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AWARENESS AND KNOWLEDGE REGARDING LOW-SODIUM SALT SUBSTITUTES AMONG RURAL HOUSEHOLDS IN KARNATAKA: A COMMUNITY-BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Excessive dietary salt intake is a major modifiable risk factor for hypertension and cardiovascular diseases. Low-sodium salt substitutes (LSSS), in which part of sodium chloride is replaced with potassium salts, have emerged as a promising strategy to reduce sodium intake at the population level.

Objectives: To assess the level of awareness and knowledge regarding low-sodium salt substitutes among rural households of Sullia taluk, Karnataka, and to examine the association between selected sociodemographic factors and awareness of these substitutes.

Methods: A community-based cross-sectional study was conducted from October 2023 to April 2025 among 800 households in rural Sullia taluk using cluster sampling. The primary cook of each household was interviewed using a pretested semi-structured questionnaire.

Results: Only 54 respondents (6.75%) had heard about low-sodium salt substitutes. Knowledge regarding their indications and contraindications was reported by 38 (4.75%) and 2 (0.25%) respondents respectively, and none were aware that these substitutes contain potassium. While 72.87% of respondents knew that excessive salt intake could cause health problems, only 36.12% recognized its association with hypertension. Awareness of recommended salt intake was observed in 5.5% of respondents, and only 0.37% correctly identified the recommended daily intake. Awareness of LSSS was significantly associated with higher educational and socioeconomic status.

Conclusion: Awareness and knowledge regarding low-sodium salt substitutes were extremely limited among rural households. Strengthening community education and integrating salt reduction strategies into existing non-communicable disease prevention programs may help promote healthier dietary practices.

Keywords: Low Sodium Salt Substitutes, Salt Intake, Hypertension Prevention, Rural Population.

INTRODUCTION

Excessive salt intake is a major public health concern and is considered to be responsible for an estimated for 1.89 million deaths every year. The primary health effect associated with intake of excessive salt rich in sodium is raised blood pressure which eventually increases the risk of cardiovascular diseases, gastric cancer, obesity, osteoporosis, Meniere's disease and kidney disease. Consequently, reducing population level salt intake which translates into reduction in mean sodium intake, can result in reduction of the burden of non communicable diseases.

It is considered that for every 1 US\$ invested in scaling up sodium reduction interventions, there will be a return of atleast 12 US \$.^[1]

The global mean intake of sodium in adults is 4310 mg/day which is equivalent to 10.78 gm/day of salt. This global mean salt intake is almost twice more than the recommended levels proposed by World Health Organisation, as it recommends only 2000 mg/day of sodium¹. In India, the mean daily salt intake has been estimated to be approximately 8 to 11 g/day which is again approximately twice the recommended levels.^[2]

Factors contributing to high salt intake in India could be discretionary salt intake added during cooking, consumption of salted accompaniments like pickles and chutneys and increased availability of packaged and processed foods.^[3]



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In addition to various strategies formulated to reduce overall salt consumption, the use of low sodium salt substitutes has emerged as a promising intervention to decrease sodium intake at population level.^[4] Potassium in diet not only results in reduction of blood pressure but also helps in reducing the incidence of stroke, renal damage and calcium excretion.^[5] Fruits and vegetables are considered as a natural source of potassium. Apart from these, there are some salts which contain more potassium and low sodium called as Low Sodium Salt substitutes (LSSS) which have shown to reduce blood pressure.^[6,7,8]

The successful implementation of such interventions depends not only on availability of LSSS but also on the community awareness and its appropriate use. In India, community based evidence regarding awareness of LSSS is limited, particularly in rural settings where discretionary salt use contributes to overall sodium intake. The level of awareness and knowledge regarding LSSS among rural households if assessed properly may help identify gaps which could then be addressed through targeted public health initiatives. Therefore, the present study was aimed to assess the level of awareness and knowledge regarding low-sodium salt substitutes among rural households of Sullia taluk, Karnataka. The study also aimed at assessing the level of knowledge regarding the indications and contraindications of LSSS and also to examine the association between selected sociodemographic factors and awareness of these substitutes.

MATERIALS AND METHODS

A community-based cross-sectional study was conducted among rural households in Sullia taluk of Dakshina Kannada district, Karnataka, India. Sullia taluk comprises 40 villages with an estimated population of approximately 145,000. The study was carried out over a period of eighteen months from October 2023 to April 2025. The study population consisted of adult household members responsible for food preparation, referred to as the primary cook of the household.

The sample size was calculated assuming the prevalence of awareness regarding low-sodium salt substitutes to be 50%, as reliable prior estimates were not available. Using the formula $n = Z^2 p (1-p) / d^2$, where $Z = 1.96$ at a 95% confidence level, $p = 0.5$, and allowable error (d) = 5%, the minimum required sample size was 384 households. Since cluster sampling was employed, a design effect of 2 was applied, resulting in a minimum required sample size of 768 households. To ensure adequate representation, a total of 800 households were included in the study.

Each of the 40 villages in Sullia taluk was considered as one cluster. From each cluster, 20 households were selected using systematic random

sampling. A central landmark in the village was identified and a random direction was chosen. The first household was selected randomly, after which every consecutive household was approached until the required number of households per cluster was obtained. If a household was closed or refused participation, the next immediate household was approached. Households that remained closed after three consecutive visits were excluded from the study. Households in which family members predominantly consumed home-cooked meals were included in the study. In addition, households with an adult member responsible for cooking who was willing to participate were included.

Data were collected through face-to-face interviews using a predesigned, semi-structured questionnaire administered to the primary cook of the household. The questionnaire included sections on sociodemographic characteristics, dietary practices related to salt intake, and awareness regarding low-sodium salt substitutes. Information regarding low-sodium salt substitutes included awareness of the existence of such substitutes, knowledge regarding their potential health benefits, awareness regarding indications for their use, awareness regarding possible contraindications, and knowledge regarding the potassium content of these substitutes. The questionnaire was developed after reviewing relevant literature and guidelines related to dietary salt intake and salt reduction strategies. Content validity of the tool was assessed by subject experts to ensure clarity, relevance, and adequacy of the items. The questionnaire was pilot tested in a population similar to the study area but not included in the final analysis. Minor modifications were made based on feedback obtained during the pilot study to improve clarity and comprehension.

For the purpose of this study, awareness of low-sodium salt substitutes was defined as having heard about the existence of salt substitutes that contain lower sodium than regular salt. Knowledge regarding low-sodium salt substitutes was defined as correct understanding regarding their indications, contraindications, or composition, including awareness that these substitutes contain potassium in varying proportions. The primary cook was defined as the household member primarily responsible for preparing meals in the household, irrespective of age or gender.

The collected data were entered into Microsoft Excel and analyzed using the Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistics were used to summarize the data. Categorical variables were expressed as frequencies and percentages. Associations between awareness of low-sodium salt substitutes and selected sociodemographic variables were assessed using the Chi-square test. A p value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Ethics Committee prior to the commencement of the study. Written informed consent was obtained from all participants before data collection. Confidentiality of the information collected was strictly maintained throughout the study.

RESULTS

A total of 800 households were included in the study, representing 3,544 individuals residing in rural areas of Sullia taluk. All respondents were adults aged 18 years and above. The majority of respondents belonged to the 26–50 year age group (66.75%), with a mean age of 41.76 ± 13.32 years (range: 18–89 years). Females constituted the majority of respondents (85.15%), as they were primarily responsible for cooking in their households. Most households (68.25%) consisted of three to five members, with a mean household size of 4.46 ± 1.45 . With regard to awareness of low-sodium salt substitutes, only 54 respondents (6.75%) reported that they had heard about such substitutes. Knowledge regarding the indications for the use of low-sodium salt substitutes was observed in 38 respondents (4.75%), while awareness regarding contraindications was extremely limited, with only 2 respondents (0.25%) reporting knowledge of potential risks associated with their use. None of the respondents were aware that low-sodium salt substitutes contain potassium in varying

proportions. Despite the low level of awareness regarding salt substitutes, a substantial proportion of respondents were aware that excessive salt intake can have adverse health effects. A total of 583 respondents (72.87%) reported that high salt intake could cause serious health problems. However, only 289 respondents (36.12%) were aware of the specific association between high salt intake and hypertension. Awareness regarding the existence of guidelines for recommended daily limit of salt intake was observed in 44 respondents (5.5%), while only 3 respondents (0.37%) were able to correctly state the recommended daily salt intake.

With respect to dietary practices, 179 respondents (22.37%) reported that they frequently added extra salt to their food while eating. Daily consumption of junk foods was reported by 191 respondents (23.87%), while 267 respondents (33.37%) reported daily consumption of processed foods such as pickles, buttermilk, or chilli preparations. These findings indicate that discretionary salt use and consumption of high-salt foods remain common practices in the study population.

An analysis of the association between sociodemographic factors and awareness regarding low-sodium salt substitutes revealed a statistically significant association with educational status and socioeconomic status. Higher awareness was observed among respondents with higher levels of education and among those belonging to higher socioeconomic classes.

Table 1: Awareness and Knowledge Regarding Low-Sodium Salt Substitutes among Study Participants (n = 800)

Sl. No.	Variable	Response	Number (%)
1	Heard about low-sodium salt substitutes	Yes	54 (6.75%)
		No	746 (93.25%)
2	Awareness of indications for low-sodium salt substitutes	Yes	38 (4.75%)
		No	762 (95.25%)
3	Awareness of contraindications of low-sodium salt substitutes	Yes	2 (0.25%)
		No	798 (99.75%)
4	Awareness that salt substitutes contain potassium	Yes	0 (0%)
		No	800 (100%)

Table 2: Awareness Regarding Health Effects of Excess Salt Intake

Sl. No.	Question	Response	Number (%)
1	Knowledge that excessive salt intake can cause serious health problems	Yes	583 (72.87%)
		No	217 (27.12%)
2	Knowledge that high salt intake can cause hypertension	Yes	289 (36.12%)
		No	511 (63.87%)
3	Awareness that there is a recommended limit for salt intake	Yes	44 (5.5%)
		No	756 (94.5%)
4	Knowledge of correct recommended daily salt intake	Yes	3 (0.37%)
		No	797 (99.62%)

Table 3: Dietary Practices Related to Salt Consumption

Sl. No.	Question	Response	Number (%)
1	Adds extra salt to food while eating	Most often	179 (22.37%)
		Very rarely	621 (77.62%)
2	Consumption of junk foods	Daily	191 (23.87%)
		Less often than daily	545 (68.12%)
		Very rarely	64 (8%)
3	Consumption of packaged and processed foods (pickles, chilli, papad etc.)	Daily	267 (33.37%)
		Less often than daily	469 (58.62%)
		Very rarely	64 (8%)

Table 4: Association between Sociodemographic Factors and Awareness of Low-Sodium Salt Substitutes

Sociodemographic Variable	Aware n (%)	Not aware n (%)	Total	χ^2	p value
Educational Status					
No formal education	1 (3.03%)	32 (96.97%)	33	18.2158	0.0011*
Primary school	5 (3.62%)	133 (96.38%)	138		
Secondary school	12 (5.38%)	211 (94.61%)	223		
Higher secondary	26 (7.28%)	331 (92.71%)	357		
Graduate and above	10 (20.41%)	39 (79.59%)	49		
Socioeconomic Status					
Class I – Upper	7 (18.42%)	31 (81.58%)	38	14.3771	0.0061*
Class II – Upper middle	26 (8.78%)	270 (91.21%)	296		
Class III – Middle	10 (5.31%)	178 (94.68%)	188		
Class IV – Lower middle	8 (3.65%)	211 (96.34%)	219		
Class V – Lower	3 (5.08%)	56 (94.92%)	59		

DISCUSSION

The present cross sectional study was performed to assess the level of awareness and knowledge regarding Low Sodium Salt Substitutes (LSSS) among the rural households in Sullia taluk of Karnataka. The study demonstrated extremely low level of awareness regarding LSSS with only 6.75% of them having heard of LSSS. The knowledge regarding their indications and contraindications were also minimal accounting for only 4.75% and 0.25% respectively. None of the respondents were aware that LSSS contained potassium in varying proportions. These findings indicate that there is a substantial gap in community awareness regarding a potential strategy for dietary sodium reduction.

Similar findings of low awareness among the study population was noted in a study conducted by Reena Sehgal et al.^[9] Limited awareness regarding LSSS have also been reported among health care providers in a study conducted in Mangalore, Karnataka suggesting that the knowledge gaps exist not only in the community but also among the health care professionals too.^[10]

In the present study, 72.87% of the study participants were aware of the fact that high salt intake could result in serious health problems, although only 36.12% were aware of the specific association between high salt intake and hypertension. Similar pattern was observed in a study conducted in North India where many study participants were aware that excessive salt intake was harmful but its role in hypertension and recommended intake levels were limited.^[11]

The present study showed that only 5.5% were aware that there was a recommendation for ideal salt intake level and only 0.37% were able to correctly state the recommended daily salt intake level. Even in a study conducted among adults in eleven regions in Xuzhou province of China, it was reported that less than one third of the study population had knowledge of recommended salt intake levels and that excessive intake can cause high blood pressure.^[12] This lack of knowledge is a cause of concern because the internationally recommended guidelines of less than 5 gms per day salt intake is not translating into community awareness. This may inturn hinder the effectiveness of population level salt reduction strategies.

Approximately 22.37% of the respondents reported frequently adding extra salt to food while eating. Daily consumption of junk food and processed food was reported by 23.87% and 33.37% of the respondents respectively. Similar findings are reported in other studies, where discretionary salt use and consumption of processed foods were identified as important contributors to overall sodium intake.^[13] These practices may also reflect the common dietary habits in the Indian households, where salted accompaniments such as pickles and chutneys are frequently consumed.

Another important finding in the present study was that there was a significant association between awareness about LSSS and the respondent's educational levels and socio economic status. Similar associations have been reported by a study conducted in Delhi^[13]. Higher educational levels may

be associated with improved health literacy and better understanding of dietary recommendations. Those belonging to higher socio economic status may have greater exposure to health information through media, health care providers and educational resources.

Overall the findings highlight that there is a substantial gap in community awareness regarding recommended salt intake and low sodium salt substitutes. The extremely low level of awareness observed suggests that potential benefits of intervention such as LSSS may not be realized without improving community education. Strengthening public health campaigns, integrating salt reduction messages and improving availability of LSSS in the rural areas may help promote healthy dietary practices.

CONCLUSION

The present study demonstrates that awareness regarding low-sodium salt substitutes among rural households in Sullia taluk is extremely limited. Although a majority of participants were aware that excessive salt intake could adversely affect health, detailed knowledge regarding recommended salt intake levels and the potential role of salt substitutes in reducing sodium consumption was markedly poor. Awareness regarding indications and contraindications of these substitutes was almost negligible. Given the growing burden of hypertension and cardiovascular diseases in India, improving community awareness regarding salt reduction strategies and safe alternatives such as low-sodium salt substitutes is essential. Integrating targeted health education programs into existing primary health care and non-communicable disease prevention initiatives may help bridge the awareness-knowledge gap and promote healthier dietary practices at the community level.

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