older females (8.07±1.97 g/d, $p<0.01$). Salt intake was significantly lower in females under 35

Table 1. Characteristics of all participants and the excessive and normal salt intake subgroups[†]

Characteristics	Total (N=26,363)	Intake >6 g/d (n=24,054)	Salt intake ≤6 g/d (n=2,331)	*p* value[‡]
Age (years)	46.3±11.8	46.4±11.7	45.8±13.1	<0.05
BMI (kg/m^2)	24.2±3.3	24.3±3.3	22.9±3.3	<0.01
SBP (mmHg)	123.1±16.1	123.4±16.0	119.4±15.9	<0.01
DBP (mmHg)	75.3±11.4	75.5±11.4	73.0±11.2	<0.01
FSB (mmol/L)	5.59±1.35	5.59±1.30	5.66±1.83	0.069
Scr (mmol/L)	73.1±20.6	73.0±17.6	74.3±40.0	0.11
TC (mmol/L)	5.03±0.97	5.04±0.97	4.92±1.02	<0.01
TG (mmol/L)	1.82±1.71	1.84±1.74	1.60±1.30	<0.01
LDL-C (mmol/L)	2.85±0.83	2.86±0.83	2.79±0.86	<0.01
HDL-C (mmol/L)	1.36±0.31	1.35±0.31	1.40±0.33	<0.01
Male sex, % (n)	57.1 (15,064)	58.0 (13,952)	47.7 (1,112)	<0.01
Current alcohol users, % (n)	31.4 (7,560)	31.9 (7,006)	26.0 (554)	<0.01
Current smokers, % (n)	24.3 (5,831)	24.0 (5,260)	26.4 (563)	<0.05

BMI: body mass index: SBP: systolic blood pressure: DBP: diastolic blood pressure: FSB: fasting serum glucose: Scr: serum creatinine: TC: total cholesterol: TG: triglycerides: LDL-C: low-density lipoprotein cholesterol: HDL-C: high-density lipoprotein cholesterol.

[†]The sum may not always add up to the total because of missing values.

[‡]*p* values were obtained using t-tests or nonparametric tests depending on the analysis of variance for continuous variables and the chi-square test for categorical variables.

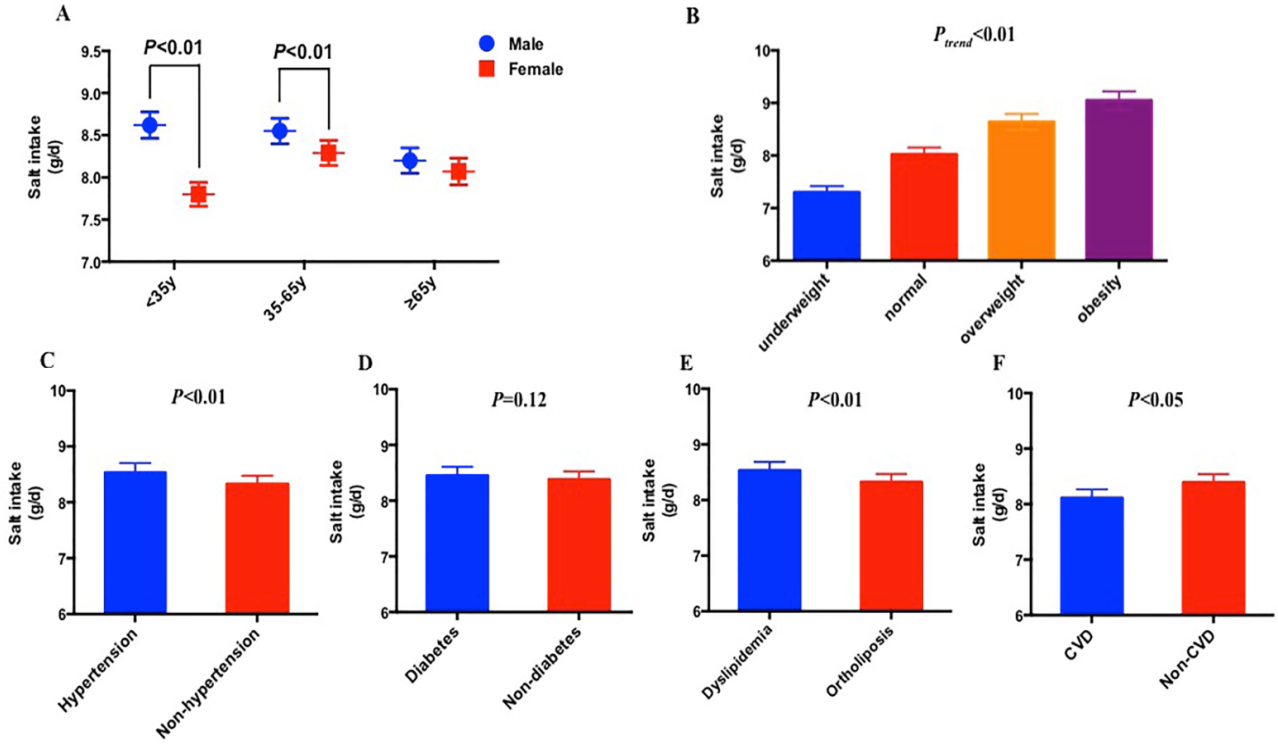

Figure 1. Salt intake levels in different groups. (A) Salt intake in different sexes populations under 35, 35-65 and over 65 years old. (B) Salt intake in the underweight, normal weight, overweight and obese populations (both p and p trend<0.01). (C) Salt intake in the hypertension and non-hypertension populations (p<0.01). (D) Salt intake in the diabetes and non-diabetes populations (p=0.12). (E) Salt intake in the dyslipidaemia and non-dyslipidaemia populations (p<0.01). (F) Salt intake in the cardiovascular disease and non-cardiovascular disease populations (p<0.01).

and 35-65 years old than that the same age range in males (p<0.01). However, there was no difference between males and females in the older age groups.

Salt intake levels in chronic disease populations

Salt intake was closely related to body weight, as shown in Figure 1B. Salt intake decreased gradually with increasing BMI (7.30±1.67, 8.02±1.69, 8.64±1.77 and 9.05±1.88 g/d in the underweight, normal weight, overweight and obese populations, respectively, both p and p trend<0.01).

The hypertensive population had a higher salt intake level than the nonhypertensive population (8.54±1.92 vs 8.33±1.75 g/d, respectively, p<0.01), as shown in Figure 1C.

There was no significant difference in salt intake between the diabetic and nondiabetic populations (8.45±1.89 vs 8.38±1.79 g/d, respectively, p=0.12), as shown in Figure 1D.

The population with dyslipidaemia had a higher salt intake level than the ortholiposis population (8.53±1.81 vs 8.32±1.79 g/d, respectively, p<0.01), as shown in Figure 1E.

The population with cardiovascular disease had a lower salt intake level than the non-cardiovascular disease population (8.11±1.93 vs 8.39±1.80 g/d, respectively, p<0.05), as shown in Figure 1F.

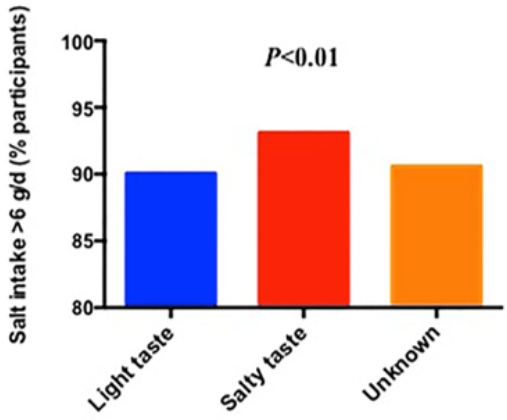

Figure 2. The percentage of people with salt intake levels over 6 g/d in the different taste groups.

The association of self-perception on taste with salt intake test results

The participant perception of lightly or strongly salted was collected by questionnaire. In total, 10,384 (39.4%) prefer lightly salted food, and 6,262 (23.7%) found it difficult to judge the saltiness of their food, while only 7,431 (28.2%) perceive their food as strongly salty. Furthermore, there was a large discrepancy between actual test results and self-perception, as shown in Figure 2. In the subgroup who thought they preferred lightly salted food, up to 9,351 (90.1%) participants have excessive salt intake of >6 g/day, 5,673 (90.6%) participants who could not judge how salty their food was had excessive salt intake of >6 g/day, while 6,919 (93.1%) participants who preferred heavily salted food actually had excessive salt intake.

The influence of dietary intake habits on salt intake

From the perspective of the food sources, shown in Fig-

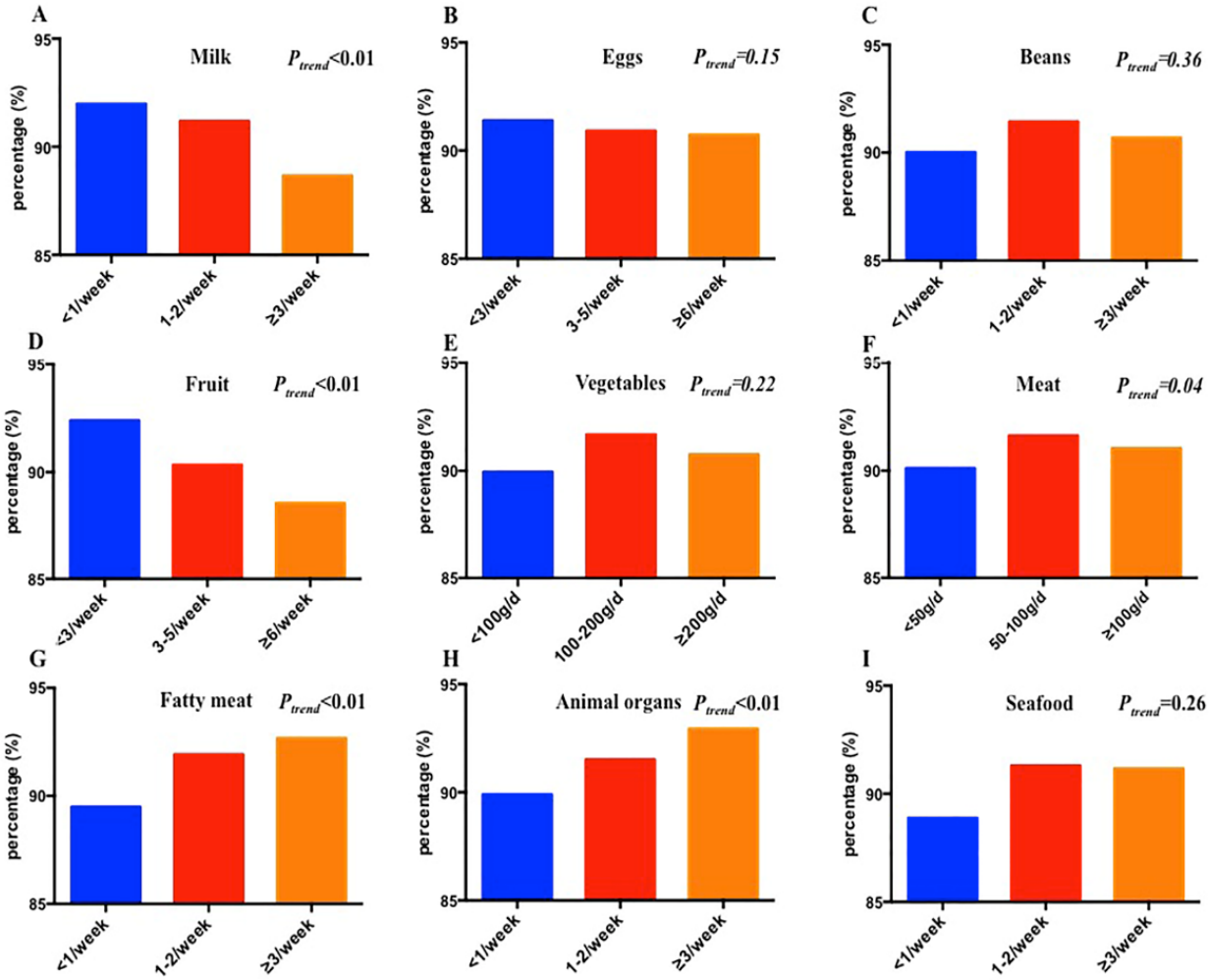

Figure 3. The percentage of people with salt intake levels over 6 g/d in the different food intake groups. (A) The percentage of people with salt intake over 6 g/d in different milk intake groups (both *p* and *p* trend<0.01). (B) The percentage of people with salt intake over 6 g/d in different egg intake groups (*p*=0.35, *p* trend=0.15). (C) The percentage of people with salt intake over 6 g/d in different bean intake groups (*p*=0.06, *p* trend=0.36). (D) The percent of people with salt intake over 6 g/d in different fruit intake groups (both *p* and *p* trend<0.01). (E) The percentage of people with salt intake over 6 g/d in different vegetable intake groups (*p*=0.01, *p* trend=0.22). (F) The percentage of people with salt intake over 6 g/d in different meat intake groups (*p*<0.01, *p*trend=0.04). (G) The percentage of people with salt intake over 6 g/d in the different fat meat intake groups (both *p* and *p* trend<0.01). (H) The percentage of people with salt intake over 6 g/d in different animal organ intake groups (both *p* and *p* trend<0.01). (I) The percentage of people with salt intake over 6 g/d in different seafood intake groups (*p*=0.01, *p* trend=0.26).

ure 3, those with less milk and fruit intake were more likely to have excessive salt intake of >6 g/day (both *p* and *p* trend<0.01), while frequent lean meat (both *p* and *p* trend<0.05), fatty meat (both *p* and *p* trend<0.01) and animal organ (both *p* and *p* trend<0.01) eaters have excessive salt intake. No significant relationship was observed between excessive salt intake and consumption of vegetables, eggs, seafood or beans.

DISCUSSION

The current study explores the feasibility of salt intake assessment in individuals undergoing physical examinations. The preliminary data show that the salt intake in this population far surpasses the recommended levels in Hunan Province. Male, middle-age, overweight and obese, hypertensive, and dyslipidaemic populations and those with non-cardiovascular disease are more likely to have excessive salt intake. Dietary sources affected salt intake, which was lower in those who consumed more milk and fruit but higher in those who consumed more meat (lean meat and fatty meat) and animal organs.

China is a country with high salt consumption.[23] Both INTERSALT and INTERMAP, two international epidemiological studies, showed that the highest mean urinary sodium excretion was recorded in China (Tianjin and Beijing) using the 24-h urine collection method.[1,13] Recently, a PURE study involving 12 administrative regions in China between 2005 and 2009 indicated that salt intake was approximately 14.3 g using a single fasting urine specimen, which was much higher than that in other PURE countries.[4,5] The SMASH study in Shandong Province indicated that individual dietary salt intake was 14.6 g/day using three-day dietary recalls and weighing methods.[24] In the current study, the salt intake was 8.39±1.80 g/day, which was much lower than that in the previous studies. This may be due to a number of factors: (1) Salt intake is higher in the north and lower in the south of China.[25] (2) Most of those receiving physical examinations were urban residents, and the salt intake of urban populations is usually lower than that of rural populations.[14] (3) Assessment methods were different. The Tanaka method we used underestimates salt intake in the

Chinese population.[16] If we conduct the analysis using the Kawasaki method, the results would be 10.9g/d (in approximately 10% of the urine sample was not from the second urine of the morning).

Male and middle-aged populations have higher levels of salt intake, which is consistent with a previous study.[16] Moreover, we found a significant correlation between BMI and salt intake, which consistent with previous studies.[26,27] A higher quantity of food intake may cause this result. Moreover, the extra fluid retention along with higher levels of salt intake may contribute to an increase in body weight.[28] Similar to previous reports, patients with hypertension had higher salt intake.[29] Further study will be carried out based on physical examination data. For example, we will further analyse the association of BP with estimated urinary sodium and potassium excretion levels and their ratio in hypertensive, normotensive, and hypotensive patients. The SMASH study, with a survey area located in northern China, demonstrated that increased urinary sodium excretion was associated with high triglyceride levels.[30] Our study also found a similar result, possibly due to participants with high sodium intake consuming more energy and unhealthy food.[31] Meanwhile, the results of both our research and the SMASH[30] indicated that there was no significant association between urinary sodium excretion and elevated fasting glucose levels. Moreover, our results showed that the population with cardiovascular disease had a lower salt intake level. Previous cohort studies demonstrated a J-shaped association with sodium intake and cardiovascular events.[20,32,33] It is clear that more than the recommended amount of salt intake is not conducive to cardiovascular health. Our observational result may be because this was a cross-sectional study or because cardiovascular disease patients have better health education available to them and greater adherence to dietary recommendations.

The relationship between different diets and salt intake was also analysed. The INTERMAP study indicated that the most (75.8%) salt was added during home cooking in China.[13] Table salt is not usual in China. A recent survey in Beijing also showed that cooking salt currently remains the major source of salt intake.[16] As shown in our results, increased intake of unprocessed foods such as milk and fruits is associated with a lower level of salt intake. Lean meat, fatty meat and animal organs are usually processed with high salt, so increased intake of these foods significantly increases salt intake. Other foods are processed in a variety of ways in China, and there is no significant correlation with salt intake.

In recent years, the Chinese government has issued a large number of salt restriction spoons[34] and promoted the use of low-sodium salts to carry out the salt restriction programme,[35,36] but the current results show that salt intake levels remain high among people in China. The lack of an effective method to evaluate an individual's owns salt intake is the main reason for this lack of change. In the current study, there was a great discrepancy between the perceptions of the subjects themselves and the actual detected levels of salt intake. More than 90% of those who thought they prefer lightly salted food actually had excessive salt intake. Therefore, we strongly recommend salt intake assessments in other hospitals since many people may not know they are consuming more than the recommended daily salt intake.

In short, the current study is the first to explore the feasibility of salt intake assessment in individuals undergoing physical health examinations. On the one hand, our salt intake assessment will help subjects to understand their salt intake level relatively accurately and will theoretically help them to control their salt intake, which will be assessed in future research. On the other hand, based on the large sample of physical examination data, we can further explore the correlations between salt intake and related conditions, such as BP conditions, carotid intima-media thickness, and cardiovascular events. Particularly in China, iodine is added to salt. Our preliminary data analysis shows that the incidence of thyroid nodules is higher in people with excessive salt intake.

There are still many shortcomings of this research: 1) This study did not use the gold standard of the 24-h urine test to evaluate salt intake. However, we think that the methods used in this study are more accurate than self-report data. 2) Our population participated voluntarily in a salt intake assessment, and this subgroup of people may not represent the overall population undergoing routine health examination. 3) The dietary assessment was based on a questionnaire, which may introduce some bias.

Conclusions

In conclusion, the salt intake level of the individuals receiving physical examinations in Hunan far surpasses the recommended amount, especially among males and middle-aged populations. Salt intake was lower in those who consumed more milk and fruit but was higher in those who consumed more meat and animal organs. Considering that excessive salt intake seemed to be associated with overweight and obesity, hypertension, and hyperlipidemia, we strongly recommend salt intake assessment as routine test in physical examination centers.

AUTHOR DISCLOSURES

The authors declare no conflict of interest.
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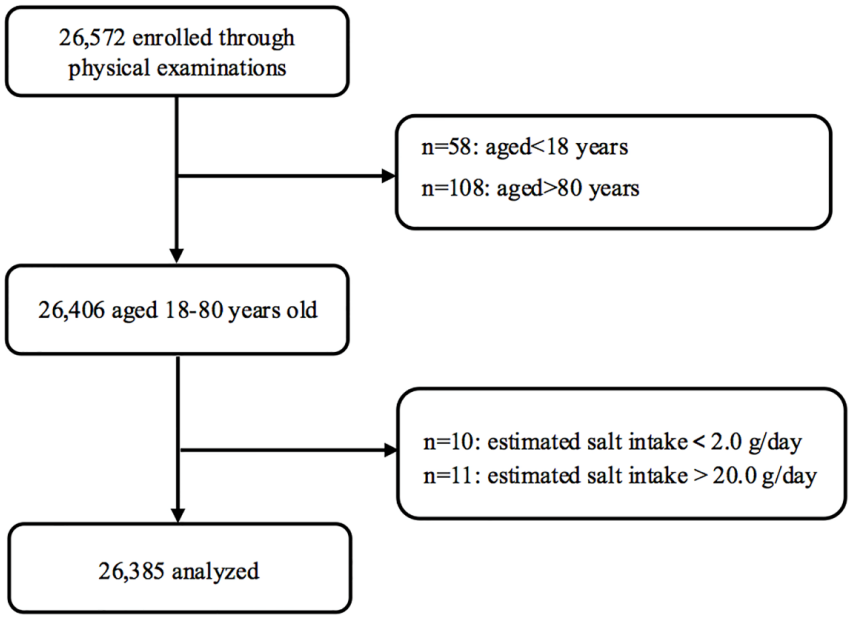
REFERENCES

1. Stamler J. The INTERSALT study: Background, methods, findings, and implications. Am J Clin Nutr. 1997;65:626S-42S.
2. Khaw KT, Barrett-Connor E. The association between blood pressure, age, and dietary sodium and potassium: A population study. Circulation. 1988;77:53-61.
3. Cutler JA, Roccella EJ. Salt reduction for preventing hypertension and cardiovascular disease: A population approach should include children. Hypertension. 2006;48: 818-9.
4. Mente A, O'Donnell M, Rangarajan S, McQueen M, Dagenais G, Wielgosz A et al. Urinary sodium excretion, blood pressure, cardiovascular disease, and mortality: a community-level prospective epidemiological cohort study. Lancet. 2018;392:496-506.
5. Yin L, Deng G, Mente A, Sun Y, Liu X, Zhang X et al. Association patterns of urinary sodium, potassium, and their ratio with blood pressure across various levels of salt-diet regions in China. Sci Rep. 2018;8:6727.

6. Mozaffarian D, Fahimi S, Singh GM, Micha R, Khatibzadeh S, Engell RE, Lim S, Danaei G, Ezzati M, Powles J; Global Burden of Diseases Nutrition and Chronic Diseases Expert Group. Global sodium consumption and death from cardiovascular causes. N Engl J Med. 2014;371: 624-34.
7. Cirillo M, Laurenzi M, Panarelli W, Stamler J, on behalf of the Gubbio Population Study Research Group. Urinary sodium to potassium ratio and urinary stone disease. The Gubbio Population Study Research Group. Kidney Int. 1994; 46:1133-9.
8. Tsugane S, Sasazuki S, Kobayashi M, Sasaki S. Salt and salted food intake and subsequent risk of gastric cancer among middle-aged Japanese men and women. Br J Cancer. 2004;90:128-34.
9. Martini LA, Cuppari L, Colugnati FA, Sigulem DM, Szejnfeld VL, Schor N, Heilberg IP. High sodium chloride intake is associated with low bone density in calcium stone-forming patients. Clin Neprol. 2000;54:85-93.
10. GBD 2015 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risk, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016;388: 1659-724.
11. World Health Organization. Diet, Nutrition, and the Prevention of Chronic Diseases: Report of a Joint WHO/FAO Expert Consultation. Geneva, Switzerland: World Health Organization; 2003. p. 85.
12. Chinese Nutrition Society. Dietary Guidelines for Chinese Residents 2007. Lhasa, China: The Peoples Press of Tibet; 2008. p. 18.
13. Anderson CA, Appel LJ, Okuda N, Brown IJ, Chan Q, Zhao L et al. Dietary sources of sodium in China, Japan, the United Kingdom, and the United States, women and men aged 40 to 59 years: The INTERMAP study. J Am Diet Assoc. 2010;110:736-45.
14. Yu D, He Y, Fang H, Xu X, Wang X, Yu W, Jia F, Yang X, Ma G, Zhao L. Salt intake among Chinese adults in 2010-2012. Zhonghua Yu Fang Yi Xue Za Zhi. 2016;50:217-20. (In Chinese)
15. World Health Organization. Reducing Salt Intake in Populations: Report of a WHO Forum and Technical Meeting. Paris, France: World Health Organization; 2006. pp. 6-11.
16. Zhao F, Zhang P, Zhang L, Niu W, Gao J, Lu L, Liu C, Gao X. Consumption and sources of dietary salt in family members in Beijing. Nutrients. 2015;7:2719-30.
17. Peng Y, Li W, Wang Y, Chen H, Bo J, Wang X, Liu L. Validation and assessment of three methods to estimate 24-h urinary sodium excretion from spot urine samples in Chinese Adults. PLoS One. 2016;11:e0149655.
18. Zhang Y, Peng Y, Li K, Peng X. Assessing whether a spot urine specimen can predict 24-h urinary sodium excretion accurately: a validation study. J Hypertens. 2019;37:99-108.
19. Tanaka T, Okamura T, Miura K, Kadowaki T, Ueshima H, Nakagawa H, Hashimoto T. A simple method to estimate populational 24-h urinary sodium and potassium excretion using a casual urine specimen. J Hum Hypertens. 2002;16: 97-103.
20. O'Donnell MJ1, Mente A, Smyth A, Yusuf S. Salt intake and cardiovascular disease: why are the data inconsistent? Eur Heart J. 2013;34:1034-40.
21. Kawasaki T, Itoh K, Uezono K, Sasaki H. A simple method for estimating 24 h urinary sodium and potassium excretion from second morning voiding urine specimen in adults. Clin Exp Pharmacol Physiol. 1993;20:7-14.
22. Brown IJ, Dyer AR, Chan Q, Cogswell ME, Ueshima H, Stamler J, Elliott P; INTERSALT Co-Operative Research Group. Estimating 24-hour urinary sodium excretion from casual urinary sodium concentrations in Western populations: the INTERSALT study. Am J Epidemiol. 2013; 177:1180-92.
23. Yan L, Guo X, Wang H, Zhang J, Tang J, Lu Z, Cai X, Liu L, Gracely EJ, Ma J. Population-based association between urinary excretion of sodium, potassium and its ratio with albuminuria in Chinese. Asia Pac J Clin Nut.r. 2016;25: 785-97.
24. Lu Z, Zhang X, Li J, Zhang J, Zhao W, Ma J, Guo X, Yan L, Chu J, Xu A. Dietary sodium intakes and resources among residents in Shandong province. Zhonghua Yu Fang Yi Xue Za Zhi. 2014;48:7-11. (In Chinese)
25. Kesteloot H, Huang DX, Li YL, Geboers J, Joossens JV. The relationship between cations and blood pressure in the People's Republic of China. Hypertension. 1987;9:654-9.
26. Larsen SC, Angquist L, Sorensen TI, Heitmann BL. 24 h urinary sodium excretionand subsequent change in weight, waist circumference and body composition. PLoS One. 2013; 8:e69689.
27. Ma Y, He FJ, MacGregor GA. High salt intake: independent risk factor for obesity? Hypertension. 2015;66:843-9.
28. Bankir L, Perucca J, Norsk P, Bouby N, Damgaard M. Relationship between sodium intake and water intake: the false and the true. Ann Nutr Metab. 2017;70(Suppl 1):51-61.
29. Zhang J, Guo X, Lu Z, Tang J, Li Y, Xu A, Liu S. Cardiovascular diseases deaths attributable to high sodium intake in Shandong Province, China. J Am Heart Assoc. 2019;8:e010737.
30. Ge Z, Guo X, Chen X, Tang J, Yan L, Ren J, Zhang J, Lu Z, Dong J, Xu J et al. Association between 24 h urinary sodium and potassium excretion and the metabolic syndrome in Chinese adults: the Shandong and Ministry of Health Action on Salt and Hypertension (SMASH) study. Br J Nutr. 2015; 113:996-1002.
31. Navia B, Aparicio A, Perea JM, Pérez-Farinós N, Villar-Villalba C, Labrado E, Ortega RM. Sodium intake may promote weight gain; results of the FANPE study in a representative sample of the adult Spanish population. Nutr Hosp Nutr Hosp. 2014;29:1283-9.
32. O'Donnell MJ, Yusuf S, Mente A, Gao P, Mann JF, Teo K et al. Urinary sodium and potassium excretion and risk of cardiovascular events. JAMA. 2011;306:2229-38.
33. Taylor RS, Ashton KE, Moxham T, Hooper L, Ebrahim S. Reduced dietary salt for the prevention of cardiovascular disease: a meta-analysis of randomized controlled trials (Cochrane review). Am J Hypertens. 2011;24:843-53.
34. Dong W, Lv W, Kang M, Du Y, Ma H, Zhang L, Zeng G. Current use of salt-restriction-spoon among urban residents in Beijing in 2011. Chin J Prev Med. 2011;45:952-3. (In Chinese)
35. China Salt Substitute Study Collaborative Group. Salt substitution: A low-cost strategy for blood pressure control among rural Chinese. A randomized, controlled trial. J Hypertens. 2007;25:2011-8.
36. Mu J, Liu Z, Liu F, Xu X, Liang Y, Zhu D. Family based randomized trial to detect effects on blood pressure of a salt substitute containing potassium and calcium in hypertensive adolescents. Am J Hypertens. 2009;22:943-7.



Supplementary figure 1. Flow chart of participant selection.

Supplementary table 1. National Unified Physical Examination Questionnaire

National Unified Physical Examination Questionnaire

1. Basic Information
   Nationality □ Han □ Ethnic minority
   Birthplace _____County _____City _____Province
   Marital status □ Unmarried □ Married (including cohabitation) □Widowed □ Divorced □ Others
   Education level
   □ Primary school and below □ Middle school □ High school □ Secondary vocational or technical school □ Undergraduate/junior college □ Postgraduate and above
   Occupation
   □ National civil servant □ Technical professional □ Office clerk □ Enterprise manager □ Worker □ Farm □ Student □ Serviceman □ Freelance □ Self-employed □ Unemployed □ Retired □ Others
   Types of medical insurance
   □ Medical insurance for urban employees □ Medical insurance for urban residents □ New rural cooperative medical insurance
   □ Others __ □ None
2. Health history –family history
   2.1 Do your parent, brothers or sisters suffer from clearly-diagnosed diseases? A. Yes B. No
   2.1.1 Please select the name of disease: (multiple choices)
   A. Hypertension B. Stroke C. Coronary heart disease D. Peripheral vascular disease E. Cardiac failure F. Diabetes G. Obesity H. Chronic renal disease I. Chronic obstructive pulmonary disease J. Osteoporosis K. Gaut L. Malignant tumor M. Rheumatic immunologic disease N. Mental disease O. Others
   2.2 Please identify the name of malignant tumor your family suffer
   A. Lung cancer B. Liver cancer C. Gastric cancer E. Esophageal cancer F. Colorectal cancer G. Leukemia H. Brain tumor I. Breast cancer J. Pancreatic cancer K. Bone cancer L. Bladder cancer M. Nasopharynx cancer N. Cervical cancer O. Uterus cancer P. Prostatic cancer Q. Ovarian cancer R. Thyroid cancer S. Skin cancer T. Others
   2.3 Do your father before 55 or your mother before 65 suffer from the above diseases? A. Yes B. No
3. Health history –present history
   3.1 Do you suffer from clearly-diagnosed diseases or feel abnormal? A. Yes B. No
   3.1.1 Please identify the name of specific diseases or abnormal changes: (multiple choices)
   A. Hypertension B. Stroke C. Coronary heart disease D. Peripheral vascular disease E. Diabetes F. Fatty liver G. Chronic kidney disease H. Chronic gastritis or gastric ulcer I. Helicobacter pylori infection J. Gastric polyp K. Polyp of intestine L. Chronic obstructive pulmonary disease M. Asthma N. Chronic pancreatitis O. Osteoporosis P. Chronic hepatitis or liver cirrhosis Q. Chronic cholecystitis, cholelithiasis R. Tuberculosis S.Rheumatoid arthritis T. Prostatitis or prostatic hyperplasia U. Chronic breast disease V.human papilloma virus (HPV) infection W. Dyslipidemia X. Elevation of uric acid Y. Malignant tumor Z. Others
   3.2 Please identify the name of malignant diseases you suffer：
   A. Lung cancer B. Liver cancer C. Gastric cancer E. Esophageal cancer F. Colorectal cancer G. Leukemia H. Brain tumor I. Breast cancer J. Pancreatic cancer K. Bone cancer L. Bladder cancer M. Nasopharynx cancer N. Cervical cancer O. Uterus cancer P. Prostatic cancer Q. Ovarian cancer R. Thyroid cancer S. Skin cancer T. Others
   3.3 Please fill in your age ____ when you are diagnosed with the above diseases
4. Health history-allergic history
   4.1 Have you ever been allergic? A. Yes B. No
   4.1.1 Please select allergen (multiple choices)
   A. Penicillin B. Sulfonamides C. Streptomycin D. Csephalosporin E. Egg F. Milk G. Seafood H. Pollen or dust mite I. Dust J. Abluent K. Cosmetics L. Others
5. Health history-medication history
   5.1 Do you have long-term medications? (continuous medication for over six months, average daily medication for more than one time) A. Yes B. No
   5.1.1 Which drugs do you take in the long term? (multiple choice)
   A. Hypotensive drug B. Hypoglycemic drug C. Lipid drug (lipid lowering drug) D. Uric-acid-lowering drug E. Antiarrhythic drug F. Asthma alleviation drug G. Analgesic-antipyretic drug (such as ibuprofen) H. Prednisone drug I. Estrogenic drug J. Diuretics K. Sedative or sleeping pill L. Chinese herbal medicine M. Contraceptive N. Antidepressant drug O. Others
6. Health history-operation history
   6.1 Have you ever received surgical treatment due to illness? A. Yes B. No
   6.1.1 Please select your surgical spot (multiple choice)
   A. Head (including brain) B. Eye C. Ear, nose and throat D. Maxillofacial region and mouth cavity E. Neck or thyroid F. Chest (including lung) G. Heart (including cardiac intervention) H. Peripheral vessel I. Stomach and intestine J. Liver and gall K. Kidney L. Spine M. Limbs and joints N. Bladder O. Gynecology P. Breast Q. Prostate R. Others

Supplementary table 1. National Unified Physical Examination Questionnaire (cont.)

National Unified Physical Examination Questionnaire

7. Health history –menstrual and obstetrical history (filled out by female)
   7.1 Age at the time of your first menstrual period: ____ years
   7.2 Menopause or not? A. Yes (age of menopause: ____ years) B. No
   7.3 Your marriage age: ____ years
   7.4 Have you ever given birth to a child? A. No B. Yes (age of first delivery: ___ years, ___ times, ___ times of abortion)
      7.4.1 Is your child breastfeed? A. Yes (feeding time _____ months) B. No
      7.4.2 Have you suffered from gestational diabetes? A. Yes B. No
      7.4.3 Have you suffered from gestational hypertension: A. Yes B. No
8. Somatization (in recent three months)
   8.1 How do you feel your physical condition? A. Good B. Medium C. Bad
   8.2 Do you feel tired or obvious discomfort all over the body? A. No B. Sometimes C. Frequently
   8.3 Do you have impaired vision? A. No B. Slightly C. Obviously
   8.4 Do you have hearing loss? A. No B. Slightly C. Obviously
   8.5 Do you have nosebleed or blood nasal discharge? A. No B. Sometimes C. Frequently
   8.6 Have you ever felt discomfort of swallowing or sense of choking? A. No B. Sometimes C. Frequently
   8.7 Do you have obvious cough or expectoration? A. No B. Sometimes C. Frequently
   8.8 Do you cough with blood-flecked phlegm or cough up blood? A. No B. Sometimes C. Frequently
   8.9 Do you feel chest pain or depressed discomfort in precordium? A. No B. Sometimes C. Frequently
   8.10 Do you feel wheezing & tightness in chest or difficult breathing? A. No B. Sometimes C. Frequently
   8.11 Do you feel low grade fever (higher body temperature) A. No B. Sometimes C. Frequently
   8.12 Do you feel dizzy or faint? A. No B. Sometimes C. Frequently
   8.13 Do you feel nausea, sour regurgitation or discomfort in upper abdomen? A. No B. Sometimes C. Frequently
   8.14 Have you ever been in loss of appetite, dyspepsia or abdominal distension? A. No B. Sometimes C. Frequently
   8.15 Have you ever experienced undiagnosed falling or fainting? A. No B. Sometimes C. Frequently
   8.16 Do you feel obvious numbness in limbs or stabbing pain? A. No B. Sometimes C. Frequently
   8.17 Do you have double lower limb edema? A. No B. Sometimes C. Frequently
   8.18 Do you feel painful to urinate? A. No B. Sometimes C. Frequently
   8.19 Do you have frequent micturition, urgency of urination, urine pain? A. No B. Sometimes C. Frequently
   8.20 Do you have diarrhea, stomachache or changes in bowel habit (toilet time, frequency or shape)?
   A. No B. Sometimes C. Frequently
   8.21 Is there tarry stool or blood in stool during defecation? A. No B. Sometimes C. Frequently
   8.22 Have you ever been in undiagnosed body emaciation or weight reduction (weight reduction is more than 10% of original weight)? A. Yes B. No
   8.23 Do you find masses in your breast with distending pain (irrelevant with menstrual cycle)? A. Yes B. No
   8.24 Do you have undiagnosed vaginal bleeding or abnormal leukorrhea? A. Yes B. No
   8.25 Have you had obvious body pain (except trauma)? A. Yes B. No
   8.25.1 Location of pain?
   A. Head B. Neck and shoulder C. Throat E. Waist and back F. Chest G. Abdomen H. Limbs I. Joints
9. Living habit -diet
   9.1 Do you usually take three meals regularly? A. Yes B. Almost C. No
   9.2 Do you often eat and drink too much? A. Yes B. No
   9.3 Do you usually eat night snack? A. No B. Sometimes C. Frequently
   9.4 How about your participating in dinner party (social engagement)?
   A. No participation or sometimes (1-2 times per month) B. Relatively more (1-2 times per week)
   C. Frequently (3-5 times per week) D. Quite frequently (**>** 5 times per week)
   9.5 How about your diet flavor? A. Light B. Salty C. Not sure
   9.6 How about your dietary preference?
   A. Smoked or pickled food B. Fried food C. Dessert D. Eating snack (except appropriate nuts) E. Eating fast food
   F. Having porridge (two time or above per day) G. Others
   9.7 How about your staple food composition?
   A. Primarily refined grain B. Coarse and fine powder grain C. Primarily coarse grain D. Not sure
   9.8 Do you drink milk?
   A. No B. Sometimes (1-2 times per week) C. Frequently (3-5 times per week) D. Every day (more than five times per week)
   9.9 Do you eat eggs?
   A. No B. Sometimes (1-2 times per week) C. Frequently (3-5 times per week) D. Every day (more than five times per week)
   9.10 Do you eat beans or bean products?
   A. No B. Sometimes (1-2 times per week) C. Frequently (more than three times per week)
   9.11 Do you eat fruits?
   A. No B. Sometimes (1-2 times per week) C. Frequently (3-5 times per week) D. Every day (more than five times per week)

Supplementary table 1. National Unified Physical Examination Questionnaire (cont.)

National Unified Physical Examination Questionnaire

9.12 How much vegetables do you eat on average a day?

A. < 100g B. 100 ~ 200g C. 200 ~ 500g D. > 500g

9.13 How much meat (pork, beef, mutton or poultry meat) do you eat on average a day?

A. < 50g B.50 ~ 100g C. 101 ~ 250g D. > 250g

9.14. Do you eat fat meat? A. No B. Sometimes C. Frequently

9.15 Do you eat animal organs? A. No B. Sometimes (1-2 time per week) C. Frequently (more than three times per week)

9.16 Do you eat fish or seafood? A. No B. Sometimes (1-2 time per week) C. Frequently (more than three times per week)

9.17 Do you drink coffee?

A. No B. Sometimes (1-2 time per week) C. Frequently (more than three times per week) D. Every day (more than five times per week)

9.18 Do you drink sugared beverages?

A. No B. Sometimes (1-2 times per week) C. Frequently (3-5 times per week) D. Every day (over 5 times per week)

10. Living habit - smoking

10.1 Do you smoke? (keep on smoking more than one year)

A. No B. Yes C. Smoke before, but quit now (quit smoking more than one year) D. Passive smoking (more than 15 min of accumulative smoking time every day, more than one day per week)

10.1.1 How may cigarettes do you usually smoke every day? (including the period before quitting smoking) _____, How many years do you keep on smoking? (including the period before quitting smoking) _____ years

10.1.2 How many years have you quit smoking? years

11. Living habit - drinking

11.1 Do you drink? (average drinking more than one time per week) A. No B. Yes C. drunk before, but cut out now (quit drinking more than one year)

11.1.1 What kind of liquor do you drink? A. White wine B. Beer C. Red wine D. All

11.1.2 How many times do you drink per week? (including times before quitting drinking)

A. 1 ~ 2 times B. 3 ~ 5 times C. > 5 times

11.1.3 How much do you drink every time? (one liang is equal to 50ml white wine, 100ml red wine, 300ml beer)

A. 1 ~ 2 liang B. 3 ~ 4 liang C. > 5 liang

11.1.4 How many years do you keep on drinking? (including years before quitting drinking) _____ years

11.1.5 How many years have you quit drinking? _____ years

12. Living habit – exercise training

12.1 Do you take exercise training?

A. No B. Sometimes C. Frequently (three times and above per week), more than 30 minutes for each time)

12.1.1 Exercise ways you frequently take: (multiple choice)

A. Stroll B. Jogging C. Swimming D. Riding bicycle E. Climbing stairs F. Ball game G. Social dance H. Yoga I. Aerobics J. Strength exercise K. Mountain climbing L. Tai-chi-quan M. Others

12.1.2 How many times do you exercise per week? A. 1 ~ 2 times B. 3 ~ 5 times C. > 5 times

12.1.3 How long do you exercise for each time? A. < 30 minutes B. 30 ~ 60 minutes C. > 60 minutes

12.1.4 How many years do you keep on exercising? _____ years

12.2 How about your physical strength in your work?

A. Primarily mental work B. Light physical labor C. Moderate physical labor D. Heavy physical labor E. don't work

12.2.1 How many days do you work per week? A. < 3 days B. 3 ~ 5 days C. > 5 days

12.2.2 How long do you work on average a day? _____ hours

12.3 Except time of work and study, how long do you sit every day (such as watching TV, surfing Internet, playing Mahjong or card) ?

A. < 2 hours B. 2 ~ 4 hours C. 4 ~ 6 hours D. > 6 hours

13. Environmental health

13.1 What kind of hazardous materials can you often contact in your working or living place?

A. None or little B. Noise and shock C. Electromagnetic radiation D. Dust E. Chemical contamination F. Air pollution G. Pollution caused by architecture decoration H. Cooking oil fume I. Others

14. Mental health – mental stress (in recent two weeks)

14.1 Do you feel depressed? A. No B. Sometimes C. Frequently

14.2 Are you easy to get emotional or angry? A. No B. Sometimes C. Frequently

14.3 Do you feel nervous and difficult to relax yourself? A. No B. Sometimes C. Frequently

14.4 Do you feel more nervous and anxious than usual? A. No B. Sometimes C. Frequently

14.5 Do you easy to lose your temper and get impatient? A. No B. Sometimes C. Frequently

14.6 Do you feel exhausted and lack enthusiasm on people and events? A. No B. Sometimes C. Frequently

14.7 Do you easy to be anxious and distracted? A. No B. Sometimes C. Frequently

14.8 Do you feel frustrated or upset? A. No B. Sometimes C. Frequently

14.9 Is it difficult for you to concentrate? A. No B. Sometimes C. Frequently

Supplementary table 1. National Unified Physical Examination Questionnaire (cont.)

National Unified Physical Examination Questionnaire
15. Sleep health
15.1 How about your sleeping condition in recent one month? A. Good B. Not bad C .Bad
15.1.1 Your poor sleep quality mainly shows:
A. Difficulty in falling asleep B. Early awakening C. Dreaminess or wakening from nightmare D. Getting up in the night E. Early sleeping time F. Others
15.1.2 Primary reason affecting your sleep:
A. Higher working pressure B. Negative life event C. Environmental disturbance (such as noise, snoring of spouse or roommate) D. Discomfort or illness E. Climate change F. Drug G. Work in shifts or time difference H. Others
15.2 Your average sleeping time a day: (unequal to time in bed)
A. < 5 hours B.5 ~ 7 hours C.7 ~ 9 hours D. > 9 hours
16. Health literacy
16.1 How long have you had a check-up? A. Never B. Half a year C. One year D. 2 ~ 3 years E. > 3 years
16.2 Do you actively health care obtain knowledge? A. Yes B. No
16.2.1 The way you obtain health care knowledge:
A. TV B. Radio broadcasting C. Books, newspapers and periodicals D. Internet E. Health agencies and doctors F. Others
16.3 Do you observe urine and stool when go to toilet? A. Never B. Sometimes C. Frequently
16.4 Do you measure blood pressure and heart rate by yourself? A. Never B. Sometimes C. Frequently
16.5 Do you carry commonly used or emergency drugs on a business or journey trip?
A. Never B. Sometimes C. Frequently
16.6 Do you buckle up safety belt when taking private car or taxi? A. Never B. Sometimes C. Every time
16.7 Do you often lie in the sun? A. Never B. Sometimes C. Frequently
16.8 Which blood pressure value is optimal in your opinion?
A. 140/90mmHg B. 120/80mmHg C. 150/100mmHg D. I don't know
16.9 Which is the optimal range of axillary temperature for an adult in your opinion?
A. 35 ~ 36℃ B. 36 ~ 37℃ C. 37 ~ 38℃ D. I don't know
16.10 Which is the optimal pulse rate for an adult in rest state in your opinion?
A. 30 ~ 50 time/minutes B. 51 ~ 70 time/minutes C. 71 ~ 90 time/minutes D. > 90 time/minutes E. I don't know
16.11 What is the optimal salt intake for an adult every day in your opinion?
A. < 6 grams B. < 8 grams C. < 10 grams D. < 12 grams E. I don't know
16.12 What is normal weight index for an adult in your opinion (weight index=weight/height m^2)?
A. ≤18.5 B. 18.5 ~ 24.9 C. 25 ~ 29.9 D. ≥30 E. I don't know
16.13 What is the normal waist size for an adult in your opinion?
Male: A. ≤80cm B. ≤85cm C. ≤90cm D. ≤ 95cm E. I don't know
Female: A. ≤70cm B. ≤75cm C. ≤80cm D. ≤85cm E. I don't know
16.14 What is the normal value of fasting blood-glucose for an adult in your opinion?
A. < 3.89mmol/L B. 3.89 ~ 6.1 mmol/L C. 6.1 ~ 7.0 mmol/L D.≥7.0 mmol/L E. I don't know
16.15 What is the normal value of triglyceride for an adult in your opinion?
A. < 0.56mmol/L B. 0.56 ~ 1.7 mmol/L C. > 1.7 mmol/L D. I don't know
16.16 What is the optimal value of total cholesterol for an adult?
A. < 5.2mmol/L B. 5.2 ~ 6.1 mmol/L C. > 6.1mmol/L D. I don't know
16.17 How do you feel your health status after completing the questionnaire?
A. Very good B. Relatively good C. Not bad D. Bad or worse E. Unsure
16.18 What is your general impression on this health self-test questionnaire?
A. Very good B. Relatively good C. Not bad D. Bad or worse E. Unsure