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INFLUENCE OF DIETARY SALT KNOWLEDGE, PERCEPTIONS AND BELIEFS ON CONSUMPTION CHOICES AFTER STROKE IN UGANDA

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Abstract

Background—Previous research on Uganda’s post-stroke population revealed that their level of dietary salt knowledge did not lead to healthier consumption choices.

Purpose—Identify barriers and motivators for healthy dietary behaviors and evaluate the understanding of widely accepted salt regulation mechanisms among post-stroke patients in Uganda.

Methods—Convergent parallel mixed methods triangulation design comprised a cross sectional survey (n=81) and 8 Focus Group Discussions with 7–10 post-stroke participants in each group. We assessed participant characteristics and obtained insights into their salt consumption attitudes, perceptions and knowledge. Qualitative responses were analyzed using an inductive approach with thematic analytic procedures. Relationships between healthy dietary salt compliance, dietary salt knowledge and participant characteristics were assessed using logistic regression analyses.

Results—Healthy dietary salt consumption behaviors were associated with basic salt knowledge ($p<0.0001$) but no association was found between compliance and salt-disease related knowledge ($p=0.314$). Only 20% and 7% obtained health-related salt knowledge from their health facility and educational sources, respectively, whereas 44% obtained this information from media personalities; 92% of participants had no understanding of nutrition labels and only 25% of the

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study population consumed potash – an inexpensive salt substitute that is both rich in potassium and low in sodium.

Conclusion—One barrier to healthy dietary consumption choices among Uganda’s stroke survivors is a lack of credible disease-related information. Improving healthcare provider stroke-related dietary knowledge in Uganda and encouraging the use of potash as a salt substitute would help reduce hypertension and thereby lower the risk of stroke.

Keywords

Sodium; Dietary Salt; Stroke; Hypertension; Sub-Saharan Africa; Uganda

Introduction

High salt consumption is an important determinant of hypertension and cardiovascular risk, having a population-attributable risk for hypertension of 9–17% (1, 2). According to World Health Organization (WHO) statistics, over 80% of cardiovascular disease (CVD) deaths occur in low-and middle-income countries with high blood pressure as a major contributor (3). In Uganda, more than 65% of post-stroke patients have uncontrolled hypertension (4). Decreasing blood pressure on a population level is one strategy for reducing the rate of CVDs (5, 6). Lowering dietary salt consumption is a potentially effective approach for decreasing blood pressure and thereby the risk of stroke and cardiovascular diseases (7). Well in excess of the WHO recommendation of 5g/d (8), 65% of Uganda’s post-stroke population registered 24h urine sodium levels 8.5g/d (9).

Multiple factors including culture, patient age, educational level and income contribute to dietary behaviors (10). In Uganda, knowledge of the impact of diet on stroke risk as well as perceptions of stroke prevention are generally poor (4); however, even the limited dietary salt knowledge that exists is not associated with either healthy consumption choices or BP control (9). Studies assessing the disparity between knowledge and healthy behaviors in Uganda are not available. The data are crucial in resource limited settings such as Uganda in which chronic disease-care costs are prohibitive, making effective, inexpensive primary prevention interventions an imperative. The main objectives of the present study were to explore Ugandan’s knowledge, attitudes, and behaviors related to their salt consumption decisions after stroke, identify barriers and motivators to healthy dietary compliance, and examine participants’ understanding of widely accepted salt regulation mechanisms including the use of salt substitutes and interpretation of nutrition labels. We hypothesize that stroke survivors do not fully understand the risks associated with high salt consumption and are largely unaware of related health effects.

Methods

Study design

Data were collected between July 2015 and January 2016 at Uganda’s Mulago National Referral Hospital. The hospital’s neurology clinic serves as a tertiary referral center for neurologic disorders for the entire country. We utilized a mixed methods triangulation design(11) to obtain complementary data on stroke, patient salt consumption behaviors and

associated motivating factors. We used quantitative data to measure patient salt-related dietary knowledge and associated behaviors and to assess the demographic and clinical characteristics of stroke survivors within the Stroke Clinic. Qualitative data was used to provide context for the interpretation of the quantitative data by determining patient perceptions and inform how identified gaps might be addressed. Focus Group Discussions (FGDs) to obtain qualitative data were moderated by an experienced qualitative researcher who was fluent in English and Luganda (the area's main local language). FGDs were conducted to give in-depth insights into the beliefs, attitudes and knowledge pertaining to the participant's salt consumption and their knowledge of its impact on health. All participants were adult (>18years) post-stroke patients identified from neurology and other medical data files using purposive sampling. Stroke was defined as a neurologic deficit of abrupt onset lasting more than 24-hrs, localizable to a vascular territory and attributable to a vascular cause with compatible findings on brain CT scan (4).

Focus Group Methods

A total of 8 focus groups were formed, each including 7–10 adults selected by purposive sampling with a history of stroke or an attendant with at least some responsibility for caring for a stroke affected participant (n=81). Patients who could not provide a reliable history or did not have an attendant and those who declined consent were excluded. The topics for the FGDs were identified after a preliminary analysis of qualitative results from a test group of 5 post-stroke subjects and included respondents' understanding of 'sodium', perceptions and attitudes towards salt consumption, level of dietary salt knowledge, salt measurement and regulation, salt substitutes and nutrition labels. Group interviews were conducted to stimulate interaction, encourage participants to respond and react to each other, and compare experiences (12). Questions were open-ended so as not to limit the range/breadth of discussion. Participants were positioned so that each could have eye contact with others in the group. Each interview lasted approximately 60 minutes, was recorded, and then transcribed verbatim. Information collected from focus group sessions included interview and observation. Figure 3 gives an overview of the semi-structured interview protocol.

Salt knowledge was assessed in three ways: 1) basic knowledge (quantified by whether the subject is aware of the harm high salt has on general health); 2) diet-disease related knowledge (quantified by responses to the question '*what is the impact of high salt on health?*'); and 3) procedural knowledge (quantified by patient report on deliberate actions taken to cut down their salt intake).

Qualitative Analysis

The focus group transcripts were first read in their entirety to gain familiarity with the data. Segments of text were labeled and assigned codes that described meaning of content (13). The codes were subsequently collapsed into broad themes or categories. Finalization of codes was based on the consensus of the qualitative team.

Quantitative Analysis

Quantitative data were entered into a database, checked for consistency, and analyzed using the Statistical Package for the Social Sciences (SPSS) program software (version 22.0) with

descriptive statistics summarized in text and tables. Fisher's Exact tests followed by multivariate logistic regression was used to determine the association between healthy dietary salt behaviors and salt-related knowledge. We adjusted for factors that could influence diet such as education, sex, location, post-stroke duration, type of stroke and stroke recurrence. All variables significant in the univariate analysis at $p < 0.25$ were included in the multiple logistic regression analysis to identify those independently associated with healthy dietary salt compliance.

After analyzing the qualitative and quantitative datasets, the results from each were compared to identify areas of convergence (similarity) and divergence (difference).

Quality control

The study tools (questionnaire, FGD guide and checklist) were pretested and revised accordingly. Experienced FGD facilitators were trained on the objectives of the study and how to administer the tools. All interviews were undertaken in private rooms offering confidentiality.

Ethical considerations

The study was approved by the Makerere University School of Medicine Research and Ethics Committee and the Uganda National Council for Science and Technology. Informed written and verbal consent was obtained for the surveys and FGDs, respectively. Confidentiality and use of data for research purposes was emphasized at point of recruitment.

Results

There were 81 post-stroke subjects enrolled aged 17 to 87years, of whom 34.6% ($n=28$) were men and 65.4% ($n=53$) were women. The average age of participants was 57.1 ± 15.7 years with a plurality 40.7% aged above 60 years. The mean interval between the index stroke and the interview was 3.0 ± 3.3 years with 19.8% reporting recurrent stroke episodes. The majority of respondents (59.3%) reported having little or no formal education with men more highly educated than the women ($OR=4.57$ 95% CI 1.72–12.05; $p=0.002$).

Table 1 gives the demographic and clinical characteristics of the participants by group according to the odds of salt-disease related knowledge. Men and those with a history of hemorrhagic stroke were more likely to have adequate salt-disease knowledge than women and those with ischemic stroke.

Based on the content of the analyzed data, derived predominant perceptions were summarized under six themes related to dietary salt consumption. Each theme is described and representative quotes illustrating prevailing perceptions are reported in italics. Responses in local language were translated into English by a translator. Table 2 provides key quotations representative of each theme.

Sodium knowledge

Participants were asked for their understanding of the term 'sodium' and its relationship with dietary salt. The majority (93%) had no understanding of the term. Only 7%, all of whom were highly educated, were able to articulate the relationship between sodium and common salt.

Dietary salt consumption – perception and attitudes

Respondents had mixed attitudes about dietary salt consumption. The majority considered salt an essential seasoning and food with low salt as inedible. A few reported raw salt as bad but regarded it as necessary for certain foods such as eggs and roasted food.

High salt was recognized as having an adverse impact on health by 89% of participants; however, 38% related that they secretly add salt to their food. Only 37% reported adhering to dietary recommendations.

The majority of male participants indicated leaving decisions on amounts of salt consumed to their caretakers (spouses). They expressed indifference to the salt amounts served in their food. In contrast, female participants indicated more responsibility and ownership of their salt consumption decisions even when they were entirely dependent on a caretaker.

Of all participants, 24% considered consumption of raw salt as more hazardous than a consistent high salt diet. The immediate effects of high salt consumption were reported as heart burn (35%), headache (36%), unusually high urinating frequency (15%), palpitations (22%), burning feeling on tongue (10%) and over sweating (4%).

Perceptions on how dietary salt can lead to health problems included erroneous suppositions of salt accumulating and blocking off blood vessels causing stroke and salt causing accumulation of fats in the body.

Nearly three quarters of participants (72%) reported being indifferent to the amount of salt they consumed prior to stroke and only changed their attitude and consumption decisions after their stroke. Figure 4 summarizes the sub-themes under perceptions and attitudes in terms of percentage count recording these opinions.

Dietary salt knowledge

An analysis of knowledge of the study group participants pertaining to salt and its impact on health found that a majority (51.9%) had basic knowledge that high salt is harmful to health, but only 14.8% knew the reasons for this risk. The majority reported being told by their doctors that salt was bad for their post-stroke condition, but did not specifically know why. Participants whose responses to the question '*what is the impact of high salt on health?*' included both high blood pressure and stroke were considered to have sufficient salt-disease related knowledge; responses excluding either condition were considered to indicate a knowledge gap. There was a significant association between healthy dietary salt compliance behavior and basic salt knowledge ($p<0.0001$) but no association found between this compliance and salt-disease related knowledge ($p=0.314$). Univariate chi-square analysis showed relationship between low salt dietary compliance and basic salt knowledge

(unadjusted OR 14.2, $p<0.0001$). The relationship remained significant after adjustment for variables with $p \leq 0.25$ in the univariate analyses (sex, marital status, location, stroke type and post-stroke duration; adjusted OR 21.8, $p<0.0001$). Similar analysis found no association between low salt dietary compliance and salt-disease knowledge (unadjusted OR 1.88, $p=0.319$; adjusted OR 2.69, $p=0.181$). Table 3 gives the results of the multivariate logistic regression analysis for healthy dietary salt compliance and salt knowledge.

Only 31% and 20% of participants, respectively, correctly related high salt consumption to hypertension and stroke. Other side effects were reported as diabetes (6%), organ damage (liver, kidney, lungs) (20%) and increased body fat (5%); 26% of participants indicated they did not know the answer.

To reduce the amount of salt in their bodies or in the meals they eat, participants reported eating food with minimal (63%) or completely devoid of salt (20%), drinking lots of water after high salt meals (40%), adding sugar to high salt meals (10%), adding water to dilute high salty food (35%), forgoing salty soup in favor of dry food (12%), eating fruits with salty meals e.g. mangoes, avocado or bitter berries (6%) and opting for fresh foods as opposed to junk food (51%).

Dietary salt measurement and regulation

No stroke survivor could articulate a specific recommended dietary salt consumption target. They agreed on the need to consume 'very little salt', but were unable to quantify how much. Reported dietary salt measurement units were derived from a combination of cooking experience, cultural inferences and intuition – from tablespoons, palm measurements to pinches.

Salt substitutes

Respondents reported utilizing a wide variety of salt types and salt substitutes including alkaline salt deposits from Lake Magadi (11%), unrefined crater lake salt from Lake Katwe (7%), Iodized salt (47%), non iodized salt (27%), potash- ash from burnt banana peels & stems, pawpaw stems (25%) and Lemon extract (15%). Their information sources included TV/radio shows (44%), knowledge passed on from elders (11%), post-stroke peers (18%), medical personnel (20%) and school (7%).

Nutrition labels

A total of 92% of respondents had no knowledge of nutrition labels or their interpretation; only 8% used these labels to determine whether food items were salty vs sweet, and/or savory vs hot. Reasons listed for the failure of participants to utilize nutrition labels to inform respondents' food choices included: 1) respondents' inability to read (16%); 2) inability to understand food label values (38%); and 3) lack of nutrition labels on local food products (62%).

Discussion

Understanding salt knowledge, attitudes and behaviors related to dietary salt consumption may provide insights into the likely effectiveness of education-based programs (14). There were four key findings from our study: 1, the vast majority of stroke survivors (>80%) had minimal knowledge on the relationship between salt consumption and stroke risk; 2, dietary health knowledge is mainly derived from non-medical, non-educational sources; 3, current food/sodium labeling schemes in Uganda are inadequate; and 4, stroke survivors' use of salt substitutes may be key to feasible hypertension and stroke control in this population.

Misperceptions regarding the effects of high salt on health among participants included causing diabetes, hypercholesterolemia, headaches, heartburn, and excessive sweating. Our findings are consistent with a New Zealand study in which factual awareness of health conditions associated with high salt was similarly low (15).

Participants' attitudes towards dietary salt were examined as influencers of their consumption choices. Whereas 89% of post-stroke participants indicated that a high salt diet could lead to serious health problems, 26% considered added salt as necessary to make certain foods palatable and 38% reported adding table salt to improve flavor. Even with some knowledge of the hazards of high salt, it is hard for these participants to overcome prior consumption habits. Salt addiction is in part physiological as a high salt diet down regulates taste buds, allowing habituation and resulting in the need for higher salt concentrations to provide the "saltiness" reward (16).

Only 31% were able to correctly relate high salt and hypertension. This percentage is very low when compared with a 40.7% proportion of participants with a post-stroke duration of >2yrs over which time they are expected to have interacted with health personnel on repeat visits (a minimum of 6-times per year). A survey conducted in Europe and Australia found that as many as 80% of residents knew the relationship between high salt intake and hypertension (14). In another study, 95% of participants identified the seriousness of a high salt diet on health with 81% linking it to raised blood pressure (17), indicating that there is still great potential for improvement in Uganda, especially in high risk, post-stroke patients. These differences may be explained by a deliberate effort in the more developed countries to drive salt awareness strategies primarily at patient stroke care points aimed specifically at high risk patients which is absent in Uganda.

Only 14.8% of study participants had adequate salt-disease related knowledge. Of these, men had better salt-disease knowledge than women, possibly related to their higher levels of education. Those with a history of hemorrhagic stroke were more knowledgeable than those with a history of ischemic stroke. We speculate that better knowledge among those with hemorrhagic stroke may be because hemorrhagic stroke is strongly associated with greater stroke severity, higher mortality, and poorer long-term neurologic outcomes (18). This may relatively increase the importance disease-related information among these patients.

Patients with lower disease specific knowledge report a lower quality of life, and have poorer health related outcomes (19). The salt-disease knowledge registered in this study is low compared to prior knowledge results of 39% on this same population (9). The disparity

may be attributed to differences in study methodology. The questionnaire from the cross sectional study provided subjects with response options whereas questions in the focus group discussion were open-ended (12). None of the respondents were able to articulate an optimal salt target indicating a fundamental lack of procedural knowledge. Even with health providers advocating reduced salt consumption, respondents reported having no specific information on target values and associated measurement units. Although 37% report strict adherence to dietary recommendations, without accurate knowledge of consumption targets, the probability of success is low. Limited salt knowledge coupled with erroneous medical information highlighted by this study partly explains the absence of a positive relationship between salt knowledge and behavior (9).

Participants reported that their primary sources of stroke-disease information were non-medical media personalities and post-stroke peers. In addition, education provided by medical personnel was found to have little in way of diet recommendations or salt targets. Although a high number of post-stroke patients report consuming little salt, it is not reflected in their 24h urine sodium (9). Inadequate access to credible disease information is a key barrier to healthier consumption choices. That only 20% of participants in this study identified interaction with medical professionals as a source of stroke and hypertension control knowledge is a reflection of the poor level of purposeful and educative interaction between health workers and patients (20). It may also point to a lack of sufficient disease knowledge on the part of health workers in Uganda. A study in Pakistan found that junior and future doctors had poor hypertension knowledge leading to sub-optimal management of hypertension cases (21). Another study in Iran showed only 20% of physicians could properly manage a patient with hypertension (22). There is, therefore, a need in these environments to provide healthcare providers with holistic hypertension case management knowledge that is more than medication but also includes dietary (salt) lifestyle changes to share with their patients.

Only 8% were familiar with the concept of nutrition labels while 7% had an understanding of the term 'sodium' as it is reported on food labels; 38% were unable to read deriving no value from the food labels. Less educated respondents are less likely to check nutrition labels as an aid to lower salt intake (23, 24). To increase the value of food labels, there is need for a system that makes the salt content of foods easily apparent regardless of consumers' ability to read (25). A scheme that includes color-coded interpretation of nutrient levels is most likely to help consumers identify at a glance those foods low in salt (26). Improved nutrition knowledge associated with food labels may support healthier food choices (27).

Of the participants, 18% reported using naturally occurring salts versus processed table salt. Although they contain a higher trace mineral content than refined table salt, there no is difference in their sodium content (8). Therefore, natural salts consumed in the same amounts as table salt will not achieve salt reduction targets.

Salt substitutes replace some or all of the sodium with potassium (29), which is associated with lower blood pressures (30). An important portion of our study population (25%) reported using potash- ash from burnt banana stems and pawpaw stems as a viable salt

substitute. Banana is the most farmed fruit in Uganda (31). In rural parts of Uganda, their stems are cut up, sundried and then burnt for ash extract composed of ~46% potassium and ~2.6% sodium. It has been used as a food additive and salt substitute for generations in other places including West Africa and India (32, 33). Inexpensive and readily available, its incorporation in salt reduction campaigns and possible commercialization could help Uganda's population achieve salt reduction targets.

There are some limitations to the generalizability of the present results. We used a convenience sample (n=81) that is not necessarily representative of the wider Ugandan community. Its relatively small size meant we could not explore knowledge, perceptions or preferences among people of different ethnicities or socio-economic status. In addition, an overrepresentation of women in the study sample occurred as a result of the sampling methodology. This was due to greater willingness among women to participate. Participation bias could also occur if those more or less severely affected were more likely to participate.

To address the identified barriers to healthy dietary behaviors among Uganda's stroke survivors, there is an urgent need to make healthcare providers the primary sources of accurate stroke and hypertension control knowledge. This should be coupled with equipping these providers with evidence-based diet-related information. There is also value to be had from harnessing the existing correct information in the population such as use of potash. Education regarding sodium replacement and salt substitution is feasible and has the potential to improve blood pressure control and reduce the burden of stroke and other cardiovascular diseases in the country. Furthermore, future research is needed to evaluate the impact of dietary behavioral change programs on patient outcomes.

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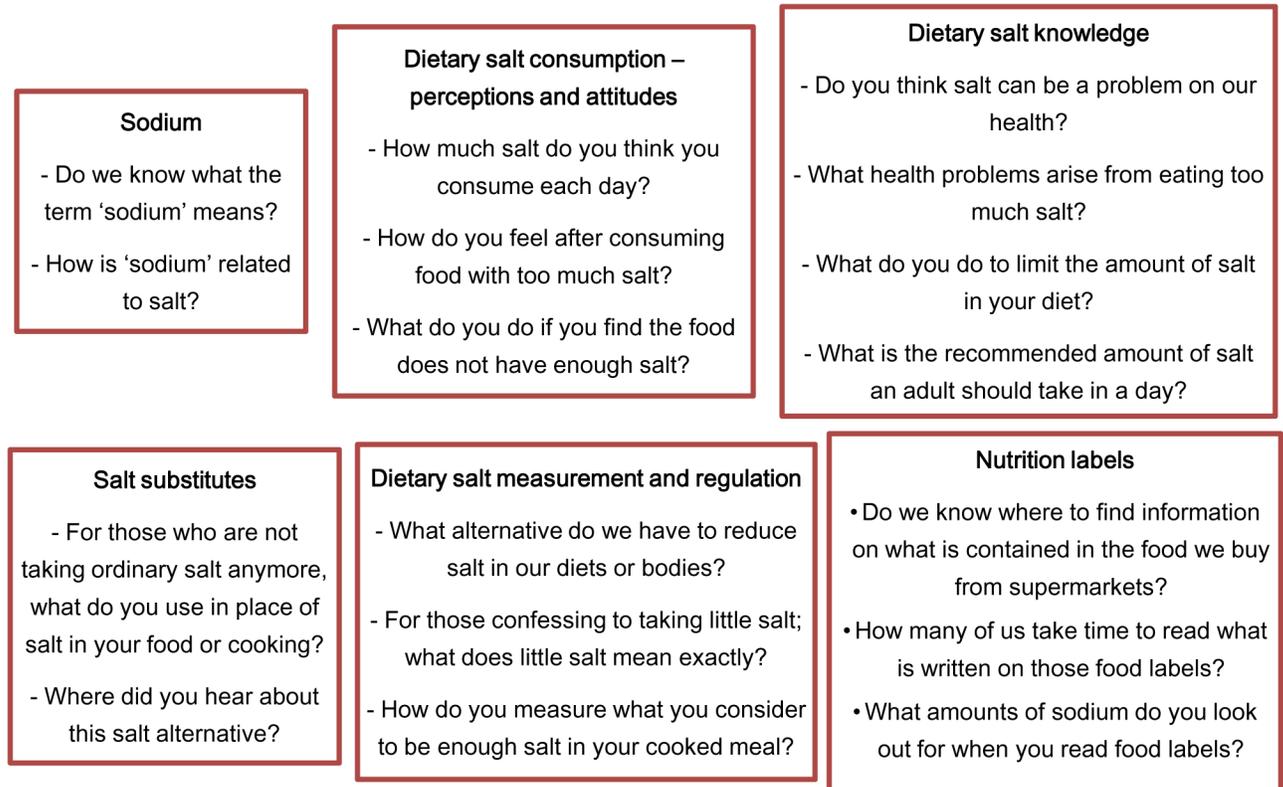


Figure 3.
Overview of the semi structured interview protocol

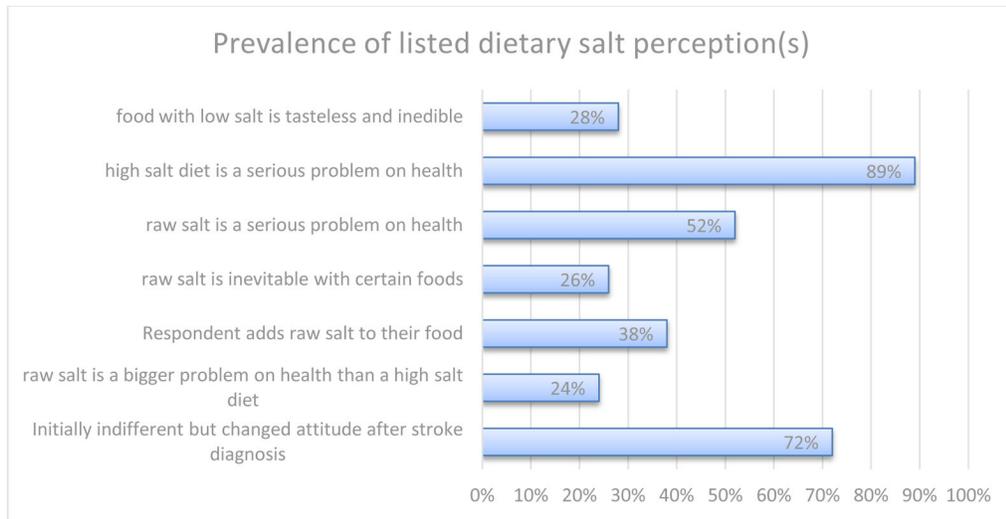


Figure 4.
Prevalence of common dietary salt consumption perceptions

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Table 1

Study group characteristics, prevalence of Salt-Disease knowledge, Adjusted OR by characteristics

Characteristic (n)	% knowledgeable	Odds Ratio (95% CI) p-value	* Odds Ratio (95% CI) p-value
Total	14.8%		
Sex			
Men (28)	28.6%	4.90 (1.33,18.1)	5.77 (1.38,24.20)
Women (53)	7.5%	p=0.011	p=0.017
Age Group			
>45years (60)	16.7%	1.80 (0.36,9.01)	1.86 (0.37,9.43)
< 45 years (20)	10.0%	p=0.470	p=0.453
Marital Status			
Single/Divorced/Widowed (37)	21.6%	2.76(0.76,10.04)	2.70(0.75,9.73)
Married (44)	9.1%	p=0.114	p=0.129
Education			
Low (None/Primary) (48)	14.6%	0.96 (0.28,3.32)	
High (Secondary/Higher) (33)	15.2%	p=0.944	
Stroke History			
Hemorrhagic (20)	30.0%	3.85 (1.10,14.29)	3.85 (1.10,14.29)
Ischemic (61)	9.8%	p=0.028	p=0.036
History of stroke recurrence (12)	16.7%	1.18 (0.22,6.20)	1.18 (0.23,6.19)
No recurrent stroke (69)	14.5%	p=0.845	p=0.842
Time since stroke			
>2yr (33)	24.2%	3.52 (0.96,12.87)	3.29 (0.94,11.52)
2yr (48)	8.3%	p=0.048	p=0.063
Location			
Urban (46)	10.9%	0.49 (0.14,1.69)	0.49 (0.14,1.69)
Rural (35)	20.0%	p=0.252	p=0.258

* Adjusted for participant level of education

Table 2

Samples of key quotations in the derived themes

Theme	Sub-theme	Quotation	Respondent (Gender, age, post-stroke duration, No. of recurrent strokes)	
Perceptions, attitudes	Strict adherence	<i>"With stroke you have to discipline yourself not to eat raw or too much salt."</i>	male, 51years, 3years, 0	
	Poor adherence	<i>"My patient is stubborn, if you refuse to give him salt he will refuse the food totally"</i>	caretaker of male, 67years, 6years, 2	
	Indifferent	<i>"I take the salt that is cooked in food by my wife and I don't add."</i>	male, 58years, 1year, 0	
	Owns salt consumption choices	<i>"I instruct my caretaker to reduce the salt. She sometimes disobeys but I still insist."</i>	female, 85years, 10years, 0	
	Raw salt worse than consistent high salt diet	<i>"Eating too much salt is bad however raw salt is much worse."</i>	female, 51years, 5years, 0	
	Erroneous perceptions		<i>"Salt accumulates in our blood vessels causing stroke."</i>	male, 58years, 4years, 1
			<i>"Too much salt makes lots of fats which block the veins."</i>	male, 55years, 4years, 0
Salt Knowledge	Know high salt is bad but do not know why	<i>"My doctor told me not to take too much salt since I got this stroke, but I don't know why"</i>	male, 58years, 1year, 0	
	Sodium is unknown	<i>"I do not know sodium, but I understand salt"</i>	male, 65years, 3years, 0	
Salt measurement		<i>"We use hands or pinches to measure salt. Cooking experience determines amount of salt"</i>	female, 68years, 1year, 0	

Table 3
Logistic regression analysis of healthy dietary salt compliance against salt-knowledge

Outcome: Healthy dietary salt compliance	Unadjusted results			Adjusted results*		
	Regression coefficient	p-value	OR (95%CI)	Regression coefficient	p-value	OR (95%CI)
Basic knowledge	2.655	<0.0001	14.22 (4.17, 48.48)	3.06	<0.0001	21.31(5.11, 88.91)
Salt-Disease Knowledge	0.629	0.319	1.88 (1.86, 22.85)	0.95	0.191	2.59(0.61, 11.06)

* Adjusted for gender, marital status, location, stroke type and post-stroke duration