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Salt Consumption, Knowledge, Attitude, and Practices: The Intervention to Reduce Salt Intake on University Students

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Abstract: High salt intake, one of the modifiable unhealthy eating habits, causes important health problems such as hypertension, cardiovascular diseases, cancer, osteoporosis, and kidney diseases. The objective of this study is to examine the impact of educational intervention on university students' salt-related knowledge, attitudes, and practices (KAP). This intervention study was carried out at Selcuk University in Türkiye. A total of 30 students were included in this intervention study carried out using the pretest-posttest control group experimental model. The educational intervention consisting of 14 sessions was completed in six weeks. The salt intake of male students in the experimental group in the pre-test and the control group in the pre-test and post-test was found to be significantly higher than that of female students ($p < 0.05$). The mean daily salt intake in the experimental group compared to the pre-test decreased by about 1,834 mg after intervention ($p > 0.05$). There was a significant difference ($p < 0.05$) between the knowledge and attitude pre-test and post-test scores of the experimental group students. The intervention study positively affected the students' salt-related KAP. In order for this effect to continue for a lifetime, educational interventions should be reproducible and sustainable.

Keywords: salt; reducing salt intake; university students; intervention; KAP

INTRODUCTION

Non-communicable diseases (NCDs) are considered the biggest health problem threatening the global population. Cardiovascular diseases account for the majority of NCD deaths worldwide, followed by cancers, chronic respiratory diseases, and diabetes. The vast majority of these deaths occur in low- and middle-income countries. Tobacco use, harmful use of alcohol, physical inactivity, and unhealthy diet are modifiable behavioral risk factors that increase the risk of NCDs.[1]

High salt and sodium intake is an unhealthy diet that is associated with many diseases and deaths, such as hypertension, cardiovascular diseases, stroke, chronic kidney diseases, osteoporosis, stomach cancer, and obesity.[2] Globally, in 2017, excessive sodium intake was the leading dietary risk factor associated with 3 million deaths and 70 million disability-adjusted life-years worldwide.[3]

The World Health Organization (WHO) recommends <2,000 mg/day sodium and <5 g/day salt intake for adults.[4] Despite WHO recommendations, daily sodium and salt intakes are well above recommended amounts in many countries.[5] The global mean sodium intake of adults is estimated to be 4,310 mg/day (equivalent to 10.78 g/day salt).[6] According to the results of studies conducted in Türkiye, the average daily salt intake was 18 g in 2008[7], 15 g in 2012[8], and 9.9 g in 2017[9]. In addition, it was found that the daily salt intake was 10.2 grams in the Türkiye Nutrition and Health Survey 2017 data[10]. According to this, the mean salt intake in Türkiye and around the world is much higher than the physiological requirement and more than twice the WHO recommendations.

Reducing salt intake is one of the most cost-effective ways to improve health and reduce the burden of NCDs. In 2013, WHO member states committed to reducing salt intake by 30% by 2025 for the prevention and control of NCDs.[6]

On the other side, the transition to university is a critical period in which irregular and unhealthy eating habits are formed or developed.[11] Students' eating habits may change for many reasons, such as rapid changes in their sociocultural environment during university limited cooking opportunities and skills. Most university students have unhealthy eating behaviors, such as a high intake of fast foods, snacks, soft drinks, and sweets.[12] University students who eat foods prepared outside the home, in cafes and restaurants, whose exact ingredients they do not know, and who frequently consume fast foods and packaged snack products are at risk of excessive salt intake.

Various intervention studies have been conducted for diverse groups in relation to salt in the world.[13-19] In a study conducted with university students in the United Arab Emirates, it was underlined that educational intervention has a positive effect on salt-related knowledge, attitudes, and practices (KAP). [13] A study conducted with nursing students in Thailand revealed that a program to reduce sodium intake could be effective in knowledge level and behavior. [14] However, it has been seen in the literature that the number of studies conducted with trial models to reduce salt intake in Türkiye remains limited. This research, therefore, was conducted to determine the effect of salt reduction intervention on university students' salt consumption status and KAP about salt.

MATERIALS AND METHODS

The study was designed as an experimental using the two-group pre-test post-test control group trial model on a sample of undergraduates from the Selcuk University in Türkiye during the academic year of 2019/2020. Before conducting the study, approval was obtained from Selcuk University, Faculty of Health Sciences, Non-Interventional Clinical Research Ethics Committee, with the decision dated 31.03.2022 and numbered 2019/480.

Participants

Some criteria were determined for students to be included in this study. Students, who did not have any disease diagnosed by a doctor, did not use medication constantly, did not follow a special nutrition program, liked salty foods, thought the amount of salt they consumed daily was too much, added extra salt to their meals, and volunteered to participate in the research, were included in the study.

The study started with a total of 40 students: 20 in the experimental group (EG) and 20 in the control group (CG). However, there was a loss of participants due to reasons, such as some students not wanting to continue the study, not attending the educational sessions, and not receiving feedback on issues related to the study. Therefore, the study was completed with a total of 30 students, 15 in each of the EG and CGs. The flow of the participants and the study is depicted in Figure 1.

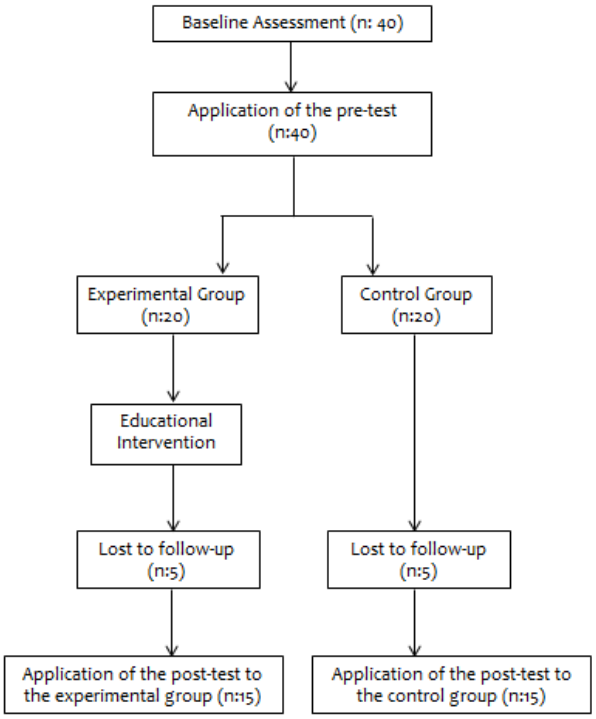

Figure 1. The flow of the participants and the study

Data Collection

A questionnaire form was developed by the researchers to be used before and after the intervention. Sociodemographic characteristics, body weight, height, frequency of food consumption, salt-related KAP, calculation of label information on food products, 24-hour dietary recalls, and 24-hour retrospective food consumption records were questioned using the questionnaire form. The data were obtained through a questionnaire using a face-to-face interview.

Pre-Post Test Implementation and Intervention

At the beginning of the study, the questionnaire was applied to the students in the EG and CGs as a pre-test. Then, educational sessions aimed at reducing salt intake were held with the students in the EG. At the end of this intervention, the questionnaire form was applied again to the students in both the EG and CGs, and these data were evaluated as the post-test.

The educational intervention consisted of 14 sessions and was completed in six weeks. During the educational sessions attended by the students in the EG, information was given about salt and sodium, salt types, sodium functions and balance in the body, salt and sodium sources, salt and sodium labeling, salt intake reduction, recommended daily intake of salt and sodium, excessive salt intake and associated diseases, the importance of iodized salt, and ways to reduce salt intake. At the same time, the labels of various food products were examined so that the participants could have an idea about the amount of sodium and salt contained in ready-made foods. By examining food labels, it was aimed to understand and use the information on salt and sodium on the labels. A practical application was made to prepare food with low salt content, and in the last session of the intervention, the importance of nutrition and physical activity for a healthy life was mentioned.

Data Analysis

The 24-hour retrospective food consumption record data were evaluated using Nutrition Information System (BEBIS) 8.2. BEBIS is a software program consisting of data banks in which the content of nutrients is analyzed and calculated. In this way, the participants' mean intake of sodium was determined

regarding their food consumption. The daily sodium (mg) intake obtained with this program was multiplied by 2.5 to calculate the daily salt (mg) intake of the participants.

In addition, the SPSS 22 (Statistical Package for Social Science) statistical program was utilized to statistically evaluate the data obtained as a result of the research. Number (n), percentage (%), minimum (min), maximum (max), mean ($\bar{x}$), and standard deviation (SD) were used for descriptive statistics of the data. Since the number of participants in the groups was small, non-parametric analysis methods were applied. In data analysis, the significance level was accepted as $p<0.05$.

RESULTS

The study group consisted of a total of 30 undergraduate students, and equal numbers of students were assigned to the EG (n:15) and CG (n:15). The mean age ($\bar{x}$±SD) of these students was 20.07±1.14 years. While the mean BMI value of the students in the EG was 21.35 kg/m^2, the mean BMI value of the students in the CG was 22.45 kg/m^2. The sociodemographic characteristics of the participants are shown in Table 1.

Table 1. Sociodemographic Characteristics of the Participants

	EG		CG	
	Total (n)	**Percentage (%)**	**Total (n)**	**Percentage (%)**
Gender				
Male	6	40.0	5	33.3
Female	9	60.0	10	66.7
Place of residence				
Family home	3	20.0	2	13.3
Student home with friends	-	-	3	20.0
Home alone	1	6.7	2	13.3
Public dormitories	7	46.7	7	46.7
Private dormitories	4	26.7	1	6.7

The salt intake of the students in the pre-test and post-test was examined, and it was seen that the mean daily salt intake of the students in the EG after the intervention decreased by 1,834.44 mg compared to the before the intervention, while the mean daily salt intake of the students in the CG increased by 1,731.83 mg in the post-test compared to the pre-test. Despite this change observed in both groups, these differences were not statistically significant in both groups ($p>0.05$). Table 2 shows the daily sodium and salt intake status of the students in the EG and CGs.

Table 2. Daily Sodium and Salt Intake of Students in the EG and CGs

	EG (n:15)			CG (n:15)		
	Pre-Test ($\bar{x}$±SD)	**Post-Test ($\bar{x}$±SD)**	**P**	**Pre-Test ($\bar{x}$±SD)**	**Post-Test ($\bar{x}$±SD)**	**P***
Sodium (mg)	3,565.14±1642.59	2,831.37±805.72	0.140	3,666.95±2195.38	4,359.68±1561.27	0.078
Salt (mg)	8,912.86±4106.48	7,078.42±2014.30	0.140	9,167.36±5488.46	10,899.19±3903.18	0.078

*: Wilcoxon signed-rank test

Daily salt intake of the students participating in the research was examined according to gender in Table 3. It was determined that the salt intake of male students in the EG before the intervention was significantly higher than that of the female students ($p<0.05$), and after the intervention, there was no significant difference between salt intake and gender ($p>0.05$).

Table 3. Examination of Daily Salt Intake of Students in the EG and CGs by Gender

		Gender	Total (n)	Mean Rank	Sum of Rank	U	P*
EG (n:15)	Pre-Test	Female	9	5.78	52.00	7.00	0.018
		Male	6	11.33	68.00		
	Post-Test	Female	9	6.67	60.00	15.00	0.157
		Male	6	10.00	60.00		
CG (n:15)	Pre-Test	Female	10	5.60	56.00	1.00	0.003
		Male	5	12.80	64.00		
	Post-Test	Female	10	5.80	58.00	3.00	0.007
		Male	5	12.40	62.00		

*: Mann Whitney U Test

Table 4 reveals the comparison of knowledge and attitudes about salt of the students in the EG before and after the intervention. While the pre-test mean scores of the students in the EG regarding salt knowledge were 62.93±15.23, the post-test scores were 84.53±8.26. The difference between the pre-test and post-test knowledge score means of the students in the EG about salt was found to be statistically significant ($p<0.05$). While the average salt-related attitude score of the students in the EG was 3.96±0.54 in the pre-test, it increased to 4.26±0.37 in the post-test. The attitudes of the students in the EG about salt changed positively in the post-test, and this change was uncovered to be statistically significant ($p<0.05$). However, the changes in the knowledge levels and attitudes of the students in the EG after the intervention were not statistically significant ($p>0.05$). On the other hand, the knowledge and attitudes of the students in the CG about salt did not differ statistically in the pre-test and post-test ($p>0.05$).

Table 4. Comparison of Students' Knowledge and Attitudes about Salt in the EG Pre-Test and Post-Test

EG		n	$\bar{x}$	SD	Min	Max	P*
Knowledge questions about salt	Pre-Test	15	62.93	15.23	32.00	84.00	0.001
	Post-Test	15	84.53	8.26	68.00	96.00	
Attitude questions about salt	Pre-Test	15	3.96	0.54	1.00	2.60	0.020
	Post-Test	15	4.26	0.37	1.20	2.40	

*: Wilcoxon signed-rank test

Table 5 exhibits the changes in the salt-related behaviors of the students in the EG before and after the intervention. Before the intervention, 13.3% of the students in the EG stated that they rarely paid attention to the warning messages about salt on food labels, and 46.7% stated that they did not pay any attention. After the intervention, the rate of those who rarely paid attention to the warning messages about salt on food labels increased to 26.7%, while the rate of those who never paid attention decreased to 33.3%.

Table 5. Changes in Salt-Related Behaviors of Students in the EG Pre-Test and Post-Test

EG (n:15)		Always (%)	Often (%)	Sometimes (%)	Rarely (%)	Never (%)	Total (%)
Paying attention to the salt and sodium content of purchased foods	Pre-Test	-	6.7	20.0	13.3	60.0	100.0
	Post-Test	-	26.7	20.0	-	53.3	100.0
Paying attention to the warning messages about salt on food labels	Pre-Test	-	13.3	26.7	13.3	46.7	100.0
	Post-Test	-	13.3	26.7	26.7	33.3	100.0
Buying low-salt foods that have warning messages about salt on food labels	Pre-Test	6.7	20.0	40.0	13.3	20.0	100.0
	Post-Test	13.3	40.0	26.7	6.7	13.3	100.0

According to Table 5, students in the EG stated that 6.7% always, 20.0% often, 40.0% sometimes, and 13.3% rarely bought low-salt foods with salt warning messages on food labels before the intervention, and 20.0% never bought them. After the intervention, it was observed that the frequency of students stating that

they always and frequently bought low-salt foods increased, while the frequency of those who never took low-salt foods decreased.

The type of salt the students used in their daily diet was also questioned in the pre-test and post-test. Before the intervention, it was determined that 66.7% of the students in the EG used iodized table salt in their daily diet, while 26.7% used non-iodized table salt and 6.7% used rock salt. After the intervention, the frequency of students using iodized salt in the EG increased to 86.7%, while there was no change in those using rock salt.

Students in the EG stated that before the intervention, 60.0% of them stored salt at home in a light-colored glass container, 33.3% in a plastic container, and 6.7% in a nylon bag. After the intervention, the container in which the salt was stored at home had not changed.

The place where the students stored the salt before the intervention was examined, and 33.3% of the students in the EG stated that they kept the salt in a cupboard close to the stove that is not exposed to sunlight, 40.0% stated that they stored it in a cupboard away from the stove that is not exposed to sunlight, and 26.7% stated that they stored it next to the stove. At the end of the intervention, 53.3% of the students in the EG started to store the salt in a cupboard away from the stove and away from sunlight.

In the research, a sample food label was given, and three questions were asked to evaluate reading the label and interpreting the information contained on the label. The education given to students in the EG included applications for reading and calculating label information.

Table 6 displays the situations of students in the EG to calculate the label information on food products in the pre-test and post-test. To the question of how many servings of product, 26.7% of the students in the EG gave the correct answer before the intervention, and 80.0% of the students in the EG gave the correct answer at the end of the intervention. This change after the intervention was found to be statistically significant ($p<0.05$). The question asked (How many grams of salt are in two portions of this product?) in the study was answered correctly by 33.3% of the students in the EG before the intervention and 93.3% after the intervention. This change in the calculations of students before and after the intervention was statistically significant. In addition, the question "How many grams of salt are in the whole product?" was answered correctly by 26.7% of the students in the EG before the intervention and 60.0% after the intervention. While the number of students who correctly answered this calculation question about salt on the sample food label increased after the intervention, this change was not found to be statistically significant ($p>0.05$).

Table 6. The Situations of the Students in the EG to Calculate the Label Information on Food Products in the Pre-Test and Post-Test

	EG				P*
	Pre-Test		Post-Test		
	n	%	n	%	
How many servings is this product?					
Correct answer (36 servings)	4	26.7	12	80.0	0.008
Wrong answers	11	73.3	3	20.0	
Total	15	100.0	15	100.0	
How many grams of salt are in two portions of this product?					
Correct answer (2.7 g)	5	33.3	14	93.3	0.004
Wrong answers	10	66.7	1	6.7	
Total	15	100.0	15	100.0	
How many grams of salt are in this entire product?					
Correct answer (48.6 g)	4	26.7	9	60.0	0.125
Wrong answers	11	73.3	6	40.0	
Total	15	100.0	15	100.0	

*: Mc Nemar

The column percentage has been taken, and each of the incorrect answers has been collected into a single heading.

DISCUSSION

Although the daily sodium and salt intake decreased in the EG after the intervention, the current sodium and salt intake was still found to be much higher than the WHO recommendations (sodium intake <2

g/day, salt intake 5 g/day). In this respect, educational intervention has not been fully effective in reducing salt intake. This may be due to students' unhealthy food choices and eating habits, such as fast food snack food consumption, as well as their inability to take an active role during the preparation and cooking of the foods they consume and their inability to control the amount of salt added to food. On the other hand, the sodium and salt intakes of the students in the CG increased slightly in the post-test compared to the pre-test. This situation is probably related to inappropriate eating habits, such as the consumption of snacks, processed foods, and fast food, which are common among university students.

Similar to the results obtained from the study, in a study conducted for students and adults in China, salt intake decreased in the intervention group at the end of the intervention, while an increase occurred in the control group.[15] In an intervention study conducted for homemakers in Japan, where there is excessive salt intake, salt intake in the pre-test was 10 g in the control group and 9.57 g in the intervention group; salt intake in the post-test was 10.30 g in the control group and 8.95 g in the intervention group. The study also suggests that the effects of cooking classes focusing on salt reduction for homemakers could be transferred to other family members.[16] On the other hand, in a study conducted with children aged 10-12 in Portugal, at the end of the educational intervention, the average salt intake decreased by 0.4 g in the control group, 0.6 g in the theoretical group, and 1.1 g in the application group.[17] Continuous and effective interventions that involve the entire society starting from an early age can help reduce salt intake.

In this current study, the researchers found that the daily salt intake of male students was significantly higher than that of female students. This situation is similar to the results of some studies conducted in Türkiye.[8,9] In another study on the subject, it was determined that the sodium intake of young adults and male gender was higher.[20] A systematic analysis covering 187 countries between 1990 and 2010 also found that men's salt intake was 10% higher than women's.[21] This may be due to the fact that women pay more attention to issues related to nutrition and health. On the other hand, there was no significant difference between salt intake and gender after the intervention. This may be an indication that intervention is effective in male students regarding salt intake. It may result from differences in motivation regarding education.

After the intervention, the knowledge levels of the students in the EG about salt increased significantly, and their attitudes about salt changed positively. A four-week sodium intake reduction program applied to nursing students also significantly increased their knowledge levels about sodium.[14] Similarly, a study conducted on university students in the United Arab Emirates exhibited a significant increase in students' knowledge and positive attitudes about salt after the educational sessions.[13] In another study, significant improvements were observed in the post-intervention knowledge scores and some salt-related attitudes and behaviors of student pharmacists who participated in the salt education program.[18] In an intervention study conducted in China, a one-year intervention significantly improved salt-related knowledge and attitudes, although the average effect of salt intake did not produce a significant change in the intervention group compared to the control group.[19] As such, educational interventions can improve individuals' and society's nutritional knowledge and attitudes. These results are consistent with the findings of this current study. The rich content of the educational sessions in this intervention study may have been effective in the development of students' knowledge and attitudes about salt.

When the effect of salt intake reduction intervention on practices was examined, positive changes were observed in the salt-related practices of the students in the EG. After the intervention, it was determined that the students in the EG paid more attention to the salt and sodium content of the foods they purchased and the warning messages about salt, and they more often purchased low-salt foods with warning messages about salt on the food labels. In this study, before the intervention, 6.7% of the students in the EG were paying frequent attention to the salt and sodium content of the foods they purchased. Similarly, another study conducted in Türkiye found that 5.7% of the participants frequently checked the salt/sodium content information on food labels during shopping, while about half did not check it at all.[22]

In a study conducted with approximately 12.000 people in Italy, it was determined that less than 50% of the participants read the salt content on nutrition labels and purchased less salty food products.[23] Similar to these studies, in this current study, it was observed that after the intervention, less than 50% of the students in the EG paid attention to the information about salt and sodium on the labels of the foods they purchased, and nearly 50% did not read this information on the labels. On the other hand, in this current study, after the intervention, more than 50% of students in EG stated that they always bought and often bought low-salt foods with warning messages about salt on food labels. Nevertheless, these changes in salt-related behavior of students in EG after the intervention are indicative of the positive effect of the intervention on

behaviors. Habits and food preferences that are ongoing and difficult to change in a short time, the idea that more time is needed to read food labels, and the fact that messages about salt on food labels do not attract enough attention may be the difficulties in university students to perform these behaviors. The limited variety of products with low salt content and the fact that these products are not very common may be obstacles to changing behavior.

Additionally, in this current study, after the intervention, the frequency of those who paid attention to the warning messages about salt on food labels increased, while the frequency of those who did not do so decreased. However, labels in different formats, such as the traffic light label added to the front of the package regarding the sodium and salt content of the product, will help consumers distinguish between low and high-sodium products.[24] The development and use of simple, effective, and consumer-friendly labeling models that enable consumers to easily understand the salt content of processed products may be effective in this regard.

While 66.7% of the students in the EG used iodized salt in the pre-test, these values were found to be 67.2% and 75.6%, respectively, in two studies conducted on university students in Türkiye. [25, 26] Although the majority of students in the EG used iodized salt, more than half of them stored the iodized salt in inappropriate conditions before the intervention. In fact, incorrect practices regarding the use of iodized salt at home and storage conditions cause iodine loss. The intervention provided in this respect and the sharing of information on the preservation and use of iodized salt has partially improved the practice. In the post-test, approximately half of the students in the EG started to keep the salt in a cupboard away from the stove and away from sunlight to prevent iodine loss. Focusing on the importance of iodine and iodized salt in the intervention study helped to demonstrate correct behavior regarding the use and storage of iodized salt by increasing awareness about iodine.

Therefore, it can be concluded that intervention had positive effects not only on knowledge, attitude, and salt-related practices but also on students' label reading and calculation skills. The rate of those who answered correctly to the three calculation questions asked after the intervention increased. Nevertheless, this increase was found to be statistically significant except for one question. As such, interventions focusing specifically on label information and calculations will help consumers make healthier food choices. Thus, consumers will be able to eat healthier by choosing foods containing less salt, sugar, fat, and energy.

CONCLUSION

This study showcased that the intervention given to reduce salt intake was effective in increasing university students' level of knowledge about salt and developing positive attitudes, as well as improving their ability to read food labels.

Increases in knowledge and attitude levels were not fully reflected in practice. Despite the positive changes in practice, the expected decrease in students' daily salt intake after the intervention did not occur. This study reveals that intervention alone may not be sufficient to reduce salt intake and that effective and versatile practices that will encourage behavioral change should be continued. Changing eating habits and practices can be achieved by applying long-term behavior modification methods. Education should, thus, be sustainable to increase mindful awareness.

On the other hand, in the food industry, reducing the salt content of processed foods, making special labels for people to make healthy food choices, taxing high-sodium foods, and conducting community-based education studies in special groups may be effective in achieving the targets recommended by WHO.

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REFERENCES

1. World Health Organization. Noncommunicable diseases, Fact sheets. 2023. Available from https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases

2. He FJ, Tan M, Ma Y, MacGregor GA. Salt reduction to prevent hypertension and cardiovascular disease: JACC state-of-the-art review. Journal of the American College of Cardiology. 2020;75(6):632-47. https://doi.org/10.1016/j.jacc.2019.11.055
3. Afshin A, Sur PJ, Fay KA, Cornaby L, Ferrara G, Salama JS, et al. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet. 2019;393(10184):1958-72. https://doi.org/10.1016/S0140-6736(19)30041-8
4. World Health Organization. Guideline: Sodium intake for adults and children. 2012. Available from https://iris.who.int/bitstream/handle/10665/77985/9789241504836_eng.pdf?sequence=1
5. He FJ, MacGregor GA. Salt intake, plasma sodium and worldwide salt reduction. Annals of Medicine. 2012;44: 127-37. https://doi.org/10.3109/07853890.2012.660495
6. World Health Organization. WHO global report on sodium intake reduction. 2023. Available from https://iris.who.int/bitstream/handle/10665/366393/9789240069985-eng.pdf?sequence=1
7. Erdem Y, Arici M, Altun B, Turgan C, Sindel S, Erbay B. et al. The relationship between hypertension and salt intake in Turkish population: SALTURK study. Blood Pressure. 2010;19(5):313-18. https://doi.org/10.3109/08037051003802541
8. Erdem Y, Akpolat T, Derici Ü, Şengül Ş, Ertürk Ş, Ulusoy Ş, et al. Dietary sources of high sodium intake in Turkey: SALTURK II. Nutrients. 2017;9(9):933. https://doi.org/10.3390/nu9090933
9. Türkiye Hanehalkı Sağlık Araştırması: Bulaşıcı Olmayan Hastalıkların Risk Faktörleri Prevalansı 2017 (STEPS). Editörler: Üner S, Balcılar M, Ergüder T. Dünya Sağlık Örgütü Türkiye Ofisi, Ankara, 2018. Available from https://www.who.int/publications/m/item/2017-steps-country-report-turkey-(Turkish)
10. Turkish Nutrition and Health Survey. (2019). Türkiye Beslenme ve Sağlık Araştırması (TBSA) 2017. T.C. Sağlık Bakanlığı Halk Sağlığı Genel Müdürlüğü, Yayın No: 1132, Ankara. Available from https://hsgm.saglik.gov.tr/depo/birimler/saglikli-beslenme-ve-hareketli-hayat-db/Dokumanlar/Kitaplar/Turkiye_Beslenme_ve_Saglik_Arastirmasi_TBSA_2017.pdf
11. El-Mani SF, Mansour RM, Abdessamad AE, Al-Abbar EA, Shallouf N, Amer R. Factors influencing eating behavior of Benghazi University students. Asian Journal of Medical Sciences. 2020;11(4):20-29 https://doi.org/10.3126/ajms.v11i4.26464
12. Bernardo GL, Jomori MM, Fernandes AC, Proença RPdC. Food Intake of University Students. Food intake of university students. *Revista de Nutrição.* 2017;30(6):847-65. https://doi.org/10.1590/1678-98652017000600016
13. Cheikh Ismail L, Hashim M, Jarrar AH, Mohamad MN, Al Daour R, Al Rajaby R, et al. Impact of a nutrition education intervention on salt/sodium related knowledge, attitude, and practice of university students. Frontiers in Nutrition. 2022; 9: 830262. https://doi.org/10.3389/fnut.2022.830262
14. Piaseu N. Effects of program promoting food consumption for sodium reduction on knowledge, sodium consumption behaviors, and urinary sodium in nursing students: a multi-setting study. The Bangkok Medical Journal. 2020;16(1):44. https://doi.org/10.31524/bkkmedj.2020.11.009
15. He FJ, Wu Y, Feng XX, Ma J, Ma Y, Wang H, et al. School based education programme to reduce salt intake in children and their families (School-EduSalt): cluster randomised controlled trial. BMJ. 2015; 350:h770 https://doi.org/10.1136/bmj.h770
16. Takada T, Imamoto M, Fukuma S, Yamamoto Y, Sasaki S, Uchida M, et al. Effect of cooking classes for housewives on salt reduction in family members: a cluster randomized controlled trial. Public Health. 2016;140:144-50. https://doi.org/10.1016/j.puhe.2016.07.005
17. Cotter J, Cotter MJ, Oliveira P, Cunha P, Polónia J. Salt intake in children 10-12 years old and its modification by active working practices in a school garden. Journal of Hypertension. 2013;31(10): 1966-71. https://doi.org/10.1097/hjh.0b013e328363572f
18. Garza KB, Westrick SC, Teeter BS, Stevenson TL. Incorporating hypertensive patient education on salt intake into an introductory pharmacy practice experience. American Journal of Pharmaceutical Education. 2013;77(9):199. https://doi.org/10.5688/ajpe779199
19. Liu M, Xu J, Li Y, He FJ, Zhang P, Song J, et al. A town-level comprehensive intervention study to reduce salt intake in China: cluster randomized controlled trial. Nutrients. 2022;14(21):4698. https://doi.org/10.3390/nu14214698
20. Abdul Aziz NS, Ambak R, Othman F, He FJ, Yusof M, Paiwai F, et al. Risk factors related with high sodium intake among Malaysian adults: findings from the Malaysian Community Salt Survey (MyCoSS) 2017–2018. Journal of Health, Population and Nutrition; 2021;40:1-6. https://doi.org/10.1186/s41043-021-00233-2

21. Powles J, Fahimi S, Micha R, Khatibzadeh S, Shi P, Ezzati M, et al. Global, regional and national sodium intakes in 1990 and 2010: a systematic analysis of 24 h urinary sodium excretion and dietary surveys worldwide. BMJ Open. 2013;3(12), e003733. https://doi.org/10.1136/bmjopen-2013-003733
22. Altuntaş N, İnan CM, Özçelik AÖ. Yetişkin bireylerin tuz ile ilgili bilgi, tutum ve davranışlarının değerlendirilmesi. Artuklu International Journal of Health Sciences, 2023;3(3):270-77. https://doi.org/10.58252/artukluder.1376088
23. Iaccarino Idelson P, D'Elia L, Cairella G, Sabino P, Scalfi L, Fabbri A, et al. Salt and health: survey on knowledge and salt intake related behaviour in Italy. *Nutrients.* 2020;12(2):279. https://doi.org/10.3390/nu12020279
24. McLean R, Hoek J, Hedderley D. Effects of alternative label formats on choice of high-and low-sodium products in a New Zealand population sample. Public Health Nutrition. 2012;15(5):783-91. https://doi.org/10.1017/S1368980011003508
25. Uzun SU, Özdemir C, Zencir M. Pamukkale üniversitesi öğrencilerinin tuz kullanımı ile ilgili bilgi, tutum ve davranışları. Fırat Tıp Dergisi. 2016;21(4): 187-94. https://www.firattipdergisi.com/text.php3?id=1013#:~:text=%C3%96%C4%9Frenciler%20tuzu%20%25%205 0%2C%203%20ile,tad%C4%B1na%20bakmadan%20tuz%20ekledi%C4%9Fini%20belirtmi%C5%9Ftir.
26. Yılmazer M, Akış T. Salt, from history to consumption: an evaluation of Izmir Katip Celebi University students' knowledge, attitudes and behaviours about salt consumption. Disiplinlerarası Gıda Çalışmaları Dergisi. 2022;2(1), 15-24. https://doi.org/10.5281/zenodo.6783670