ORIGINAL RESEARCH

Nutritional Knowledge, Attitudes, and Needs Among Community Residents of Beijing: A Cross Sectional Study

Ningning Xue, Yue Du

Emergency Department of Beijing Tiantan Hospital, Capital Medical University, Beijing, 100007, People's Republic of China

Correspondence: Yue Du, Emergency Department of Beijing Tiantan Hospital, Capital Medical University, No. 119, South Fourth Ring West Road, Fengtai District, Beijing, 100007, People's Republic of China, Tel +8613718565030, Email 13718565030@sina.cn

Background: Community health education is essential in combating obesity and cardiovascular diseases by addressing nutritional knowledge gaps and promoting healthier dietary habits in China. The aim of this study was to investigate the nutritional knowledge, attitudes, and needs of residents at Beijing Fengtai District.

Methods: This cross-sectional study was conducted between October 2021 and January 2022, residents from 31 communities of the Fengtai District were given an online questionnaire, which was designed to assess their nutritional knowledge, attitudes, and needs.

Results: From 420 distributed surveys, a total of 416 participants were enrolled for an effective recovery rate of 99.05%. Among them, 317 participants (76.20%) scored 80% or higher on the nutritional knowledge questionnaire, participants with higher nutritional knowledge scores were more likely to be aged over 60 years (OR = 0.21, 95% CI 0.06–0.76, p = 0.02), female (OR = 0.40, 95% CI 0.22–0.73, p < 0.01) and employed (OR = 2.31, 95% CI 1.04–5.12, p = 0.04). While many community residents expressed a desire to receive guidance on dietary guidance (n = 303, 72.84%) dietary matching (n = 303, 72.84%), and preventive health care (n = 286, 68.75%). Residents were familiar with nutritional care clinics (55.05%) and believed that the nutritional care clinics should be increased (59.86%). In addition, 345 residents (83.41%) wanted nutritional care clinics to provide consultation on nutritious meal planning.

Conclusion: Beijing residents need additional access to clinical nutritional resources as their needs are not fulfilled despite a relatively strong knowledge of nutrition.

Keywords: Beijing, community residents, nutrition knowledge, education, questionnaire

Introduction

Community health education is essential for disseminating the latest evidence-based medical guidelines and for providing information relevant to the local political, economic, and health environment.[1–3] The national strategy of "Healthy China" has increased the public's awareness of common health problems.[4] Nutrition, a critical factor for alleviation of disease development and improvement in disease management, plays a key role in achieving the goal of the Healthy China 2030 plan.[5]

The recent acceleration of the pace of life, increased work stress, and changing eating habits and behaviors in China have led to an increased incidence of cerebrovascular disease, coronary heart disease, diabetes, hypertension and other diseases.[6] Meanwhile, the fast growing economic conditions and increased urbanization have led to a nutritional transition in China.[7] Western diets characterized by high animal proteins, high sugar, and refined grains are replacing the traditional high carbohydrate and low protein and fat diet.[8,9] And the national obesity rate has increased during the past few decades, and became a heavy burden for the country.[10]

In order to address the increasing incidence of cardiovascular disease (CVD) in China, diet must be addressed as a critical modifiable risk factor.[11] It is estimated that poor diet accounts for 11 million deaths worldwide, including 50%

3319

of all CVD deaths.[12] Eating higher levels of fat can exacerbate hyperlipidemia by directly increasing blood lipid levels and indirectly by contributing to obesity.[13] Moreover, whole-grain consumption has been shown to lower the risk of hypertension in Asian populations.[14] Furthermore, it has been increasingly recognized that a predominately Western-type diet can lead to an overfed but undernourished state from inadequate intakes of essential vitamins and minerals such as vitamin B12, iron, and calcium.[15] All these evidences showed that diet planning is important for better health conditions at population level and dissemination of diet knowledge is urgently required.

Previous studies showed insufficient knowledge of diet and a lack of community resources may be contributing to poor nutrition, rising obesity and CVD in Beijing.[16,17] Medical consortium hospitals and community hospitals are responsible for promoting the health of community residents, optimizing community residents' health services. Therefore, in the present study, we aimed to investigate nutritional knowledge, attitudes and needs at community level using a self-designed questionnaire among residents in Fengtai District.

Materials and Methods

Study Design and Participants

A cross-sectional study was conducted among residents of 31 communities of 6 streets in the Fengtai District of Beijing (Supplemental Table 1) between October 2021 and January 2022. Permanent residents with normal cognition, aged older than 18 years were included in this study. Disabled residents with significantly impaired mobility and residents who were pregnant or breastfeeding were not eligible to participate. Questionnaires with incomplete or incorrect data were excluded.

This study was approved by the Medical Ethics Committee of the Medical Ethics Committee of Beijing Tiantan Hospital, Capital Medical University, and all participants provided written informed consent.

Procedures

A self-designed questionnaire was developed by xxx experts for this study according to the 2016 edition of the "Dietary Guidelines for Chinese Residents", and contained five items: 1) Information on demographics of participants, including gender, age, ethnicity, marital status, educational level, occupation type, and monthly income; 2) Ten multiple choice questions on participant's knowledge of nutrition, with 10 points assigned for correct responses and 0 points assigned for incorrect responses (range: 0–100). Knowledge scores above 80 were classified as high score, while those between 60 and 80 or less than 60 were classified as moderate and poor, respectively.; 3) Nutritional knowledge dissemination platforms; 4) Community residents' nutritional needs and demand for nutritional care clinics.

An online questionnaire was constructed using the WeChat-based QuestionnaireStar application, and a Quick Response (QR) code was generated to collect data through WeChat. The QR code of the questionnaire was sent to the care managers of the Fengtai medical alliance community hospitals, who received online training in advance. The recruited participants logged in by scanning the QR code sent by neighborhood committees using WeChat and filled in the questionnaire. Paper-based questionnaires were used for elderly participants who were unwilling or unable to use WeChat. To ensure the quality and completeness of the questionnaire results, each IP address could only submit once, and all items were mandatory. A reward was sent to encourage the participants to complete the submission.

Statistical Analysis

The 10 event per variable rule was used to decide the sample size in our study, the questionnaire has 30 questions and 300 valid questionnaire were required, considering there were 20% invalid questionnaire and the response rate was 80%; therefore, a total of 420 participants were selected using the random stratified sampling method. Questionnaires were entered twice and independently using EpiData software (EpiData Version 3.1, EpiData Association Odense, Denmark). Statistical analysis was performed using SPSS 18.0 (SPSS Inc., Chicago, IL, USA). Continuous variables with normal distribution were expressed as Mean ± standard deviation (SD). Continuous variables with a skewed distribution were expressed as median (range). Categorical variables were expressed as frequency and percentage (%). Univariate and

multivariate logistic regression analyses were performed to determine the influencing factors on community residents' knowledge score (high or not) of nutrition and disease. Two-sided P < 0.05 was considered statistically significant.

Results

A total of 420 questionnaires were distributed, and 416 valid questionnaires were recovered, for an effective recovery rate of 99.05%. The average age of the participants was 46.19±13.88 years, and 125 (30.05%) were male. Among them, 281 (67.55%) participants had a tertiary level of education (Table 1).

The knowledge score was 88.17 ±17.37 from a total score of 100, with 360 (86.54%) participants had high knowledge level, 28 (6.73%) participants had moderate knowledge and 28 (6.73%) participants had poor knowledge. The question "what foods should not be eaten by hypertensive patients?" Achieved the highest score (93.75%), whereas the question "how many grams of salt should an adult consume per day?" Scored lowest (n = 315, 75.72%) (Table 2). We also found that age over 60 years (OR = 0.21, 95% CI 0.06–0.76, p = 0.02), female sex (OR = 0.40, 95% CI 0.22–0.73, p < 0.01) and unemployment (OR = 2.31, 95% CI 1.04–5.12, p = 0.04) were independently associated with the level of nutritional knowledge (Table 3).

Among the 416 community residents, only 80 (19.23%) were very familiar with the "Food Guide Pagoda for Chinese", while 244 (58.65%) had heard of it but were not clear about the specific content, 72 (17.31%) had not

Table 1 Characteristics of the Study Population (n = 416)

Variables	n	%
Gender		
Male	125	30.05%
Female	291	69.95%
Age, year		
18–35	110	26.44%
36–60	218	52.40%
>60	88	21.16%
Nationality		
Han	403	96.87%
Others	13	3.13%
Marital status		
Married	351	84.37%
Unmarried	65	15.63%
Educational level		
Junior high school and below	65	15.63%
High school	70	16.83%
College and above	281	67.54%
Occupation type		
Personnel of state organs and institutions	115	27.64%
Personnel of scientific research or professional technical staff	48	11.54%
Service personnel of business, catering, entertainment and other	19	4.57%
Unemployed	15	3.61%
Retirees	109	26.20%
Others	110	26.44%
Monthly income		
<3000 yuan	62	14.90%
3000–5000 yuan	152	36.54%
5000–10000 yuan	172	41.35%
>10000 yuan	30	7.21%
Religious belief		
Yes	29	6.97%
No	387	93.03%

Table 2 Distribution of the Questionnaire

Participants' Knowledge of Nutrition	Correct	Incorrect
How many grams of salt an adult should eat a day	315(75.72%)	101(24.28%)
Health hazards of a high-salt diet	323(77.64%)	93(22.36%)
What foods alleviate constipation	384(92.31%)	32(7.69%)
What foods should patients with hyperlipidemia not eat	390(93.75%)	26(6.25%)
What foods should participants with high blood pressure not eat	398(95.67%)	18(4.33%)
What foods should diabetics not eat	367(88.22%)	49(11.78%)
What foods should patients with coronary heart disease not eat?	387(93.03%)	29(6.97%)
Stroke (cerebral infarction and cerebral hemorrhage) patients should not eat the following foods	364(87.50%)	52(12.50%)
Foods that patients with calcium deficiency should eat more of	366(87.98%)	50(12.02%)
What foods provide iron to iron deficiency anemia patients?	374(89.90%)	42(10.10%)
Community residents' nutritional knowledge and needs	Number (n)	%
Have you heard of the "Food Guide Pagoda for Chinese"?		
Familiar with the content.	80	19.23%
I have heard of it, but I do not know the specific content.	244	58.65%
I have not heard of it.	72	17.31%
I do not care about it.	20	4.81%
What nutritional knowledge would you most like to obtain?		
Dietary guidance	303	72.84%
Diet matching	303	72.84%
Preventive health care	286	68.75%
Food safety	216	51.92%
Feeding tube Care	73	17.55%
Needs of nutritional care clinic	Number (n)	%
Have you heard of nutritional care clinics?		
Familiar with the content.	229	55.05%
I have heard of it, but I do not know the specific content.	13	3.13%
I have not heard of it.	141	33.89%
I do not care about it.	33	7.93%
What is your opinion on the current access to nutritional care clinic?		
Should increase	249	59.86%
Only need when encounter the problems	117	28.13%
Should not increase	9	2.16%
I do not care about it	41	9.86%
If nutritional care clinics were added to community hospitals, what would you like to see in nutritional care clinics?		
Nutritious meal planning	347	83.41%
Introduction about disease and diet	333	80.05%
Consultation of diet meal	203	48.80%
Tube feeding care and maintenance	78	18.75%

heard of it and 20 (4.81%) did not care about it. The residents were most likely to achieve knowledge of dietary guidance (72.84%) and diet matching (72.84%) (Table 2).

The platforms from which residents acquired nutrition knowledge were ranked from most to least prevalent: TV broadcast (60.58%), community outreach (57.69%), social lecture (39.66%), newspapers and magazines (38.70%), social-media (TikTok, WeChat) (36.06%), internet and school (31.25%) and other (chatting with others) (3.61%). The ideal way to promote nutrition knowledge according to the community residents was ranked, from high to low, as follows: TV broadcasting (74.28%), internet (61.78%), popular science books (52.16%), lectures (free lectures in the community) (38.94%), newspapers (32.45%), school (23.08%) and other (chatting with others) (1.20%). Most resident (173 (41.59%)) responded that the

Table 3 Multivariate Logistic Regression Analysis

Factors	Univariate Logistic Regression		Multivariate Logistic Regression	
	OR (95% CI)	P	OR (95% CI)	P
Gender				
Male	–	Ref	–	Ref
Female	0.37 (0.21,0.65)	**0.001***	0.40 (0.22,0.73)	**0.003***
Age				
18–35	–	Ref	–	Ref
36–60	0.59 (0.32,1.01)	0.090	0.52 (0.26,1.01)	0.050
>60	0.29 (0.11,0.76)	**0.010***	0.21 (0.06,0.76)	**0.020***
Nationality				
Han	–	Ref		
Others	1.98 (0.53,7.43)	0.310		
Marital status				
Married	–	Ref		
Unmarried	1.58 (0.78,3.19)	0.200		
Educational level				
Junior high school and below	–	Ref		
High school	1.19 (0.44,3.22)	0.740		
College and above	1.11 (0.49,2.52)	0.800		
Occupation type				
Personnel of state organs and institutions	–	Ref	–	Ref
Personnel of scientific research or professional technical staff	0.86 (0.26,2.85)	0.800	0.79 (0.23,2.67)	0.700
Service personnel of business, catering, entertainment and other	4.36 (1.38,13.78)	**0.010***	3.08 (0.92,10.36)	0.070
Unemployed	2.36 (0.58,9.68)	0.23	3.00 (0.66,13.52)	0.150
Retirees	2.39 (1.10,5.20)	**0.030***	2.31 (1.04,5.12)	**0.040***
Others	0.950 (0.39,2.32)	0.900	2.13 (0.69,6.64)	0.190
Monthly income				
<3000 yuan	–	Ref		
3000–5000 yuan	0.48 (0.22,1.05)	0.070		
5000–10000 yuan	0.47 (0.22,1.02)	0.060		
>10000 yuan	1.15 (0.40,3.26)	0.800		
Religious belief				
Yes	–	Ref		
No	0.57 (0.22,1.47)	0.240		

Notes: The bold text means the variables with statistical significance. **Means $P<0.001$, *Means $P<0.05$.

community should be conducting events for nutritional education every 3 months, while 17.55% responded once every 6 months, 15.14% with once every year, and 25.72% with never (Supplemental Table 2).

Over half of the participants (55.05%) stated that they were familiar with nutritional care clinics, 141 participants (33.89%) stated had not heard of nutritional care clinics and 13 participants (3.13%) had heard of nutritional care clinics but were not familiar with the specific content. The remaining 33 participants (7.93%) responded that they did not care about nutritional care clinics.

Additionally, 249 participants (59.86%) thought that the community should increase nutritional care clinic availability, while 117 participants (28.13%) expressed that they thought nutritional care clinics were only necessary on a case-by-base basis. Only 9 participants (2.16%) responded that the community should not increase access to nutritional care clinics. In contrast, 347 participants (83.41%) hoped that the nutritional care clinic would provide consultation for nutritious meal planning, 333 participants (80.05%) wished for the nutritional care clinic to offer an introduction to nutritional for specific diseases, 203 participants (48.80%) responded with a need for consultation for diet meals, and 78 participants (18.75%) with a need for consultation on endotracheal tube replacement and maintenance (Table 2).

Finally, we presented the knowledge points and need points for nutrition knowledge in Table 4. We found that females showed higher knowledge points (90.3 vs 83.3, P < 0.001), also when age grows, the knowledge became higher (P = 0.006), marital status was another factor for knowledge points, and married participants had higher knowledge points (89.0 vs 83.9, P = 0.029). From a need perspective, participants with higher education level tended to have higher need for nutrition (P = 0.004). For patients with different occupation type and monthly income, there were significant differences among both knowledge and needs (all P < 0.05), indicating that these two factors will affect participants' nutritional status. We also showed that religious status did not affect both knowledge and needs.

Table 4 Comparison of the Scores of Knowledge and Needs of Community Residents with Different Characteristic

Variables		N	Knowledge	Needs
Gender	Male	125	83.28±21.96	8.52±2.37
	Female	291	90.27±14.52	8.84±2.12
	t		−3.827	−1.303
	P		**<0.001****	0.193
Age	18–35	110	84.00±19.31	8.85±2.26
	36–60	218	88.85±16.87	8.86±2.20
	>60	88	91.70±15.03	8.31±2.12
	F		5.266	2.198
	P		**0.006***	0.112
Nationality	Han	403	88.19±17.25	8.73±2.21
	Others	13	87.69±21.66	9.23±2.20
	t		0.101	−0.810
	P		0.919	0.418
Marital status	Married	351	88.97±16.25	8.70±2.19
	Unmarried	65	83.85±22.13	9.00±2.30
	t		2.196	−1.024
	P		**0.029***	0.306
Educational level	Junior high school and below	65	89.08±17.14	8.11±2.36
	High school	70	88.57±15.06	8.36±2.16
	College and above	281	87.86±17.99	8.99±2.14
	F		0.150	5.595
	P		0.861	**0.004***
Occupation type	Personnel of state organs and institutions	115	90.87±13.02	9.35±2.04
	Personnel of scientific research or professional technical staff	48	91.04±15.33	9.02±2.05
	Service personnel of business, catering, entertainment and other	19	80.00±20.82	8.21±2.55
	Unemployed	15	83.33±22.89	7.60±2.53
	Retirees	109	91.83±13.69	8.43±2.04
	Others	110	82.55±21.78	8.55±2.35
	F		5.445	3.635
	P		**<0.001****	**0.003***
Monthly income	<3000 yuan	62	84.84±22.38	8.19±2.28
	3000–5000 yuan	152	90.00±13.71	8.45±2.30
	5000–10000 yuan	172	89.01±16.31	9.19±2.02
	>10000 yuan	30	81.00±24.83	8.80±2.14
	F		3.212	4.700
	P		**0.023***	**0.003***
Religious belief	Yes	29	83.10±17.95	8.79±2.47
	No	387	88.55±17.29	8.74±2.19
	t		−1.633	0.127
	P		0.103	0.899

Notes: The bold text means the variables with statistical significance. **Means P<0.001, *Means P<0.05.

Discussion

In the present study, most residents demonstrated a high level of knowledge but still displayed a greater need for nutritional knowledge, nutritional counseling, and nutritional health resources. These results would provide a basis and reference for subsequent targeted nutrition health education. The residents expressed interest in increased access to professional nutritional support in Beijing to provide guidance for their unmet nutritional needs.

In this study, it was found that residents had the least knowledge about daily salt intake, and did not know enough about the dangers of excessive consumption of "table salt".[18] Thus, it is necessary to increase efforts to publicize the dangers of excessive consumption of table salt and the relationship between table salt and diseases.[19,20] The reduction in salt consumption may lower the rate of hypertension and other diseases exacerbated by high salt consumption and reduce symptoms among those afflicted, some researches already showed that app-based education showed great performance on lowering salt intake and systolic blood pressure,[21] however, research also pointed out that individualized strategy is the key for successful salt consumption lowering, which indicated that in the communities where this study carried out, a further in depth analysis and education was required.[22] Understanding the platforms patients use to acquire knowledge is an important part of nutrition education. Community residents are most interested in receiving "dietary guidance", "diet matching" and "preventive health care" from nutritional clinics. indicating that they could recognize the important relationship between nutrition to health and have a positive attitude towards using nutrition to improve health outcomes.[23,24]

The primary platforms community residents used to obtain nutrition knowledge were "TV broadcasting", "community publicity" and "social lectures", which was consistent with the study reported by Xiong et al.[25] With the development of networking and the emergence of various new media, TV broadcasting has been gradually replaced with other online platforms, such as TikTok, however, the effectiveness of the two channels required further analysis.[26] Thus, the community could utilize different publicity platforms for different age groups.[27–29] Community residents were unfamiliar with nutritional care clinics and did not know that these clinics carry out consultations for community residents. This may be because the nutritional care clinic is an emerging clinic for nutrition management, nutrition assessment, and screening, and is in a development period. However, the vast majority of residents still hoped to increase access to nutritional care clinics in community hospitals for consultation on diseases, diet, and endotracheal tube care.

This study still possessed several limitations. One main limitation is the deficiency in the representativeness of the survey samples, with only one district in Beijing selected. Because of the dispersion and clutter of the community information (as seen in Supplementary Table 1), it is difficult to control for the community's variable in our analysis. Moreover, while the high response rate rules out the presence of non-response bias, more than two-thirds of the surveyed residents have a university degree, which is higher than the general situation in Beijing or China,[30,31] so there is a possibility of prevalence bias.[32] The community is a social functional institution that plays a major role in popularizing nutrition knowledge among residents.[33] Therefore, the results of this study may only be applicable to communities with a high level of education, and the actual Chinese population may need more nutrition counseling and support than suggested by this study. Also, the self-developed questionnaire was not validated by clinical practice and further amendment of the questionnaire was required for widespread clinical application.

Conclusions

In conclusion, community residents in Beijing have a high level of nutritional knowledge, yet their needs are still unsatisfied. The results of this study provide a reference for subsequent nutritional and health education for residents. In the future, community hospitals should target more men, young people, and unemployed residents, and provide nutritional education and training through more channels in a targeted manner, to improve the overall health and nutritional status of residents.

Abbreviations

CVD: cardiovascular disease, QR: Quick Response, SD: standard deviation.

Data Sharing Statement

All data generated or analysed during this study are included in this published article.

Ethics Approval and Consent to Participate

The research was carried out in accordance with the Declaration of Helsinki. This study was approved by the Medical Ethics Committee of Beijing Tiantan Hospital, Capital Medical University, and all participants provided written informed consent in this study. The ethics approval number is KY2022-229-02.

Author Contributions

All authors contributed to data analysis, drafting or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Funding

Disclosure

The authors declare no potential conflicts of interest in this work.

References

1. Mason JB, Sanders D, Musgrove P, Galloway R. *Community Health and Nutrition Programs*; World Bank. 2011.
2. Prinja S, Chauhan AS, Angell B, Gupta I, Jan S. A systematic review of the state of economic evaluation for health care in India. *Appl Health Econ Health Policy*. 2015;13(6):595–613. doi:10.1007/s40258-015-0201-6
3. Braveman P, Egerter S, Williams DR. The social determinants of health: coming of age. *Annu Rev Public Health*. 2011;32(1):381–398. doi:10.1146/annurev-publhealth-031210-101218
4. Tan X, Liu X, Shao H. Healthy China 2030: a vision for health care. *Value Health Reg Issues*. 2017;12:112–114. doi:10.1016/j.vhri.2017.04.001
5. Gao C, Xu J, Liu Y, Yang Y. Nutrition policy and healthy china 2030 building. *Eur J Clin Nutr*. 2021;75(2):238–246. doi:10.1038/s41430-020-00765-6
6. Zhao D, Liu J, Wang M, Zhang X, Zhou M. Epidemiology of cardiovascular disease in China: current features and implications. *Nat Rev Cardiol*. 2019;16(4):203–212. doi:10.1038/s41569-018-0119-4
7. Zhai F, Wang H, Du S, et al. Prospective study on nutrition transition in China. *Nutr Rev*. 2009;67(Suppl 1):S56–S561. doi:10.1111/j.1753-4887.2009.00160.x
8. Zhu S. Development of nutritional studies in China. *Eur J Clin Nutr*. 2021;75(2):230–231. doi:10.1038/s41430-020-00793-2
9. Wang J, Lin X, Bloomgarden ZT, Ning G. The Jiangnan diet, a healthy diet pattern for Chinese. *J Diabetes*. 2020;12(5):365–371. doi:10.1111/1753-0407.13015
10. Veronese N, Ragusa FS, Pegreffi F, et al. Sarcopenic obesity and health outcomes: an umbrella review of systematic reviews with meta-analysis. *J Cachexia, Sarcopenia Muscle*. 2024. doi:10.1002/jcsm.13502
11. Zhao D. Epidemiological features of cardiovascular disease in Asia. *JACC Asia*. 2021;1(1):1–13. doi:10.1016/j.jacasi.2021.04.007
12. Afshin A, Sur PJ, Fay KA. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the global burden of disease study 2017. *Lancet*. 2019;393(10184):1958–1972. doi:10.1016/S0140-6736(19)30041-8
13. Nouh F, Omar M, Younis M. Risk factors and management of hyperlipidemia (review). *Asian J Cardiol Res*. 2019;2(1):1–10.
14. Kashino I, Eguchi M, Miki T, et al. Prospective association between whole grain consumption and hypertension: the furukawa nutrition and Health Study. *Nutrients*. 2020;12(4):902. doi:10.3390/nu12040902
15. Astrup A, Bügel S. Overfed but undernourished: recognizing nutritional inadequacies/deficiencies in patients with overweight or obesity. *Int J Obes*. 2019;43(2):219–232. doi:10.1038/s41366-018-0143-9
16. Mphasha MH, Mothiba TM, Skaal L. Assessment of diabetes dietary knowledge and its impact on intake of patients in Senwabarwana, Limpopo, South Africa. *J Endocrinol Metab Diabetes S Afr*. 2022;26(3):89–95. doi:10.1080/16089677.2021.1927584
17. Zhao Z, Kong X, Wang L, Guo G, Ll Y. Prevalence survey of overweight, obesity and central obesity among community-living residents in Beijing's Pinggu District. *Chin Gen Pract*. 2020;23(23):2981.
18. Stern N, Buch A, Goldsmith R, et al. The role of caloric intake in the association of high salt intake with high blood pressure. *Sci Rep*. 2021;11(1):15803. doi:10.1038/s41598-021-95216-y
19. Cappuccio FP, Beer M, Strazzullo P. Population dietary salt reduction and the risk of cardiovascular disease. A scientific statement from the European salt action network. *Nutr Metab Cardiovasc Dis*. 2018;29(2):107–114. doi:10.1016/j.numecd.2018.11.010
20. Kotchen TA, Cowley AW Jr, Frohlich ED. Salt in health and disease--a delicate balance. *New Engl J Med*. 2013;368(13):1229–1237. doi:10.1056/NEJMra1212606
21. He FJ, Zhang P, Luo R, et al. App based education programme to reduce salt intake (AppSalt) in schoolchildren and their families in China: parallel, cluster randomised controlled trial. *BMJ*. 2022;376:e066982.
22. Silva-Santos T, Moreira P, Rodrigues M, et al. Interventions that successfully reduced adults salt intake-a systematic review. *Nutrients*. 2021;14(1):6. doi:10.3390/nu14010006
23. Weerasekara PC, Withanachchi CR, Ginigaddara GAS, Ploeger A. Food and nutrition-related knowledge, attitudes, and practices among reproductive-age women in marginalized areas in Sri Lanka. *Int J Environ Res Public Health*. 2020;17(11):3985. doi:10.3390/ijerph17113985

24. Jeruszka-Bielak M, Kollajtis-Dolowy A, Santoro A, et al. Are nutrition-related knowledge and attitudes reflected in lifestyle and health among elderly people? A study across five European Countries. *Front Physiol*. 2018;9:994. doi:10.3389/fphys.2018.00994

25. Xiong WH, Yi-Ting MA. Investigation on nutrition knowledge and behavior of community residents in Shenzhen City. *Occup Health*. 2008;24 (23):2594–2595.

26. Ding C, Qiu Y, Zhao B, et al. Access channels on nutrition and health knowledge of Chinese adults in 2021. *Wei Sheng Yan Jiu*. 2022;51 (6):886–897. doi:10.19813/j.cnki.weishengyanjiu.2022.06.006

27. Al-Dmour H, Masa'deh R, Salman A, Abuhashesh M, Al-Dmour R. Influence of social media platforms on public health protection against the covid-19 pandemic via the mediating effects of public health awareness and behavioral changes: integrated model. *J Med Internet Res*. 2020;22(8): e19996. doi:10.2196/19996

28. Basch CH, Hillyer GC, Jaime C. COVID-19 on TikTok: harnessing an emerging social media platform to convey important public health messages. *Int J Adolesc Med Health*. 2022;34(5):367–369. doi:10.1515/ijamh-2020-0111

29. Mheidly N, Fares J. Leveraging media and health communication strategies to overcome the COVID-19 infodemic. *J Public Health Policy*. 2020;41 (4):410–420. doi:10.1057/s41271-020-00247-w

30. Ben-Ami I, Armon L, Freimann S, Strassburger D, Ron-El R, Amsterdam A. EGF-like growth factors as LH mediators in the human corpus luteum. *Hum Reprod*. 2009;24(1):176–184. doi:10.1093/humrep/den359

31. Yusuf F, Brooks G. Demographics and consumption patterns in urban China. *Popul Res Policy Rev*. 2010;29(1):5–17. doi:10.1007/s11113-009-9154-5

32. Tripepi G, Jager KJ, Dekker FW, Zoccali C. Selection bias and information bias in clinical research. *Nephron Clin Pract*. 2010;115(2):c94–c99. doi:10.1159/000312871

33. Tian TJL, Ti MM, Mei Y. Analysis of the effect of nutrition education on improving the nutritional knowledge level of community residents in Futian District of Shenzhen. *Prev Med*. 2017;24(4):458–461.