Review

Salt Intake- Related Knowledge, Attitudes, and Practices among Jordanian Adults

Zeina Abdel Majeed , Rawhieh Barham , Ayoub Al-Jawaldeh * , Nada Ahmad , Yousef Khader

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Salt Intake- Related Knowledge, Attitudes, and Practices among Jordanian Adults

Zeina Abdel Majeed, [1], Rawhieh Barham [2], Ayoub Al-Jawaldeh [3,*], Nada Ahmad [4] and Yousef Khader [5]

[1] Global Health Development EMPHNET; zabdelmajeed@emphnet.net
[2] Ministry of Health Jordan, Head of Nutrition Department; majeda_barham@hotmail.com
[3] World Health Organization, Regional Office for the Eastern Mediterranean, aljawaldeha@who.int
[4] Global Health Development EMPHNET; nahmad@emphnet.net
[5] Distinguished Professor of Epidemiology, Medical Education and Biostatistics, Jordan University of Science and Technology, yskhader@just.edu.jo
* Correspondence: aljawaldeha@who.int

Abstract: High salt consumption is a worldwide public health problem, and its magnitude is highly variable among different communities. This study aimed to assess the knowledge, attitudes, and practices of Jordanian citizens related to salt intake. A cross-sectional quantitative study was conducted with a multi-stage sampling technique used to select a representative sample from the population of Amman. Data was collected using a structured, validated questionnaire administered by trained interviewers between November and December 2021. The majority of participants (70.8%) did not know the maximum amount of salt allowed per day and reported not reading food labels when buying food. Almost half of participants (48.2%) reported always adding salt while cooking, and 14.6% always add table salt after cooking. The most common reported practices to reduce salt intake included using spices other than salt while cooking (67.2%) and avoiding or decreasing the amount of salt-rich food. This study showed that Jordanian adults have relatively limited knowledge about salt intake, and their practices of salt intake are inappropriate. Therefore, there is a need to adopt long-term strategies to reduce salt intake among the Jordanian population and lessen the negative impacts on community health.

Keywords: knowledge; attitudes; practices; salt intake

1. Introduction

Non-communicable diseases (NCDS) are the world's commonest killers and the leading cause of death in the WHO Eastern Mediterranean Region (EMR). Commonly known as chronic or lifestyle-related diseases, they include cardiovascular diseases, cancers, chronic respiratory diseases and diabetes (1). Many of these deaths are preventable through lifestyle-related changes and cost-effective interventions implemented by national governments (2). Globally, two thirds (63%) of deaths are attributable to NCDs, with low- and middle-income countries (LMICs) bearing 86% of the burden of these deaths occurring prematurely (3). Raised blood pressure is a major cause of premature deaths worldwide. The complications arising from increased blood pressure contribute to 9.4 million deaths every year (4). Raised blood pressure is reported to cause at least 45% of deaths due to heart diseases and 51% of deaths due to stroke (16). Globally, raised blood pressure is evident in 1 in 4 men and 1 in 5 women in 2015.

In Jordan, 78% of all deaths in 2016 were due to NCDs (5). The prevalence of hypertension has doubled from 16% in 1995 to 32% in 2009, while the prevalence of DM increased significantly from 13% in 1994 to 17% in 2004(6,7). Moreover, researchers estimated that by the year 2050, 3.8 million (37%) Jordanian citizens would have hypertension, 3.0 million (30%) will have DM, and 2.9 million (29%) will have dyslipidemia (8). A systematic review from 10 Arab countries reported an overall prevalence of hypertension of 29.5% (9). The high rate of obesity and physical inactivity coupled with

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high salt and fat intake explains the high prevalence of hypertension in Jordan as well as other Arab countries (10).

Consuming a healthy diet throughout life helps protect against malnutrition in all its forms and NCDs such as heart disease, stroke, diabetes, and cancer. As detailed data regarding salt consumption in the Jordanian population is lacking, a cross-sectional study on salt consumption in Jordan revealed that participants were consuming at least double the current WHO recommended daily sodium allowance of 2 g (5 g salt) (11). These results are consistent with the reported results from Tehran, where an average sodium level of 130 mmol/day was reported, with higher intake in males at 151 mmol/day, compared with 117 mmol/day in females (12). A report from Saudi Arabia demonstrated a mean sodium level of 153 mmol/ day and 118 mmol/day (6.7–9 g salt) in males and females, respectively(13). Results from the INTERSALT study also revealed that salt ingestion in Italy, Finland and Portugal were between 9 and 12 g/day, while people in the Netherlands, Denmark and Belgium ingested between 8 and 9 g/day(14).

Like other countries in EMR, people in Jordan consume higher energy, fats, free sugars, and salt/sodium. Furthermore, many people are not eating enough fruit, vegetables, and other dietary fibres such as whole grains. Jordanian citizens currently consume high sodium and low potassium diet and are mostly unaware of its negative impact on their health. Hence, it is crucial for healthcare providers to intervene and adopt long-term strategies to control salt intake to reduce its negative effects in Jordan and elsewhere (11). The most recent STEPwise survey in Jordan (15) showed that the fruit and vegetable consumption is considered low, where 84% consumed less than five portions per day, as recommended by the WHO. The average number of servings per day of vegetables were two and of fruit was one, where half of the sample (50%) consumed 1-2 servings of vegetables or fruit per day (16)

Several epidemiological, experimental, and clinical studies positively correlated excessive sodium consumption with hypertension (17). High sodium intake increases the risk of cardiovascular disease and mortality and may have other harmful effects, including increased risk of stroke, heart failure, osteoporosis, obesity, gastric cancer, and chronic kidney disease (18). A meta-analysis of 31 trials shows that reduction of sodium consumption by 75 mmol/day (equivalent to 4 g salt) led to an average decrease of 5.0 mmHg systolic blood pressure (BP) and 2.7 mmHg diastolic BP in hypertensive patients (19). High potassium consumption has been found to be beneficial in preventing hypertension and cardiovascular events (20). Keeping salt intake to less than five g/day (equivalent to sodium intake of less than two g/day) helps prevent hypertension and reduces the risk of heart disease and stroke in the adult population (16). One-third of the people in the Jordan STEP survey were found to always add salt to their food, with the mean daily salt intake in all respondents being 11 g/day (6), which revealed the high daily intake of salt among Jordanians, being double that recommended by the WHO.

Cost-effective interventions to reduce the impact of NCDs are widely available, and their implementation can avert premature death and prevent economic losses, which have been estimated to account for USD 7 trillion over the timeframe of 2015-2030(3). NCDs can be prevented by changing policies and actively engaging all sectors through a whole government and whole society approach. Among these are the strengthening of NCDs surveillance system at all levels, the improvement of NCDs programs at the primary healthcare level and the promotion of a healthy lifestyle through awareness campaigns within the community. This can positively reflect on reducing NCDs morbidity and mortality rates in Jordan and pave the way for achieving sustainable development goals by 2030(21). Although high salt consumption is considered a worldwide public health problem, its magnitude is highly variable among different communities; therefore, it is essential to study locally salt consumption habits in Jordan and specifically in the capital Amman.

2. Materials and Methods

The study population is the Jordanian adults aged above 18 years residing in the Capital, Amman. The total Amman population is estimated at 2,182,151 persons in 2021.

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Study Design

A cross-sectional study was conducted among adults living in Amman to assess the knowledge, attitude and practices related to salt intake.

Sampling

A multi-stage sampling technique was used to select representative sample from the population of Amman. In the first stage, well-defined geopolitical areas were selected from each district of Amman governorate. In the second stage, a random sample of households using a systematic sampling technique was selected from in each selected area. Within each selected household, only one person was selected and interviewed. For this KAP study, the number of households included in the study was determined using the appropriate formula for estimation of single proportion using cluster sampling approach. At 95% confidence interval (CI), 5% precision and 10% nonresponse rate and assuming that the expected proportion of population with adequate knowledge is 50% the sample size calculated was 856 persons.

Institutional Review Board Statement

"The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of Jordan University of Science and Technology IRB #637/2021, " (approval number: 53/637/2021) was approved by the IRB committee on the 8th of October 2021.

Questionnaire

Data were collected using a structured, validated questionnaire administered by trained interviewers. The questionnaire is developed based on previous similar surveys(14,32). The questionnaire included items on the socio-demographic characteristics and health characteristics of participants, including previous diagnoses of diabetes, high cholesterol and triglyceride levels and hypertension. The questionnaire was prepared in English (**Appendix 1**) and translated to Arabic using backward forward translation method. The questionnaire was checked for clarity, consistency, and cultural acceptability. The questionnaire contained 41 questions divided into sections to examine people's knowledge, attitudes, and practices and potential interventions

Demographics and general health information section

This section describes the characteristics of people under study and confirms the inclusion criteria of sampling.

Knowledge Section:

Knowledge is the understanding of a person, this study examined people's awareness on salt and its intake.

Attitudes Section:

Attitudes are people's feelings towards negative or positive statements. So, a person's subjective norm and attitude along with perceived control can be used to decide his/her intent to be involved in a behavior such as irrational or rational use of salt.

Practices Section:

Theory of Planned Behavior defines intentions as key factors in the performance of behaviors (practices) since it captures motivational factors influencing a behavior. So, any factor that predict intentions can affect the performance of behaviors, and beliefs of this behavior state the person's intention to carry it out such as salt usage.

Sources of receiving health information and the preferred method for obtaining information

This section explores Media and other communication channels usage habits and client preference to inform behavior and awareness future planning

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Data collection

Research assistants (data collectors) were recruited and trained by research supervisors. Data were collected through face-to-face interviews with an automated household questionnaire. Ethical considerations were strictly followed, and informed consent was obtained from the respondents before each interview. Different measures were undertaken to ensure quality of the collected data. The supervisors and research assistants (data collectors) were recruited based on their good knowledge of the local context, as well as experience in data collection and working among local communities. The data collectors received training on the interpretation and use of the data collection tools to enable them collect quality data. The data collectors worked under the direct supervision to ensure that the team focused on the objectives of the study, and data collected as planned for. Data cleaning was carried out involving both field and office editing of the collected data. In the field, the supervisor sought to ensure that data was properly entered onto the questionnaires. At office level, data was further checked and screened for inconsistencies by core team.

Statistical analysis

Data were entered and analyzed using the Statistical Package for Social Sciences software IBM SPSSS (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp). Means, standard deviations, and percentages were used to describe the data. Gender-specific estimates were reported. Because the samples were self-weighted, weights in analysis were not included. Chi-square was used to compare percentages. A p-value of less than 0.05 was considered statistically significant.

3. Results

Participants' characteristics

A total of 1354 persons (1042 (77.0%) females and 312 (23.0%) males) were included in the study. Table 1 shows the participants' sociodemographic and clinical characteristics. Almost half of the participants were younger than 40 years and 45.6% had university education. Males were significantly more educated than females. Of all participants, 6.9% reported having cardiovascular disease and 22.4% reported having hypertension. Almost 9.3% and 14% of females and 59.6% and 9.3% of males reported smoking cigarettes and waterpipe every day, respectively.

Table 1. Participants' sociodemographic and clinical characteristics (n= 1354).

Variable	Female		Male		Total		P value
	n	%	n	%	N	%	
Age							0.625
<40	538	51.6	166	53.2	704	52.0	
≥40	504	48.4	146	46.8	650	48.0	
Qualifications							0.010
Less than university education	587	56.3	150	48.1	737	54.4	
University education	455	43.7	162	51.9	617	45.6	
Marital Status							0.000
Widow	88	8.4	8	2.6	96	7.1	
Single	193	18.5	98	31.4	291	21.5	
Married	700	67.2	198	63.5	898	66.3	
Divorced	61	5.9	8	2.6	69	5.1	
Hypertension	228	21.9	75	24.0	303	22.4	0.422
Diabetes	142	13.6	43	13.8	185	13.7	0.944
Hypercholesterolemia	165	15.8	50	16.0	215	15.9	0.936
Cardiovascular diseases	66	6.3	27	8.7	93	6.9	0.155
Other chronic illnesses	93	8.9	25	8.0	118	8.7	0.616

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Current Cigarettes Smoker							0.000
Sometimes	56	5.4	12	3.8	68	5.0	
Every day	97	9.3	186	59.6	283	20.9	
Not at all	889	85.3	114	36.5	1003	74.1	
Current waterpipe smokers							0.029
Sometimes	253	24.3	67	21.5	320	23.6	
Every day	146	14.0	29	9.3	175	12.9	
Not at all	643	61.7	216	69.2	859	63.4	

Salt intake- related knowledge

Table 2 shows respondents' knowledge about salt intake according to gender. Almost 70.8% of participants didn't know the maximum salt intake amount per day for adults. However, they knew the relation between the access intake and illnesses such as hypertension (96.1%) and kidney stone (86.2%). Almost two thirds of the participants (65.0%) said it very important to lower salt intake. Almost 6.4% reported that salt is high in bread, pizza (27.5%), Pasta, Rice and other non-cooked grains (5.3%), cheese (89.3%), canned meat (47.0%), Canned food such as canned vegetables, tuna, sardine and canned mushrooms (31.8%), yogurt containing products (79.0%), readymade sauces (58.3%), nuts (58.0%), pickles and Olives (87.8%). Less than half of participants (40.8%) reported that there is a type of salt that is used in food making which is harmless regardless of its quantity (Table 3).

Table 2. Respondents' knowledge about salt intake according to gender (n= 1354).

Variable	Female		Male		Total		P value
	n	%	n	%	N	%	
What is the maximum salt intake for an adult to maintain a healthy diet?							0.001
10g/day	84	8.1	21	6.7	105	7.8	
2g/day	193	18.5	58	18.6	251	18.5	
5g/day	328	31.5	67	21.5	395	29.2	
I don't know	437	41.9	166	53.2	603	44.5	
Does eating too much salt or salty sauces in your diet causes:							0.381
Hypertension	1000	96.0	301	96.5	1301	96.1	0.687
Osteoporosis	558	53.6	136	43.6	694	51.3	0.002
Stomach Cancer	482	46.3	120	38.5	602	44.5	0.015
Kidney Stones	906	86.9	261	83.7	1167	86.2	0.139
How important to you is lowering salt in your diet?							0.003
Not Important at All	48	4.6	30	9.6	78	5.8	
Somehow Important	305	29.3	91	29.2	396	29.2	
Very Important	689	66.1	191	61.2	880	65.0	
What is your estimate of the amount of salt available in the following diets:							0.477
White bread							
Normal/ Acceptable	603	57.9	191	61.2	794	58.6	
Low	373	35.8	100	32.1	473	34.9	
High	66	6.3	21	6.7	87	6.4	
Pizza							0.783
Normal/ Acceptable	621	59.6	190	60.9	811	59.9	
Low	130	12.5	41	13.1	171	12.6	
High	291	27.9	81	26.0	372	27.5	
Pasta, Rice and other non-cooked grains							0.899
Normal/ Acceptable	591	56.7	178	57.1	769	56.8	
Low	397	38.1	116	37.2	513	37.9	
High	54	5.2	18	5.8	72	5.3	
white Cheese							0.132

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Normal/ Acceptable	81	7.8	34	10.9	115	8.5	
Low	18	1.7	8	2.6	26	1.9	
High	943	90.5	270	86.5	1213	89.6	
Canned Meat							0.506
Normal/ Acceptable	483	46.4	142	45.5	625	46.2	
Low	67	6.4	26	8.3	93	6.9	
High	492	47.2	144	46.2	636	47.0	
Canned food such as canned vegetables, tuna, sardine and canned mushrooms							0.990
Normal/ Acceptable	571	54.8	172	55.1	743	54.9	
Low	140	13.4	41	13.1	181	13.4	
High	331	31.8	99	31.7	430	31.8	
yogurt containing products such as Laban, Labaneh, Ayran and Jameed							0.625
Normal/ Acceptable	198	19.0	65	20.8	263	19.4	
Low	15	1.4	6	1.9	21	1.6	
High	829	79.6	241	77.2	1070	79.0	
Readymade sauces such as soya sauce and ketchup							0.092
Normal/ Acceptable	361	34.6	127	40.7	488	36.0	
Low	64	6.1	13	4.2	77	5.7	
High	617	59.2	172	55.1	789	58.3	
Nuts							0.396
Normal/ Acceptable	393	37.7	131	42.0	524	38.7	
Low	35	3.4	10	3.2	45	3.3	
High	614	58.9	171	54.8	785	58.0	
Pickles and Olives							0.191
Normal/ Acceptable	106	10.2	43	13.8	149	11.0	
Low	13	1.2	3	1.0	16	1.2	
High	923	88.6	266	85.3	1189	87.8	

Table 3. Respondents' attitude towards salt intake according to gender (n= 1354).

Variable	Female		Male		Total		P value
Do you think there is a type of salt that is used in food making which is harmless regardless of its quantity?							**0.000**
No	586	56.2	215	68.9	801	59.2	
Yes	456	43.8	97	31.1	553	40.8	
When eating meals outside the home, how do you feel the taste of food?							0.833
No taste	75	7.2	23	7.4	98	7.2	
Normal	802	77.0	244	78.2	1046	77.3	
Salty	165	15.8	45	14.4	210	15.5	
Do you believe there are alternatives to salt that can be added to the food?							0.023
No	488	46.8	169	54.2	657	48.5	
Yes	554	53.2	143	45.8	697	51.5	

Salt intake practices

As shown in Table 4, almost three quarters (77.4%) of persons reported using iodized salt. Only 17.1% reported reading food label. Of those, 41.4% reported that they benefited from food labels in finding out the amount of salt in food items. About 67.7% of respondents don't buy food if it contains high. Almost half of participants (48.2%) always add salt while cooking and 14.6 % add table salt always after cooking. The most common reported practices to reduce salt intake included using spices other than salt while cooking (67.2%) and avoiding or decreasing amount of salt rich food (64.2%) (Table 5).

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Table 6 shows the frequency of eating common foods. Almost 87.2% of participants reported eating three or less Arabic breads daily and 62.1% of participants reported eating pickles and olives at least once per day.

Table 4. Respondents' salt intake related practice according to gender (n= 1354).

Variable	Female		Male		Total		P value
What type of salt you usually use when preparing your meals at home?							**0.003**
Non- iodized	50	4.8	19	6.1	69	5.1	
I don't Know	164	15.7	73	23.4	237	17.5	
Iodized	828	79.5	220	70.5	1048	77.4	
Do you read the nutritional label on the food items when grocery shopping?							0.285
No	858	82.3	265	84.9	1123	82.9	
Yes	184	17.7	47	15.1	231	17.1	
In case the food item contains a higher amount of salt than the allowed one, do you still buy it?							0.000
No	721	69.2	196	62.8	917	67.7	
Don't care	238	22.8	103	33.0	341	25.2	
Yes	83	8.0	13	4.2	96	7.1	
Do you feel thirsty after eating your meals?							0.201
Never	152	14.6	50	16.0	202	14.9	
Sometimes	610	58.5	165	52.9	775	57.2	
Always	280	26.9	97	31.1	377	27.8	
Do you add table salt when cooking your daily meals?							0.000
Never	186	17.9	50	16.0	236	17.4	
Always	581	55.8	71	22.8	652	48.2	
Not responsible for cooking meals	53	5.1	142	45.5	195	14.4	
Sometimes	222	21.3	49	15.7	271	20.0	
Do you add salt on the table in your daily meals?							0.340
Never	659	63.2	190	60.9	849	62.7	
Always	156	15.0	42	13.5	198	14.6	
Sometimes	227	21.8	80	25.6	307	22.7	
Do you add salty sauces to every meal of your day?							0.049
Never	556	53.4	191	61.2	747	55.2	
Always	125	12.0	30	9.6	155	11.4	
Sometimes	361	34.6	91	29.2	452	33.4	
Do you add salty spices such as Maggi or chicken broth when cooking your daily meals?							0.000
Never	216	20.7	122	39.1	338	25.0	
Always	541	51.9	92	29.5	633	46.8	
Sometimes	285	27.4	98	31.4	383	28.3	

Table 5. Common practices for reducing salt intake.

Variable	Female		Male		Total		P value
To reduce salt intake:							
I Avoid or I decrease amount of salt rich food I eat	689	66.1	180	57.7	869	64.2	0.006
I buy alternative products with low salt content	520	49.9	134	42.9	654	48.3	0.031
I read the salt content on the food labels	382	36.7	92	29.5	474	35.0	0.020
I do not add salt when cooking or I add a very small amount	569	54.6	136	43.6	705	52.1	0.001
I only use spices instead of salt when cooking	483	46.4	108	34.6	591	43.6	0.000
I avoid eating outside a lot	539	51.7	137	43.9	676	49.9	0.015

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If I eat outside, I choose low salt food options	434	41.7	115	36.9	549	40.5	0.130
I use spices with salt while cooking	726	69.7	184	59.0	910	67.2	0.000

Table 6. Amount and frequency of eating common foods.

Variable	Female		Male		Total		P value
What is the amount of Arabic bread you eat daily?							0.000
One bread	328	31.5	35	11.2	363	26.8	
Two breads	435	41.7	89	28.5	524	38.7	
Three breads	141	13.5	87	27.9	228	16.8	
Four breads	54	5.2	42	13.5	96	7.1	
Five breads	18	1.7	38	12.2	56	4.1	
More than five breads	8	0.8	12	3.8	20	1.5	
I don't eat bread	58	5.6	9	2.9	67	4.9	
How many times per week you eat white cheese?							0.328
1-2 times per week	599	57.5	176	56.4	775	57.2	
3-4 times per week	146	14.0	55	17.6	201	14.8	
more than five times per week	36	3.5	7	2.2	43	3.2	
I don't eat	261	25.0	74	23.7	335	24.7	
How many servings of fruits and vegetables you eat daily							0.000
One serving	303	29.1	64	20.5	367	27.1	
Two servings	366	35.1	101	32.4	467	34.5	
Three servings	205	19.7	76	24.4	281	20.8	
Four servings	83	8.0	22	7.1	105	7.8	
More than five servings	47	4.5	30	9.6	77	5.7	
I don't eat	38	3.6	19	6.1	57	4.2	
How many times per week you eat salty biscuits and chips?							0.000
1-2 times per week	435	41.7	103	33.0	538	39.7	
3-4 times per week	206	19.8	46	14.7	252	18.6	
more than five times per work	97	9.3	31	9.9	128	9.5	
I don't eat	304	29.2	132	42.3	436	32.2	
How many times per day you use pickles and olives?							0.387
More than three times per day	78	7.5	15	4.8	93	6.9	
I don't eat	320	30.7	100	32.1	420	31.0	
Once per day	491	47.1	154	49.4	645	47.6	
Twice per day	153	14.7	43	13.8	196	14.5	
How many times per week you eat Indomi?							0.048
1-2 times per week	229	22.0	61	19.6	290	21.4	
3-4 times per week	84	8.1	13	4.2	97	7.2	
more than five times per work	30	2.9	13	4.2	43	3.2	
I don't eat	699	67.1	225	72.1	924	68.2	

Source of health information

Table 7 shows the main sources of health information. The most common source reported by participants was social media (72.7%) followed by Google (64.0%) and health centers (64.3%). Table 8 shows the preferred source of information on salt intake and health. The majority (82.8%) of

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respondents preferred health centers and 78.2% preferred social media source of information on salt intake and health.

Table 7. The main sources of health information.

Variable	Female		Male		Total		P value
Flyers, Brochures and Posters	264	25.3	66	21.2	330	24.4	0.131
Television	571	54.8	149	47.8	720	53.2	0.029
Radio	123	11.8	48	15.4	171	12.6	0.095
YouTube	543	52.1	165	52.9	708	52.3	0.810
Social Media Platforms	756	72.6	229	73.4	985	72.7	0.769
Google	655	62.9	212	67.9	867	64.0	0.100
Friends	554	53.2	153	49.0	707	52.2	0.200
School or University	227	21.8	69	22.1	296	21.9	0.901
Health centers	673	64.6	198	63.5	871	64.3	0.716

Table 8. Respondent preferred source of information on salt intake.

Variable	Female		Male		Total		P value
Flyers, Brochures and Posters	402	38.6	102	32.7	504	37.2	0.059
Television	677	65.0	173	55.4	850	62.8	0.002
Radio	226	21.7	83	26.6	309	22.8	0.070
YouTube	621	59.6	196	62.8	817	60.3	0.307
Social Media Platforms	812	77.9	247	79.2	1059	78.2	0.642
Google	717	68.8	232	74.4	949	70.1	0.060
Friends	565	54.2	149	47.8	714	52.7	0.045
School or University	312	29.9	95	30.4	407	30.1	0.864
Health centers	854	82.0	267	85.6	1121	82.8	0.137

Reasons of high salt intake

Table 9 shows the participants' reported reasons of high salt intake. The main reasons of high salt intake included high cost of low salt food (72.1%), not reading food labels (78.2%), and limited options available at restaurants (72.1%).

Table 9. Participants' reported reasons of high salt intake.

Variable	Female		Male		Total		P value
Limited options available at restaurants	758	72.7	218	69.9	976	72.1	0.321
Complicated cooking process	479	46.0	121	38.8	600	44.3	0.025
Low amount of knowledge around methods of decreasing sodium	686	65.8	215	68.9	901	66.5	0.313
Not reading food labels	801	76.9	258	82.7	1059	78.2	0.029
Not knowing food labels	744	71.4	240	76.9	984	72.7	0.055
Not knowing the availability of low salt food	700	67.2	232	74.4	932	68.8	0.016
The high cost of low salt food	773	74.2	242	77.6	1015	75.0	0.227
Not knowing the risks of salt	579	55.6	194	62.2	773	57.1	0.038

Table 10 shows the respondents' recommendation on best options to reduce salt intake. The majority of participants thought of different strategies to reduce salt intake including educating the public and the community about the importance of decreasing salt intake, amending food

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specifications to reduce salt Increasing awareness for restaurant's owners to use low salt options, and establishing a bonus system for factories producing low salt food.

Table 10. Respondents' recommendation on best options to reduce salt intake.

Variable	Female		Male		Total		P value
Educating the public and the community about the importance of decreasing salt intake	1007	96.6	298	95.5	1305	96.4	0.349
Providing individual counselling services	900	86.4	250	80.1	1150	84.9	0.007
An easy-to-use food label	899	86.3	281	90.1	1180	87.1	0.079
Amending food specifications to reduce salt	987	94.7	290	92.9	1277	94.3	0.236
Using potassium chloride instead of sodium chloride	894	85.8	266	85.3	1160	85.7	0.811
Increasing awareness for restaurant's owners to use low salt options	975	93.6	288	92.3	1263	93.3	0.435
Establishing a bonus system for factories producing low salt food	980	94.0	291	93.3	1271	93.9	0.614

4. Discussion

For designing salt reduction policies, it is essential to know and understand the population patterns for salt intake, their views on it, and the potential impact of salt on health. There are available data regarding salt consumption in most developed and developing countries and there is a wide variation among different nations and population groups in salt consumption. It is necessary to study the profile of sodium intake on a national scale because of its relation with most common illnesses such as high blood pressure. Several studies showed an increased intake of salt is associated with increased prevalence of cardiovascular diseases (22-25). Although limited, studies in Jordan have shown both rising hypertension over time and high salt consumption (10,15). Studying salt consumption in the Jordanian population will guide future efforts to address this critical health concern.

Actions to decrease salt intake are essential to reduce hypertension and its burden. Studying Knowledge, Attitudes and Practices towards dietary salt amongst the public is a valuable tool to guide the design of appropriate intervention programs, for example, a public education or awareness campaign, advocacy efforts related to food labelling, or as a tool to engage the food industry in reformulation to reduce levels of salt in their products. Knowledge and attitudes define the role of people in specific health-related activities, which assess the part of their intentions. These intentions are valued by many researchers and are recognized as key predictors of actual behaviours and practices (26). This study helped to demonstrate variations regarding salt consumption.

This study showed high rates of self-reported non-communicable diseases as 22.4% were previously diagnosed with hypertension, 13.7% were previously diagnosed with diabetes, 15.9% were previously diagnosed with high cholesterol levels, and 6.9% were previously diagnosed with heart disease. One should consider that these estimates are underestimated because a high proportion of Jordanian adults have undiagnosed diseases such as diabetes and hypertension. The study showed that almost 9.3% and 14% of females and 59.6% and 9.3% of males reported smoking cigarettes and waterpipe every day, respectively. This finding is consistent with the findings of other studies in Jordan (15).

Our study showed that people have limited knowledge of issues pertaining to salt intake. Most respondents did not know the maximum amount of salt intake allowed per day for healthy adults. However, they knew that too many salty sauces cause serious health problems such as hypertension and kidney stones, with 65% of participants saying it is essential to lower salt in their diet where female showed relatively higher knowledge. The Stepwise survey showed that 49% of people believed in the high importance of lowering salt in their diets and 89% believed that too much salt

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could cause serious health while female. Females showed more awareness compared to males of the harmful effects of salt on health.(15). Only 29.2% participants knew the amount of salt intake allowed per day. Females (31.5%) had higher knowledge around the allowed salt intake amount per day than males (21.5%). This finding is not consistent with the findings from Tehran study, where males had higher knowledge of salt intake than females (27).

Overall, participants' attitudes were generally negative, where only 17% were interested in reading the nutritional label on food items. Around half of the participants think that there is a type of salt that can be added to the food that is harmless regardless of its quantity. That indicate inadequate interest in reducing salt intake. Subsequently more effort is needed to address knowledge gap to influence this negative attitude

On the other hand, most of the participants' practices were incorrect. The existing literature showed that checking food labels for salt content is considered one of the most important measures to control salt intake [39]. However, 82.9% of our participants do not check food labels for salt content. Compared this with other studies, 38.3% of people in Lebanon check food labels for salt content regularly (28). This finding should be considered when planning educational campaigns in Jordan to raise community awareness about checking food labels for salt content.

More than half of the participants reported feeling thirsty after eating, which could indicate that the food they consumed contains a high amount of salt because elevation of plasma osmolality stimulate thirst (29). Almost half of participants (48.2%) reported that they always add salt while cooking and 14.6 % add table salt always after cooking.

In a study conducted in Jordan, 68 bread samples were collected from 13 different bakeries from Amman. The mean salt content was 1.19±0.21 g /100 g bread, while the mean salt content in local bread "Shrak" was 2.06±0.19 100 g [44]. According to the national guideline of nutrition, the estimated salt content in bread is 1g in one piece of Arabic bread and in one big slice of pizza is around 1.2g. In addition, two table spoons of salsa contains around 0.5g of salt while five pieces of salty biscuit contains around 0.5g of salt (30). On average, 70.4% of people reported eating two or less pieces of Arabic bread daily. A rough estimates show that people ingest two gram or less of sodium from bread which is considered an acceptable amount. However, the intake of salt remains high. For example a study showed that 46.8% of participants always add salty spices such as Maggi or chicken broth when cooking their daily meals, 61.1% eat at least once pickles and olives per day and 18.6% eat salty biscuits and chips 3-4 times weekly. The majority of participants thought that the amount of salt in bread, pizza, pasta, rice, canned meat, canned vegetables and non-cooked grains was average. Around 40% of participants also noted that ready-made sauces such as soya sauces and nuts have an acceptable amount of salt, however large amounts of sodium can be hidden in canned, processed and convenience foods. Some High-Sodium Foods are Smoked, cured, salted or canned meat, sausage, Frozen breaded meats and dinners, such as burritos and pizza. Salted nuts. Beans canned with salt added.(31). There is a dire need for increasing public awareness messaging around salt intake and its risks, through educational materials development and implementing community awareness strategies.

Participants were also found to eat only up to two servings of fruits and vegetables per day. This result matches what was found previously in the literature, where Jordanians usually eat little fruits and vegetables (15). Around 40% of participants eat one to two salty biscuits and chips per day.

The most common reported practices to reduce salt intake included using spices other than salt while cooking and avoiding or decreasing amount of salt rich food followed by not adding salt when cooking or add a very small amount, avoiding eating outside a lot, buying alternative products with low salt content, reading the salt content on the food labels. Similar practices were reported in the stepwise survey (15)

On the other hand, social media platforms constitute the most widely preferred media to receive health information generally and around salt intake in particular. Approximately 87% of participants think that working through community awareness campaigns can help promote salt reduction while preferring places such as malls, bakeries, schools and universities to conduct these awareness

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campaigns. Furthermore, 85.2% of participants thought that community organizations and associations could support efforts to reduce salt intake.

Food is an essential aspect of Jordanian culture. Jordanians serve family, friends, and guests with great pride in their homes, no matter how modest their means. In villages, meals are a community event with immediate and extended family present. In addition, Jordanians commonly use food to express their hospitality and generosity subsequently on of the main barriers to using low salt foods, participants thought that the difficulty in eating with others, addition to limited options available at restaurants, and insufficient knowledge about decreasing sodium. As for the best ways to reduce salt intake, participants thought that providing individual counselling services should be the primary method.

5. Conclusions

This study showed that Jordanian adults have limited knowledge around salt intake and their practices of high salt intake are inappropriate. Therefore, it is necessary to take immediate steps to adopt long-term strategies to reduce salt intake among the Jordanian population and lessen the negative impacts on community health. The following are recommended:

- Several strategies need to be adopted in Jordan to limit salt intake, such as increasing knowledge of the population around the significant sources of sodium in the diet and reformulating certain food products available in the market. This entails educational materials development and conduction of community awareness strategies to enhance consumer awareness on salt intake and educate the population on reading and interpreting food labels. This should be disseminated through interactive awareness campaigns in public places, such as malls, bakeries, schools, universities, hospitals, and public and private health centers. Furthermore, targeting males and those with younger age groups should focus with this awareness interventions as males had a relatively higher percentage for not buying alternative products with low salt content even if they are available.
- Although male and female participants have adequate knowledge regarding salt consumption, their practices and attitudes were not. This shows a mismatch in the behavioral theory, where knowledge is expected to match the attitudes and practices of people. Therefore, the focus should not only be on awareness campaigns, but should be complemented by well-designed behavioral change programs.
- Enforcement of food labelling policy measures such as labelling food items moreover, we need to simplify for the community through using the traffic light approach to be more user friendly
- Furthermore, targeting food manufacturers to change the food culture around the salt intake is needed to decrease the salt intake malpractice. This can be done through social media chef influencers to promote cooking using low salt items. Giving incentives for manufacturers to announce low salt healthy food options can also be a target as a public health intervention. besides increasing availability of low-sodium foods at school, worksite and restaurants,
- Develop a local food composition table and make it accessible for professionals and publics
- Nutrition counselling should be a service provided in primary health care centers, and there is a need to invest in this area and build capacity for this service

Author Contributions: For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, X.X. and Y.Y.; methodology, X.X.; software, X.X.; validation, X.X., Y.Y. and Z.Z.; formal analysis, X.X.; investigation, X.X.; resources, X.X.; data curation, X.X.; writing—original draft preparation, X.X.; writing—review and editing, X.X.; visualization, X.X.; supervision, X.X.; project administration, X.X.; funding acquisition, Y.Y. All authors have read and agreed to the published version of the manuscript." Please turn to the CRediT taxonomy for the term explanation. Authorship must be limited to those who have contributed substantially to the work reported.

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Appendix A

List of Abbreviations:

EMR	Eastern Mediterranean Region
WHO	World Health Organization
NCDs	Noncommunicable Diseases
BP	Blood Pressure
DM	Diabetes Mellitus
LMICs	Low- and middle-income countries
KAP	Knowledge, attitude, and practice

Appendix B

Table A1. Respondents knowledge about salt intake according to Age(n= 1354).

Variable	<40 years		>=40 years		Total		P value
How important to you is lowering salt in your diet							0.000
Not Important at All	59	8.4%	19	2.9%	78	5.8%	
Somehow Important	230	32.7%	166	25.5%	396	29.2%	
Very Important	415	58.9%	465	71.5%	880	65.0%	
What is the amount of salt available in the normal white bread?							0.020
Normal/ Acceptable	415	58.9%	379	58.3%	794	58.6%	
Low	256	36.4%	217	33.4%	473	34.9%	
High	33	4.7%	54	8.3%	87	6.4%	
What is the amount of salt available in Pizza							0.092
Normal/ Acceptable	430	61/1%	381	58.6%	811	59.9%	
Low	97	13.8%	74	11.4%	171	12.6%	
High	177	25.1%	195	30%	372	27.5%	

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What is the amount of salt available in Pasta, Rice and other non-cooked grains?							0.899
Normal/ Acceptable	383	54.4%	386	59.4%	769	56.8%	
Low	277	39.3%	236	36.3%	513	37.9%	
High	44	6.3%	28	4.3%	72	5.3%	
what is the amount of salt available in white Cheese?							0.962
Normal/ Acceptable	58	8.2%	57	8.8%	115	8.5%	
Low	14	2%	12	1.8%	26	1.9%	
High	632	89.8%	581	89.4%	1213	89.6%	
what is the amount of salt available in Canned Meat?							0.020
Normal/ Acceptable	347	49.3%	278	42.8%	625	46.2%	
Low	52	7.4%	41	6.3%	93	6.9%	
High	305	43.3%	331	50.9%	636	47.0%	
What is the amount of salt available in Canned food such as canned vegetables, tuna, sardine and canned mushrooms?							0.287
Normal/ Acceptable	389	54%	363	55.8%	743	54.9%	
Low	104	14.8%	77	11.8%	181	13.4%	
High	220	31.3%	210	32.3%	430	31.8%	
what is the amount of salt available in yogurt containing products such as Laban, Labaneh, Ayran and Jameed?							0.567
Normal/ Acceptable	129	18.3%	134	20.6%	263	19.4%	
Low	11	1.6%	10	1.5%	21	1.6%	
High	864	80.1%	506	77.8%	1070	79.0%	
what is the amount of salt available in readymade sauces such as soya sauce and ketchup?							0.474
Normal/ Acceptable	353	35.9%	235	36.2%	488	36.0%	
Low	35	5%	42	6.5%	77	5.7%	
High	416	59.1%	373	57.4%	789	58.3%	
what is the amount of salt available in Nuts?							0.003
Normal/ Acceptable	303	43%	221	34%	524	38.7%	
Low	22	3.1%	23	3.5%	45	3.3%	
High	379	53.8%	406	62.5%	785	58.0%	
what is the amount of salt available in Pickles and Olives?							0.736
Normal/ Acceptable	80	11.4%	69	10.6%	149	11.0%	
Low	7	1%	9	1.4%	16	1.2%	
High	617	87.6%	572	88%	1189	87.8%	

Table A2. Respondents attitude on salt intake according to Age(n= 1354).

Variable	<40 years		>=40 years		Total		P value
Are you interested in reading the nutritional label of the salt content on food items when going grocery shopping?							0.000
No	526	74.7%	414	63.7%	940	69.4%	
I do not know what a food label is	73	10.4%	109	16.8%	182	13.4%	
Yes	105	14.9%	127	19.5%	232	17.1%	
Do you think there is a type of salt that is used in food making which is harmless regardless of its quantity?							0.168
I do not think	404	57.4%	397	61.1%	801	59.2%	
Yes, I think	300	42.6%	253	38.9%	553	40.8%	
When eating meals outside the home, how do you feel the taste of food							0.000
No taste	21	3%	77	11.8%	98	7.2%	
Normal	598	84.9%	448	68.9%	1046	77.3%	
Salty	85	12.1%	125	19.2%	210	15.5%	
Do you believe there are alternatives to salt that can be added to the food?							0.249
No	331	47%	326	50.2%	657	48.5%	
Yes	373	53%	324	49.8%	697	51.5%	

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Table A3. Respondents salt intake practices according to Age (n= 1354).

Variable	<40 years		>=40 years		Total		P value
What type of salt you usually use when preparing your meals at home?							0.003
Non- iodized	42	6%	27	4.2%	69	5.1%	
I don't Know	143	20.3%	94	14.5%	237	17.5%	
Iodized	519	73.7%	529	81.4%	1048	77.4%	
Do you read the nutritional label on the food items when grocery shopping							0.144
No	594	84.4%	529	81.4%	1123	82.9%	
Yes	110	15.6%	121	18.6%	231	17.1%	
In case the food item contains a higher amount of salt than the allowed one, do you still buy it?							0.000
No	442	62.8%	475	73.1%	917	67.7%	
Don't care	219	31.1%	122	18.8%	341	25.2%	
Yes	43	6.1%	53	8.2%	96	7.1%	
Do you feel thirsty after eating your meals?							0.002
Never	120	17%	82	12.6%	202	14.9%	
Sometimes	415	58.9%	360	55.4%	775	57.2%	
Always	169	24%	208	32%	377	27.8%	
To reduce salt intake:							
I Avoid or I decrease the usage of salt rich food?	385	54.7%	484	74.5%	869	64.2%	0.000
I buy alternative products with low salt content	315	44.7%	339	52.2%	654	48.3%	0.006
I read the salt content on the food labels	238	33.8%	236	36.3%	474	35.0%	0.335
I do not add salt when cooking or I add a very small amount	328	46.6%	377	58%	705	52.1%	0.000
I use spices instead of salt when cooking	299	42.5%	292	44.9%	591	43.6%	0.364
I avoid eating outside a lot	242	34.4%	434	66.8%	676	49.9%	0.000
If I eat outside, I choose low salt food options	227	32.2%	322	49.5%	549	40.5%	0.000
I use spices with salt while cooking	454	64.5%	456	70.2%	910	67.2%	0.027
Do you add table salt when cooking your daily meals?							0.003
Never	101	14.3%	135	20.8%	236	17.4%	
Always	337	47.9%	315	48.5%	652	48.2%	
Am not responsible for cooking meals	116	16.5%	79	12.2%	195	14.4%	
Sometimes	150	21.3%	121	18.6%	271	20.0%	
Do you add salt on the table in your daily meals?							0.000
Never	406	57.7%	443	68.2%	849	62.7%	
Always	110	15.6%	88	13.5%	198	14.6%	
Sometimes	188	26.7%	119	18.3%	307	22.7%	
Do you add salty sauces to every male of your day							0.000
Never	344	48.9%	403	62%	747	55.2%	
Always	86	12.2%	69	10.6%	155	11.4%	
Sometimes	274	38.9%	178	27.4%	452	33.4%	

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Do you add salty spices such as Maggi or chicken broth when cooking your daily meals?							0.000
Never	145	20.6%	193	29.7%	338	25%	
Always	361	51.3%	272	41.8%	633	46.8%	
Sometimes	198	28.1%	185	28.5%	383	28.3%	
What is the amount of Arabic bread you eat daily?							0.261
One bread	198	28.1%	165	25.4%	363	26.8%	
Two breads	280	39.8%	244	37.5%	524	38.7%	
Three breads	105	14.9%	123	18.9%	228	16.8%	
Four breads	45	6.4%	51	7.8%	96	7.1%	
Five breads	31	4.4%	25	3.8%	56	4.1%	
More than five breads	13	1.8%	7	1.1%	20	1.5%	
I don't eat bread	32	4.5%	35	5.4%	67	4.9%	
How many times per week you eat white cheese?							0.139
1-2 times per week	409	58.1%	366	56.3%	775	57.2%	
3-4 times per week	91	12.9%	110	16.9%	201	14.8%	
more than five times per work	20	2.8%	23	3.5%	43	3.2%	
I don't eat	184	26.1%	151	23.2%	335	24.7%	
How many servings of fruits and vegetables you eat daily?							0.079
One serving	210	29.8%	157	24.2%	367	27.1%	
Two servings	224	31.8%	243	37.4%	467	34.5%	
Three servings	148	21%	133	20.5%	281	20.8%	
Four servings	53	7.5%	52	8%	105	7.8%	
More than five servings	35	5%	42	6.5%	77	5.7%	
I don't eat	34	4.8%	23	3.5%	57	4.2%	
How many times per week you eat salty biscuits and chips?							0.000
1-2 times per week	302	42.9%	236	36.3%	538	39.7%	
3-4 times per week	197	28%	55	8.5%	252	18.6%	
more than five times per work	104	14.8%	24	3.7%	128	9.5%	
I don't eat	101	14.3%	335	51.5%	436	32.2%	
How many times per day you use pickles and olives?							0.143
More than three times per day	38	5.4%	55	8.5%	93	6.9%	
I don't eat	220	31.3%	200	30.8%	420	31.0%	
Once per day	346	49.1%	299	46%	645	47.6%	
Twice per day	100	14.2%	96	14.8%	196	14.5%	
How many times per week you eat Indomi?							0.000
1-2 times per week	213	30.3%	77	11.8%	290	21.4%	
3-4 times per week	81	11.5%	16	2.5%	97	7.2%	
more than five times per work	37	5.3%	6	0.9%	43	3.2%	
I don't eat	373	53%	551	84.8%	924	68.2%	

Table A4. Respondent's source of health information according to Age (n= 1354).

Variable	<40 years		>=40 years		Total		P value
Flyers, Brochures and Posters	169	24%	161	24.8%	330	24.4%	0.744
Television	335	47.6%	385	59.2%	720	53.2%	0.000
Radio	74	10.5%	97	14.9%	171	12.6%	0.015
YouTube	419	59.5%	289	44.5%	708	52.3%	0.000
Social Media Platforms	567	80.5%	418	64.3%	985	72.7%	0.000
Google	522	74.1%	345	53.1%	867	64.0%	0.000
Friends	352	50%	355	54.6%	707	52.2%	0.089

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School or University	222	31.5%	74	11.4%	296	21.9%	0.000
Public or Private health centres (doctor, nutritionist)	437	62.1%	434	66.8%	871	64.3%	0.072
Do you benefit from food labels in finding out the amount of salt in food items?	303	43%	258	39.7%	561	41.4%	0.212

Table A5. Respondents preferred source of information on salt intake and health (n= 1354).

Variable	<40 years		>=40 years		Total		P value
Flyers, Brochures and Posters	274	38.9%	230	35.4%	504	37.2%	0.179
Television	391	55.5%	459	70.6%	850	62.8%	0.000
Radio	142	20.2%	167	25.7%	309	22.8%	0.016
YouTube	478	67.9%	339	52.2%	817	60.3%	0.000
Social Media Platforms	595	84.5%	464	87.4%	1059	78.2%	0.000
Google	566	80.4%	383	58.9%	949	70.1%	0.000
Friends	361	51.3%	353	54.3%	714	52.7%	0.256
School or University	261	37.1%	146	22.5%	407	30.1%	0.000
Public or Private health centers (doctor, nutritionist)	573	81.4%	548	84.3%	1121	82.8%	0.156

Table A6. Respondents opinion on reasons of high salt intake (n= 1354).

Variable	<40 years		>=40 years		Total		P value
Difficulty eating with others							0.023
No	270	38.4%	289	44.5%	559	41.3%	
Yes	434	61.6%	361	55.5%	795	58.7%	
Limited options available at restaurants							0.247
No	187	26.6%	191	29.4%	378	27.9%	
Yes	517	73.4%	459	70.6%	976	72.1%	
Complicated cooking process							0.021
No	371	52.7%	383	58.9%	754	55.7%	
Yes	333	47.3%	267	41.1%	600	44.3%	
Low amount of knowledge around methods of decreasing sodium							0.044
No	253	35.9%	200	30.8%	453	33.5%	
Yes	451	64.1%	450	69.2%	901	66.5%	
Not using or reading food labels							0.216
No	144	20.5%	151	23.2%	295	21.8%	
Yes	560	79.5%	499	76.8%	1059	78.2%	
Not knowing food labels							0.680
No	189	26.8%	181	27.8%	370	27.3%	
Yes	515	73.2%	469	72.2%	984	72.7%	
Not knowing the availability of low salt food							0.214
No	230	32.7%	192	29.5%	422	31.2%	
Yes	474	67.3%	458	70.5%	932	68.8%	
The high cost of low salt food							0.639
No	180	25.6%	159	24.5%	339	25.0%	
Yes	524	74.4%	491	75.5%	1015	75.0%	
Not knowing the risks of salt							0.268
No	292	41.5%	289	44.5%	581	42.9%	
Yes	412	58.5%	361	55.5%	773	57.1%	

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Table A7. Respondents recommendation on best options to reduce salt intake.

Variable	<40 years		>=40 years		Total		P value
Do you think community organizations and associations can play a role in reducing salt intake?							0.490
No	100	14.2%	101	15.5%	201	14.8%	
Yes	604	85.8%	549	84.5%	1153	85.2%	
Educating the public and the community around the importance of decreasing salt intake							0.188
No	30	4.3%	19	2.9%	49	3.6%	
Yes	674	95.7%	631	97.1%	1305	96.4%	
Providing individual counselling services							0.356
No	100	14.2%	104	16%	204	15.1%	
Yes	604	85.8%	546	84%	1150	84.9%	
An easy-to-use food label							0.566
No	94	13.4%	80	12.3%	174	12.9%	
Yes	610	86.6%	570	87.7%	1180	87.1%	
Amending food specifications to reduce salt							0.237
No	35	5%	42	6.5%	77	5.7%	
Yes	669	95%	608	93.5%	1277	94.3%	
Using potassium chloride instead of sodium chloride							0.046
No	88	12.5%	106	16.3%	194	14.3%	
Yes	616	87.5%	544	83.7%	1160	85.7%	
Increasing awareness for restaurant's owners to use low salt options							0.775
No	46	6.5%	45	6.9%	91	6.7%	
Yes	658	93.5%	605	93.1%	1263	93.3%	
Establishing a bonus system for factories producing low salt food							0.163
No	37	5.3%	46	7.1%	83	6.1%	
Yes	667	94.7%	604	92.9%	1271	93.9%	

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