Original Article

Association of seasoning salt consumption with the risk of cardiovascular disease among postmenopausal rural women in Bangladesh: a cross-sectional study

Lingkan Barua[1]^, Muhammed Shahriar Zaman[2]^, Mithila Faruque[1]^

[1]Department of Noncommunicable Diseases, Bangladesh University of Health Sciences (BUHS), 125/1 Darus Salam, Mirpur-1, Dhaka-1216, Bangladesh; [2]School of Rehabilitation Therapy, Queen's University, Kingston, Ontario, Canada

Contributions: (I) Conception and design: All authors; (II) Administrative support: M Faruque; (III) Provision of study materials or patients: L Barua, M Faruque; (IV) Collection and assembly of data: All authors; (V) Data analysis and interpretation: L Barua, MS Zaman; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Dr. Lingkan Barua. Senior Lecturer, Department of Noncommunicable Diseases, Bangladesh University of Health Sciences, 125/1 Darus Salam, Mirpur, Dhaka-1216, Bangladesh. Email: lingkanbarua@gmail.com.

Background: High use of seasoning salt is considered as an important cause of the raised risk of cardiovascular disease (CVD) that has not yet been evaluated in postmenopausal women of Bangladesh. Hence, we attempted to investigate the association of seasoning salt consumption with the absolute risk for CVD in rural postmenopausal women in Bangladesh. In addition, we also assessed the distribution of various CVD risk factors by the consumption of seasoning salt among the study population.

Methods: This cross-sectional study recruited 265 postmenopausal women aged 40–70 years from a rural primary healthcare center by convenience sampling. Of which, a total of 118 women were self-reported seasoning salt consumers. The risk of CVD was assessed by 'Globorisk score' and risk factors were assessed using the modified STEP-wise approach to surveillance questionnaire of the World Health Organization.

Results: The consumption of seasoning salt was found very common among postmenopausal women who are comparatively aged (≥50 years), illiterate, housewives, and from low-income to lower-middle-income groups. No significant CVD risk difference (U=8,312, P=0.56) was found between the consumers and non-consumers of seasoning salt. On contrary to current knowledge, seasoning salt is found as a non-significant predictor (OR: 0.881, 95% CI: 0.529–1.467, P=0.625) of absolute risk of CVD. The study found that the smokeless tobacco consumers use more seasoning salt than their counterparts (U=888, P<0.001).

Conclusions: The study did not find any association of seasoning salt consumption with the risk of CVD. We recommended a population-based large-scale study to clarify this finding more precisely.

Keywords: Seasoning salt; cardiovascular disease (CVD); postmenopausal women; Bangladesh

Received: 15 October 2021; Accepted: 02 March 2022; Published: 30 March 2022.

doi: 10.21037/jxym-21-45

View this article at: https://dx.doi.org/10.21037/jxym-21-45

^ ORCID: Lingkan Barua, 0000-0002-9281-3839; Muhammed Shahriar Zaman, 0000-0001-9867-4473; Mithila Faruque, 0000-0002-4731-282.

Introduction

In Bangladesh, the projected mortality from cardiovascular diseases (CVD) among women is higher than the global target of mortality from CVDs (1). This finding coincides with the result of a global study that reported an increasing trend of CVD in women (2), more specifically among postmenopausal women compared to premenopausal women, and men of the same age (3). The previous study reported 17% of postmenopausal women of Bangladesh were at 'high risk' (risk ≥20%) and 25% of postmenopausal women were categorized as 'at risk' (risk ≥10%) population for CVD using the World Health Organization/ International Society of Hypertension (WHO/ISH) risk charts and Framingham Risk Score (4). The most recent study identified 56.7% of the Bangladeshi postmenopausal rural women had a risk of developing CVD within the next 10-year and half of them were classified as 'high-risk' populations (5). Another study found 35.5% of postmenopausal women as 'high risk' (AIP >0.24) population for CVD in Bangladesh according to the atherogenic index of plasma (AIP) (6). Evidence showed the burden of various CVD risk factors were also higher in postmenopausal women compared to the general population and reported as 45%, 58.1%, 23.8%, 7.5%, 73.2%, 41.9%, 20.8%, 25.7% for smokeless tobacco use, physical inactivity, overweight, generalized obesity, central obesity, hypertension, diabetes, and hypercholesterolemia respectively (4-8).

Elevated dietary salt consumption, which is a significant cause of CVD mortality, has been a subject of interest in public health nutrition for decades. In Bangladesh, data on dietary salt consumption are insufficient. Previous studies reported that, on average, Bangladeshi people consume 17 gm of dietary salt per day (9). The volume of consumption is higher than the recommended volume of daily dietary salt intake. In addition to the total daily consumption of dietary salt, the consumption of seasoning salt is a big public health concern in the context of Bangladesh as Bangladeshi people culturally use excess seasoning salt. The reported prevalence of seasoning salt intake among the various group of the population included 28.2%, 64.3%, and 49.3% among university faculties, students, and nurses, respectively (10-12). The consumption of seasoning salt among postmenopausal women was not studied extensively. Our previous studies reported that 44.5% of rural Bangladeshi postmenopausal women consumed seasoning salt (4-8). It is widely believed that the seasoning salt is a significant factor behind the elevated risk of CVD among Bangladeshi women as it constitutes a significant portion of the daily dietary salt consumption. Moreover, culturally women of Bangladesh cook foods for the family members, and thus they regularly add salt while cooking. Hence, they are the vulnerable population and at risk of salt-related health outcomes. In our aforementioned discussion, we have already mentioned that postmenopausal women are at high risk of CVD due to the high prevalence of various risk factors including added salt consumption (4-8). However, no study evaluated the association of seasoning salt with the risk of CVDs among post-menopausal women in Bangladesh. Therefore, we were prompted to investigate how the consumption of seasoning salt was associated with the absolute risk for CVD among rural postmenopausal women in Bangladesh. In addition, we also assessed the distribution of various CVD risk factors by the consumption of seasoning salt among the study population. We present the following article in accordance with the STROBE reporting checklist (available at https://jxym.amegroups.com/article/view/10.21037/jxym-21-45/rc).

Methods

Study design, setting and population

The current study was part of a cross-sectional study conducted in 2016. Details methods of the study with calculation of sample size were published elaborately elsewhere (4-8). We recruited 265 postmenopausal women aged 40–70 years from an outpatient department of a rural primary health care center of Bangladesh by convenience sampling. A total of 118 participants had the behavior of consuming seasoning salt, and rests were free of this habit. The health center was selected purposively. The subjects were included in the study if they were postmenopausal women and screened out as having no CVD based on the self-reported statement, clinical history, and medical records. The menopausal state was defined as no menstrual bleeding for at least 12 months and have no other clinical condition that causes amenorrhea. The samples were excluded if they presented with an acute illness or showed unwillingness to participate.

Ascertainment of outcome variables

Ten-year absolute risk of CVD

We used a country-specific CVD risk assessment tool, namely the 'Globorisk score' that predicted the next 10-year absolute risk of CVD (13,14). We used the

biochemical examination-based risk chart of the 'Globorisk score' for the Bangladeshi population (13). As the 'Globorisk score' has no cut-off values to categorize the estimated risk, we categorized the risk as low (<10%), moderate (10–19.9%), high (20–29.9%), and very high (≥30%). For reporting purposes, we further re-categorized the CVD risk as a dichotomized variable like 'at risk' and 'no risk'. Here 'at risk' population comprised of people who were at moderate or high or very high-risk group according to the Globorisk score.

CVD risk factors of interest

We collected data on the behavioral, anthropometric, biochemical, and blood pressure-related risk factors of CVD. The behavioral risk factors included consumption of seasoning salt, tobacco smoking, smokeless tobacco use, physical inactivity, and oral contraceptive pill use. Seasoning salt consumption was defined as the habit of people to add salt to savory food to improve its taste. The non-consumption of seasoning salt was defined as the habit of not adding salt to savory food to improve its taste. Self-reported history of consumption of seasoning salt was taken from the participants because there is no standard measure available for measuring seasoning salt consumption. The definition of the aforementioned CVD risk factors was elaborately mentioned in the previous papers (4,5,8).

Sociodemographic and reproductive factors

The data on sociodemographic information included information on age, education, occupation, and monthly income. The data on reproductive characteristics included information on the age of menarche, age of menopause, and duration of menopause. Early menarche and early menopause were defined as the onset of menstruation before 12 years and onset of menopause before 45 years of age respectively. Duration of menopause was categorized considering the 6 years as cut-off based on the evidence that reported the risk of CVD is increased after 6 years (15).

Data collection instruments and methods

We collected data by a semi-structured questionnaire, physical measurement, and biochemical measurement. A face-to-face interview was conducted using the semi-structured questionnaire that adapted from the modified STEP-wise approach to Surveillance (STEPS) questionnaire (version 2.1) of the World Health Organization (WHO). The questionnaire was pre-tested to validate before using it in the current study. According to STEP 1 of the WHO STEPS module, at first, we collected data about sociodemographic and behavioral risk factors of CVD. After that, the physical measurements including blood pressure were recorded following STEP 2 of the WHO STEPS module. In this step, we measured the height, weight, and waist circumference to calculate body mass index (BMI) and central obesity. The blood pressure was measured using a sphygmomanometer (ALPK2 Aneroid Sphygmomanometer, Japan) following standard rules for taking blood pressure measurements. In the final step, the blood sample was collected to measure fasting lipid profiles and blood glucose. To reduce recall bias, the questions were selected carefully, show cards of various risk factors used, and participants were given enough time to respond. The whole procedure of data collection was described elaborately in the previous papers (4-8).

Statistical analysis

We analyzed the data using the Statistical Package for Social Science version 20.0 for Windows (SPSS, Inc., Chicago, IL, USA). We used descriptive statistics to present the sociodemographic, reproductive, and CVD risk factors profile of the study population. We used a clustered column bar chart to show the estimated CVD risk (%) between the consumers and non-consumers of seasoning salt. The CVD risk and risk factors differ between the consumers and non-consumers of seasoning salt were evaluated using the Mann-Whitney U test as the data was non-parametric. Binary logistic regression was used to assess the association of seasoning salt consumption with the 10-year absolute risk of CVD among the study groups. Here, the dependent variable was the risk of CVD and the independent variable was the behavior of seasoning salt consumption (consumer and non-consumer). The findings were adjusted for physical inactivity and oral contraceptive use.

Ethical implications

The study was conducted following the Declaration of Helsinki (as revised in 2013). The ethical approval for the study was obtained from the Ethical Review Committee of Bangladesh University of Health Sciences [identification number: BUHS/ERC/EC/16/024 (1/1)] on January 28, 2016 and informed consent was taken from all the participants. Participation in the study was voluntary. There were no potential risks or side effects of participating in

the study. Participants had the complete right to withdraw themselves and their data at any stage of the study. The blood sample was drawn in the laboratory maintaining all aseptic precautions. The researcher bearded the cost of biochemical tests and the reports were delivered to the participants after 3 days.

Results

Socioeconomic and reproductive characteristics of the study participants

A total of 265 postmenopausal women took part in the study and completed the questionnaire and the measurements. The socioeconomic and reproductive characteristics of the study participants by the consumption of seasoning salt are presented in *Table 1*. The percentages of the consumer of seasoning salt (n=118) and non-consumer of seasoning salt (n=147) among study participants were 44.5% and 55.5% respectively. The mean age of them was 53.5±7.5 years. The highest number of women (46%) were from the age group 50–59 years. Most of the women were homemakers (90.8%) and illiterate (60.8%). The monthly income of the majority of women (70.6%) was at the lower-mid level. The percentage of women who had menopause for 6 years or more was 56.2%. Early menopause was identified for 43% of women, and only 3.8% had early menarche. Overall, the consumption of seasoning salt was higher among the elderly (≥50 years), illiterate, housewives, and lower-middle and low-income groups.

Distribution of CVD risk factors among the participants

Comparative data on the risk factors are presented in *Table 2*. The behavioral risk factors among study participants were physical inactivity (58.1%), use of oral contraceptives (34.3%), use of smokeless tobacco (44.9%), and smoking tobacco (1.5%). A comparison (*Table 2*) shows that the behavioral risk factors including smokeless tobacco use (100%) and physical inactivity (63.6%) were more common among consumers of seasoning salt. Conversely, the use of oral contraceptives (28.8%) and smoking tobacco (2%) was common among non-consumer of seasoning salt. The use of smokeless tobacco (P<0.001) was significantly higher among seasoning salt consumers.

Overall, a significant portion of the study participants had hypertension (41.9%), diabetes (20%), and abnormal lipid profiles (59.6%). Interestingly, the proportion of hypertension, diabetes, and abnormal lipid profile was higher among non-consumers of seasoning salt, which was not statistically significant. The proportion of pre-hypertensive and pre-diabetic participants were 36.4% and 16.1%, respectively; the proportion was higher among seasoning salt consumers, but not statistically significant. About 73.2% of the participants were centrally obese, which was more common among seasoning salt consumers, and 7.5% were obese on BMI scores.

Risk of CVD and its association with seasoning salt consumption

The Globorisk assessment showed that the 10-year absolute risk of CVD was very high in 10.9%, high in 17%, moderate in 28.7%, and low in 43.4% of the total study participants. A distribution of 10 years absolute risk of CVD between the consumers and non-consumers of seasoning salt is also presented in *Figure 1*. The risk of CVD among the participants did not differ significantly by the consumption of seasoning salt (U=8,312, P=0.56). The binary logistic regression (*Table 3*) showed the consumption of seasoning salt is a non-significant predictor of 10-year absolute risk of CVD by controlling physical inactivity and use of oral contraceptives (P=0.625). The odds of 10-year absolute risk of CVD for the seasoning salt consumer were 0.881 (95% CI: 0.529–1.467).

Discussion

The study intended to investigate how the consumption of seasoning salt is associated with the absolute risk of CVD in postmenopausal women in Bangladesh and how the CVD risk factors differ by the consumption of seasoning salt. The study found that consumption of seasoning salt is common among postmenopausal women, particularly among aged, housewives, and women from low-middle and low-income groups. Despite the high proportion of seasoning salt consumers among the study participants, no significant difference in absolute risk of CVD was found between consumers and non-consumers of the seasoning salt. Interestingly, seasoning salt consumption was not associated with the risk of CVD among the study participants. The comparison of the CVD risk factors showed the use of smokeless tobacco is significantly different between the two groups.

The relationship between excess salt consumption and CVD has been proven in ample studies (16). Studies on

Table 1 Sociodemographic and reproductive characteristics of the study population, n=265

Characteristics	Seasoning salt consumers, n (%)	Non-consumers, n (%)
Socio-demographic		
Age (years)*	54.47±7.1	52.7±7.8
40–49	24 (20.3)	43 (29.3)
50–59	56 (47.5)	66 (44.9)
≥60	38 (32.2)	38 (25.9)
Education status		
Illiterate	81 (68.6)	80 (54.4)
Literate	37 (31.4)	67 (45.6)
Occupation		
Housewife	107 (90.7)	132 (89.8)
Others	11 (9.3)	15 (10.2)
Monthly income (BDT)†	10,000 [6,000–15,000]	10,000 [7,500–16,000]
Monthly income groups (BDT)‡		
<4,906 (low income)	11 (9.3)	13 (8.8)
4,907–19,488 (lower-middle income)	85 (72.0)	102 (69.4)
19,489–60,252 (upper-middle income)	22 (18.6)	31 (21.1)
>60,252 (high income)	0	1 (0.7)
Reproductive		
Age of menarche (years)*	13.6±1.9	13.5±1.7
Early menarche (<12)	5 (4.2)	5 (3.4)
Menarche at usual age (≥12)	113 (95.8)	142 (96.6)
Age of onset of menopause (years)*	45.1±5.6	44.7±4.9
Early menopause (<45)	49 (41.5)	65 (44.2)
Menopause at usual age (≥45)	69 (58.5)	82 (55.8)
Duration of menopause (years)*	9.5±6.7	8.2±6.2
≥6	68 (57.6)	81 (55.1)
<6	50 (42.4)	66 (44.9)

*, mean and standard deviation; †, median and interquartile range; ‡, according to the 2006 per-capita GNI and the World Bank calculation. GNI, gross national income; BDT, Bangladeshi taka.

postmenopausal women also showed blood pressure among postmenopausal women is salt-sensitive in comparison to premenopausal women (17,18). However, the current study has shown no difference in CVD risk between seasoning salt consumers and non-consumers. The inconsistent finding on salt consumption and its effect on CVD is also reported in other studies (19). The possible reasons postulated for the inconsistent association between salt intake and CVD included differences in methods of measurement, population characteristics, study designs, and outcome measures (19). Besides, population-wise impact of low sodium intake on other dietary factors and J-shaped association between sodium intake and CVD are also considered as the principal reasons for different findings between studies (20). All of

Table 2 CVD risk factors among the study population, n=265

Risk factors	Seasoning salt consumers, n (%)	Non-consumers, n (%)	P value
Behavioral			
Current smokers*	1 (0.8)	3 (2.0)	0.42
Current smokeless tobacco user*	118 (100.0)	1 (0.7)	<0.001
Physical inactivity†	75 (63.6)	79 (53.7)	0.10
OCP use	34 (28.8)	57 (38.8)	0.09
Anthropometric			
Generalized obese‡	6 (5.1)	14 (9.5)	0.17
Centrally obese§	89 (75.4)	105 (71.4)	0.46
High blood pressure			
Pre-hypertension‖	43 (36.4)	43 (29.3)	0.21
Hypertension¶	49 (41.5)	62 (42.2)	0.91
Biochemical			
Pre-diabetes**	19 (16.1)	16 (10.9)	0.21
Diabetes††	18 (15.3)	35 (23.8)	0.08
Abnormal lipid profile‡‡	63 (53.4)	95 (64.6)	0.06
Hypercholesterolaemia (mmol/L)	30 (25.4)	38 (25.9)	0.08
Low HDL-C (mmol/L)	25 (21.2)	45 (30.6)	0.13
High LDL-C (mmol/L)	24 (20.3)	31 (21.1)	0.10
High TG (mmol/L)	46 (39.0)	66 (44.9)	0.69

P value is based on Mann-Whitney U test and the significant level is <0.05. *, tobacco use in the past 30 days; †, metabolic equivalent of task <600 minutes/week; ‡, body-mass-index >29 kg/m^2; §, waist-hip ratio >0.85; ‖, systolic blood pressure 120–139 mmHg and/ or diastolic blood pressure 80–89 mmHg; ¶, systolic blood pressure ≥140 mmHg and/ or diastolic blood pressure ≥90 mmHg or anti-hypertensive treatment; **, fasting plasma glucose <7.0 mmol/L and 2-h plasma glucose ≥7.8 and <11.1mmol/L, or fasting plasma glucose 6.1 to 6.9 mmol/L and 2-h plasma glucose <7.8 mmol/L; ††, fasting plasma glucose ≥7.0 mmol/L or 2-h plasma glucose ≥11.1 mmol/L and/or self-statement of a person as known diabetic or on anti-diabetic medication; ‡‡, abnormality in any one of the lipid parameter: hypercholesterolaemia (total cholesterol ≥6.2 mmol/L), HDL-C <1.0 mmol/L, LDL-C >4.1 mmol/L, TG >2.3 mmol/L. CVD, cardiovascular diseases; OCP, oral contraceptive pill; HDL-C, high density lipoprotein cholesterol; LDL-C, low density lipoprotein cholesterol; TG, triglyceride.

these indicated that the issue of salt and CVD is still in a paradox that needs precise and careful evaluation to reach in conclusion.

For the current study, the definition of the outcome measure 'seasoning salt consumption' is an important factor that can impact the findings. The term 'seasoning salt' is different from the total salt intake of a person. The 'seasoning salt' is the amount of salt that is taken with meals to improve the taste of the food; it excludes the amount of salt added with the food at the time of cooking. Therefore, it is quite possible that the distribution of the absolute risk of CVD could be different by the amount of total salt consumption, despite no difference being found by the consumption of seasoning salt. The comparison by the total salt intake was not within the scope of the current study. A further study is recommended for investigating the assumption.

Another possible reason for the non-significant difference in the distribution of CVD risk lies in the characteristics of the study participants. A big portion of the participants was diagnosed with cases of hypertension, diabetes, and dyslipidemia. They usually receive healthcare services from the healthcare center where they were recruited from. The healthcare center provides them salt-reduction education as part of the ongoing health promotion activity and management of chronic diseases. Therefore, it can be

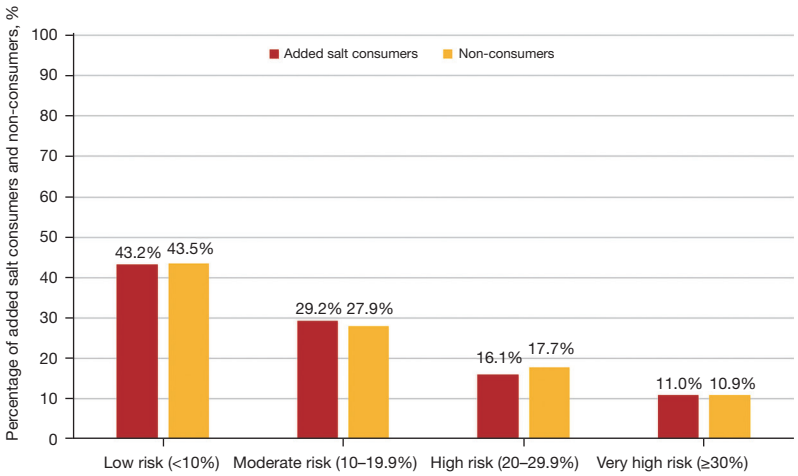

Figure 1 Next 10-year absolute risk of cardiovascular diseases among the study population (seasoning salt consumers/non-consumers), n=265.

Table 3 Association of seasoning salt consumption with the 10-year absolute risk of cardiovascular disease in binary logistic regression controlling physical inactivity and oral contraceptives use, n=265

Comparison groups	N	10-year absolute risk of CVD		UAOR	P value*	AOR	95% CI for OR	
		At risk (%)	No risk (%)				Lower	Upper
Consumers of seasoning salt	118	44.7	44.3	–0.127	0.625	0.881	0.529	1.467
Non-consumers of seasoning salt	147	55.3	55.7					

*, significant at the threshold of P<0.05. CVD, cardiovascular diseases; UAOR, unadjusted odd-ratio; AOR, adjusted odd-ratio; CI, confidence interval.

speculated that health education has played an important role in the reduction of salt consumption among the samples who have the diseases. The data has also shown a lower proportion of salt consumers among samples who have hypertension, diabetes, and dyslipidemia. On the contrary, those who did not develop any diseases consume more salt than those who did develop any. Thus, it can be argued that the result of the study is greatly influenced by the lower salt consumption behavior of the sample who have a prior chronic disease. Therefore, it can be said that this institute-based data may not reflect the actual attribution of added salt consumption in the absolute risk of CVD due to the educational influence. Another important issue is the study population who is usually considered as a high-risk group due to withdrawal of hormonal protection in favor of CVD. There is no scope to assess the influence of menopausal state whether it masked the impact of added salt consumption on the risk of CVD. Thus, further population-based study is needed to scale the actual impact of seasoning salt consumption among post-menopausal women.

The difference in the use of smokeless tobacco by the consumption of seasoning salt is a significant finding that indicated a behavior that has a great interest in public health. The data of the study showed all the smokeless tobacco users consume seasoning salt with meals. How the consumption of smokeless tobacco is related to the consumption of seasoning salt can be explained in the light of another research. A study on the rat model showed that long-term exposure to nicotine reduces the ion current mediated by the Epithelial Sodium Channel (ENaC), which is a sodium receptor occurring in taste cells (20). As a consequence, the capacity of taste cells to respond to sodium ions reduces (21). The mechanism explains why tobacco consumers tend to use salt more abundantly with their food. Studies on the human population also showed that the taste identification time for salty taste is more in tobacco chewers than non-chewers (21). As a result, the taste perception of the tobacco chewers becomes impaired, and the tobacco chewer uses more salt with food. In Bangladesh, a popular way of taking tobacco is chewing and the use of smokeless

tobacco is very common among rural women (22). This explains why smokeless tobacco users consume more salt.

The limitations of this study included convenience sampling, a relatively small sample size, and subjective measurement of seasoning salt consumption. We had to compromise with the limitation because of the budget, logistic, and methodological limitations. The quantifiable measurement of the consumption of the seasoning salt cannot be done because of the lack of validated and reliable tools for measuring seasoning salt. The limitations may elevate the risk of selection bias, recalled bias, and the less generalizability of the study findings. However, to our best knowledge, this is the first study that assessed the association of seasoning salt consumption on the CVD risk among postmenopausal women in Bangladesh. As the data on the seasoning salt consumption in this population is lacking in Bangladesh, this study has provided preliminary evidence in this field.

Conclusions

In conclusion, the study did not find any association of seasoning salt consumption with the absolute risk of CVD among postmenopausal women, but it confirmed the relationship with the use of smokeless tobacco. A larger population-based epidemiological study is required to justify the impact of seasoning salt on CVD risk more precisely. The link between smokeless tobacco uses and seasoning salt consumption has wide public health importance and implications and requires further investigation too.

Acknowledgments

The authors would like to thank the hospital administrator, Mr. Rafael Biswas, for his kind cooperation to conduct the study in his primary health-care center at Gazipur.
Funding: None.

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://jxym.amegroups.com/article/view/10.21037/jxym-21-45/rc

Data Sharing Statement: Available at https://jxym.amegroups.com/article/view/10.21037/jxym-21-45/dss

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jxym.amegroups.com/article/view/10.21037/jxym-21-45/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted following the Declaration of Helsinki (as revised in 2013). The ethical approval for the study was obtained from Ethical Review Committee of Bangladesh University of Health Sciences [identification number: BUHS/ERC/EC/16/024 (1/1)] on January 28, 2016 and informed consent was taken from all the participants.

References

1. Noncommunicable diseases country profiles 2018 [Internet]. World Health Organization. World Health Organization; 1970 [cited 2020 Jun 8]. Available online: https://apps.who.int/iris/handle/10665/274512
2. GBD 2013 Mortality and Causes of Death Collaborators. Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2015;385:117-71.
3. Maas AH, Appelman YE. Gender differences in coronary heart disease. Neth Heart J 2010;18:598-602.
4. Barua L, Faruque M, Banik PC, et al. Concordance between two versions of world health organization/international society of hypertension risk prediction chart and framingham risk score among postmenopausal women in a rural area of Bangladesh. Indian J Public Health 2019;63:101-6.
5. Barua L, Banik PC, Islam SMS, et al. Application of country-specific Globorisk score to estimate next 10 years risk of cardiovascular diseases and its associated predictors among postmenopausal rural women ofBangladesh: A

cross-sectional study in a primary care setting. Lifestyle Med 2021;2:e32.
6. Barua L, Faruque M, Banik PC, et al. Atherogenic index of plasma and its association with cardiovascular disease risk factors among postmenopausal rural women of Bangladesh. Indian Heart J 2019;71:155-60.
7. Barua L, Faruque M, Chandra Banik P, et al. Physical activity levels and associated cardiovascular disease risk factors among postmenopausal rural women of Bangladesh. Indian Heart J 2018;70 Suppl 3:S161-6.
8. Barua L, Faruque M, Banik PC, et al. Agreement between 2017 ACC/AHA Hypertension Clinical Practice Guidelines and Seventh Report of the Joint National Committee Guidelines to Estimate Prevalence of Postmenopausal Hypertension in a Rural Area of Bangladesh: A Cross Sectional Study. Medicina (Kaunas) 2019;55:315.
9. Zaman MM, Choudhury SR, Ahmed J, et al. Salt Intake in an Adult Population of Bangladesh. Glob Heart 2017;12:265-6.
10. Zaman MS, Barua L, Bushra S, et al. Salt Intake Behavior Among the Faculties And Doctors of Bangladesh University of Health Sciences. Cardiovascular Journal 2016;8:94-8.
11. Mondal R, Sarker RC, Banik PC. Knowledge attitude and behaviour towards dietary salt intake among Bangladeshi medical and nonmedical undergraduate students. International Journal of Perceptions in Public Health 2017;2:31-7.
12. Mondal R, Sarker RC, Sayrin R, et al. Knowledge, Attitude and Practice towards Dietary Salt Intake among Nurses Working in a Cardiac Hospital in Bangladesh Sciences. Cardiovascular Journal 2019;12:53-8.
13. Globorisk. Lab Risk Calculator. Available online: http://www.globorisk.org/calc/labform (Accessed June 15, 2020).
14. Hajifathalian K, Ueda P, Lu Y, et al. A novel risk score to predict cardiovascular disease risk in national populations (Globorisk): a pooled analysis of prospective cohorts and health examination surveys. Lancet Diabetes Endocrinol 2015;3:339-55.
15. Zhao Z, Wang H, Jessup JA, et al. Role of estrogen in diastolic dysfunction. Am J Physiol Heart Circ Physiol 2014;306:H628-40.
16. de Wardener HE, MacGregor GA. Harmful effects of dietary salt in addition to hypertension. J Hum Hypertens 2002;16:213-23.
17. Yamori Y, Liu L, Ikeda K, et al. Different associations of blood pressure with 24-hour urinary sodium excretion among pre- and post-menopausal women. WHO Cardiovascular Diseases and Alimentary Comparison (WHO-CARDIAC) Study. J Hypertens 2001;19:535-8.
18. Pechère-Bertschi A, Burnier M. Female sex hormones, salt, and blood pressure regulation. Am J Hypertens 2004;17:994-1001.
19. O'Donnell MJ, Mente A, Smyth A, et al. Salt intake and cardiovascular disease: why are the data inconsistent? Eur Heart J 2013;34:1034-40.
20. Bigiani AB. Nicotine and the taste allure for salty food. Science Proceedings 2016;3:1133.
21. Kale YS, Vibhute N, Belgaumi U, et al. Effect of using tobacco on taste perception. J Family Med Prim Care 2019;8:2699-702.
22. Zaman MM, Rahman MM, Rahman MR, et al. Prevalence of risk factors for non-communicable diseases in Bangladesh: Results from STEPS survey 2010. Indian J Public Health 2016;60:17-25.

doi: 10.21037/jxym-21-45
Cite this article as: Barua L, Zaman MS, Faruque M. Association of seasoning salt consumption with the risk of cardiovascular disease among postmenopausal rural women in Bangladesh: a cross-sectional study. J Xiangya Med 2022;7:5.