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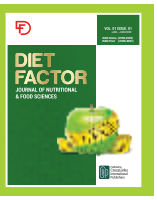

Original Article

Knowledge, Attitude and Practices Regarding Dietary Salt Intake Among University Students

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ABSTRACT

High salt intake is associated with an increased risk of hypertension, which is a major risk factor for cardiovascular diseases. **Objective:** To investigate the knowledge, attitudes and practices (KAP) for dietary salt intake among university students. **Methods:** A cross-sectional study was carried out from The University of Lahore. Total 100 students were selected through non-probability convenient sampling technique. SPSS Version 25.0 was used for data analysis. Inclusion Criteria included participants between the ages of 18 to 30 and also healthy individuals. **Results:** 40 participants were underweighted, 44 normal-weight, and 16 were over-weight of BMI. 80 respondents were under-graduated and 20 respondents were post graduated, 90 unmarried and 10 married respondents, 83 belonged to middle class, 23 participants felt warning signs before the start of blood pressure. 60 was affecting the quality of life, 28 were affecting on daily activities. In knowledge based, 95% agreed high salt cause health problems, 23 consumed high salt. In Attitude based, 50 participants were right amount of salt, 35 participants consumed salty snacks and 32 consumed pickle foods. In practices based, 31 participants rarely tried to reduce spices, 41 participants were trying to buy low salt foods, 23 consumed or added soy sauce to food at the table, and 20 consumed pasta and noodles less than 1-2 times weekly, 59 consumed fast foods. **Conclusions:** The study showed that all of the participants consume sauces, pickles and salty snacks which are major dietary sources of salt. Public education initiatives should promote less use of "hidden salt".

INTRODUCTION

Common salt, also known as sodium chloride, is frequently used in packaged foods. Salt has a big impact on the taste, quality, and overall structure of solid meals. The most popular way to consume salt, which is an essential nutrient that contains 40% sodium and is recognised as sodium chloride. The meat, fish, and eggs group, together with the snacks items and pizza group, are the leading source of salt, along with additional salt, cereals, cereal-based products, and starchy tubers [1]. The majority about 75% of the salt consumed in affluent nations comes from industrially processed foods [2]. Salt is used to preserve and treat food, such as pickles, processed meats like sausages, and salted fish, to lengthen their shelf lives [3]. Salt is the main dietary sodium source (95%), with the exception of nations that employ large quantities of monosodium glutamate as a taste enhancement [4]. The majority of salt consumption comes from baked goods because they have a comparatively higher salt content than other foods. Also rich in salt include dairy products, soups, snacks, spices, and sauces [5]. The World Health Organization (WHO) found that humans worldwide intake more salt than is physiologically necessary [6]. One Of the

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World Health Organization's voluntarily globally health strategies is a 30% decrease in population level salt by 2020. If salt consumption were reduced to the daily recommends limit of < 5g, it has been calculated that 1.7 million lives may be saved globally each year [7]. The World Health Organization estimates that 62% of all strokes and 49% of cardiovascular events are caused by excessive blood pressure. In addition, a high salt intake in the diet is a well-known risk factor for high blood pressure. It has been hypothesized that limiting salt will lower blood pressure in all age groups and in both men and women. There is evidence to support the idea that small dietary salts reductions could significantly lower cardiovascular events and medical expenses as well as prevent serious vascular problems [8]. According to estimates, 77% of fatalities in the United Arab Emirates (UAE) are attributable to NCDs, and 40% of these deaths are attributable to CVDs. One of the most economical ways to improve population health has been shown to be salt restriction. Clinical studies have demonstrated that limiting dietary salt intake can minimize the incidence of CVDs by lowering blood pressure [9]. According to information from the National Health and Nutrition Examination Survey 2015–2016, hypertension affects about one-third of Americans. This is concerning because hypertension is a risk factor for both stroke and cardiovascular disease, which are the first and fifth leading causes of mortality in the US, respectively. Many factors, including biological and behavioural ones, affect a person's risk for hypertension. The three key lifestyle elements that can be adjusted are smoking, eating, and exercise [10]. Restricting salt may lower blood pressure in all age groups and in both men and women. High-blood pressure is unquestionably one of the key risk factors for the emergence of CVDs [11]. Due to the high salt content of the sauce and soup, this had an indirect impact on blood pressure. Individuals' knowledge, attitude, and practises (KAP) regarding salt intake had an impact on it. Due to a lack of knowledge regarding the link between high salt consumption and hypertension, people still consume excessive amounts of salt [12]. According to previous researchers, there was a significant increase in both knowledge and attitude towards salt immediately after the intervention, but this improvement was not fully maintained four weeks later. After 4 weeks, 5 of the 13 practices evaluated showed improvement: trying to buy low-salt items rose from 10% to 19% (P = 0.022); adding salt to food only rarely rose from 5% to 16% (P = 0.019); adding salt to food only Occasionally rose from 29% to 42% (P = 0.011); reducing salt intake rose from 26% to 41% (P= 0.014); and using spices to reduce salt rose from 31% to 45% (P = 0.044). The educational intervention increased participants' salt-related knowledge, attitudes, and practices; however, these gains were not maintained over time. Educational interventions should be considered on a periodic basis to update knowledge and reinforce behaviors [13]. Furthermore, different studies had been conducted in 2019 Dalal Alkazemi et al., investigated the research on six hundred and fifteen KU undergraduates were recruited between November 2013 and March 2014 for this cross-sectional study. The research involved the use of a self-report questionnaire, a body mass index calculation, and a Healthy Eating Score (HES) calculation. The HES was used to assess how people think about and approach food. The results showed that the prevalence of overweight and obesity among males was higher than among women. Both sexes have unhealthy eating habits, as shown by their low mean HES scores. Gender variations in diet are evident, with males reporting consuming more than 6 ounces (168 g) of animal protein daily compared to women (p 0.001). Female students were more likely to report more than twice-daily use of sweets (p = 0.041) and frequent consumption of potato chips and other fatty, salty snacks p = 0.12 [14]. In 2021, Mansor et al., was to determine the prevalence of hypertension and the associations between participants' socioeconomic status, anthropometric blood pressure measurements, and Participants' Knowledge, Attitude, and Practise (KAP) regarding the relationship between salt intake and hypertension. When asked how essential it was to them to reduce their salt intake, only 62.2% answered it was very important, while 35.1% and 2.7% respectively indicated it was not at all important. 8% or more of those with hypertension believed their salt consumption was normal. The correlation between gender and diastolic blood pressure DBP (the lower number) was statistically Significant (p=0.003) [15]. People continue to consume excessive salt intake due to lack of awareness about the effect of excessive salt intake towards hypertension. They need to develop culture-specific awareness campaigns on salt intake, and their association with health. To make a good attitude and behaviour towards the salt intake nutrition education is necessity so that the chances of high blood pressure and chronic diseases like CVD can be reduced. There is need to arrange seminars and workshops to encourage people to modify their dietary practices and they should be guided regarding the sources of hidden salt.

METHODS

A cross-sectional study was carried out from The University of Lahore, total 100 students were selected through non-probability convenient sampling technique. The ethical approval was signed by the ethical committee of the University of Lahore. In this study, all data were collected randomly through a survey using a detailed self-constructed questionnaire after approval from experts.

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The consent was taken from the participants before data collection. Questionnaires were distributed among participants, and they were asked to fill them. Inclusion Criteria includes participants between the ages of 18 to 30 and also healthy individuals including in the study. In Exclusion criteria includes Participants below and above the selected age groups. The first section included demographic information of the participants, i.e., their gender, occupation, socioeconomic status, marital status, and family type. In the same section, there were also questions regarding participant's anthropometric measurements. It included height, weight, age, and BMI. The level of knowledge, attitudes and practices (KAP) towards salt intake among university students. Knowledge questions were added to assess participant's perception about high salt intake health problems, low salt intake reduce blood pressure, salt content in foods, nutrition fact table in the whole package of food, and consumption of foods high in salt. It covered almost ten questions. For Attitude questions were added to assess participant's perception about salt consume, importance of reducing consumption of processed foods, regular basis of salt intake, usual taste for foods, consuming pickle foods and consuming salty snacks. It covered almost ten questions. And some practices questions were added about added salt to food at the table, salt added in cooking or preparing foods, use spices to reduce salt, read nutrition labels on food packages, trying to buy low salt foods, Intention to reduce salt and salt intake per day. It covered almost twelve questions. A table (like a food frequency questionnaire) was added to assess which food groups are mostly preferred by participants usually. Processed foods were also added like ketchup, mayonnaise, sauces, chicken spread, chips, Nimko and also fast foods were added. The servings of the foods group per day, per week and monthly frequencies were added to the table. Data collected from this study were analyzed using SPSS version 25.0. The qualitative variables were expressed as mean ± S.D, results were expressed in mean S.D, frequency and percentages. Descriptive and inferential statistics was used to report the data. The association between the variables was found by using chi-square. Level of significance is set as p-value ≤ 0.05.

RESULTS

As shown in Table 1, participants' age ranged between 18-30 years. Majority of students were male (60%), and (40%) females, (90%) unmarried and (10%) married. Most of the students were under-graduated (80%) and (20%) post-graduated. Students belongs to (4%) lower class, (83%) middle class and (13%) upper class. More than 44% of the study were classified as normal weight, (40%) under-weight and (16%) over-weight.

Table 1: Socio Demographic Characteristics of the students

Demographic Profile	Frequency (%)
Gender	
Male	60(60)
Female	40(40)
Marital Status	
Unmarried	90(90)
Married	10(10)
Age	
18-25	83(83)
26-29	14(14)
Above 30	3(3)
Education Level	
Under Graduated	80(80)
Post Graduated	20(20)
BMI	
Under-Weight	40(40)
Normal Weight	44(44)
Over-Weight	16(16)
Socio-Economic Status	
Lower class	4(4)
Middle class	83(83)
Upper class	13(13)

Table 2, indicates that virtually all students (95%) had knowledge that high salt diet can cause a serious health problem while those who had no knowledge were (5%). Almost (93%) students had knowledge that low salt intake helps reduce blood pressure while those who had no knowledge were (7%). Almost half of the students agreed that low salt intake would make people limb weakened. (79%) had knowledge about eating a low salt diet help breathe easier while (21%) denied it. Most of the students had knowledge that nutrition fact table tells you the no. of mgs of salt in the whole package of food while (22%) had no knowledge. (23%) had knowledge that consumption of high salty foods almost every day, (34%) consumed 1-2 times per day, (21%) had consumed 3-4 times per day and (22%) had no knowledge about consumption of high salty foods.

Table 2: Knowledge Regarding Salt Intake

Knowledge Regarding Salt Intake	Frequency (%)
Do you agree high salt intake would cause health problems?	
Agree	95(95)
Disagree	5(5)
Do you agree less salt intake helps reduce blood pressure?	
Agree	93(93)
Disagree	7(7)
Do you agree low salt intake would make people limb weakened?	
Agree	55(55)
Disagree	45(45)
Agree	79(79)
Disagree	21(21)
Agree	78(78)
Disagree	22(22)

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Do you agree low salt intake would make people limb weakened?	
Almost every day	23(23)
1-2 times per week	34(34)
3-4 times per week	21(21)
Never	22(22)

The Table 3, shows that half of the respondents (50%) believed that they were consuming right amount of salt, and (15%) were unsure the amount of salt that they think they are consumed. Most of the respondents (49%) believed that lowering salt in the diet is very important. Almost (76%) agreed that reducing consumption of processed foods is important. (60%) of the respondents think that they either do anything on regular basis to control their salt intake. (35%) of the respondents were consumed salty snacks 1-2 times per week. (32%) respondents were consumed pickle foods 1-2 times per week.

Table 3: Attitude Regarding Salt Intake

Attitude Regarding Salt Intake	Frequency (%)
How much salt do you think you consume?	
Too Much	15(15)
Right Amount	50(50)
Too Little	20(20)
Don't Know	15(15)
How important to you is lowering the salt in your diet?	
Very Important	49(49)
Somehow important	39(39)
Not Really Important	12(12)
Reducing consumption of processed foods is important to you?	
Agree	76(76)
Disagree	24(25)
Do you do anything on regular basis to control your salt intake?	
Yes	60(60)
No	40(40)
How often have you consumed salty snacks in the past months?	
Almost every day	20(20)
1-2 days per week	35(35)
3-4 days per week	22(22)
Once per week or less	23(23)
How often have you consumed pickled foods in the past month?	
Almost every day	16(16)
1-2 days per week	32(32)
3-5 days per week	11(11)
Once per week or less	41(41)

In Table 4, majority of the respondents (34%) rarely add salt to food at the table. Most of the respondents add salt in cooking or preparing salt in their household. Most of them never tried to use spices to reduce salt. About (47%) never add salt to food at the table. On the other hand, majority of them (41%) sometimes tried to buy low salt foods.

Table 4: Practices Regarding Salt Intake

Practices Regarding Salt Intake	Frequency (%)
Do you add salt to food at the table?	
Never	24(24)
Rarely	34(34)
Sometimes	28(28)
Often	7(7)
Always	7(7)
How often is salt added in cooking or preparing foods in your household?	
Never	12(12)
Rarely	20(20)
Sometimes	23(23)
Often	21(21)
Always	24(24)
Did you try to use spices to reduce salt?	
Never	31(31)
Rarely	28(28)
Sometimes	25(25)
Often	13(13)
Always	3(3)
Do you add soy sauce to food at the table?	
Never	47(47)
Rarely	17(17)
Sometimes	23(23)
Often	8(8)
Always	5(5)
Did you try to buy low salt foods?	
Never	29(29)
Rarely	17(17)
Sometimes	41(41)
Often	10(10)
Always	3(3)

Figure 1, showed that, 54 respondents consumed processed foods less than 1-2 times monthly whereas 23 respondents consumed 4-6 times monthly.

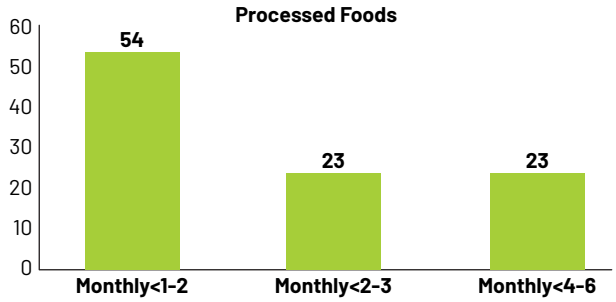

Figure 1: Daily Consumption of Processed Foods among participants

Figure 2 showed that, 21 respondents consumed different types of sauces less than 1-2 times monthly, 16 respondents consumed 2-3 times weekly and 13 respondents consumed 1-2 times daily.

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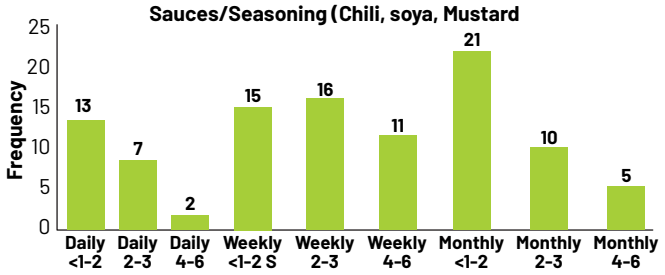

Figure 2: Daily Consumption of Sauces/Seasoning (Chili, Soya and Mustard)

Figure 3, showed that, 58 respondents consumed monthly less than 1-2 times, 23 respondents consume 2-3 times monthly and 19 respondents consume 4-6 times monthly.

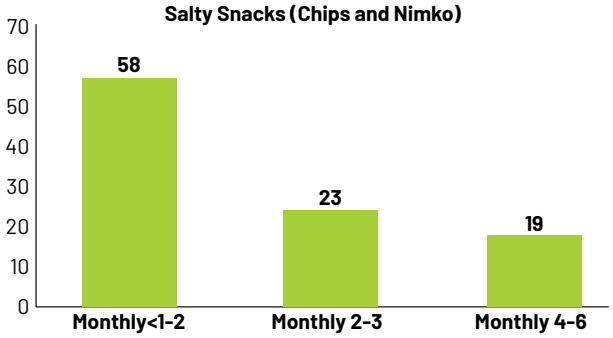

Figure 3: Daily Consumption of Salty Snacks (Chips and Nimko) among participants

DISCUSSION

The knowledge, attitude and practices of the students studying at University of Lahore to salt were investigated in this research. Moreover, the participants were selected through a non-probability convenient sampling technique. The current study demonstrates a cross-sectional survey which was conducted with 100 individuals whose ages ranged from 18 to above 30. Bhattacharya *et al.*, in 2018, undertook a cross-sectional study with 300 participants, ages 18 to 69 [16]. Another similar study was conducted by Kenao *et al.*, in 2023, a cross-sectional survey with 400 participants between the ages of 25 and 44 that was conducted in 2022 knowledge, attitudes, and practises (KAP) about dietary intakes of salt and potassium [17]. According to a recent study, a cross-sectional survey included 60 male participants and 40 female participants. In a cross-sectional study conducted by Ahmad in 2020, 358 female (89.1%) and 44 male (10.1%) participated [6]. According to this study, 90 respondents were unmarried and 10 respondents were married. In a cross-sectional study conducted by Santos *et al.*, 2022, (17.5%) were unmarried and (68%) were married [1]. According to the current study, 40 of these individuals were underweight, 44 were of normal weight, and 16 were overweight. According to Herrera-F *at el.*, in 2021, 44% of them were overweight and 19% of them were obese [18]. Other than this, we focused on the salt intake related knowledge, attitudes, and practices among graduated and under-graduated students. In a research conducted by Cheikh Ismail *at el.*, in (2019) ninety university non-medical students were enlisted to look at KAP in relation to dietary salt consumption. According to our study, under-graduated students of University of Lahore were (80%) and post-graduate students were (20%) [13]. Another similar study was conducted by Ahmad in 2020, a total of 402 undergraduate students participated in this cross-sectional survey. Another similar study was conducted by Ahmed *et al.*, in 2016, the majority of participants were women, just 19% and 21% of medical and dentistry students' respectively [19]. The current study shows that 44 participants had family history of hypertension and 56 participants had no history of hypertension. According to Hu *et al.*, in 2017, no significant difference was seen with respect to family history of hypertension [20]. The current study showed that 95 participants agree that high salt intake cause health problems. According to Sarker *et al.*, in 2018, more than three out of every five respondents (61.9%) said consuming too much salt could result in major health issues [21]. Another similar study conducted by Herrera-F *et al.*, in 2021, only 38.4% of people systematically limit their salt intake, despite the fact that 99% are aware that a diet heavy in salt contributes to health issues [18]. The current study showed that 93 participants had awareness of low salt help reduce blood pressure. According to the Zhang *et al.*, 2013, (25%) know that less salt help reduce blood pressure [22]. The current study showed that 55 respondents agreed low salt intake limb weakened. According to the Zhang *et al.*, 2013, (18%) know that less salt intake made people limb weakened [22]. The current study shows that 79 respondents were aware about low salt diet helps breathe easier. According to the Zhang *et al.*, 2013, more than 65% know that less salt intake helps breathe easier [22]. According to the current study, 34 respondents consumed high salt diet in 1-2 times per week. According to the Zhang *et al.*, 2013, (22%) was consuming high salty diet (< 3times per week) [22]. According to the current study, 60% of the respondents think that they either do anything on regular basis to control their salt intake. According to Grimes *et al.*, 2020, more than (78%) thought on regular basis to control dietary salt consumption [23]. According to the current study, 95 participants concur that consuming too much salt has negative health effects. According to Sarker *et al.*, in 2018, more than three out of every five respondents (61.9%) stated that ingesting too much salt could lead to serious health problems [21]. According to another study conducted by Dahalim *et al.*, in 2020, all people (95.4%) were aware that excessive salt consumption can lead to hypertension [3]. According to the

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current study, 49 individuals thought reducing salt in our diets was very important, while 39 thought it was important in some other way. According to Bhattacharya *et al.*, in 2018, the majority of respondents (64%) said it was not vital to minimize their salt intake [16]. Another study was conducted by Mansor *et al.*, in 2021, only 62.2% of respondents said consuming less salt in their everyday meals was extremely important, while 35.1% and 2.7% said it was only somewhat or not at all important [15]. Reducing processed food consumption, as shown by the current study's 70 participants, is crucial. Bhattacharya *et al.*, found that in 2018, the majority of people there (96%) ate processed food and that 99% didn't care how salty it was [16]. According to the current survey, 50 respondents said they consumed the appropriate amount of salt. According to Bhattacharya *et al.*, in 2018, the majority of them (75%) thought they were taking in the recommended amount of salt. They had no idea what the daily recommended allowance was. 43 percent of people were not aware of the harmful effects of dietary salt [16]. Another similar study conducted by Sarker *et al.*, in 2018, more than four out of five respondents (82.8%) thought they used to consume the proper quantity of salt, and one-fourth (26.0%) thought it was crucial to reduce salt intake [21]. Another similar study conducted by Herrera-F *et al.*, in 2021, 97 percent of individuals believed they consumed too much salt [18]. The study's findings of the present investigation demonstrated that 28 individuals occasionally added salt to their meals. In 2019, Cheikh Ismail *et al.*, studies that knowledge and attitudes about salt have greatly improved, and more people now occasionally season their food at the dinner table up from (29 to 42%) [13]. The results of the current investigation revealed that 20 participants rarely used salt when preparing meals at home. A recent investigation found that 28 respondents tried using spices instead of salt. Cheikh Ismail *et al.*, attempted to use spices in 2019 to reduce salt consumption, which reached from (31 to) 45% [13]. A recent study found that 24 respondents occasionally looked at labels to see how much salt they contained. Wicaksana *et al.*, (2017), who conducted the study, found that the total salt amount listed on the label was favoured (42% vs. 31.1%) and that only a small percentage of participants frequently examined the packaging indication (7.2% vs. 11.3%) [24]. According to a recent survey, 41 respondents were attempting to purchase low-salt items. In 2019, Cheikh Ismail *et al.*, study, after four weeks, five of the 13 practises that were reviewed improved: attempting to purchase low-salt foods increased from 10% to 19% [13]. Another similar study conducted by Hadgu *et al.*, in 2016, Most of the participants (83%) know why they should buy iodized salts because it is good for well-being while 2% of respondents choose not to purchase it because they are unsure of its necessity [25]. This research found that 38 individuals intended to cut back on their intake of salt. Cheikh Ismail *et al.*, in 2019 attempted to reduce salt consumption by (26 to 41%) [13]. According to the current study, 35 participants eat salty snacks 1-2 days per week, and 2-3 servings of chips. According to Alkazemi *et al.*, (2019), female students were more likely to say they routinely ate chips and other fatty, salty snacks ($p = 0.12$) [14]. According to the current study, 54 respondents consumed processed foods monthly 1-2. According to Leyvraz *et al.*, (2018), several processed food items with known or presumably high salt content (such as pizzas and savory snacks) were consumed rather infrequently <3 times/week [26].

CONCLUSIONS

Salt consumption is increasing among the university students which is alarming for increasing the risk of hypertension and cardiovascular diseases among them. It was assessed that during the study majority of the students didn't know about the harmful effects of excess sodium intake. Their knowledge about salt was very doubtful that they even don't know about its consequences, and most of the respondents have awareness about nutrition fact table. Their attitude regarding salt is that students were consuming too much salt in the form of fast foods, pickles food and processed foods due to social culture or in peer influence. Their poor practices due to consumption of salty snacks, fast foods (burger, pizza, rolls etc.) was very high and that results in poor dietary practices regarding salt intake. They have inadequate healthy dietary practices. They are overly consuming salt and the form of different sauces, fast foods, and processed foods. Few of them were trying to use spices to reduce salt and some of them are trying to buy low salt or alternatives foods.

Authors Contribution

Conceptualization: AZ, BR
Methodology: HMJ, AU, AZ
Formal analysis: HA, SGG
Writing-review and editing: SSA, ZA, AZ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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