

Salt Intake in an Adult Population of Bangladesh



High dietary salt intake is an important risk factor of hypertension and other noncommunicable diseases (NCD). Therefore it has been identified as an indicator of global monitoring framework for NCD control [1]. Under this framework, a 30% relative reduction of dietary salt intake (compared with the 2010 baseline) has been targeted by 2025. Along with 8 other targets of risk reduction and the health system's response, a 25% relative reduction of premature mortality of NCD is expected.

The World Health Organization and Food and Agricultural Organization recommend an intake of <5 gm of sodium chloride from all sources. However, dietary salt intake is much higher than this in many of the countries. On the other hand, many countries do not have representative population data on dietary salt intake. Bangladesh is one of these countries. Intakes as high as 15 g/day and 21 g/day were reported based on industrial output and hospital patient data reports [2], respectively. A campaign on salt reduction in Bangladesh has already started. However, a 2010 baseline for evaluating progress on salt reduction is not available for the Bangladeshi population. We have done this study to estimate the mean level salt intake in the Bangladeshi adult population.

A cross-sectional study was done in 2009 in a rural community (Ekhaspur village of Chandpur district) and an urban worksite (National Heart Foundation Hospital and Research Institute, Dhaka). A total of 200 (100 rural and 100 urban) persons aged 20 years or older volunteered to participate in this study in response to an invitation to all adults of Ekhaspur and all personnel of the National Heart Foundation. Equal numbers of men and women were recruited in consecutive order until we achieved the targeted number.

A questionnaire was used to collect data on their habit of adding salt during meals. Information was also requested about the usual amount of monthly salt purchased for the household. Number of household members both children (≤ 12 years) and older children and adults (> 12 years) were noted. Children were assigned a 50% weight of an adult to estimate per

capita consumption of purchased salt. The amount of salt (in grams) purchased for the household in a month was divided by the weighted number of household members to get the quantity of added salt taken (added during cooking and while eating a meal) by an individual per month. Then consumption per day was obtained. Blood pressure was measured using standard methods. Urine samples were collected the next morning. Urine analyses were done in the laboratory of the National Heart Foundation Hospital and Research Institute for measurement of sodium, potassium, and creatinine by an auto analyzer. We estimated 24-h sodium excretion using spot urine samples according to Tanaka et al. [3].

Informed consent was obtained from participants and the community/organization before starting the survey. Institutional ethical clearance was obtained from the National Heart Foundation Hospital and Research Institute.

Rural respondents on average were 40 years old, but urban respondents were on average 31 years old. Urban subjects were younger because they were recruited from a worksite. Sixty-nine percent (94% in rural and 44% in urban areas) were habituated to take extra salt during their meals. Their mean systolic blood pressure and diastolic blood pressure were 113 mm Hg and 74 mm Hg, respectively. More than 11% of them had hypertension (blood pressure $\geq 140/90$ mm Hg and/or medication).

Average estimated 24-h urinary excretion of sodium chloride was 17.0 g/day. It was a little higher in the rural area (17.2 g/day) than the urban area (16.8 g/day). However this difference was not statistically significant (Table 1). There was no statistically significant difference of salt intake between men and women. We corroborated these findings with average daily consumption of salt estimated from monthly purchased salt, which was 13.4 (95% confidence interval: 7.3 to 19.5) g/day per person. This quantity, as expected, was close to and a little less than the estimated findings derived from spot urine.

This is the first ever study in the Bangladeshi population to determine dietary salt intake by getting indirect estimates of 24-h urinary excretion of salt. We estimated a high salt intake of 17 g/day in our sample. This is consistent with previously reported high intake data (15

TABLE 1. Estimated 24-h excretion of sodium chloride (g/day) in urine* of rural and urban adults of Bangladesh

Sex	Rural (n = 100)	Urban (n = 100)	Total (N = 200)
Men (n = 100)	17.3 (13.8–20.8)	18.0 (14.3–21.7)	17.6 (14.0–21.2)
Women (n = 100)	17.1 (13.6–19.7)	15.6 (11.4–19.0)	16.3 (12.4–20.2)
Both sexes (N = 200)	17.2 (13.8–20.7)	16.8 (12.8–20.8)	17.0 (13.8–20.2)

Values are mean (95% CI).
*Based on spot morning urine sodium [3].

to 21 g/day) [2]. However, a few population-based studies have been conducted after our survey was done in 2009. They have reported an intake as low as 3.4 g/day [4]. This is quite a bit lower than the salt intake values of countries (such as the United Kingdom), where it is known to be very low. An Indian 13-state study reported an intake of 13.8 g/day using household salt weighing method [5]. This approach is somewhat similar to our household salt purchase data (13.4 g/day).

It is well known that Bangladeshi people have a strong preference for salty taste and a habit of adding salt during meals. Use of salted pickles is very popular. Many people eat sour seasonal fruit with salts. Preservation of food items such as fish in salt is another popular dietary practice in Bangladesh.

Salt that is being taken during meals constitutes a substantial proportion of total salt intake in Bangladesh. This is true even for educated health and medical professionals. Therefore, the added salt on the table should be the primary target of salt reduction in Bangladesh. Policy support is necessary for reducing salt content of the processed food. Advocacy is necessary for voluntary engagement of restaurant industry. Doctors and nurses can counsel their patients to minimize consumption of salt from various sources.

The limitation of method that we used, spot urine to estimate 24-h sodium excretion, is well known. This does not give a stable estimate for individual values but provides a relatively reliable estimate of population mean. In absence of data using a 24-h urine samples, the gold standard in this case, our findings could be used as a basis for setting the baseline values for reporting progress of the NCD monitoring framework indicator. Further validation of the formula that we used for 24-h sodium excretion is necessary.

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*M. Mostafa Zaman
Sohel Reza Choudhury
Jasimuddin Ahmed
Rezaul Karim Khandaker
Mian Abdur Rouf*

Abdul Malik, Dhaka, Bangladesh

Correspondence: M. M. Zaman (zamanm@who.int)

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policies of the institutions with which they are affiliated. Authors' declare no other conflict of interest.

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Salt Intake, Overweight, and High Blood Pressure, With Special Reference to Sex Difference



Laatikainen et al. [1] summarized the association between sodium intake and blood pressure in Finland in the past 4 decades for the purpose of preventing hypertension. By conducting the salt intake reduction intervention in late 1970s, remarkable improvements have been observed both in blood pressure levels and in treatment and control of hypertension. Namely, the mean systolic blood pressure among 30- to 59-year-old men and women has decreased from 149 mm Hg to 135 mm Hg and from 153 mm Hg to 129 mm Hg, respectively. The decreases in mean diastolic blood pressure have been from 92 mm Hg to 84 mm Hg among Finnish men and from 92 mm Hg to 79 mm Hg among Finnish women. I present here the trend of sodium intake and blood pressure by using ecological data from Japan's National Health and Nutrition Survey [2] in combination of the trend in the percentage of overweight.