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Knowledge, Attitude, Behavior and Practices on Salt and Snack Consumption and Determination of Average Daily Salt Intake of Families of Selected Undergraduate Students in a Sri Lankan University

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ABSTRACT

High salt intake leads to health issues, including hypertension and cardiovascular diseases and the World Health Organization (WHO) recommends the daily salt intake for adults to be less than 2,000 mg of sodium, equivalent to 5 g of salt per day. The objective of this study was to find out the average daily salt intake among undergraduate students and their families in a selected Sri Lankan university. Further, the study assessed the knowledge, attitude, practices, and behavior related to salt and snack consumption among the selected population. An online based questionnaire was used to collect data, and 24-hour recall was used to estimate the average daily salt intake. Majority of the respondents were females (71.1%). The average daily salt intake per person per day was 7.59±2.17g in the tested population. Even though this was more than the recommended value, it was lower than the previous studies indicating a potential decrease in salt consumption, implying the success of the salt reduction programmes implemented. According to the survey, 55.7% of respondents were not aware of the Recommended Daily Value (RDV) for salt and 75.3% of respondents were not aware of the amount of salt in the food. Around 14.1% of respondents believed that they consume the right amount of salt as recommended by WHO. Moreover, 90.4% of respondents were aware of the adverse health effects of high salt consumption. Among the respondents, 75.8% believed that their health was good, and 65.1% believed that they were trying to have a healthy diet in their day-to-day lives. Determined salt content exceeded the label value in all the analyzed snacks indicating label violation. The survey showed that 51% of respondents consumed salty snacks every day for the taste and 76.8% of respondents were not aware of healthy snacks.

KEYWORDS: *Health problems, Recommended value, 24-recall, Nutritional awareness, Fast food consumption*

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1 INTRODUCTION

Salt has become part of human life since its discovery. It plays a major role in food consumption; and is also used for the preservation of food (National Salt Reduction Strategy 2018-2022, 2019). It is essential for individuals' daily diet due to its seasoning ability and improvement of the sensory quality of food (McGuire, 2010). Salt is a combination of Sodium (Na^+) and Chloride (Cl^-) minerals (WHO, 2016). Sodium is an essential micro-nutrient that is needed for the human body due to its osmotic pressure and electrolyte ability (Linus Pauling Institute, 2014). However, there is strong evidence that high salt intake leads to cardiovascular diseases, hypertension, and stroke (Chobanian *et al*., 2003). In 2012, a worldwide salt reduction program revealed that high salt intake not only directly causes hypertension but also increases strokes, osteoporosis, left ventricular hypertrophy, renal diseases, and stomach cancers (He and MacGregor, 2008; Frisoli *et al.*, 2012). In the vast majority, kidneys malfunction due to an overabundance of sodium in the blood (Harvard School of Public Health, 2019). When sodium accumulates, the body tends to dilute it by using water (Harvard School of Public Health, 2019) increasing the amount of fluid surrounding the cell and the volume of blood in the circulatory system (Harvard School of Public Health 2019). Expanded blood volume implies more work for the heart and more tension in the veins. With time, the additional work and strain can solidify veins, prompting hypertension, respiratory failure, and stroke (Harvard School of Public Health, 2019). Also, there is some proof that an excessive amount of salt can harm the heart, aorta, and kidneys without an increment in blood pressure (Harvard School of Public Health, 2019). Loss of calcium in the body is increased through urination along with high salt consumption. The reduction in calcium in blood is compensated by taking calcium from bones. Therefore, high salt consumption leads to osteoporosis (He and MacGregor, 2008). Cancer may also occur due to a higher intake of salt, and some research shows that salt and salty foods have a high probability of causing stomach cancer (Clinton, Giovannucci and Hursting, 2019).

While the World Health Organization recommends the daily salt intake for adults to be less than 2,000 mg of sodium, equivalent to 5 g of salt per day (WHO, 2020), a review conducted in 2019 has shown that worldwide salt consumption per day exceeds the WHO recommended level (Thout *et al.*, 2019). In 2012, the National Population Salt Consumption Survey in Sri Lanka showed that the salt intake in individuals per day was 10.5g, which was double the recommended salt intake per day (World Health Organization. Regional Office for South-East Asia, 2013). In 2020, a study was conducted to estimate the salt intake by using urinary sodium excretion among 328 adults covering nine provinces in Sri Lanka, and the results showed that the average salt intake was 8.3g/ day (Jayatissa *et al*., 2020).

In recent times, there has been a growing popularity for fast food driven by its exciting taste, convenience, and affordable prices (Gunarathne *et al*., 2021). However, the surge in fast-food consumption, especially in urban areas, raises concerns about its impact on public health. Data suggests that fast food, with its specific qualities, may pose risks to human well-being. Experts in food and health advice limiting fast-food intake. Studies such as Jayawardena *et al*. (2013) indicate potential links between consuming fast food and the prevalence of non-communicable diseases in a population. It highlights the need for caution and moderation in incorporating fast food into our diets to safeguard public health.

Where snack foods are concerned, food manufacturers use bland base materials to produce them, so they need flavors to be added for the taste. Salt is used as a fundamental flavoring agent with other additional flavorings. Salt plays a major role in the snack industry, acting as a carrier for the additional flavors and also distributing those flavors evenly (Bhattacharya, 2022). Apart from enhancing the flavors, salt gives color to snack foods (Bhattacharya, 2022). Moreover, some sweet snacks and savory snacks have a salty taste due to the salt and other flavors on the surface, but they do not have excess salt.

According to color-coding regulations, foods should be labeled with color codes reflecting the food contents. In 2019, the Sri Lankan government imposed food color coding regulations for semi-solids and solid foods (USDA Foreign Agricultural Service, 2020). Under this color-coding system, salt is referred to as total salt in foods in the form of sodium chloride. These color codes are displayed on the front of the pack and use three colors to indicate the salt content. “Amber” color, meaning R255, is used to indicate the salt content between 0.25g-1.25g. “Red” means R230 and is used to indicate the salt content is more than 1.25g, and “Green” color, which is G195 indicates the salt content is lower than 0.25g.

The objectives of the present study were to find out the average daily salt intake among undergraduate students in a selected university to obtain the average salt intake and compare it with the Recommended Daily Intake Amount, to determine the salt content in selected snacks, and to assess the knowledge, attitude, behavior, and practices with regard to salt consumption.

2 RESEARCH METHODOLOGY

An online questionnaire-based survey was performed, which recorded the respondents’ knowledge, practices, attitudes, and behavior on the consumption of salt and snacks. A 24-hour recall was used to assess the average daily salt intake per person per day in selected populations from April to June 2022. The amount of salt in selected snack samples was quantified by Mohr titration and compared with the label value to evaluate whether there was any label violation.

2.1 Study design

This study design included analyzing cross-sectional data gathered through an online questionnaire-based survey to assess the consumer knowledge, practices, attitudes and behavior on the consumption of salt and snack foods per day.

A pilot test was performed with the online questionnaire and maintained the 7-day food diary and 24-hour recall to assess, validate, and optimize the questionnaire in order to ensure that the respondents can understand the questionnaire and answer them meaningfully. The most consumable snacks were identified via the maintenance of a food diary for seven days, the response rate on maintaining the 24-hour recall and the evaluation of the 7-day food diary According to the responses of the pilot test, the 17 most consumable snacks were selected from the 7-day food diary for salt content analysis, and 24-hour recall was chosen to assess the average daily salt intake in the final study.

As the survey population, undergraduate students in a selected faculty in University “A” in Sri Lanka and their families were selected. The desired sample size for the questionnaire-based survey and 24-hour recall was estimated by Andrew Fisher's Formula (Fisher, L. D, 1998). Specific

Stratified random sampling method was used for the selection of 384 sample size from the responses of the survey. Considering a 30% non-respondent rate, the questionnaire was given to 550 participants.

Ethical clearance for the study was obtained from the Ethics Review Committee (ERC) of the Faculty of Medical Sciences, University of Sri Jayewardenepura (FMS/USJP ERC 05/22). This study included undergraduates in the selected faculty at University "A" who have given consent to participate in the study and family members of those undergraduates in the University "A", who are above the age of 2 years.

The people who are not undergraduates of the selected faculty in University "A" and family members of those students of University "A", and who have not given consent to participate in the study and family members of the undergraduates in selected faculty in University "A" who are under the age of 2years were excluded from the study.

2.2 Data collection process

This self-administered survey was used as the method of primary data collection. The survey was conducted as an online questionnaire-based survey, and it was used to collect the selected undergraduates' knowledge, practices, attitudes, and behavior on the consumption of salt and snack foods and 24-hour recall was done to collect the household salt consumption to determine the average daily salt intake per person per day and the questionnaire and informed consent & assent forms were circulated as Google Forms through email to all the participants.

2.3 Data analysis

The sample of the survey was stratified into groups by gender (female and male) and by age. A descriptive analysis was carried out to define and explain the results, and SPSS was used for statistical analysis (t-test and ANOVA test). The 24-hour recall was used to calculate the directly added salt amount to the food during preparation in the household.

2.4 Analysis of the amount of salt in snacks

From the pilot survey, the 17 most consumed snacks were selected, and they were named sanck1 to snack17. Snacks 1-14 were branded, sealed packets (biscuits, peanuts, and yoghurt), and three samples from three different batches of the branded snacks were purchased from well-known supermarkets. Snacks 15-17 were non-branded bakery products (Snack 15=" Fish roll", Snack 16= "Cutlets" and Snack 17= "*Wade"*), and five samples from each non-branded snack were purchased from cafeterias. For the branded and sealed snack foods, a whole packet was used to prepare homogenized samples, and the salt content was analyzed on a wet basis. Other snack foods, which were non-branded food items, were dried at 105 ºC to a constant weight and ground by using a mortar and pestle and kept in air-tight bags.

The quantification of salt content in the solid sample was conducted using the procedure outlined by Khan and Martin in 1983. This method aligns closely with the AOAC Official method 960.29, indicating a concurrence between the two methodologies. Five grams of dried homogenized food sample was soaked in 20ml of distilled water for 3min, while stirring intermittently. After filtering, a 10ml aliquot of the filtrate was mixed with 5 drops of 5% Potassium dichromate and titrated against a standardized 0.1N $AgNO_3$ solution. Determination of salt content was performed in triplicate. Method validation was done by spiking the known weight of analytical grade NaCl with the known weight of the sample and then by analyzing the recovery results.

Calculation:

Formula 1: Calculation of the weight of NaCl in the sample.

Weight of NaCl (g) = "v" ml of 0.1N $AgNO_3 \times 58.44 \times 10^{-4}$

3 RESULTS & DISCUSSION

3.1 Determination of the average daily salt intake among the undergraduate students and their families

The average daily salt intake per person per day was 7.59±2.17g. The difference between values of daily requirement (5 g) and mean consumption of salt per person per day (7.59 g) is significant ($p \leq 0.001$) with a mean difference of 2.17 g.

In 2012, a national survey estimated that the salt intake per person per day was 10.5g (World Health Organization. Regional Office for South-East Asia, 2013) which was double the recommended amount. Therefore NSP 2018-2022 was to achieve a 30% reduction of the average daily salt intake by 2025 from its baseline of 10.5g (National Salt Reduction Strategy 2018-2022, 2019). In 2020, the salt intake per person per day was estimated as 8.3g from the urinary sodium extraction method

(Jayatissa *et al*., 2020) and from the current study in 2022, the average daily salt intake was estimated as 7.59±2.17 g in the selected population. It appears that the salt intake has gradually decreased from its baseline of 10.5g and nearly achieved the desired 30% reduction from baseline (7.35g), although it still exceeds the RDV for salt.

India also conducts strategies to achieve a 30% salt reduction in the mean population by 2025, and the estimated salt intake was 10.98 g/day (95%, $p \leq 0.001$) (Johnson *et al*., 2017). A study conducted in Vietnam showed the average daily salt intake as 10g/per day per person (Jensen *et al*., 2018). The first Iranian national report of estimation of daily salt intake showed it as 9.52g/day in the Iranian mean population (Rezaei *et al*., 2018). The present findings in Sri Lanka (7.59± 2.17g) are lower compared to the above values. For the estimation of salt intake, different methods have been used in previous studies. Those are biochemical measures and self-report measures (Perin *et al*., 2019). Some studies have used one method, while others have used a combination of both measures to estimate salt intake. Biochemical measures are identified as 24-hour urinary sodium excretion (which is the predominant method), 12-hour urinary sodium excretion, overnight urine, and urine spot tests. The 24-hour urinary excretion method has been considered the "gold standard" and is the most reliable method to estimate the daily intake of sodium (Kuehneman *et al*., 2002). Sodium is excreted via urine in a healthy person (Perin *et al*., 2019). Typically, 95% to 98% of dietary sodium intake can be accounted for by using 24-hour urine sodium excretion. According to the variability of a person, sodium excretion can be as high as 30% (Perin *et al*., 2019). 24-hour urine sodium excretion can be used to estimate the validity of the accuracy in the dietary salt assessment methods. The dietary survey is another method that is used to assess the daily salt intake by individuals. Here, recalls have been used in recent or usual diet, and real time intake can be captured through food diaries and dietary questionnaires to assess the daily intake. These methods should be conducted by giving proper instructions to the participants, and the accuracy of these methods depends on the person's ability to provide accurate information about their salt intake in day-to-day life. The 24-hour urinary sodium discharge was the prevalent biochemical strategy (79.1%), and the Food Frequency Questionnaire was the overwhelming self-report measure (36.4%) (Perin *et al.*, 2019). The accuracy of the conclusions drawn from the above methods depends on the design of the study plan, requirements identified with costs, and the test size (Perin *et al.*, 2019). This study also used self-report measures to assess the daily salt intake of the target population and evaluate the daily salt intake. In Sri Lanka, most of the dietary salt comes from household cooking, either added directly while cooking or at the table or in the form of sauces and pickles and only 15-25% of dietary salt comes from processed food (Ministry of Healthcare, 2015). Rapid urbanization and the adoption of an open economy have led to a flourishing fast-food industry and consequent lifestyle changes where home cooking is gradually being replaced by over-the-counter purchases of fast-food and restaurant eating, which use high salt-containing processed food (Karim, 2016). Advertising of various fast food and processed foods and their attractive outlets is contributing much to this changing phenomenon (Jayatilleke *et al.*, 2020).

3.2 Online questionnaire-based survey

The online questionnaire-based survey was distributed among 550 undergraduate students, and 384(69.82%) responded. The majority of the respondents were females (71.1%, n=273), and males were only 28.9% (n=111). Mainly young adults of the age of 23y-28y responded (89.8%, n=345) compared to other age groups (Figure 1). Therefore, the research findings are biased toward the young females within the age group 23y-28y.

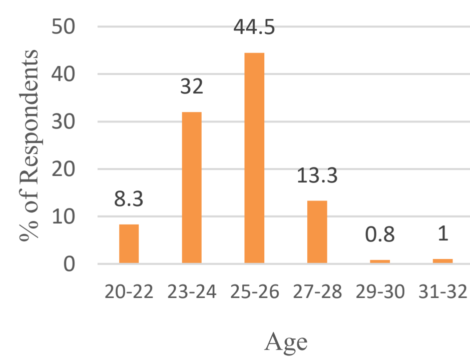

Figure 1. Age distribution of the respondents

Knowledge of respondents on salt consumption revealed that 90.4% (n=347) of the respondents were aware that a high salt diet can cause health problems but 9.6% (n=37) of respondents were not aware of it. Further, 85.2% (n=327) of respondents agreed that there is pressure to eat a healthy diet these days in society. The majority of the respondents (96.6%, n=371) know that high salt intake can cause hypertension and osteoporosis compared to other diseases (Figure 2).

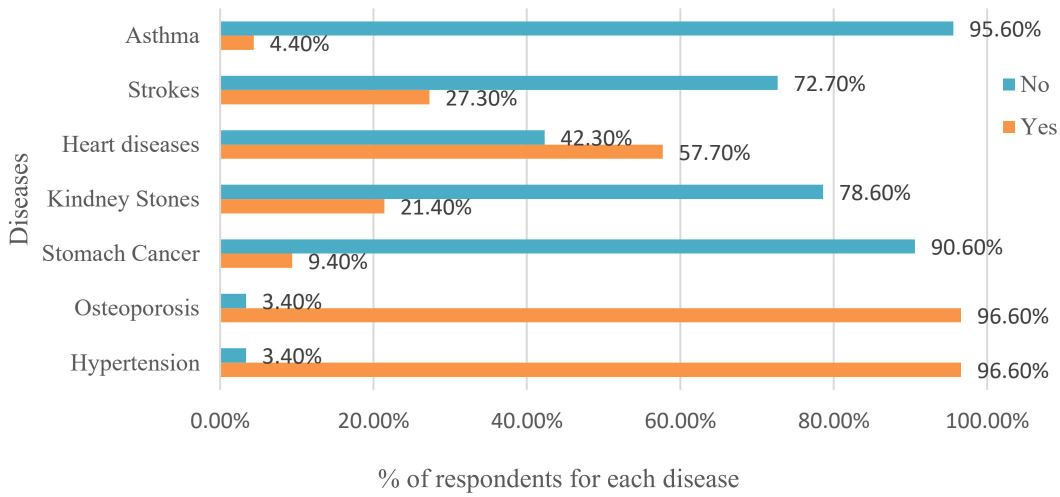

Figure 2. Knowledge of Diseases that can cause due to the high salt intake

However, according to Figure 3, 55.7% (n=214) of respondents were not aware of the WHO recommended value for salt as 5g or less per day per adult, and 22.1% (n=85) of respondents were aware of it.

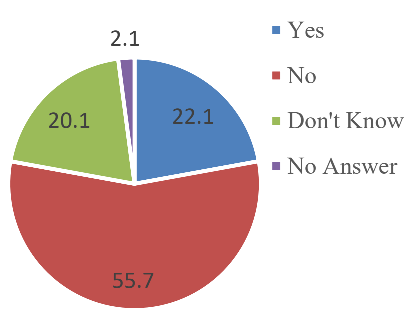

Figure 3. Respondents' awareness of RDV for salt

Most of the respondents were aware that high salt intake causes health problems but were not aware of the diseases and less aware of the RDV for salt.

When attitudes related to salt consumption were analyzed, 65.1% (n=250) believed that they were trying to have a healthy diet, 75.8% (n=291) of respondents believed that their health was good, and 75.3% (n=289) of the respondents did not know the amount of salt included in the food they consumed. Further, 66.7% (n=256) of respondents did not know how much salt they consumed in their day-to-day life, and 14.1% (n=54) of respondents believed that they eat the right amount (WHO recommended 5g) of salt in their day-to-day life. Without awareness of the salt amount included in the food, they think that they are trying a healthy diet and being healthy,–which indicates a gap in their knowledge. The majority (64.3%, n=247) of the respondents were using table salt, and 4.9% (n=19) of the respondents were using crystal salt in cooking. Salt was added while cooking by 64.8% (n=249) of the respondents. The majority (59.1%, n=227) were not trying to minimize the salt that they consumed, and 7.3% (n=28) of respondents were taking medical advice for hypertension, osteoporosis, obesity, and/or kidney stones. From that, 3.4% (n=13) of respondents were taking medical advice for hypertension. Also, 16.9% (n= 65) of respondents were taking medical advice to reduce body weight, and 4.7% (n=18) of respondents had medical advice to reduce the amount of salt they consume.

According to the attitude level of responses, the majority believed that they were trying a healthy diet and thought to have good health, but respondents were not trying to minimize salt consumption. Therefore, there is a conflict between the attitude level and the behavior of the respondents. The majority were not trying to minimize the salt intake probably due to their lack of knowledge regarding salt reduction methods. Minimizing the salt intake can be achieved by reducing the salty food intake and limiting the addition of salt while cooking. Herbs, spices, garlic, and citrus can be used as salt substitutes to enhance the flavor in cooking and at the table (Durack, Alonso-Gomez and Wilkinson, 2008). There are several studies which were conducted, related to Salt and Health: Public awareness, attitudes and practices in Sri Lanka to reduce salt intake to the recommended level (Jayatilleke *et al.*, 2020). One study was done by a household survey among adults (n=1016) and adolescents (n=505) in 10 districts to evaluate the dietary salt intake of the individuals (Jayatilleke *et al.*, 2020). That study revealed that 40% of respondents were aware of the daily recommended salt intake limit (Jayatilleke *et al.*, 2020), but in the present study it was only 22.1% of the tested sample, which is considerably less. The majority, of adults (90.8%) and adolescents (86.1%) knew the adverse health effects of high salt intake (Jayatilleke *et al.*, 2020). Although the household monthly purchase of salt indicated that the consumption is much higher than the recommended, 48.3% of adults and 45.9% of adolescents believed that they consume 'just the right' amount (Jayatilleke *et al.*, 2020). Discretionary salt added to home cooking was a major contributor to the salt intake, with approximately half (50%) adding salt when cooking rice, the staple (Jayatilleke *et al.*, 2020). For health-related information, the most preferred (adults-72%, adolescents – 69%) media is to be television (Jayatilleke *et al.*, 2020). A high proportion of respondents (76.8%, n=295) were not aware of healthy snacks. Healthy snacks help to fulfill our daily nutrition needs, and there are several choices that can be taken as healthy snacks, such as fruit and veggies (eg; carrot sticks, apple slices, steamed vegetables) dairy products, fat-reduced products and whole grains (Dreher, 2018), (Njike *et al.*, 2016). Most of the respondents (n=196, 51%) consume snacks every day, and 20.1% (n=77) of respondents consumed snacks 2-3 times per week. Taste was the main reason for snack consumption. Ninety- three percent (n=357) of the respondents consumed snacks due to their taste by ignoring the health risk, because only 7% (n=27) of respondents considered the health risk when consuming the snacks. To reduce salty snack consumption, we can introduce tasty and healthy snacks to the market as the taste is the main motive. Also, parents can develop dietary habits in their children to eat healthy snacks rather than salty snacks. Moreover, the majority of the respondents (69.3%, n=266) believed that there is sufficient information on the labels of food and drinks to make a better purchase decision by the customer and 91.4% (n=351) preferred the traffic light system (color code) for the bakery food items to indicate the added salt amount. The main purpose of the food label is to help the consumer make an informed decision. Information in the food labels helps the consumer to make better purchase decisions which is good for health (Goodman *et al.*, 2012). Traffic light labeling (color coding) is an effective method for the consumer to select low-salt products (Goodman et al., 2012). The majority (52.3%, n=201) of the respondents were reading nutrition labels occasionally, and 13.8% (n=53) of respondents never read the nutrition labels. While 36.2% (n=139) rarely paid attention to indications on packages of the level of salt added, and 33.9% (n=130) of respondents never paid attention to the amount of salt. The majority (62.2%, n=239) of the respondents preferred salt labeling in grams/milligrams. Paying attention to the indication of salt level on the label is helping to select low salt-containing foods by consumers, and it will lead to avoiding health problems that can occur from high salt consumption. There are several studies that have shown the food label reading behavior in society. In the UK, in 2011, 38% of respondents read labels to find out the salt amount in the food and 33% of respondents were concerned about the salt content when purchasing the product (Liem, Miremadi and Keast, 2011). In Melbourne, 69% of respondents were reported as reading the salt content on the label when they purchased food (Grimes, Riddell and Nowson, 2009). A study done in Korea showed that 62% of female college students were more likely to read labels, and 32% were reading the sodium information on the label (Chang, 2006). Compared to this in the present study, 52.3% (n=201) were reading labels sometimes, and 36.2% were rarely paying attention to the salt content on the label. The majority of Sri Lankan young adults were not concerned about the salt content indicated on the label. This emphasizes the importance of behavioral change in young adults.

3.3 Determination of salt content in most consumed snacks

Table 1. Salt quantity of branded snacks by Mohr titration

Snack Type (n=3)	Labelled salt (g)/100g of snack	Salt (g)/100g of snack	Salt (g) content in an average portion size of food	Calculated % of salt in an average portion size of food as Daily Value (DV)(5g)
Snack 1	2.6	2.92 ± 0.06 [a]	0.88 ± 0.02	17.54[a]
Snack 2	2.5	2.78 ± 0.01[a]	0.83 ± 0.00	16.66 [a,b]
Snack 3	2.4	2.66 ± 0.13 [a]	0.53± 0.03	10.65[c]
Snack 4	2.12	2.30 ± 0.02 [b]	0.46 ± 0.00	9.19 [c,d]
Snack 5	2	2.15 ± 0.01[b,c]	0.54 ± 0.00	10.77[c]
Snack 6	1.82	1.90 ± 0.02 [b,c]	0.38 ± 0.00	7.61[d]
Snack 7	1.8	1.96 ± 0.04 [c]	0.70 ± 0.12	14.08[b]
Snack 8	0.8	0.98 ± 0.02 [d]	0.23 ± 0.00	4.52[e]
Snack 9	0.78	0.84 ± 0.02 [d,e]	0.09 ± 0.00	1.76 [g]
Snack 10	0.68	0.76 ± 0.0 [d,e,f]	0.11 ± 0.00	2.27 [g]
Snack 11	0.6	0.73 ± 0.02 [d,e,f]	0.22 ± 0.00	4.36 [e,f]
Snack 12	0.52	0.60 ± 0.02 [e,f]	0.11 ± 0.00	2.17[g]
Snack 13	0.5	0.53 ± 0.01[f]	0.13 ± 0.00	2.54 [f,g]

Values bearing different superscript letters in the same column are significantly different ($p < 0.05$)

As presented in Table 1, all tested snacks exceeded the labelled value of salt violating the label regulations. This deceives the consumer by providing misinformation. Though the differences in labelled values to tested values are considerably low, it can adversely affect the health of the consumer depending on the frequency and amount of snack consumed per serving. According to the snack salt contribution to the RDV (Table 1), snacks 1, 2 and 7 are contributing highly with a significant difference to the RDV compared to the other snacks. Therefore, consumers should make dietary changes regarding those snacks and all the experimented values exceeded the labeled salt value highlighting the importance of having procedures to implement the regulations otherwise it will deceive the consumer and adversely affect when consumer tries to purchase low salt products.

Table 2. Salt quantity of non-branded snacks by Mohr titration.

Snack type	Salt (g)/100g of snack	Salt (g) amount in a serving of food	Calculated % of salt (In a serving of food) as DV(5g)
Snack 15 - "Fish roll"	1.73 ± 0.44^{a}	1.2144 ± 0.33	24.29^{a}
Snack 16 - "Cutlets"	$1.59 \pm 0.17^{a,b}$	1.0764 ± 0.30	$21.53^{a,b}$
Snack 17 - "*Wade*"	2.86 ± 0.23^{b}	0.6542 ± 0.19	13.08^{b}

Values bearing different superscript letters in the same column are significantly different ($p<0.05$)

According to Table 2, snack 15, which is fish rolls, contains a high salt amount per serving (1.2144 ± 0.33) and highly contributes to daily salt consumption compared to other non-branded snack foods. Snacks 15-17 were bakery products, and those snacks contribute to the RDV more compared to branded snacks. In a previous study by Gunarathne *et al.* (2021), the salt content of the "Fish roll" was reported as 1.45 ± 0.64g/100g, whereas the current investigation determined a higher value of 1.73 ± 0.44g/100g. Similarly, the salt content of the "Wade" in the previous research was documented as 2.69 ± 0.58g/100g, whereas current findings indicated a slightly elevated amount of 2.86 ± 0.23g/100g. Despite these variations, both items still exhibit high salt content. According to the traffic light system, which categorizes food items based on their nutritional content, the observed salt levels qualify for a red code designation. All three snacks should be signed in red light, because all of them have more than 1.25g of salt/ 100g of snack (USDA Foreign Agricultural Service, 2020). This implies that the salt content remains high, posing potential health concerns. The study's comprehensive findings indicate that the amounts of salt in these foods are largely influenced by the size of the serving portions. Since items like fish rolls, wade, and cutlets are typically sold in small servings, individuals might consume more than one serving of the same food or indulge in multiple types of fast food. This practice can result in an additional salt intake potentially surpassing the recommended Daily Values (DV). Therefore, there is a risk of exceeding the advised levels of salt when consuming these fast foods, particularly if multiple servings or types are consumed. The need for heightened awareness and regulatory measures to address the nutritional implications of these fast-food items is underscored by the persistent elevation in salt levels as per the updated findings. The seasoning level varies among savory snack foods, and it may be up to 15% of the weight of snacks (Bhattacharya, 2022). Salt percentage also varies depending on the seasoning, and it can be as high as 25%. When compared to crisps and snacks with other sources of salt, snacks are consumed in small amounts, and snacks contribute to salt consumption in less than 2% of the dietary intake (Whitton, 2008). It is recommended to introduce a traffic light system to the bakery products as well, to aid the consumer in making a better-informed decision. These purchasing decisions are important to have a healthy life leading to a healthy nation. A study conducted by Jayasinghe and De Silva (2014) found that most students at a Sri Lankan university have a habit of consuming fast food daily, with at least one serving each day. The widespread availability of fast-food services is identified as a key factor contributing to this increased consumption. The study also highlights that the concentration of fast-food outlets in specific geographical areas is linked to adverse health effects in the population. In simpler terms, the study indicates that easy access to fast food is a significant factor in the frequent consumption of these foods, which, in turn, is associated with negative health outcomes.

In the current study, the sample chloride amount was unknown and titration was carried out at pH between 7 and 10 (Deniz Korkmaz, n.d.). To keep the pH, we have used a few drops of sodium bicarbonate. In the absence of sodium bicarbonate, chromate ion will be protonated and form chromic acid and predominates in the solution because chromate ion is a conjugate base of weak chromic acid

(Deniz Korkmaz, n.d.). Therefore, if the solution is more acidic, chromate ion concentration is too low to produce silver chromate precipitate at the end-point. Also, if the pH is above 10 in the solution will mask the endpoint by forming brownish silver hydroxide. Silver chloride and silver chromate solubility depend on the temperature at which the titration was carried out, and all the titrations should be done at the same temperature. Good stirring is also required to obtain a sharp and reproducible end-point; otherwise, formed silver chromate can be occluded in the silver chloride precipitate rather than re-dissolving (Deniz Korkmaz, n.d.). Further, standard silver nitrate solution and the silver chloride precipitate that formed should be kept protected from the light.

The World Health Organization (WHO) has put forth strategies to decrease salt intake in diets. It is essential for governments to create and implement national policies that promote a healthier society. Individuals, too, play a crucial role in fostering health by adopting practices such as maintaining a low-salt diet. By following these recommendations, people can collectively work towards reducing the health risks associated with excessive salt consumption, contributing to the well-being of communities on a broader scale.

4 CONCLUSION & RECOMMENDATIONS

In this study, the major finding was the average daily salt intake per person per day which was 7.59 ± 2.17g. That estimated value exceeded the recommended daily value. The difference between values of daily requirement (5 g) and mean consumption of salt per person per day (7.59 g) is significant ($p \leq 0.001$) with a mean difference of 2.17 g.

The study identified gaps in knowledge, attitudes, practices, and behavior of undergraduate students related to salt and snack consumption. Lack of awareness of the recommended daily value for salt, unawareness of the salt amount in the food, and believing that they consumed the right amount of salt while the majority are unaware of how much they consume are some key gaps. The majority used table salt while cooking, which is the key point that can be changed to implement low salt usage by a gradual decrease in salt added, which leads to salt reduction in day-to-day life.

The majority were not aware of the healthy snacks, but they consume snacks every day due to their taste, and awareness programs should focus on introducing healthy snacks. Insufficient nutritional information about the fast food sold in Sri Lanka poses a challenge to enhancing public health. This study demonstrated that the consumption of salt from fast food varies depending on the type of food and the weight of the serving portion. In essence, the lack of comprehensive nutritional data makes it difficult to make informed choices regarding the health implications of consuming fast food in Sri Lanka. Understanding how the intake of fats, salt, and sodium fluctuates based on the type and serving size of fast food is crucial for developing effective strategies to address public health concerns associated with the consumption of these foods. All measured values of salt in the experiments surpass the indicated salt content, underscoring the critical need for established procedures to enforce regulatory measures. This highlights the importance of implementing and adhering to regulations to ensure that the labeled salt values align with the actual salt content in food products. The observed discrepancy between the experimented salt values and the labelled amounts emphasizes the necessity for robust procedures and adherence to regulatory frameworks to uphold accuracy and transparency in food labelling, thereby safeguarding consumer trust and promoting compliance within the industry.

The individuals in this study were either educated themselves or belonged to families with educational backgrounds, making them more informed than the general population. As a result, the awareness levels observed in the study may be higher than what is typical among the broader population. This distinction underscores the need to interpret the study findings with the awareness that the participants may not be fully representative of the general public, where awareness levels could potentially be lower.

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