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REVIEW IDENTIFICATION OF BASELINE SALT INTAKE IN THE POPULATION OF UZBEKISTAN AGED 18-64 YEARS

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Abstract Baseline of salt intake levels in the adult population was surveyed for the first time in the Republic of Uzbekistan and the Central Asian region. This survey relied on the standard method of 24-hour urinary sodium excretion measurement. This survey will allow for further monitoring of salt intake trends and of effectiveness of activities aimed at reducing dietary salt intake in the population. The survey covered 598 residents from 5 regions of the country, who were divided by sex into 3 age groups (18-29 years, 30-44 years, 45-64 years) as well as according to residence in urban or rural settings. According to the survey findings:

- Mean salt intake in adults aged 18-64 years amounts to 14.9±3,5g/day;
- The level of salt intake was high for 46.5% of the population (more than 15.0 g/day), moderate for 53.2% (7.5-15.0 g/day) and low for 0.3% (less than 7.5 g/day); three-quarters of men of older age (age should be specified) consume more than 15.0 g/day;
- No difference in salt intake was identified between the sexes;
- Strict correlation was identified between salt intake and age in both sexes;
- No difference in salt intake was identified between rural and urban population;
- Salt intake indicators vary significantly across different regions reaching up to 18.5 g/day in the Autonomous Republic of Karakalpakstan and 18.8 g/day among the Karakalpaks;
- In the population of Uzbekistan aged 18-64 years, 0% of residents were found to follow WHO recommendation to consume less than 5 g salt daily;

Keywords: WHO, salt intake, NCDs, BASELINE SALT

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INTRODUCTION

Urgency of the problem

Today, according to WHO, no communicable diseases (NCDs), mainly, cardiovascular diseases, cancers, chronic respiratory diseases and diabetes represent a leading threat to disability and mortality around the worldand projects are that, globally, deaths from these diseases will increase by 17% every ten years. Elevated blood pressure is the leading NCD risk factor, which is responsible for 13% of deaths globally, 51% of strokes and 45% of ischemic heart disease cases. The risk of death from hypertension in low- and middle-income countries is more than double that of high-income countries.

At the same time, recent research findings show that development of nearly 80% of cardiovascular cases can be prevented. The most cost-effective approach to NCD prevention is salt intake reduction in the population. This is confirmed through various methodological approaches, in different countries around the world, for specific age groups, as this relationship is direct and progressive with no apparent threshold, and salt reduction in individuals is an important intervention in reducing blood pressure, increasing the efficacy of pharmacological therapies, and reducing the global risk of cardiovascular disease.

Further research of salt intake as a risk factor showed that apart from hypertension, it is another risk factor for obesity independent of energy intake, while overweight/obesity exacerbates the influence of high salt intake on the development and course of arterial hypertension.

The experience of various countries shows that population-wide sodium reduction interventions are unique not only because they do not require high costs, but also lead to cost effectiveness for countries implementing them[1].Therefore, in the age of increasing dietary salt intake in the global population and a worldwide social catastrophe resulting from progressing rise in mortality from noncommunicable diseases, it is crucial to search for most effective ways to reduce salt intake for the surveyed population with uniform cultural and ethnic roots, which also include the food culture.

A starting point for further intervention is initial baseline assessment of salt intake in the population, which determines further monitoring of the problem in question as the key intervention for planning salt intake reduction. Moreover, monitoring informs decision-makers and all stakeholders about the implementation, progress, limitations and outcomes of sodium salt reduction and may help in future planning and decision-making through creation of a database and ensuring accountabilities of all participants.

Under a WHO Framework Initiative for all Members States with a global target of 30% salt intake reduction by 2025 and

pursuant Resolution No. 102 of the Cabinet of Ministers of the Republic of Uzbekistan "On Further Enhancement of Ongoing Measures in the Area of Healthy Nutrition in the Population of the Republic of Uzbekistan" dated 25 April 2015, where key directions of ensuring healthy nutrition in the population of the Republic of Uzbekistan include development and implementation of food and public health monitoring programmes on the basis of special surveys of nutrition of individuals':

a decision was passed to conduct a survey to determine the baseline level of salt intake in the population.

Despite relative difficulties, 24-hour urinary sodium measurements in a representative sample produces the most accurate information and is considered to be the "golden standard" by WHO. This indicator is the key component of effective government salt intake reduction policy that indicates the scale of the problem in question in a given country.

Another important factor is the identification of main sodium sources and ways to reduce its intake, which requires additional survey methods such as research into food procurement and household budgets; sodium content in food products and in a diet of an individual, data on import, sales and others. 2014 nationwide survey into the prevalence of risk factors for the development of noncommunicable diseases (NCDs) based on the WHO STEPS methodologyobtained data on1) demographic and behavioral information (Socio-demographic information, Tobacco and alcohol use, Dietary habits, Physical activity), 2) Personal medical history, including drug treatment, 3) Physical measurements with simple methods.

An additional module "Dietary Salt Intake" was included into the STEPSsurvey to determine knowledge, attitudes and behaviours with respect to dietary salt in Uzbekistan with due regard to local and regional influencing factors (e.g., cultural and regional customs relating to specific dishes and seasonings), which evaluated:

1) consumption of foods high in salt content;
2) consumption of salt, salted seasonings, salty sauces or salty gravy while cooking at home,
3) discretionary salt intake at a table,
4) knowledge and attitude concerning excessive salt intake.

An analysis of the STEPS survey findings along with conclusions drawn from this survey will not only allow for identifying the scale of the problem in question, but the findings and recommendations will also help guide the country's executive health authorities towards effective strategies aimed at reducing salt intake in the population of Uzbekistan.

Thus, the goal of this survey is to determine the baseline level of salt intake in the population of Uzbekistan aged 18-64 years.

Priority survey objectives include:

1. assessment of mean dietary salt intake in the population of Uzbekistan aged 18-64 years through measurement of 24 urinary sodium excretion.
2. stratification of dietary salt intake by sex, age (3 age groups 18-29, 30-44 and 45-64 years) and across urban and rural settings.
3. identification of baseline indicators for future estimation of salt intake in the same populations for salt intake monitoring in the long run.
4. providing information for the development and implementation of measures aimed at reducing dietary salt intake in the population.

SURVEY METHODOLOGY

Study phases

Preparation Phase (April–September) included adaptation and development of the methodology and protocol based on WHO/PAHO guide for country-level action establishment of a steering and technical groups; representative sampling for the survey; survey planning and budgeting; procurement of necessary equipment; preparation and printing (1) *Urine Collection Sheets* and (2) *Detailed Instructions for Participants in 24-Hour Urine Collection* in Russian and Uzbek, which were developed on the basis of WHO/PAHO guidelines.

Taking into account the climatic parameters of hot summers, estimation of 24-hour urine sodium excretion was performed during autumn and winter to minimize the loss of sodium through sweat and to obtain reliable results.

Survey Phase (September – November) included selection of a team of surveyors, planning field work, questionnaire piloting, holding a workshop on the data collection methodology, and conducting the actual survey.

Immediate data was collected in:

Tashkent province – 2-6 November,
Republic of Karakalpakstan – 9-13 November,
Bukhara province – 16-20 November,
Fergana province – 23-25 November,
Andijan province – 26-28 November.

Data analysis and interpretation phase included processing of obtained information, data analysis and interpretation, and drafting a final report.

Sample Calculation

The minimum sample size per stratum (6 groups)was set at 100 individuals to allow for an evaluation of mean sodium intake with 95% confidence interval of± 0.3 g/day (mean salt intake with 95% confidence interval± 0.7g/day).The rate of presumable losses was identified at 15% (0.85) based on 2014 nationwide survey NCD risk factor prevalence (Step 3) using the standards WHO STEPS methodology:

The sample size amounted to = (100*6)/0.85 = 706, and was rounded to 710 individuals.

Sampling Stages

Uzbekistan is geographically divided into five key regions:

Western Region: Autonomous Republic of Karakalpakstan, Khorezm Province

Central Region: Navoi, Bukhara, Kashkadarya, and Surkhandarya provinces

Eastern-Central Region: Samarkand, Jizzakh, Syrdarya, and Tashkent provinces

Eastern Region: Namangan, Fergana, and Andijan provinces

Thecity of Tashkent.

According to resources allocated for the survey, 1 administrative unit was randomly selected as the primary sampling unit (PSU). Due to high population density in the Eastern Region, 2 administrative units were selected. As a result, PSUs included: Autonomous Republic of Karakalpakstan, Andijan, Bukhara, Tashkent, and Fergana provinces. Then, 3-5 secondary sampling units (SSU) (primary health care (PHC) facilities) were selected from each of the PSUs using a method of random numbers and a probability proportionate to the size of catchment area population according to the register of PHC facilities provided by the Institute of Health and Medical Statistics. A total of 20 PHC facilities were selected. Households comprised the tertiary sampling unit (TSU): 35-36 households per each PHC facility summing up to a total of 710 households. The survey team members selected each respondent from each of the households on the spot during visits to selected households using "last-birthday method". An adult household member WHO last birthday was the closest to the survey date took part in the survey. Survey respondents were selected using criteria for inclusion and exclusion (see below).

Inclusion/Exclusion Criteria

The survey included one member of a selected household aged from 18 to 64 years inclusively or any other person within this age group temporarily residing at the household address.

The survey excluded:

- Individuals who did not provide an informed consent.
- Individuals who had had stroke, suffered from heart, kidney or liver diseases.
- Individuals who had recently taken diuretics (less than two weeks ago).
- Individuals who had other reasons preventing 24-hour urine collection.
- Pregnant women.

Survey Team Selection and Training

WHO country office experts held a training on the 24-hour urine collection methodology for the survey team. A total of 10 people were trained. Teams were formed, whereby the composition and size of the teams changed in different regions depending on the sample size. On average, every team was composed of 4-6 people: 2 survey staff members and 2-4 laboratory technicians.

Questionnaire Piloting

The questionnaire including information about age, sex, nationality, and education was piloted in selected PHC facilities in the Tashkent Province. Information on knowledge, attitudes and behaviours with respect to dietary salt was not included into the questionnaire as this data was collected as part of NCD risk factors survey (STEPS survey) in Uzbekistan in 2014.

Questionnaire piloting took two days. The piloting of the method did not identify any provisions that would require changes.

Field Work

Field work was conducted from 2 November to 28 November 2015.

The survey team visited selected households, selected respondents from among residents aged 18-64 with due regard to inclusion and exclusion criteria. Upon obtaining a *Written Consent* to take part in the survey, the survey team instructed the respondent(s) on the urine collection procedure and gave them *Detailed Instructions for Participants in 24-Hour Urine Collection* and *Urine Collection Sheets*, where the survey participants noted down start and end time of 24-hour urine collection, any missed urine samples and any medication taken during the collection

Every participant was provided with supplies for urine collection:

• A 3-litre screw-capped container, containing preservative, to store the collected urine.
• A 1 litre wide-mouthed container for urine collection to be used with or without a funnel.
• A funnel to help women collect urine.
• Plastic bags for transportation of the containers outdoors.
• A reminder for participants about the need to collect 24-hour urine (a safety pin attached to underclothes or garments during the collection).

The second visit of the survey team member occurred upon the end of 24-hour urine collection period.

Then, the survey staff measured total urine volume onsite, thoroughly swirled urine in the container and isolated three portions of 10 mL each into individual labelled test-tubes for storage and transportation at -20°C for further analysis. The rest of the urine was discarded.

Laboratory analysis

Sodium content in urine was identified at the Scientific and Research Institute of Sanitation, Hygiene and Occupational Diseases under the Ministry of Health of the Republic of Uzbekistan following urine collection criteria as shown below;

- Urine was collected within 20-28 hours, but not less than 20 and no more than 28 hours;
- Total urine volume was no less than 250 mL;
- No urine sample/s were missed.

If the criteria were not met, the urine was discarded and registered as the survey loss. Amount of sodium (in mmol) in urine samples were identified using a micro-colorimetric method.

Estimating 24hour sodium excretion and salt intake

The findings, total urine volume and overall urine collection time were entered into the database together with demographic characteristics of the participants.

Sodium was converted (mmol) into kitchen salt (sodium chloride) (g) using the formula**Error! Bookmark not defined.**: 1 mmol sodium x 23 x 2.5421/1000 = 58.47 g ≈ 58.5 of sodium chloride;

Urine collection time adjustment to 24 hours was conducted according to Elliott and Brown indicator* 24/(total urine collection time).

Post-stratification Weighing

Post-stratification weighing to total population of individuals aged 18-64 years was performed taking into account sex, age, and residential status in urban and rural settings.

To this end, data was weighted considering proportionate ratio of each stratum in line with population distribution data in these groups as provided by the State Statistics Committee (SSC).

$$W_{post\text{-}stratification} = \frac{\text{Share of group according to SSC data}}{\text{Share of group according to survey findings}}$$

Data Entry and Statistical Processing

The entered data was processed using *SPSS-22*for further statistical analysis of comprehensive salt intake data, by calculating the mean values, standard deviation (SD) with 95% confidence interval (95% CI).

Additionally, the median and 25th and 75th percentiles were estimated in order to identify the normality of the salt intake.

Statistical significance

Two-sided $P < 0.05$ was considered to indicate statistical significance. Results were expressed as mean ± SD or median and25th-75th percentiles.

SURVEY FINDINGS

Coverage of Respondents and Survey Losses/ Response rate

The planned number of survey participants, according to sample data estimation, amounted to 710 individuals. Losses accounted for in the survey amounted to 15.8% - 112respondents, reasons for losses during the survey in Table1.

Table1. Losses during the Survey

Reasons	Number of Respondents	Percent
Lack of written consent from the side of the selected participant at the initial stage of the study during the first visit of supervisors	92	13.0%
Refusal to take part in the survey with the written consent available (no urine collected)входеэтапасборамочи	5	0.7%
Missed urine sample according to Urine Collection Sheets	13	1.8%
Urine Collection Sheet with personal data lost	1	0.1%
Incomplete information in the Urine Collection Sheet(sex was not identified)	1	0.1%
Total	112	15.8%

The further processing included data from 598 participants (including 9 respondents did not report their ethnic background) making up 84.2% of the estimated number of participants and 99.7% of the minimum required quantity for the survey. Salt intake across ethnic groups was studied based on data from 589 participants.

Demographic Indicators

The survey also collected demographic and socioeconomic characteristics of the participants such as gender, age, education and ethnicity. Table 2 presents data on ethnic background of the participants. The column "Other Ethnicities" in the table includes Tajiks, Turks, Ukrainians, Chuvash, and Greeks.

Table2. Distribution of the Survey Participants According to Their Ethnic Background

	Uzbek	Karakalpak	Russian	Tatar	Kazakh	Other Ethnicities	Total
Number	483	62	21	12	5	6	589
Percent	82%	10.5%	3.6%	2.0%	0.9%	1.1%	100%

During the survey, the level of educational attainment of the participants was identified as higher (includingincomplete higher), secondary vocational (including incomplete secondary vocational), and secondary school education (Table 3).

Table2. Distribution of the Survey Participants According to the Level of Educational Attainment

	Higher (including Incomplete Higher)	Secondary Vocational (including Incomplete Secondary Vocational)	Secondary School	Total
Number	198 (18)	192 (24) 24	208	598
Percent	33.1% (3.0%)	32.1% (4.0%) 4.0%	34.8%	100%

Post-stratification Weighing

Post-stratification weighing of survey findings to total population aged 18-64 years with regard to sex and age categories and estimation of the adjustment factor is shown in Table 4.

Table 4. Post-stratification Weighing

Age Groups	Sample	Percentage of Sample Strata	Population Data acc. to SSC	Percentage of Sample Strata acc. to SSC	Adjustment Factor
Men					
18-29 years	107	17.9%	3697161	20.5%	1.14
30-44 years	56	9.4%	3000544	16.6%	1.77
45-64 years	89	14.9%	2280681	12.6%	0.9
18-64 years	252	42.1%			
Women					
18-29 years	115	19.2%	3612621	20.0%	1.0
30-44 years	115	19.2%	3025792	16.8%	0.97
45-64 years	116	19.4%	2443460	13.5%	0.7
18-64 years	346	57.9%			
Both sexes					
18-64 years	598	100%	18060259	100%	

Mean Salt Intake in Adult Population of Uzbekistan
Mean salt intake in adults aged 18-64 years was 14.9±3,5g/day).

Table 5. Salt Intake according to Sex and Age Categories in g/day

Strata	Mean Value	Standard Deviation	95% CI		Median	Percentiles	
			Lower Threshold	Upper Threshold		P25	P75
Men							
18-29 years	***13.2***	*3.1*	*12.6*	*13.9*	*13.1*	*11.2*	*14.9*
30-44 years	***14.9***	*2.7*	*14.3*	*15.5*	*14.9*	*12.9*	*17.2*
45-64 years	***16.7***	*3.8*	*15.8*	*17.5*	*16.9*	*14.5*	*18.2*
18-64 years	***14.9***	*3.5*	*14.4*	*15.3*	*14.8*	*12.5*	*17.3*
Women							
18-29 years	***13.6***	*2.7*	*13.2*	*14.1*	*13.4*	*11.5*	*15.3*
30-44 years	***15.8***	*3.2*	*15.1*	*16.4*	*15.8*	*13.4*	*17.9*

45-64 years	***16.3***	*4.3*	*15.3*	*17.2*	*16.0*	*13.1*	*18.3*
18-64 years	***14.9***	*3.5*	*14.5*	*15.3*	*14.7*	*12.4*	*17.0*
Both sexes							
18-29 years	***13.5***	*2.9*	*13.1*	*13.8*	*13.4*	*11.5*	*15.1*
30-44 years	***15.4***	*3,0*	*15,0*	*15.8*	*15.5*	*13.1*	*17.7*
45-64 years	***16.5***	*4.0*	*15.8*	*17.1*	*16.7*	*13.7*	*18.2*
18-64 years	***14.9***	*3.5*	*14.6*	*15.2*	*14.7*	*12.4*	*17.2*

Salt intake did not differ between men and women in all age groups in Uzbekistan (Table 5). However, there was a strong correlation between salt intake and age. As for men, salt intake noticeably increases from one age group to another with statistical significance ($p<0.05$), while among women, statistical significant differences were only observed between young and middle-aged groups. The lowest population-wide salt intake was observed for young men aged 18-29 years and amounts to 13.2±3,1 g/day.

Comparison of medians and means in each stratum shows coincidence in most cases, which is the evidence of normal data distribution. The exception is a 45-64 age group for both sexes: with the median of 16.5g/day, 25th percentile equals 13.7 g/day, while with the 75th percentile equalling 18.2 g/day, asymmetric distribution is observed because of a small elderly group consuming a small amount of salt. This being said, a much more asymmetric distribution was found among men. Overall frequency distribution of salt intake among men and women is shown in Figure 1.

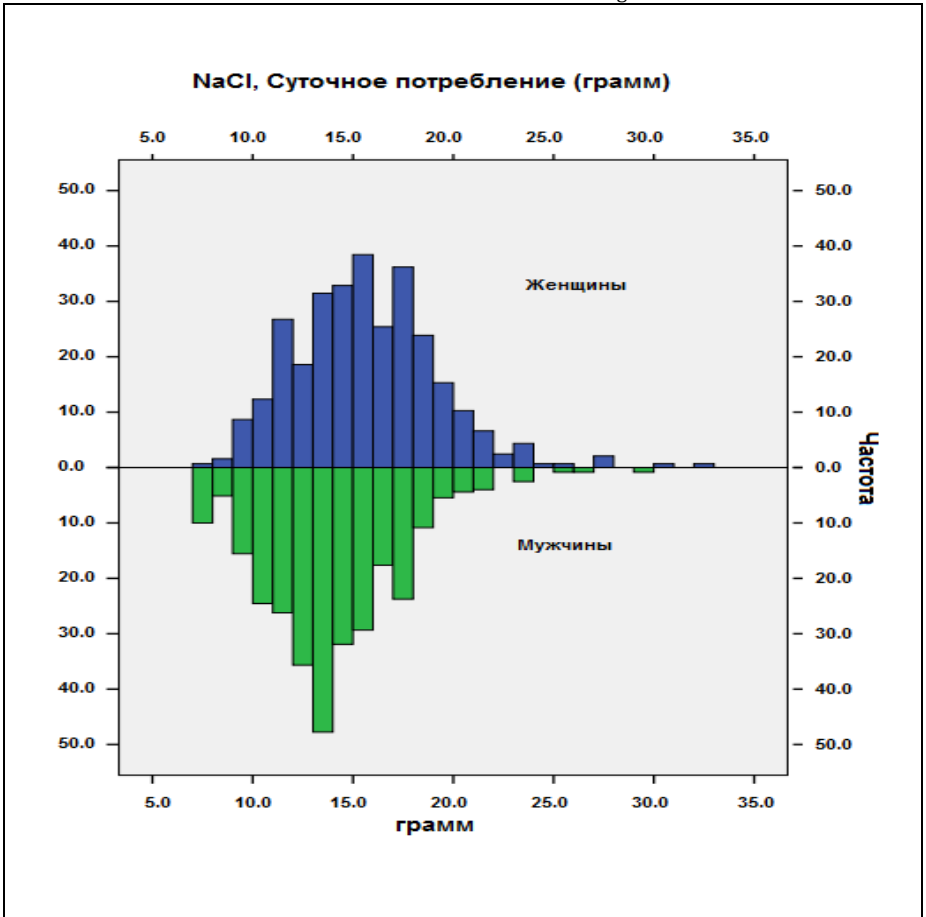

Figure 1. Frequency distribution of Salt Intake in Men and Women

Salt intake did not statistically differ between the rural and urban population (Figure 2), neither among men, nor among women. Same picture is observed with regards to education level.

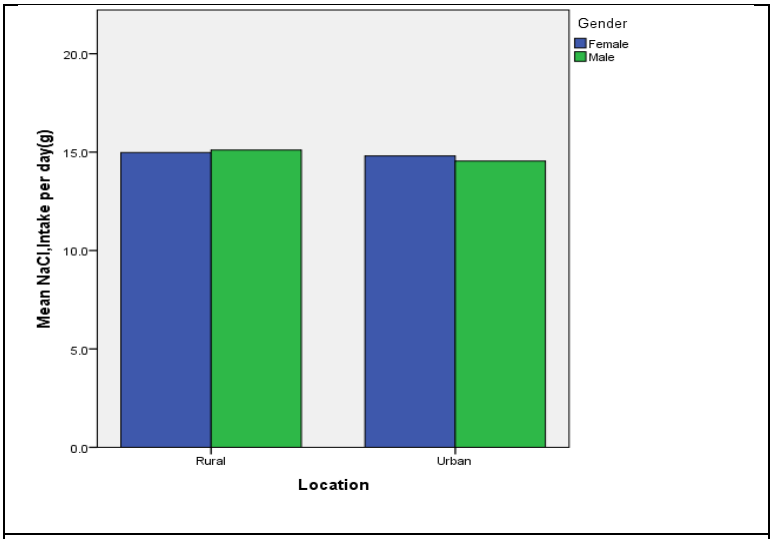

Figure 2. Mean Salt Intake in Rural and Urban Population

Mean Salt Intake Across Regions of Uzbekistan

The analysis of mean salt intake across the regions produced considerable variability of salt intake throughout the country. Autonomous Republic of Karakal pakstan is the leading region with the mean salt intake equalling 18.5±4.3 g/day. From statistics perspective, significantly less salt is consumed in the Fergana Province (16.9±1.7 g/day), and even less in the Bukhara Province (15.9±3.1 g/day). In these regions, mean salt intake was higher than the national average.

Considerably less salt is consumed in the Tashkent and Andijan provinces, 12.6±2.3g/day) and 12.5±2.1g/day), respectively. Statistically significant differences were not found between the sexes in each of the regions (Figure 3).

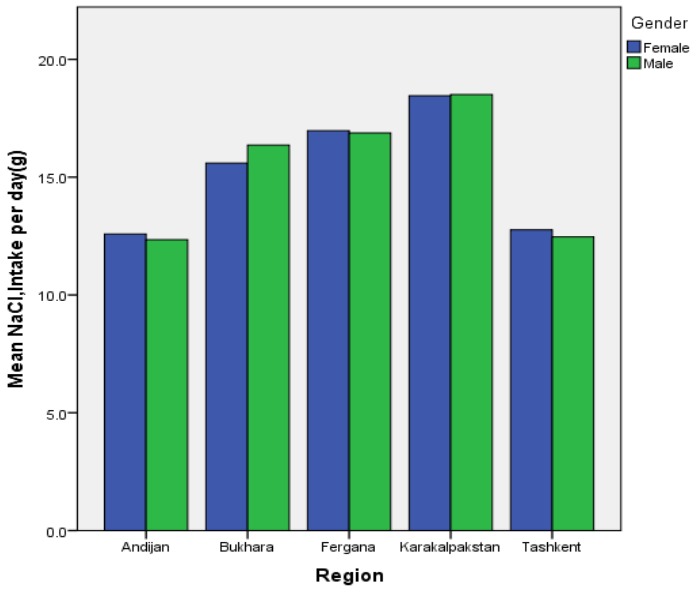

Figure 3. Salt Intake in 5 Administrative Units of the Republic of Uzbekistan

Salt intake assessment depending on ethnic background was held with respect to 3 ethnic groups and a group that included all other nationalities (Figure 4). Maximum salt intake was observed among the Karakalpaks – 18.8±4.2g/day, who are the

dominant ethnic group in the population of Karakalpakstan. Representatives of the Uzbek ethnic group consumed significantly less salt – 14.7±3.2g/day, this indicator was closer to the mean nationwide value, also reflective the predominant majority of Uzbeks among other ethnicities in the country. No statistical difference was found between the sexes in all these ethnic groups.

Salt Intake According to WHO Recommendations

The latest WHO recommendation is to reduce sodium intake to <2 g/day sodium (5 g/day salt) in order to reduce blood pressure and risk of cardiovascular disease, stroke and coronary heart disease in adults (strong recommendation)[1].

This survey identified0% of residents in the population of Uzbekistan aged 18-64 years, who fulfil this WHO recommendation.

Depending on the amount of salt intake, the adult population was divided into 3 groups:

Consuming less than 7.5 g/day – low salt intake level;

consuming from 7.5 to 15.0 g/day – medium salt intake level; and

consuming more than 15.0 g/day – high salt intake level.

Figure 5 shows that there are no women who consume less than 7.5 g/day across all age groups, while less than 1% of men do.

Nearly three-quarters of younger individuals aged 18-29 years consume less than 15.0 g/day, mostly falling under the category of medium salt intake.

Ratio between groups with medium and high salt intake groups in middle-aged and older age groups does not change significantly. However, a significant increase in the proportion of individuals with high salt intake in the group 45-64 years compared with younger groups was observed among men: almost three-quarters of men in the older-age group consume more than15.0 g/day.

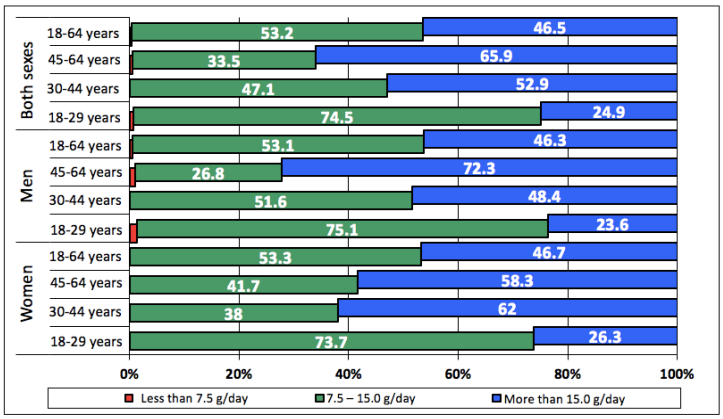

Figure 5. Percentage ration of the population with low, medium and high salt intake.

Determining the mean salt intake target for salt intake monitoring

The basis for calculation is one of global NCD goals as declared by WHO and according to which one of targets by 2025 is "Relative 30% reduction in mean salt intake in the population".

Considering these recommendations and based on the mean value of salt intake in the population at the time of the survey equalling 14.9 g/day, the target of mean salt intake in adult population of Uzbekistan should be set as 10.4 g/day.

Comparison of the survey findings with the target level of salt intake in the population is shown in Figure 6.

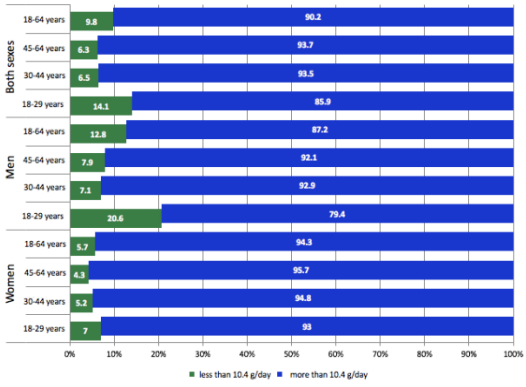

Figure 6. Percentage ratio of the population with salt intake more and less than 10.4 g/day at the time of the survey.

According to the findings, the percentage of men with salt intake below 10.4 g/day was twice as much as the percentage of women: 12.8% versus 5.7%. Mostly young men, one-fifth of whom consume less than 10.4 g/day, contribute to this difference.

CONCLUSION ANDDISCUSSION OF FINDINGS

The survey findings showed that mean salt intake in adult population of Uzbekistan aged 18-64 years in 2015 amounts to 14.9±3,5 g/day. Indicators of salt intake in the population from different regions of the country differ appreciably reaching up to 18.5 g/day for the Autonomous Republic of Karakalpakstan and 18.8 g/day for the Karakalpaks. However, no significant difference in salt intake was detected between urban and rural areas between men and women.

- The survey also showed that 0% of population of Uzbekistan aged 18-64 years follow WHO recommendation to consume less than 5 g salt daily. The level of salt intake was high for 46.5% of the population (more than 15.0 g/daily), moderate for 53.2% (7.5-15.0 g/day) and low for 0.3% (less than 7.5 g/day); three quarters of men of 45-64 age consume more than 15.0 g/day.
- Mean salt intake in adult population aged 18-64 years amounts to 14.9±3,5g/day;
- 46.5% of the population were observed to have a high salt intake level (more than 15.0 g/day), 53.2% - medium (7.5-15.0 g/day) and 0.3% - low (less than 7.5 g/day); three-quarters of older-aged men consume more than 15.0 g of salt daily;
- No difference in salt intake was identified between the sexes;
- Strict correlation was identified between salt intake and age in both sexes;
- No difference in salt intake was identified between rural and urban population;
- Salt intake indicators vary significantly across different regions reaching up to 18.5 g/day in the Autonomous Republic of Karakalpakstan and 18.8 g/day among the Karakalpaks;
- In the population of Uzbekistan aged 18-64 years, 0% of residents were found to follow WHO recommendation to consume less than 5 g salt daily;

Based on the survey findings, the target level of mean salt intake in adult population of Uzbekistan should be set at 10.4 g/day.

There are a variety of sources of dietary salt intake. Small quantities of sodium in the form of different salts including sodium chloride are ingested with drinking water. This usually comprises less than 1 % of daily sodium norm. The remaining 99% are contain in three crucial sources. Firstly, sodium is found in foods (so-called natural sodium). The second major source of sodium includes processed foods, where sodium, in the form of sodium chloride, is added to cooked food. The third main source of sodium is salt use at home when more salt is added to food – "discretionary salt use"[1].It is worthwhile mentioning another sodium source, which in some cases, can be rather substantial. This is sodium found in different medications, sometimes, in quite large amounts.

Today, excessive salt intake has reached the scale of a global problem associated with increased risk of hypertension and cardiovascular diseases. About 1.65 million deaths resulting from cardiovascular diseases globally are related to excessive sodium intake. The current situation requires immediate interventions at the government level because the worldwide salt intake trends are on the rise, Countries, where salt intake is under strict control, particularly, UK, Finland, and Japan, report a decrease in both salt intake and associated pathologies.

Setting national goals and developing effective campaigns for consumers requires identification of baseline *salt* intake level. In this regard, Uzbekistan has conducted salt intake survey in adult population (18-64 years) and this is so far the only such survey conducted in Central Asia.

Salt intake in the country was studied using a standard method: one-time 24-hour urinary sodium excretion taking into account WHO recommendation. This allowed for comparison of finding with a broad range of studies held in other countries in the recent decades including INTERSALT conducted in 52 populations of 32 counties in the 1980s, INTERMAP conducted in China, Japan, the United Kingdom and the USA in the 1990s as well as survey reviews in 1990-2010 and others.

For the purposes of a country-specific analysis, the survey findings were evaluated taking into account the data obtained as a result of 2014 nationwide study of prevalence of NCD risk factors in Uzbekistan, which is based on the standard WHO STEPS methodologyand includes additional module "Dietary Salt Intake" on knowledge, attitudes and behaviours with respect to dietary saltand information on Diet habits. Also the data of findings from the study "Uzbekistan Health Examination Survey 2002"which explored discretionary salt used in the population aged 15-59 years was given.

Salt Intake in the Population of Uzbekistan

In 2010, global mean salt intake was estimated as 10.1 (9.9–10.2) g/day with variation of mean values across regions from 5.5to 14.0 g/day. The highest salt intake was observed in the Asian Region – 12.2g/day, in the Pacific Region with the highest development level (these mainly include Japan and South Korea) – 12.7g/day, in Central Asia – 14.0 g/day and in Eastern Europe – more 10.7 g/day. These are followed by Central European countries and Middle East/North Africa - 9.9–10.7 g/day.

According to the findings, mean salt intake in Uzbekistan equals 14.9 g/day, which corresponds to data for Asian countries with high salt intake. Presently, these include China, Shandong Province, where mean salt intake level equals 13.9 g/day (14.4 g/day in men and 13.4 g/day in women). There is also information about high salt intake among students of medical institute in Angola (14.2 ± 5.1 g/day (123 participants, aged 17-43 years)).

Some earlier studies in the Asian region contain data on China in 1985-2000, where residents of Tibet were found to have the highest salt intake – 14.8 g/day (sodium 253.7 mmol/day), Kazakhs – 12.5 g/day (sodium 231.7 mmol/day), in Japan in 1993-1994: salt intake among men and women – 13.5 g/day (sodium 231 mmol/day) and 11.1 g/day (sodium 189 mmol/day), accordingly. Data for the Iranian city of Rasht in 1998 indicate to mean salt intake of 12.3 g/day (210 mmol/day).

Thus, mean salt intake amounting to 14.9 g/day ranks Uzbekistan as the country with the highest salt intake globally.

Salt Intake among Women and Men

The vast majority of studies refer to the fact that salt intake among men is higher than among women because they consume more food. Mean difference in salt intake amounts to 10% ranging from 8.9% in South Asia to 10.7% in Western Europe, where salt intake is one of lowest in the world. In other words,

the following tendency is observed: the higher the mean salt intake, the smaller is the difference between the sexes.

In Uzbekistan, no differences in salt intake were identified between men and women – 14.9±3.5 g/day,, but a direct dependence on age was detected. With equal mean salt intake values among men and women, young men stand out in all age groups, 20.6% of whom consume less than 10.4 g of salt per day and 1.3% - less than 7.5 g/day. At the same time, men of older age were found to have high salt intake (more than 15.0 g/day). The development of interventions to reduce salt intake should certainly aim at women

The explanation for such a high level of salt intake among women in Uzbekistan, i.e., identification of an additional source of sodium, could be found in the nationwide survey of NCD risk factors, 2014.A supplementary module "Dietary Salt Intake" identified a statistically insignificant, but still a higher mean percentage of women than men with respect to all surveyed parameters among individuals, who:

- always or frequently add salt to meals before eating: 16.3% versus 14.9%;
- always or frequently add salt, salty seasoning, salty sauces or salty gravy in the process cooking in household settings: 37.8% versus 34.5%;
- always or frequently consume foods high in salt content (more often than 3 times a week): 33.6% versus 29.5%;
- suppose that salt content in their diets contain high or excessively high amounts of salt: 15.8% versus 14.2%.
- Thus, the identified fact that more women than men prefer foods high in salt content and adding salt to cooked food at the table may account for equal salt intake among men and women in the country.

At the same time, these data do not correlate with a generally recognised fact that high salt intake leads to the development hypertension. This is to say that with equal salt intake levels among men and women, it could be expected that there would be an equal percentage of men and women with elevated blood pressure.However, risk factor prevalence survey 2014 indicate to prevalence of elevated BP in men: statistically significant mean SBP and DBP in men aged 18-64 years is higher than among women, althoughthis difference becomes vague in an older age group. The survey showed that more men than women were 1) in the NCD risk group associated with elevated BP (33.9% versus 27.5%); 2) among individuals who currently do not take anti-hypertension therapy, but have elevated BP including those with SBP ≥160 mmHg and/or DBP ≥100 mmHg (27.8% versus 15.7%); and 3) the group with elevated blood pressure who are not on treatment for hypertension (63.8% versus 49%).

It should be noted, however, that according to the survey findings given equal mean salt intake among men and women, there is an outstanding high percentage of men aged 45-64 years who consume salt in an amount of more than 15.0 g/day. Besides, it is important to note that men tend to have low adherence to treatment and less frequent return visits to a health facility as compared to women, especially, considering the fact that there are considerably more women than men who take aspirin for prevention of cardiovascular diseases (7.7% versus 3.3%), another potential source of salt intake.

Salt Intake in Urban and Rural Population

In most studies of salt intake in urban and rural population prevails in rural population as a socio-demographic indicator.As for Uzbekistan, no differences were found between urban and rural population, which was also intrinsic to the prevailing majority of studied in the nationwide survey of NCD risk factor prevalence in 2014. The main reason for such "homogeneity" was, most likely, "artificial" urbanisation of the population. Moreover, there is also a need to consider an overall trend of "internal migration" and a flow of rural population into cities.

Salt Intake across Regions of Uzbekistan

Mean salt intake across regions of Uzbekistan is characterized by significant differences in indicators. Geographically, Uzbekistan lies in the heart of Central Asia, where 80% of the area is covered with deserts and degraded lands.

Degradation of ecosystems resulting from human activities, especially, considerable mineralisation of surface and ground waters and soil salinity as a consequence of unsustainable irrigated land use; cutting down of trees and bushes by local population to be used as firewood and construction materials both in the mountains and on the plans has lead to secondary salinization of more than 52% of irrigated lands. The reflection of this problem was that salt intake became rather high in environmentally unfavourable regions, especially in Karakalpakstan, which was most impacted by the catastrophe in the Near Aral Sea region.In this regard, salt intake reduction in these regions is not only related to healthy diets, but is also an environmental issue, which requires government control to be resolved.

What do you think are successful strategies to reduce salt intake in Uzbekistan, so that you can reach the target of WHO? Should the food industry reduce sodium levels in processed foods, focus on the discretionary salt use? What would you recommend?

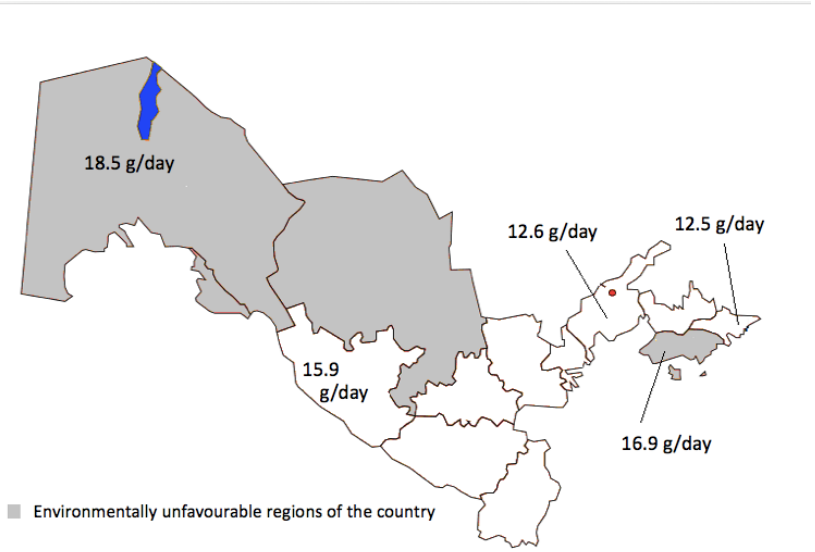

Figure 6. Indicators of mean salt intake in 5 administrative units of Uzbekistan, in g/day.

Conclusion:

Baseline of salt intake levels in the adult population was surveyed for the first time in the Republic of Uzbekistan and the Central Asian region. This survey relied on the standard method of 24-hour urinary sodium excretion measurement. This survey will allow for further monitoring of salt intake trends and of effectiveness of activities aimed at reducing dietary salt intake in the population.

The survey covered 598 residents from 5 regions of the country, who were divided by sex into 3 age groups (18-29 years, 30-44 years, 45-64 years) as well as according to residence in urban or rural settings. According to the survey findings:

- Mean salt intake in adults aged 18-64 yearsamounts to 14.9±3,5g/day;
- The level of salt intake was high for 46.5% of the population (more than 15.0 g/day), moderate for 53.2% (7.5-15.0 g/day) andlow for 0.3% (less than 7.5 g/day); three-quarters of men of older age (age should be specified) consume more than 15.0g/day;
- No difference in salt intake was identified between the sexes;
- Strict correlation was identified between salt intake and age in both sexes;
- No difference in salt intake was identified between rural and urban population;
- Salt intake indicators vary significantly across different regions reaching up to 18.5 g/dayin the Autonomous Republic of Karakalpakstan and 18.8 g/day among the Karakalpaks;
- In the population of Uzbekistan aged 18-64 years, 0% of residents were found to follow WHO recommendation to consume less than 5 g salt daily;

Based on the findings of this survey, the target mean salt intake in adult population of Uzbekistan should be set at 10.4 g/day by 2025.

Thus, the ascertained baseline salt intake level in the population of Uzbekistan will become the starting point for monitoring this risk factor, the basis for priority setting and effective planning of targeted interventions aimed at reducing salt intake in the country.

Once baseline data are identified, there is a need to decide on the desired frequency of data collection for monitoring sodium intake on the basis of a final goal. Accordingly, a five-year schedule could be sufficient for tracking trends of sodium intake in the population. However, considering the scope of this problem in Uzbekistan as well as pursuant Resolution No. 102 of the Cabinet of Ministers of the Republic of Uzbekistan "On Further Enhancement of Ongoing Measures in the Area of Healthy Nutrition in the Population of the Republic of Uzbekistan" dated 25 April 2015, where key directions of ensuring healthy nutrition in the population of the Republic of Uzbekistan include 'development and implementation of food and public health monitoring programmes on the basis of special surveys of nutrition of individuals', it is planned to conduct the next salt intake survey in 2018. It is also advisable to consider an issue about conducting such surveys among adolescents and children.

Formulas for conversion:

1 mmol sodium = 23 g sodium = 58.47 g sodium chloride;

1 g sodium chloride = 393.4 mg sodium = 17.1 mmol sodium

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