Control of Dietary Salt Intake at Family Level by Housewives in Tripura, India: A Rural - Urban Comparison

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ABSTRACT

Background

Intake of excess salt can lead to high blood pressure a leading cause of cardiovascular diseases (CVDs). The behaviour risk factors for hypertension including high salt consumption, alcohol and tobacco use and physical inactivity; among them, salt intake reduction is one of the most cost-effective ways to control hypertension and CVD.

Objective

To find out the practice of salt intake control among rural and urban women of Tripura.

Method

This community based cross-sectional study was conducted among 400 housewives from rural and urban areas of Tripura, India for a period of ten months (June 2017-March 2018). A pre-tested, semi-structured interview schedule was used to collect required information regarding their socio-demographic, behavioural characteristics, family history and practice of salt intake control etc. The collected data was entered in SPSS version 16.0, represented in proportions and $p<0.05$ was considered as statistically significant.

Result

In present study, less than half of the participants (46% rural vs 41.5% urban) from both areas have good practice on control of salt intake. The mean control scores of rural and urban housewives were 9.7200±1.63246 and 9.4750±1.68927 respectively. Rural housewives had more control of extra salt intake in comparison to urban housewives but difference was not statistically significant ($p>0.05$). Majority Hindu housewives in rural areas had good control of salt intake than urban housewives ($p<0.05$).

Conclusion

The current study found less than half of the participants both in rural and urban areas have good control of dietary salt intake. This finding may provide an idea for development of intervention strategies aiming at increasing salt control-related awareness.

KEY WORDS

Cross-sectional studies, Female, Human, Hypertension, Rural

INTRODUCTION

Cardiovascular disease (CVD) is a leading cause of morbidity and mortality worldwide with increasing incidence in developing countries like India.[1,2] Hypertension and dyslipidemia are two major risk factors for CVD.[3] Intake of excess salt can lead to high blood pressure a leading cause of cardiovascular diseases (CVDs), which accounted for 23% of all deaths in India between 2010 and 2013.[4]

Consumption of high dietary salt, fat and lifestyle changes associated with urbanization and nutritional transitions that accompany economic development in India leading to increased prevalence of CVD, including hypertension and dyslipidemia.[5-7] The behaviour risk factors for hypertension including high salt consumption, alcohol and tobacco use and physical inactivity, among them, salt intake reduction is one of the most cost-effective ways to control hypertension and CVD.[8]

The average Indian consumes 10.98 gm salt a day, twice the WHO-recommended upper limit per day, 5 gm and seven times what the body actually needs. About 10% of the daily salt intake of an Indian occurs naturally in fruit, vegetables, cereal and other raw ingredients; rest is added during cooking or at the table. So, cutting down involves adding less salt during cooking and on the table.[9]

Population-based intervention studies have shown that once salt intake was decreased, a reduction in population BP will be shown along with the decreased salt consumption.[10] It's reported that population-wide intervention for reducing salt consumption is very cost-effective (only US $10.6 per DALY saved) and salt intake reduction and tobacco use control can avoid 13.8 million death at the cost of less than one US dollars per person per year in developing countries over a decade.[11,12]

Above all, hypertension is a public health issue in India; however hypertension is also an avoidable disease by addressing behaviour risk factors, such as salt intake reduction. With this background, this study was conducted among rural women of Madhupur, Tripura to assess the practice of salt intake control.

METHODS

This community based cross-sectional study was conducted among women (housewives) residing in rural and urban areas of Tripura, India for a period of ten months (June 2017-March 2018). Assuming 50% as the prevalence of salt intake control among the residents in above mentioned areas, with 15% relative allowable error sample size became 178 using formula $n= Z\alpha^2pq/L^2$ where, Zα= Standard normal deviate at a desired confidence level (95%); p = prevalence; q = 100 – p; L = allowable error (At 95% confidence level Zα value is 1.96). Finally 200 study populations from each urban and rural areas were included in this study, taking 10% as non-response rate.

Women who were currently involved in cooking daily household meals and gave their consent to participate were included in the study.

A pre-designed, pre-tested, semi-structured interview schedule was used to collect the required information regarding their practices of salt intake control. This had 2 parts: Part 1: Socio-demographic variables, Part 2: Questions on salt intake control.

In this study, from the list of all villages and urban area of Tripura, Madhupur and Dukli area respectively were selected randomly.

Madhupur is a village in district of Sepahijala, Tripura having a population of 14,105 (7,178 males vs 6,927 female) with Sex Ratio is of 965 against state average of 960 as per Census India 2011 report. Literacy rate of Madhupur is 93.06 % higher than state average of 87.22 % (95.31% Male while 90.76% female literacy rate). Madhupur has total administration over 3,591 houses to which it supplies basic amenities like water and sewerage. Again, Dukli is a Census Town in Dukli block in the district of West Tripura, located 4km south from Agartala city, Tripura having a population of 16,941 (8,550 male vs 8391 female) with sex ratio of 981 against state average of 960 as per report released by Census India 2011. Literacy rate of Dukli is 91.61% higher than state average of 87.22% (94.81% Male while 88.35% female literacy rate). Dukli has total administration over 4,138 houses to which it supplies basic amenities like water and sewerage, build roads and impose taxes on properties coming under its jurisdiction.

Individual households were taken as sampling unit and total number of households in each area (3591 and 4138 for Madhupur and Dukli respectively) was taken as sampling frame which was obtained from Madhupur Gram Panchayet and Dukli Block respectively (as per Population Census 2011 records). Study participants were selected by systematic random sampling technique, starting from one fixed point in both Madhupur village and Dukli peri-urban area. A single women was considered from a household; in case of more ladies in a house, those who were involved mostly in cooking were considered. If women were not found or absent in any house during survey, the next household as per sampling interval (k=17 and 20; i.e, every 17th and 20th household, in Madhupur and Dukli respectively) were visited until the required sample size (200 women from each area) was achieved.

Researchers obtained written informed consent from all participants and they were asked about their socio-demographic, behavioural characteristics, family history and salt intake control etc. The collected data was entered in SPSS version 16.0 and represented in proportions with the help of frequency distribution tables and charts. Statistical test of significance according to nature and distribution of data (Chi square test and Fisher's exact test wherever applicable) was used to find out association

between socio-demographic factors with practice of salt intake control among the participants and p <0.05 was considered as statistically significant.

Study proposal was submitted to the Institutional Ethics Committee of Tripura Medical College and Dr. BRAM Teaching Hospital and ethical clearance was taken before commencing the study.

The independent variables were age, religion, social caste, education, occupation, type of family and socio-economic status. The dependent variable was 'good and poor practice' of salt intake control.

Two marks were awarded for every correct answer and one for every wrong answer. Later, scores below mean value and equal and above mean value respectively were categorized as 'good and poor practice' of salt intake control (mean value).

RESULTS

Table 1 showed that in both rural and urban areas, more than half of the population was lower than mean age (55% rural vs 58.5% urban), mean age were 37±12.1 years and 37.4±12.5 years for rural and urban areas respectively. Most of them (90%) were Hindu in rural area whereas all urban participants (100%) were Hindu. In both areas, majority of the population belonged to General (37.5% rural vs 34.5% urban) and SC category (30.5% rural vs 44% urban). Majority participants were Madhyamik pass (36.5% rural vs 35.5% urban) followed by upto class VIII (24.5% rural vs 20.5% urban), illiterate (19.5% rural vs10% urban) and least was graduate (3% rural vs 9% urban). Most of them were from nuclear families (71.5% rural vs 69.5% urban). In rural housewives, half of them (50%) belonged to class IV socio-economic class followed by class V (20%), class III (15%) whereas in urban area majority (41.5%) were from class II socio-economic class followed by class IV (38%); class I were least in number in both areas (1.5% rural vs 3% urban) as per modified B.G. Prasad' scale May 2016.[13]

Table 2 showed that In both rural and urban areas, almost similar number (22.5% rural vs 24% urban) of the population was suffering from any serious health problem (chronic disease); majority was suffering from hypertension (18.5% rural vs 19% urban)followed by diabetes (1% rural vs 3% urban), only 1% heart disease in each areas.

Participants from rural areas had more (35%) family history of any serious health problem (chronic disease) than urban housewives (22.5%); majority family members were suffering from hypertension (27% rural vs 17.5% urban) followed by diabetes (7.5% rural vs 9% urban).

In both rural and urban areas, almost half (51% rural vs 50% urban) of the population knew that few diseases caused by excess salt consumption, majority said about hypertension (46.5% rural vs 45.5% urban), only few (1% rural vs 1.5% urban) replied goitre.

Table 1. Distribution of the participants according to their socio-demography. (n= 400)

Socio-demographic characteristics	Frequency	
	Rural n(%)	Rural n(%)
Age in years		
< Mean	110 (55.0)	117 (58.5)
≥ Mean	90 (45.0)	83 (41.5)
(*37±12.127 years for Rural and 37.44±12.512 years for Urban areas)		
Religion		
Hindu	180 (90.0)	200 (100.0)
Muslim	20 (10.0)	0 (0.0)
Caste		
General	75 (37.5)	69 (34.5)
OBC	56 (28.0)	41 (20.5)
SC	61 (30.5)	88 (44.0)
ST	8 (4.0)	2 (1.0)
Education		
Illiterate	39 (19.5)	20 (10.0)
Primary school	22 (11.0)	24 (12.0)
Middle school	49 (24.5)	41 (20.5)
High school/ X	73 (36.5)	71 (35.5)
Higher secondary	11 (5.51)	26 (13.0)
Graduate and above	6 (3.0)	18 (9.0)
Type of family		
Nuclear	143 (71.5)	139 (69.5)
Joint	57 (28.5)	61 (30.5)
Socio-Economic status		
CLASS I (PCI Rs. ≥ 6277)	3 (1.5)	6 (3.0)
CLASS II (PCI Rs. 3139-6276)	27 (13.5)	41 (41.5)
CLASS III (PCI Rs. 1883-3138)	30 (15.0)	56 (28.0)
CLASS IV (PCI Rs. 942-1882)	100 (50.0)	76 (38.0)
CLASS V (PCI Rs. <942)	40 (20.0)	21 (10.5)
TOTAL	**200 (100)**	**200 (100)**

Only 20% study population in both areas avoid processed food, while most of the housewives look at sodium labels on food (87.5% rural vs 86% urban). Maximum numbers of participants add extra salt on the table (75.5% rural vs 80.5% urban). Higher percentage (58%) of rural people bought low salt alternatives than urban housewives (45%). Majority of rural housewives (23%) did not add too much salt during cooking in comparison to urban housewives (14.5%).

Almost similar representation (45% rural vs 46.5% urban) in use of herbs/spices other than salt or any form of salt when cooking/eating on table and avoid eating outside fried/ fast-food (14% rural vs 16% urban).

The mean salt intake control scores for rural and urban housewives were 9.7200±1.63246 and 9.4750±1.68927 respectively. Rural housewives had more practice of salt

Table 2. Perception and practice of the study population regarding SALT INTAKE: (n=400)

Perception of the respondents regarding issues with health problems and salt intake control	Frequency	
	Rural n(%)	Urban n n(%)
1. Do you suffer from any serious health problem (chronic disease)?		
Yes	45 (22.5)	48 (24.0)
No	155 (77.5)	152 (76.0)
2. Does anyone of your parental house suffer from any serious health problem (chronic disease)?		
Yes	70 (35.0)	56 (28.0)
No	130 (65.0)	144 (72.0)
3. Do you know any disease caused by excess salt consumption?		
Yes	102 (51.0)	100 (50.0)
No	98 (49.0)	100 (50.0)
PRACTICE OF SALT INTAKE CONTROL		
Avoid processed food		
Yes	40 (20.0)	40 (20.0)
No	160 (80.0)	160 (80.0)
Look at sodium labels on food		
Yes	175 (87.5)	172 (86.0)
No	25 (12.5)	28 (14.0)
Do not add extra salt on the table		
Yes	49 (24.5)	39 (19.5)
No	151 (75.5)	161 (80.5)
Buy low salt alternatives		
Yes	116 (58.0)	90 (45.0)
No	84 (42.0)	110 (55.0)
Do not add too much salt when cooking		
Yes	46 (23.0)	29 (14.5)
No	154 (77.0)	171 (85.5)
Use of herbs/spices other than salt or any form of salt when cooking/eating on table		
Yes	90 (45.0)	93 (46.5)
No	110 (55.0)	107 (53.5)
Avoid eating outside fried/ fast-food		
Yes	28 (14.0)	32 (16.0)
No	172 (86.0)	168 (84.0)
Total	**200 (100.0)**	**200(100.0)**

Table 3. Comparison of control score among rural and urban housewives: (n = 400)

Residence	N	Mean	SD	t Value	Mean Difference (95% CI)	Significance (2-tailed)
Rural	200	9.7200	1.63246	1.475	0.24500 (-0.08157 to -0.57157)	0.141
Urban	200	9.4750	1.68927			
Conclusion:		Not Significant At 0.05 Level.				

intake control in comparison to urban housewives but this difference was not found statistically significant (p>0.05) (Table 3).

In present study, less than half of the participants (46% rural vs 41.5% urban) from both areas have good practice on control of salt intake. Majority of the Hindu housewives in rural areas had good control of salt intake than urban

Table 4. Association of socio demographic variables with Control of dietary salt intake among study population: (n=400)

Socio demographic variables		Control of dietary salt intake			
		Rural		Urban	
		Poor (<10) n(%)	Good (≥10) n(%)	Poor (<10) n(%)	Good (≥10) n(%)
Age in years	< Mean*	58(52.7)	52 (47.3)	69 (59.0)	48(41.0)
(*37±12.127 years for Rural and 37.44 ±12.512 years for Urban areas)	≥Mean*	50 (55.6)	40 (44.4)	48 (57.8)	35 (42.2)
		χ^2= 0.159,3 df=1, P=0.690		χ^2= 0.026, df= 1, P= 0.872	
Religion	Hindu	93 (51.7)	87 (48.3)	117 (58.5)	83 (41.5)
	Muslim	15 (75.0)	5 (25.0)	0	0
		χ^2= 3.945, df=1 P=0.047		Not applicable	
Caste	SC	35 (57.4)	26 (42.6)	46 (52.3)	42(47.7)
	ST	3 (37.5)	5 (62.5)	2 (100.0)	0
	OBC	31 (55.4)	25 (44.6)	26 (63.4)	15(36.6)
	GEN	39 (52.0)	36 (48.0)	43 (62.3)	26(37.7)
		χ^2=0.544, df=1, P=0.461		χ^2= 3.647, df=3, P= 0.302	
Education	Illiterate	19 (48.7)	20 (51.3)	9 (45.0)	11(55.0)
	Literate	89 (55.3)	72 (44.7)	108 (60.0)	72 (40.0)
		χ^2=0.147, df=1, P=0.701		χ^2=1.668, df=1, P=0.196	
Type of family	Nuclear	76 (53.1)	67 (46.9)	79 (56.8)	60(43.2)
	Joint	32 (56.1)	25 (43.9)	38 (62.3)	23(37.7)
		χ^2=0.147,df=1, P=0.701		χ^2=0.521,df=1, P=0.471	
Economic status	Class I	2 (66.7)	1 (33.3)	4 (66.7)	2 (33.3)
	Class II	15 (55.6)	12 (44.4)	22 (53.7)	19(46.3)
	Class III	22 (73.3)	8 (26.7)	36 (64.3)	20(35.7)
	Class IV	53 (53.0)	47 (47.0)	43 (56.6)	33(43.4)
	Class V	16 (40.0)	24 (60.0)	12 (57.1%)	9 (42.9)
Total		**108 (54.0)**	**92 (46.0)**	**117 (58.5)**	**83(41.5)**
		χ^2 =7.931, df=4, P=0.094		χ^2 =1.464,df=4 P=0.833	

housewives and this association was significant statistically (p<0.05). Good practice of salt intake control was more among ST (62.5%), practice of salt intake control among housewives in other categories were below 50% in rural area (p>0.05) whereas practice of salt intake control was poor among all ST (100%), less than 50% housewives in other categories were having good control over salt intake in urban area (p>0.05). Good practice of salt intake control is more among illiterate housewives in both areas (51.3% rural vs55% urban) in but this association was not statistically significant (p>0.05) (Table 4).

DISCUSSION

This is the first study as per researcher's knowledge which has examined the perception of salt intake related disease perceptions and mediating effects of dietary salt intake control on socio-demographic factors. Public awareness campaigns have been one of the components of successful salt reduction initiatives, among the strategies recommended by the WHO for population-based salt reduction.[14-16] The WHO report also explicitly notes that planning key campaign messages requires information about current levels of salt consumption and the health knowledge of the population. Further, awareness campaigns are likely to be more effective if they include practical tips on how consumers can manage their salt intake.[16]

This present study showed that in both rural and urban areas, more than half of the population was less than equal to 37 years age (55% rural vs 58.5% urban). In another study among Chinese population, Zhang et al. found that, half of the participants were men and half women with an age range from 50 to over 80 years.[17] Sarmugam et al. found that, majority (23.2%) were from 61-70 years age group followed by 18.1% 41-50 years, 15.8% and 15.5% were from 31-40 and 21-30 years age group respectively with female predominance (58.3%).[18]

In current study, majority participants were Madhyamik pass (36.5% rural vs 35.5% urban) followed by upto class VIII (24.5% rural vs 20.5% urban), illiterate (19.5% rural vs 10% urban) and least was graduate (3% rural vs 9% urban). In a study among Chinese population, Li et al. found that, 27.7% were urban residents and 72.3% were rural counterparts, education in most subjects was middle school and below.[19] Another study among Chinese population by Zhang et al. showed more (32%) illiteracy and only 17% had more than 9 years of education.[17] Sarmugam et al. found that, about a third of the respondents (27.0%) had tertiary education.[18] Sarmugam et al. found that, 75% of the participants had completed high school education.[20]

Present study found that among rural housewives, 50% belonged to class IV socio-economic class whereas in urban area majority (41.5%) were from class II socio-economic class; class I were least in number in both areas (1.5% rural vs 3% urban). Sarmugam et al. found that, almost half of the respondents' had annual household incomes above $60,000.[18]

Rural (22.5%) vs urban (24%) population was suffering from serious health problem (chronic disease) almost similar (26.0% study subjects were with diagnosed NCDs) to that of Li et al.; majority were suffering from hypertension (18.5% rural vs 19% urban) followed by diabetes (1% rural vs 3% urban), only 1% heart disease in each areas.[19] Zang et al. found that about 20% had cardiovascular disease, another 49% had hypertension, and more than half were not aware of their health status. Less than a third (32%) were without cardiovascular disease or hypertension.[17]

In present study, participants from rural areas had more (35%) family history of any serious health problem (chronic disease) than urban housewives (22.5%); majority family members were hypertensive (27% rural vs 17.5% urban) followed by diabetic (7.5% rural vs 9% urban). In a study among Chinese population, Li et al. found that, 25.1% participants with family history of NCDs; prevalence of central obesity and overweight/obesity were 40.4% and 43.9% respectively.[19]

Nasreddine et al. found that 77.6% study subjects reported high dietary salt might worsen health status, 94.6% female replied high blood pressure, higher than present study where both 51% rural vs 50% urban population knew that some disease caused by excess salt consumption, majority said about hypertension (46.5% rural vs 45.5% urban).[21] Another study by Li et al. found that 29.7% with knowledge of excess salt intake resulting in hypertension.[19] Overall 57.6% participants had ever been received health education on low-salt diet.[19] Sarmugam et al. found that, at least 80% of the participants were aware of high salt intake and hypertension.[20]

Present study showed that only 20% study population in both areas avoid processed food, while most of the housewives look at sodium labels on food (87.5% rural vs 86% urban) almost similar (74.6%) to Nasreddine et al. but much higher than Zang et al. where only 13.9% (urban), 9.7% (rural) participants read label for salt content.[21,22]

In our study, maximum numbers of participants (75.5% rural vs 80.5% urban) add extra salt on the table slightly higher (57.8%) than Nasreddine et al. whereas only few {27.6% (urban), 19.7% (rural)} added salt later or used table salt Zang et al.[21,22] Sarmugam et al. found that, almost half (48.1%) of the respondents reported that they never or rarely added salt at the table, about a third of the study sample reported that they usually or always used salt in cooking (34.7%) and at the table (25.7%).[18] Zang et al. found that maximum participants {96.2% (urban), 95.7% (rural)} used less salt during cooking, much higher (23% rural vs 14.5% urban) than present study.[22]

Nasreddine et al. found that 44.6% bought low salt alternatives, similar to urban (45%) but lower (58%)

than rural housewives in present study. Almost similar representation (45% rural vs 46.5% urban) in use of herbs/spices other than salt or any form of salt when cooking/eating on table and avoid eating outside fried/fast-food (14% rural vs 16% urban).[21]

Zhang et al. found that participants used less pickles {54.0% (urban), 44.6% (rural)}, low sodium processed foods {21.4% (urban), 10.4% (rural)}, less high sodium condiments {24.9% (urban), 12.2% (rural)} and used green onion or garlic to improve the taste of food when not using salt {20.2% (urban), 8.7% (rural)}.[22]

In present study, less than half of the participants (46% rural vs 41.5% urban) from both areas have good practice on control of salt intake whereas Zhang et al. found more participants (81%) had healthy salt intake behaviour.[17] Another study by Zhang et al. found that 45.6% of urban and 34.8% of rural respondents reported they had taken actions to control their salt intake.[22]

Majority of the Hindu housewives in rural areas had good control of salt intake than urban housewives and this association was significant statistically ($p<0.05$). Good practice of salt intake control was more among ST (62.5%), housewives in other categories were below 50% in Rural area ($p>0.05$) whereas practice of salt intake control was poor among all ST (100%), housewives in other categories were having good control of below 50% in urban area ($p>0.05$). Good control is more among illiterate housewives in both areas (51.3% rural vs55% urban) but this association was not statistically significant ($p>0.05$).

Zhang et al. showed that healthy salt intake behaviour was more common among women ($p<0.01$) and was positively associated with age ($p<0.01$) and poorer health status ($p<0.01$), but negatively associated with years in school ($p<0.05$). Belief in the harm of high salt intake rather than knowledge about salt and health was associated with healthy salt intake behavior, independent of age, sex, years in school, and health status.[17]

CONCLUSION

The current study found less than half of the participants both in rural and urban areas have good control of dietary salt intake. It has also identified dearth of literature showing the relationships between different factors and control of dietary salt intake and on validated comprehensive salt intake control questionnaires. Salt reduction initiatives such as nutrition education and public awareness campaigns were implemented by at least 32 countries around the world.[23] There is urgent need of nationwide educational program teaching people about to eat and how to reduce the salt in their diet to tackle rapidly rising levels of CVD and high blood pressure in India; along with involvement of food industry, to reduce salt levels in the highly processed foods many Indian people now eat daily.[24] In this context, this study finding may provide an idea for development of intervention strategies aiming at increasing dietary salt control-related awareness which will have great impact on non-communicable disease burden in a long run.

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REFERENCES

1. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002to 2030. *PLoS Med.* 2006; 3:e442.
2. World Health Organization, World Heart Federation, World Stroke Organization. Global atlas on cardiovascular disease prevention and control: policies, strategies, and interventions. Published 2011. Available at: http://www.who.int/cardiovascular_diseases/publications/atlas_cvd/en/.[Last assessed on 25.12.2017]
3. Gupta R, Joshi P, Mohan V, Reddy KS, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. *Heart.* 2008; 94:16-26.
4. Saha D. Salt consumption of average Indian 119% more than WHO limit. There was wide variance in consumption among different regions and states. Available from www.business-standard.com/article/printer-friendly-version? article_id=116110700630_1 [Last assessed on 20.04.2018]
5. Anchala R, Kannuri NK, Pant H, Khan H, Franco OH, Di Angelantonio E, et al. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. *J Hypertens.* 2014; 32:1170-7.
6. Misra A, Singhal N, Sivakumar B, Bhagat N, Jaiswal A, Khurana L. Nutrition transition in India: secular trends in dietary intake and their relationship to diet-related non-communicable diseases. *J Diabetes.* 2011;3:278-92.
7. Misra A, Khurana L, Isharwal S, Bhardwaj S. South Asian diets and insulin resistance. *Br J Nutr.* 2009; 101:465-73.
8. Organization WH. Global action plan for the prevention and control of non-communicable diseases. 2013-20.
9. Fitness: Indian are now alert to dangers of high salt intake and are modifying their diet. Available from https://www.hindustantimes.com/fitness/indian-are-now-alert-to-dangers-of-high-salt-intake-and-are-modifying-their-diet/story-yx2GUHAYogVVbWZH69M3KJ.html [Last assessed on 24.03.2018]
10. Forte J, Miquel JM, Miquel MJ, de Paudua F, Rose G. Salt and blood pressure: A community trial. *Journal of human hypertension*. 1989; 3: 179-184.
11. Wang G, Labarthe D. The cost-effectiveness of interventions designed to reduce sodium intake. *J Hypertens*. 1989;29: 1693-99.
12. Asaria P, Chisholm D, Mathers C, Ezzati M, Beaglehole R. Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. *Lancet.* 2007;370:2044-53.
13. Vasudevan J, Mishra AK, Singh Z. An update on B. G. Prasad's socioeconomic scale: May 2016. *International Journal of Research in Medical Sciences*. 2016; 4(9):4183-86.

14. Laatikainen T, Pietinen P, Valsta L, Sundvall, J, Reinivuo H, Tuomilehto J. Sodium in the Finnish diet: 20-year trends in urinary sodium excretion among the adult population. *Eur. J. Clin. Nutr.* 2006;60:965-70.

15. Shankar B, Brambila-Macias J, Traill B, Mazzocchi M, Capacci S. An evaluation of the UK Food Standards Agency's salt campaign. *Health Econ.* 2013;22:243-50.

16. World Health Organization. Creating an Enabling Environment for Population-Based Salt Reduction Strategies: Report of A Joint Technical Meeting Held by WHO and the Food Standards Agency, United Kingdom, July 2010; World Health Organisation: Geneva, Switzerland, 2010;1-42.

17. Zhang J, Wu T, Chu H, Feng X, Shi J, Zhang R. et al. Salt intake belief, knowledge, and behavior: a cross-sectional study of older rural Chinese Adults. *Medicine.* 2016;95:31.

18. Sarmugam R, Worsley A, Wang W. An examination of the mediating role of salt knowledge and beliefs on the relationship between socio-demographic factors and discretionary salt use: a cross-sectional study. International Journal of Behavioral Nutrition and Physical Activity 2013, 10:25 http://www.ijbnpa.org/content/10/1/25

19. Li T, Qin Y, Lou P, Chang G, Chen P, Qiao C, et al. Salt Intake and Knowledge of Salt Intake in a Chinese Population: A Cross-sectional Study. *Intern Med.* 2015; 5: 186. doi:10.4172/2165-8048.1000186

20. Sarmugam R, Worsley A. Current Levels of Salt Knowledge: A Review of the Literature. *Nutrients*. 2014;6:5534-59. doi:10.3390/nu6125534

21. Nasreddine L, Akl C, Al-Shaar L, Almedawar MM, Isma'eel H. Consumer Knowledge, Attitudes and Salt-Related Behavior in the Middle-East: The Case of Lebanon. *Nutrients*. 2014;6:5079-102. doi:10.3390/nu6115079

22. Zhang J, Xu AQ, Ma JX, Shi XM, Guo XL, Engelgau M, et al. Dietary sodium intake: Knowledge, attitudes and practices in Shandong province, China, 2011. *PLoS One.* 2013; 8, doi:10.1371/journal.pone.0058973.

23. Webster JL, Dunford EK, Hawkes C, Neal BC. Salt reduction initiatives around the world. *J. Hypertens.* 2011;29:1043-50.

24. Urgent need for action plan to reduce deadly salt consumption in India. Available from https://www.georgeinstitute.org.in/media-releases/urgent-need-for-action-plan-to-reduce-deadly-salt-consumption-in-india [Last assessed on 24.03.2018]