



**COLLEGE OF HEALTH SCIENCE**

**SCHOOL OF PUBLIC HEALTH**

**DIETARY SODIUM AND POTASSIUM INTAKE AMONG ADULT POPULATION  
OF ADDIS ABABA, ETHIOPIA**

**BY: SEMIRA MITIKU (BSc)**

**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, ADDIS  
ABABA UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR  
THE DEGREE OF MASTERS IN PUBLIC HEALTH NUTRITION**

**NOVEMBER, 2018**

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**APPROVED BY THE BOARD OF EXAMINERS**

This thesis, by **Semira Mitiku** is accepted in its present form by the board of examiners as a partial fulfilment for the degree of masters in public health nutrition.

**Dietary Sodium and Potassium Intake among Adult Populations of Addis Ababa, Ethiopia**

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## **List of Abbreviation and Acronyms**

BMI	Body Mass Index
BP	Blood Pressure
CSA	Central Statistics Agency
CVD	Cardiovascular Disease
EAR	Estimated Average Requirement
ETB	Ethiopian Birr
HH	Household
IOM	Institute of Medicine
IQR	Interquartile Range
K	Potassium
Na	Sodium
NaCl	Salt
NCD	Non Communicable Disease
NCI	National Cancer Institute
RDA	Recommended Daily Amount
SD	Standard Deviation
WHO	World Health Organization

## Summary

**Background:** World health organization recommends approximately a one to one ratio of sodium to potassium intake. However, most populations around the world consume high amount of sodium and low amount of potassium leading to high sodium to potassium ratio, which puts the population at risk of hypertension and cardiovascular disease. In Ethiopia, population potassium intake and body sodium to potassium ratio is unknown.

**Objective:** The main aim of this study was to see the pattern of potassium and sodium intake and to evaluate salt related knowledge, attitude and behavior among Addis Ababa adult population.

**Method:** A community based cross-sectional study was conducted among 294 individuals aged 20 years and above residing in Addis Ababa. Socio-demographic data and knowledge, attitude and behaviour regarding dietary salt were collected. Repeated multiple pass 24-hour dietary recall and random urine were collected to estimate sodium and potassium intake. Nutrient content of diet was calculated using software package Nutrisurvey. Usual intake from the diet recall was determined using national cancer institute (NCI) method. Prevalence of inadequate potassium intake and prevalence of excess sodium intake were compared with recommended values using SAS 9.3 and STATA14 software. Cobas 6000(501) analyser was used for urine electrolyte analysis. Estimated 24 hour electrolyte (Na and K) excretion was calculated from sample urine using INTERSALT and Tanaka formula.

**Result:** Two hundred eighty four participants were included in the study. The mean intake of potassium was 1.9(SD=0.4) g/day and 1.9(SD=0.6) g/day from urine and diet evaluation respectively. The mean intake of sodium was 3.3 (SD=0.7) g/day and 3.0 (SD=0.9) g/day from urine and diet evaluation respectively. The prevalence of inadequate potassium intake was 100% from both dietary assessment and urine analysis. The prevalence of excess intake of sodium to potassium ratio was 90.1%, with a mean intake of 2.5(1.4).

**Conclusion and Recommendation:** We conclude that there is a high prevalence of inadequate potassium intake and an excess intake of sodium leading to a high prevalence of excess sodium to potassium ratio. Salt related knowledge, attitude and behaviour found to be

low as many participants were unaware of their high salt intake. Interventions targeting to decrease sodium intake and to increase potassium intake is needed.

# **1. Introduction**

## **1.1 Background of the study**

Sodium and potassium are essential nutrients that are needed for maintenance of total body fluid volume, acid and electrolyte balance, and normal cell function. Urinary excretion is the primary mechanism for maintaining body homeostasis (1-3).

Dietary sodium consumption depends on the cultural context and dietary habits of a population. Sodium can be found in common table salt and in other forms (4). Sodium is found naturally in a variety of foods, such as milk, meat and shellfish. It is often found in high amounts in processed foods such as breads, crackers, processed meats and snack foods. Potassium is commonly found in a variety of unrefined foods, especially fresh fruits and vegetables and beans (5). Thus, a diet high in processed foods and low in fresh fruits and vegetables is often high in sodium and low in potassium (6-9).

World health organization (WHO) recommends a reduction in sodium intake less than 2 gram per day (equivalent to 5 gram salt per day) and an intake of potassium at least 3.5 gram per day in adults to reduce blood pressure and risk of cardiovascular disease, stroke and coronary heart disease (5, 10). Despite this recommendation, sodium intake around the world is well in excess of physiological need. Most adult populations have mean sodium intakes greater than 2.3 g per day. On the opposite, most populations around the world consume less than the recommended levels of potassium (10-12). If an individual consumes sodium and potassium at the levels recommended in the WHO guideline, the ratio of sodium to potassium would be approximately one to one, which is considered beneficial for health (13). However, most populations around the world consume a ratio of sodium to potassium of two to one or more (14).

Findings from the International Cooperative Study on Salt, Other Factors, and Blood Pressure (INTERSALT) and the International Study on Macronutrients and Blood Pressure (INTREMAP) studies indicated a positive association between sodium intake and body sodium to potassium ratio and blood pressure in multi-ethnic populations (15, 16). On the other hand, reduced potassium consumption has been associated with hypertension and

cardiovascular diseases, and appropriate consumption levels could be protective against these conditions (13). The ratio of the two nutrients is an important factor in cardiovascular disease and mortality (17, 18). As sodium consumption rises, increased consumption of potassium may be even more beneficial because, in addition to other benefits, it can mitigate the negative effects of elevated sodium consumption on blood pressure (19).

Two types of knowledge are required for consumers to make informed choices about their intake (20, 21). The first is declarative knowledge, also known as knowledge of “what is” (i.e., awareness of things and processes) or “know that” knowledge (for example, consumers need to know the recommended level of salt intake and the health risks of high salt intakes). The second is procedural knowledge, or “know how” knowledge. Procedural knowledge is about practical skills-how to carry out certain tasks. For example, how to choose a lower salt product by comparing food label information and how to reduce the amount of salt used in the cooking by using herbs and spices (22).

## 1.2 Statement of the Problem

In 2010, the mean level of consumption of sodium worldwide was 3.95 g per day. Overall 99.2% of the adult population in the world had estimated mean levels of sodium intake exceeding the World Health Organization recommendation of 2.0 g per day (23). In sub-Saharan countries, 81% of adult populations consumed more than 2 g sodium/day, with urban populations consumed higher amounts of salt than rural populations (24).

Data from around the world suggest that the population average potassium consumption in many countries is below the current recommendations (5). In average, less than 1.5 gram/day of potassium excretion was reported from prospective cohort study in 17 countries of low and middle income countries (25, 26). Most populations around the world consume a ratio of sodium to potassium higher than one to one ratio. A one to one ratio estimated by combining the WHO recommendation for the two minerals, which is considered beneficial for health (14).

High intake of sodium and low intake of potassium appears to be associated with high blood pressure and cardiovascular disease (27-29). Cardiovascular diseases (CVD) are the number one cause of death globally. An estimated 17.7 million people dies from CVD in 2015, representing 31% of all global deaths. Out of 17 million premature deaths (<70 years) due to noncommunicable diseases in 2015, 82% are in low and middle income countries, and 37% are caused by CVDs (30). Globally, 1.65 million annual deaths (nearly 1 of every 10 deaths) from cardiovascular causes were attributed to sodium intake above the reference level (23).

In 2011, WHO estimated that 34% of Ethiopian population is dying from non-communicable diseases, with a national cardiovascular disease prevalence of 15% (31). In 2013, CVD was the leading cause of death among NCDs in Ethiopia, accounting for 16.2% of all deaths (32). In a study with randomly-sampled adult deaths in the capital city Addis Ababa in 2014, 24% of deaths were attributed to cardiovascular diseases (33).

Hypertension is one of major causes of cardiovascular events, both in developed and developing countries. In 2008, the overall prevalence of raised blood pressure in adults aged  $\geq 25$  years was around 40% worldwide(34). WHO estimated that around 62 % of CVDs and 49 % of ischemic heart diseases are attributable to high blood pressure (35). The number of

people with uncontrolled hypertension increased from 600 million in 1980 to nearly 1 billion in 2008 because of population growth and aging (23). The number of adults with hypertension in 2025 is predicted to increase by about 60 % to a total of 1.56 billion (36),

African region has the highest prevalence rate of hypertension, 46 % of adults aged 25 and above. It has been suggested that the prevalence of CVD and hypertension are increasing rapidly in sub-Saharan Africa (37). The predicted prevalence for 2025 is also expected to have a disproportionate prevalence in developing countries including sub-Saharan Africa. In contrast with other CVD risks such as high BMI, the burden of hypertension is greater in lower income countries than higher income settings (38).

A systematic meta-analysis done in 2014 showed a 19.6% pooled prevalence of hypertension among Ethiopian population. Subgroup analyses showed that the prevalence of hypertension in the urban population was 23.5% (39). A most recent study found a hypertension prevalence of 15.6% among participants who were unaware of their raised blood pressure status. In Addis Ababa a 22.6% prevalence was reported (40).

In a review of 22 articles, it is found that at least 80% of the participants were aware of the relationships between high salt intake and hypertension. However, awareness of other cardiovascular diseases such as stroke, heart diseases or heart attacks was lower. Despite the differences in education levels and the countries where the studies were conducted, the majority (at least 70%) of the participants in 13 studies were unable to correctly recall or identify the recommended amount of salt intake. In four of these studies, fewer than 10% were able to identify the recommended amount of salt intake (22). None of the participants were aware of the recommended daily salt intake limit in a study done South Africa (41). In Angola, China and Lebanon only 6.5%, 27% and 36.2% of the participants recognised their salt consumption to be excessive respectively (42-44).

The World Health Organization's (WHO) global action plan for the prevention and control of noncommunicable diseases identifies a 25% reduction in premature mortality from cardiovascular disease, a 25% reduction in raised blood pressure, and a 30% reduction in mean population salt intake as targets for 2025 using the 2010 baseline data for evaluating progress on salt reduction (45). In Ethiopia studies are limited on quantifying potassium intake and its ratio with sodium, which plays a great role in achieving these goals.

### **1.3 Significance of the Study**

The study will provide a baseline data on potassium intake and body sodium to potassium ratio, which will be used for future evidence based plans and interventions to prevent CVDs. The result will help us to know Addis Ababa adult population sodium and potassium intake status compared with the WHO recommendation and to proceed accordingly. The overall finding will also pave the way for further research.

## 2. Literature Review

### 2.1 Sodium Intake

Physiological need of the body is 1g of sodium per day, but populations around the world are consuming much more sodium than physiologically necessary (14). In many cases, they are consuming much more than the current World Health Organization (WHO) recommendation on sodium consumption for adults, which is 2 g sodium/day (equivalent to 5 g salt/day) (46).

A study in Australia and Belgium, using 24hour dietary recall found a salt intake of 6.8g/day and 6.75g/day respectively. Only 23.3 % of the Belgian population complied with the WHO recommendation of taking less than 5 grams of salt a day. Men ingested substantially more sodium than women. Since the difficulty of quantifying discretionary salt intake and demerits of dietary recall, it is likely to get low figures from dietary recall (47, 48).

In Germany, salt intake estimated from spot urine showed that more than 75 % of men and about 70 % of women exceeded the current recommendation of a maximum salt intake with a mean intake of 10.0 g/day for men and 8.4 g/day for women (49). Average estimated 24-h urinary excretion of sodium chloride from spot urine was 17.0 g/day in Bangladesh. There was no statistically significant difference of salt intake between urban and rural areas and between genders (50).

A study in Wales, using 24h urine collection found a mean daily salt intake of 8.1 gram, higher intake is recorded from men in the age group of 19-24 years old (51). In China the mean salt intake was 13.9 g/day, intake by rural residents was more than that of urban residents (14.00 vs. 13.68 g;  $p < 0.01$ ). Salt intake in men was higher than in women (14.40 vs. 13.37 g;  $p < 0.01$ ) and there were no significant difference in the salt intake between age groups (52). In India salt intake was 9.27 (0.4) g/day, which is higher in men and rural residents. (53).

In South African population, 82% of were taking more than the recommended value for sodium intake , among African descent in the country reported a mean dietary salt intake of 10.2 (3.05) g/day (54, 55). A most recent study in South Africa found a mean intake of salt 8.2(5.2) g/day and 7.6(1.8) g/day using 24 hour urine and spot urine respectively (56). In

Mozambique the mean (standard deviation) urinary sodium excretion was 4.2 (1.8) g/day, and 92% of the participants were above the World Health Organization (WHO) recommendations (57). The proportion of participants exceeding the limit of 5 g/day of salt in Angola was 96.7%. The average salt intake was  $14.2 \pm 5.1$  g/day using 24 hour urine analysis, without a gender difference (43).

A study from Benin using 24 hour urine found a mean salt intake of 11.0(5.3) gram per day. They advised participants to abstain from going to work on the day of urine collection to facilitate their 24-h urine collection and to spend the day at health care centres. Although it is mentioned that, most participants brought food from home for their meals, this might have altered the participants' dietary habits. It is not easy to anticipate the direction and the magnitude of systematic biases that can have altered salt and potassium intake estimates (58).

A systematic review of articles in sub-Saharan countries among 67 adult populations showed that 81 % consumed more than 2 g sodium/day. The highest sodium intake was recorded in a Nigerian population over 10 g of sodium per day. The meta-regression found that urban populations consumed higher amounts of salt than rural populations. There is no difference noticed between sex in sodium intake (24). In contrast, two global systematic reviews found men consumed more than women (4, 59).

In Ethiopia, a study was done in 2005 with an aim to estimate salt consumption in relation to goitre among children between the ages of 6 to 12 years old found a mean consumption of salt  $8.4 \pm 5.9$  g per person per day. In Addis Ababa, the intake was within the range of 1.9 to 17.9g per person per day (60). In another study by Ethiopian Public Health Institute showed a mean salt intake of 8.3 g/day (95% CI 8.2-8.4) using spot urine. Salt intake was higher among men (9.0 grams daily, 95% CI 8.9-9.1) than in female. There was no significant difference in the average salt intake among urban and rural residents. Overall, 96.2% of the study participants (97.5% of men and 95.3% of the women) had more salt intake than the WHO recommendations (5g/day), in Addis Ababa the prevalence was 97.5% (61).

## 2.2 Potassium Intake

Data around the world suggest that the population average potassium consumption in many countries is below the least recommended intake (3.5g/day) (13). Women consistently have lower levels of potassium intake than men, but both groups commonly consume a level that is below current recommendations (5).

In New Zealand, the mean 24 hour potassium excretion was 2.7 g/day. Potassium excretion was positively associated with age and sodium excretion, and male sex. The study didn't exclude a known hypertensive patients. Even though, they didn't mention the type of medication they took some hypertensive drugs alter potassium excretion (62). Relatively a high potassium intake was reported from Greece, 33.4% of participants had intakes equal or higher than the WHO recommendation, with mean and standard deviation of 3.3 and 1.3g per day respectively. Men had significantly higher potassium intake compared to women ( $p = 0.001$ ) with a daily potassium intake of 3.6g in men versus 3.1g in women. Since they used opportunistic sampling frame the validity of the study is questionable (63).

In China, 1.8 g/day and 1.6 g/day intake of potassium was reported in 2009 and in 2017 respectively. Potassium intake was lower in women ( $P, 0.0001$ ), in the low-income group ( $P, 0.0001$ ), and in the lower-education group ( $P, 0.0100$ ) (64, 65). In South Korea, mean potassium intake estimated from 24 hour dietary recall was 2.9 g/capita/d ( $p < 0.001$ ) in 2009. The highest intake is reported from male sex and the age group of 40-59 years old which is 3.2 gram per day (66). In another Asian country Japan, only 7.5% of non-randomly selected subjects met the recommended values of the WHO, the mean potassium excretion values over 24 h were 2 gram/ day in men, and 1.8 gram/day in women. The mean potassium excretion was higher in older subjects, in those with a higher BMI, and in female subjects with a higher physical activity level (67). In Iran, urban population mean potassium consumption was 1.9(0.9) gram per day for men and 1.6(1.1) gram per day for women. Intake was high in the age group of 35-44 years old and lowest in the age group of 65-75 years old (68).

In urban area of South Africa, all subjects had 24-hour urinary potassium excretion rates lower than the recommendation for K<sup>+</sup> intake of 4.7g/day with mean excretion of 1.3 ± 0.7g/day (55). In Mozambique the mean (standard deviation) urinary potassium excretion was 1.9 (0.8) g/day, and 96% of the participants were below the WHO potassium intake recommendation (57). In Angola medical students, there was no statistically significant difference between men and women for urinary potassium concentration with average intake of 1.32±0.5g/d using 24 hour urine analysis (43). In Benin 93.5% of study participants potassium intake is less than the WHO the least recommendation of 3.5 gram per day with mean intake of 1.8 0.9 g/24 h, High potassium intake was associated with male sex, administrative occupation, BMI 25 kg/m<sup>2</sup>, and large waist circumference (58).

### **2.3 Sodium to Potassium Ratio (Na:K)**

If an individual consumes sodium and potassium at the levels recommended in the WHO guideline, the ratio of sodium to potassium would be approximately one to one, which is considered beneficial for health (13). However, most populations around the world consume a ratio of sodium to potassium of two to one or more (14).

In Greek, the urinary sodium-to-potassium ratio was 2.82 (1.07). However, the dietary assessment showed a lower ratio 1.34 (0.51). There was no statistically significant difference in dietary sodium-to-potassium ratio between genders (63). Mean sodium to potassium ratio was 1.32 (1.39 for men and 1.26 for women) in New Zealand (62).

The average sodium-to-potassium ratio was 2.8 in 2009 and 6.7 in 2017 in China. The ratio was higher in the low-income group, in the lower education group, and in the group aged >50 years old. On average, 6.1% of subjects had sodium-to-potassium ratio < 1.0, whereas 62.5% had an Na/K ratio ≥2.0 (64, 65). The mean sodium to potassium ratio in South Korea was 1:71. Population percentage of sodium to potassium ratio greater than 2 was 27% (66). In Japan, mean of sodium to potassium ratio was 2.47 and 2.27 in men and women respectively, younger age was significantly associated with a higher Na:K ratio (67). A study in Iran, only one participant had the ideal sodium-to-potassium ratio of less than one. Na/K ratios greater than one and less than 2 were observed in 11.3 % (n=24), and ratio equal to or greater than 2 was observed in 82.3% of participants. The average Na/K ratio was 3.69±1.58 gram per day (68).

The mean (standard deviation) sodium to potassium molar ratio was 4.2 (2.4) in Mozambique (57). In another African country Angola compared to women, men had significantly higher mean values for sodium-to-potassium ratio with mean sodium to potassium ratio of 3 with standard deviation of 1.2 and in Benin a study done between November 2012 and September 2013 found mean sodium to potassium ratio was 3.9 with standard deviation of 2 (43, 58).

## **2.4 Main Dietary Source of Sodium and Potassium**

Sodium and chloride are the chemical components of common table salt; however, sodium can be found in other forms, and the primary contributors to dietary sodium consumption depend on the cultural context and dietary habits of a population (4). Sodium is found naturally in a variety of foods, such as milk, meat and shellfish (10). It is often found in high amounts in processed foods such as breads, crackers, processed meats and snack foods. High amounts of sodium are also found in many condiments (e.g. soy and fish sauces). Thus, a diet high in processed foods and low in fresh fruits and vegetables is often high in sodium and low in potassium (6-9).

In European and Northern American diets, an estimated 75% of sodium intake comes from processed or restaurant-prepared foods, 10–12% occurs naturally in foods, and a similar proportion was from discretionary use at home or at the table (69, 70). Cheeses, cooked pork meats, pastries and sugary products, breakfast cereals, breads, soups and fast foods showed the highest sodium/potassium intake ratios. Whereas fruits, hot beverages, meats, vegetables and dairy products displayed the lowest ratios (71).

In China and Japan, the greatest proportion of dietary sodium comes from salt added during cooking and from sauce. In the Chinese Health and Nutrition Survey, 72% of sodium was from salt added during cooking and 8% from soy sauce (72). In Japan main sources were soy sauce (20%), salted vegetables and fruits (9.8%), miso soup (9.7%), fresh and salted fish (9.5%) and salt added in restaurants, fast food and at home (9.5%) (73).

In South Africa, on average 55% of salt intake is from processed food and 40% is from salt added in the household, with considerable variation between the population groups. The main food sources of salt include bread, processed meat and meat sausages, seasoning such as soup powder and stock cubes, hard margarine, breakfast cereal and savoury snacks. Most people

add salt to food during preparation, and approximately a third sprinkle salt on their food during the meal, purely from habit (74).

According to the national food consumption survey in Ethiopia, the highest proportion of foods consumed by women and men in Addis Ababa come from the cereals/grains group which accounts 63.9% for women and 57.1% for men (75). A study done in Belgium reported that cereals contribute 25.8% and 28.4% of the total salt consumed in women and men respectively (48). In Addis Ababa, the contribution of fruits and vegetables to the total diet is 10.5% and 6.5% for women and men respectively. According to another most recent study, the prevalence of fruit and/or vegetable consumption in Ethiopia was 1.5%. In urban areas of the country, the prevalence was 0.9%, more female than male ate fruit and vegetables (75, 76). Potassium is commonly found in a variety of unrefined foods, especially fruits and vegetables. Food processing reduces the amount of potassium in many food products, and a diet high in processed foods and low in fresh fruits and vegetables is often lacking in potassium with increased amount of sodium (9).

## **2.5 Salt and Potassium Intake and Cardiovascular Disease**

Evidence from randomized control trials showed blood pressure fell, on average, by 5/3 mmHg for reducing salt intake from 9.5g/day to 5.1g/day in hypertensive patients and 2/1 mmHg in normotensives for reducing salt intake from 9.1g/day to 4.8g/day. The dose response analysis showed a reduction of 100 mmol/day in salt intake predicted a fall in blood pressure of 7.11/3.88 mmHg (P 0.001 for both systolic and diastolic) among hypertensive and 3.57/1.66 mmHg (P 0.001 for systolic and P 0.05 for diastolic) among normotensives (77). When sodium intake was <2g/day versus  $\geq 2$  g/day, systolic blood pressure was reduced by 3.47 mmHg (0.76 to 6.18) and diastolic blood pressure by 1.81 mm Hg (0.54 to 3.08) (78).

Most published studies confirmed a blood pressure reducing effect by potassium intake either by consumption of more fruits and vegetables, salt-substitutes and enrichment, or supplementation; and these studies suggests that it also plays a cardio protective role. The BP-lowering benefit has been shown in both normotensive and hypertensive individuals (79). Increased potassium intake reduced systolic blood pressure by 3.49 (95% confidence interval 1.82 to 5.15) mm Hg and diastolic blood pressure by 1.96 (0.86 to 3.06) mm Hg in adults, an effect seen in people with hypertension (80).

The results from INTERSALT study showed a negative association between potassium and diastolic pressure, which was significant in the analysis adjusted for all confounders. Sodium to potassium ratio to systolic pressure was positive and highly significant. Though the relation of the sodium to potassium ratio to diastolic pressure was less strong, the pooled regression coefficients adjusted for age, sex, body mass index, and alcohol consumption were positive and significant (15).

The sodium-to-potassium ratio appears to be more strongly associated with blood pressure outcomes than either sodium or potassium alone in hypertensive adult populations (81). The sodium to potassium excretion ratio demonstrated a statistically significant linear relationship to risk of CVD, with an RR of 1.24 (95% CI: 1.05-1.46;  $P=.01$ ) (29). Additionally, there is evidence from randomized controlled trials (RCTs) that a combination of increased potassium and decreased sodium intake can be effective in reducing blood pressure, cardiovascular mortality and medical expenses (27, 28).

## **2.6 Knowledge, Attitudes and Behaviour toward Dietary Salt**

In Australian study the majority of participants (90%) knew that eating too much salt could damage their health. Most were aware of high blood pressure (83%) and heart disease/heart attack (77%). Approximately two thirds knew the relationship between salt intake and stroke and kidney disease, however far fewer were aware of links with stomach cancer. Three quarters (75%) knew that most salt in the Australian diet comes from processed foods. Only 28% could correctly identify the recommended maximum amount of salt to eat per day and less than a third (29%) of participants believed their own individual salt intake would exceed dietary guidelines. Forty per cent of all participants reported that they were trying to cut down on the amount of salt they consume. The most commonly reported behaviours by half of the sample to lower salt intake includes using spices/herbs instead of salt when cooking, avoiding eating from fast food outlets and avoiding eating packaged foods. Fewer participants reported that they purchased salt reduced foods or used the sodium information on food labels. The reported use of cooking salt was higher than table salt (82).

Almost 90% of the participants in sentinel countries of the Americas agreed that eating a diet high in salt can cause serious health issues. But only 13% of participants believed they personally consumed too much salt. More than 30% of participants believed that limiting

their intake of salt was very important while 44% believed it was somewhat important. Only 26% of participants reported knowing the existence of a recommended maximum value of salt intake and only 7% of participants were able to correctly identify the value. (83).

In Indian study, the majority of participants (70%) identified the maximum salt consumption recommendation as <5 g/day and 90% identified that a diet high in salt can cause serious health problems. About half (52%) of the participants reported that lowering salt in their diets was important but 78% of participants reported “always” adding salt to cooking. Of those who reported taking action to lower their salt intake, participants did so by using spices other than salt (98%), avoiding eating out (61%) and avoiding eating processed foods (52%) (53).

About half of the population of China were aware of the relationship of sodium with hypertension. However, less than one third of subjects knew the Chinese Nutrition Guideline recommendation of daily salt intake of less than 6 grams. Most participants (80%) indicated they favoured low sodium diets. Approximately one third of participants (urban: 27%; rural: 28%) reported that they consumed excess amounts of salt. Over four fifth of subjects (urban: 85%; rural: 86%) indicated their intention to reduce sodium intake. Most subjects (urban: 96%, rural: 96%) reported using less salt when cooking (42).

In another Asian country Lebanon, majority of study subjects (77.6%) reported that high dietary salt might worsen health status. However, less than one fourth of the study subjects (22.6%) were able to identify processed foods as the main source of salt in the Lebanese diet. Less than third of the participants (32.4%) were aware of the 6 g maximum daily limit of salt intake. Yet, 63.8% believed their own daily salt intake to be below or equal to dietary recommendations. Only a third of the interviewed shoppers reported trying to buy low salt foods (38.6%) (44).

Only 14% the participants perceived their personal salt intake to be a little. No participants were aware of the recommended daily salt intake limit in a study done South Africa (41). The majority of participants in the Angola study stated that salt was always added in preparing food at home, and rarely or sometimes added to food at the table. It was also observed that almost all participants knew that a high-salt diet could cause health problems, and 91.1% of them recognised the importance of reduced salt in the diet. However, less than half of the participants (45.5%) were aware of their high dietary sodium intake, and most reported a

preventative measure was the avoidance of adding salt at the table. When participants were asked their perception of the amount of salt they were consuming, the majority of them classified their own level of salt consumption as 'just right' or 'too little'. Only 6.5% of participants recognised they consumed salt excessively (43).

In Ethiopia in 2015 a study found total of 64.5% of urban respondents mentioned they added salt or salty sauce to their food before eating or as they are eating always or often. Three fourth (75.0%) the participants respond they add salt always or often when cooking or preparing food at home. Only 10.7% of all respondents believed that they consume too much or far too much salt. The proportion of respondents reported they consume too little or far too little salt were about 13%. More than six in ten (61.2%) of survey participants considered that lowering salt in diet is very important while 31.5% thought this was somewhat important; and 7.3% thought it was not at all important. Urban population 85.8% was more aware of that serious health problems could be cause due to too much consumption of salt. The findings showed that 12.6% of the study population undertook actions to limit their consumption of processed foods high in salt. A total of 9.2% of respondents of both sexes reported using salty products (such as, *mitmita*) other than salt when cooking while 9.4% of the respondents avoid eating foods prepared outside of home (84).

### **3. Objectives**

#### **3.1 General Objective**

The general objective of this study was to evaluate sodium and potassium intake and salt related knowledge, attitude and behavior among adult populations of Addis Ababa, Ethiopia, 2018.

#### **3.2 Specific objective**

- To estimate mean sodium and potassium intake of adult population in Addis Ababa.
- To determine prevalence of inadequate potassium and excess sodium intake among Addis Ababa adult population.
- To determine excess prevalence of sodium & potassium ratio (Na:K) among Addis Ababa adult population.
- To evaluate salt related knowledge, attitude and behavior of adult population in Addis Ababa.

## **4. Methods and materials**

### **4.1 Study area and study period**

The study was conducted from April 17 to March 7, 2018 in Addis Ababa, the capital city and also the largest city in Ethiopia which covers 530.14 square kilometres. Addis Ababa is found with an altitude of 2300 meters and is located at 901'48"N with subtropical highland climate. The city has three levels of administration: city government, 10 sub cities and 116 wereda administrations. Based on the 2007 national Census conducted by the Central Statistical Agency of Ethiopia (CSA), Addis Ababa has a total projected population size of 3,243,514 in 2016, 54% are females. All of the population is urban inhabitants (85).

According to the national food consumption survey the highest proportion of foods consumed by women and men in Addis Ababa come from the cereals/grains group. These food groups accounts 63.9% for women and 57.1 % for men followed by legumes and nut and non-vitamin A rich fruits and vegetables (75). National salt coverage was 85% and 26% of the total households were getting adequately iodized salt (86).

### **4.2 Study Design**

A community based cross-sectional study was conducted among Addis Ababa adult population.

### **4.3 Source Population**

The source population for this study was all adult population of Addis Ababa whose age is above 19 years old.

### **4.4 Study Population**

The study population for this study was adult population of Addis Ababa whose age is above 19 years old and resident in the selected ketenas (the lowest administrative body in Addis Ababa, Ethiopia).

We excluded the following parts of population from the study

- Medically diagnosed hypertension and diabetes mellitus patients
- Women who are on their Pregnancy and menstruation period

#### 4.5 Sample Size

The sample size is calculated using single population mean for the first specific objective (87). Single population proportion formula used for the second and third specific objectives by Epi Info window version 7 statistical software. The largest sample size was taken, the sample size calculation is based on the following assumptions; mean and standard deviation for potassium intake is 1.46 g/person/day and 0.8 g/person/day respectively (58), desired degree of precision will be 0.12 g/person/day and 95% of confidence interval. Using 1.5 design effect and a contingency of 10% for non-respondent the final sample size was **294**. (Table 1)

Table 1: Sample size calculation

		Formula	Design effect	10% non-response rate	Total
Mean potassium intake	s=0.8 g/person/day	$n = s^2 / e^2$	178*1.5	267*10%	<b>294</b>
Mean salt consumption	s=5.3 g/person/day	$n = s^2 / e^2$	176*1.5	264*10%	290
Prevalence of potassium intake below 3.5 g/day	P=93.5%	$n = z^2 pq / d^2$	93*1.5	140*10%	154
Prevalence of sodium intake above 2 g/day	P=97.5%	$n = z^2 pq / d^2$	37*1.5	56*10%	62
Sodium to potassium ratio above 1:1 ratio	P=93.9%	$n = z^2 pq / d^2$	88*1.5	132*10%	145

Where;

$n$ = the desired sample size

$s$ = standard deviation value for salt, 5.3 g/person/day (58).

= standard deviation value for potassium, 0.8 g/person/day (58).

$p$ = Prevalence of salt intake above the recommendation 97.5% (61).

= prevalence of potassium intake below the recommendation 93.5% (58).

=prevalence of sodium to potassium ratio above the recommendation 93.9% (64).

$Z$ = is the standard normal score set at 1.96 (95% confidence interval)

$d$ = is the margin of error (5%)

$e$ = standard error

#### **4.6 Sampling Procedure**

Figure 1 shows the sampling procedure for this study. A multi-stage stratified sampling technique was applied. The ten administrative sub-cities were stratified into three groups (least, medium and most developed) based on socioeconomic indicators from Ethiopian household consumption-expenditure survey 2016. The total sample size was distributed to the three strata proportional to their household size. One sub-city was selected from each stratum randomly. Then respective wereda and ketena were selected randomly from the selected sub-cities. Households were selected by simple random sampling using list of households from health extension workers. A household with more than one eligible person was represented with randomly selected one participant. When the selected individual had one of the exclusion criteria, he/she replaced by another eligible person from the same household or the next household. We arranged another visit when the selected person is not available in the first visit.

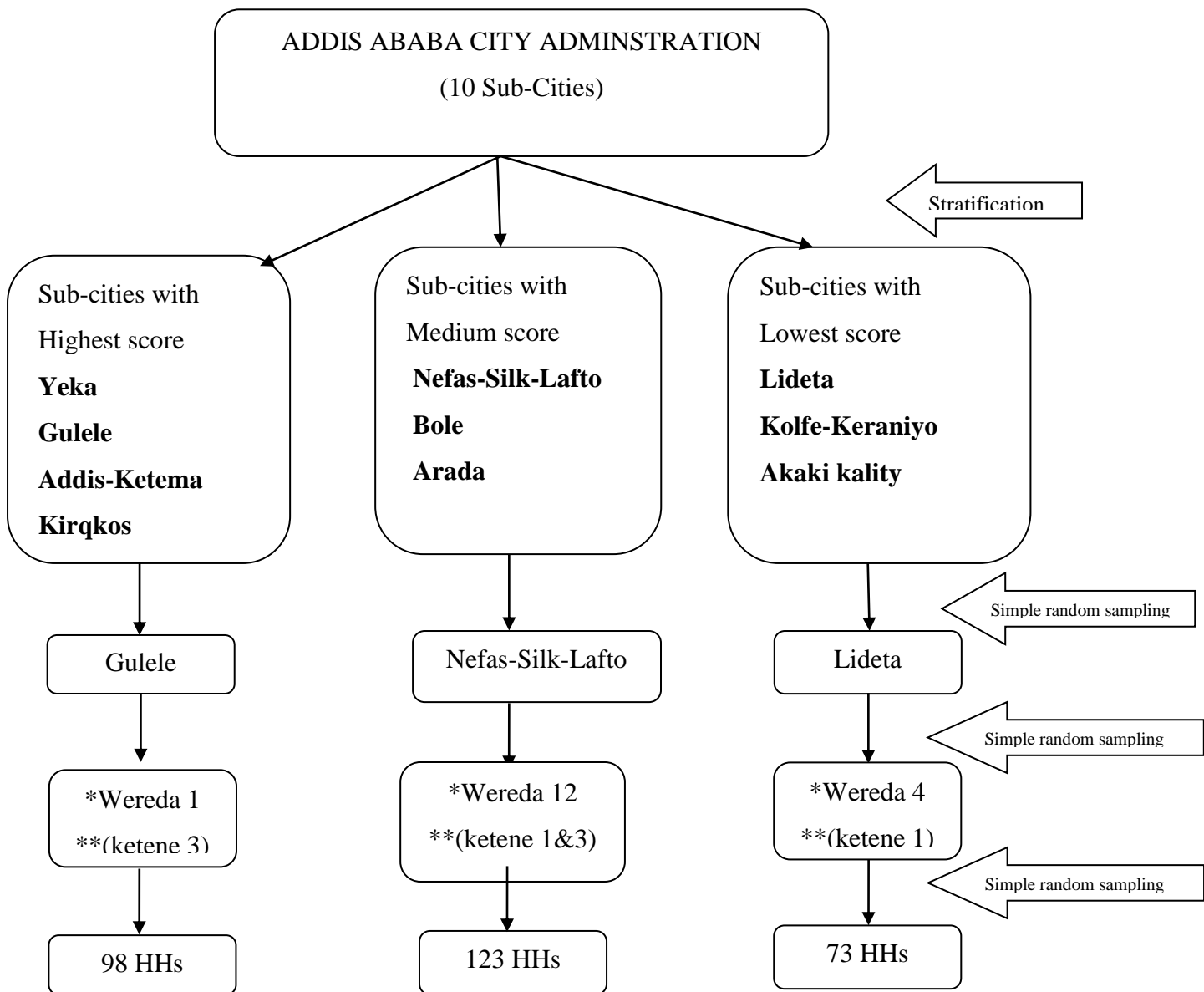


Figure 1: Diagrammatic representation of sampling procedures and sample size distributions

\* The second administrative body of Addis Ababa, Ethiopia

\*\* The lowest administrative body of Addis Ababa, Ethiopia

## **4.7 Data Collection Tool and Procedure**

### **4.7.1 Data Collection Tool**

The socio demographic and economic status of the study participants were assessed using questionnaire adopted from Ethiopian demographic and health survey. A questionnaire developed by WHO was used to assess knowledge attitude and behaviour related to dietary salt.

An interactive, multiple-pass 24hr dietary recall questionnaire adapted and validated for use in developing countries by Rosalind S. Gibson, Elaine L. Ferguson (87) was used to collect data on dietary intake. It is translated in to the local language (Amharic). This tool is a rapid, non-invasive dietary tool, with a low respondent burden and the ability to quantify daily intakes of nutrients.

Random urine sample were taken to estimate sodium and potassium intake. Height and weight measurements were also taken, which we used to estimate 24 hour electrolyte excretion from random urine for each individual.

### **4.7.2 Data Collectors**

Fourteen female nurses as data collector and two supervisors were selected. Four days training was given including briefing about the study, sampling method, questionnaire, urine sample collection and ethical issues. Small group discussion and demonstration were given on how to measure height, weight and how to use the food weighing scale.

### **4.7.3 Data Collection Procedure**

Interviewer-administered face to face data collection method was employed to collect data from each participant. The aim of the study was first explained to the participant and informed consent was obtained prior to data collection.

#### **4.7.4 Measurements of Variables**

##### **Socio-demographic characteristics**

Participant's gender, age, educational status, marital status, occupation, religion, family size and income were asked (Annex 5).

##### **Knowledge, attitude and behaviour about dietary salt**

Knowledge about dietary salt intake was evaluated using questions adopted from WHO and literatures. The questions include knowledge about daily maximum intake of salt, source of salt, relation of high salt intake with health problems (Annex 5).

Attitude was evaluated using questions (perception of own salt consumption and perceived importance of lowering salt intake) adopted from WHO (Annex 5).

Salt related behaviour was evaluated using questions adopted from WHO. Questions included behaviour of adding salt and taking actions to lower salt intake (Annex 5).

##### **24 hour dietary recall**

An interactive multiple-pass technique was employed (Annex 5). It includes,

First pass- quick list of all foods, drinks, snacks consumed from morning of yesterday until morning of the data collection day was asked.

Second pass- detailed and more specific descriptions of all the foods and drinks consumed, including cooking method, salt added and brand names (where possible) were obtained. The data collector also asked if the respondent has remembered any additional items that were consumed but which were forgotten in the first pass.

Third pass- Estimating portion sizes- In order to accurately estimate the portion size of foods and drinks consumed food weighing scale and pictures of fruits and vegetables and calibrated locally available labelled cup, bowl, spoon, serving spoons was used. Each participant was asked to put the amount of food that is equivalent to the actually eaten if actual food is available in the house. Dietary intake was weighted at the household of the respondent and

for shared foods the respondents were asked to estimate the portion they ate by using the equipment. Salt added during eating was asked and estimated using spoon and weighing scale. For purchased foods, the price, brand name, name of food, and weight or size on the label was recorded together with the number of items consumed. The respondents were also asked to estimate left over if there is.

Pass four- At the end the interviewer reviewed the recall to ensure that all the items have been recorded correctly. Every respondent was probed for snacks, fruits, drinks, salt added at the table and outdoor consumption of any kind of food after they complete the recall.

The dietary recall was repeated in randomly selected 30 households per stratum by different interviewer and in a different non-consecutive day than the first to adjust for the day to day variation of nutrient intakes of the study participants (88).

### **Urine analysis**

Five millilitre random urine was collected on site with a labelled additive free tube and transported to Ethiopian Public Health Institute on daily base. (Annex 8)

**Height:** Measurements of height was carried out using measuring board with a sliding head bar/ stadiometer. The study subjects were asked to stand straight on the board with shoes off, heels together, eyes looking straight ahead (Frankfurt plane), hands freely by the side, head, shoulder blades and buttocks are against the board/wall. The moving head piece of the stadiometer was lowered to rest flat on the top of the head and reading was noted to the nearest 0.1cm. (Annex 7)

**Weight:** Measurement of weight was done using a battery powered digital scale. The measurement was done without shoes and with minimum clothes and reading was noted to the nearest 0.1kg. (Annex 7)

The data collection conducted on all seven days of the week to capture changes in intakes across various days of the week and to include all age group adults who may not be available on working days. All data collection days were arranged on non-special occasion days like holidays or feast days.

## **4.8 Study Variables**

- ✓ Potassium intake: consumption of potassium measured from 24 hour diet and estimated 24 hour urine and compared with the recommended amount.
- ✓ Sodium intake: consumption of sodium measured from 24 hour diet and estimated 24 hour urine and compared with the recommended amount.
- ✓ Sodium to potassium ratio: consumption of sodium to potassium ratio measured from 24 hour diet and estimated 24 hour urine and compared with the recommended amount.
- ✓ Knowledge, attitude and behavior about dietary salt

## **4.9 Definition of Terms**

Inadequate potassium intake: potassium intake less than 3.5 gram per day.

Excess sodium intake: sodium intake greater than or equal to 2 gram per day.

Excess salt intake: salt intake greater than or equal to 5 gram per day.

Excess sodium to potassium ratio: ratio greater than or equal to one.

## **4.10 Data Management and Analysis procedure**

The socio-demographic data and salt related knowledge, attitude and behaviour data were checked for completeness and entered to epi data version 3.1 and analysed using STATA 14 software. The normality of continuous variables were assessed by evaluating histograms, normally distributed data's presented as mean (SD) and skewed data presented as median (IQR: 25th to 75th). Categorical variables were expressed as percentage.

#### **4.10.1 Twenty four hour diet recall**

##### **Compilation of Food Composition Table**

Ethiopian food composition table, Tanzanian food composition table and dietary database of nutrisurvey were used to calculate sodium and potassium content of foods and drinks. Nutrient values of mixed dishes (firfir\*, dulet\*, meat sauce\* and keneto\*) were calculated from recipes and information on the missing foods was taken from substitutes (estimation from similar foods), local beer was taken for mead since we couldn't find sodium and potassium content of hop. Nutrient labelling was used to analyse nutrient composition values of purchased food (moya biscuit, mar checholate and milk).

Firfir\*: a food made of thin teff bread and tomato sauce

Dulet\*: roasted liver, stomach and red meat with fat

Meat sauce\*: made of meat and tomato sauce

Keneto\*: a drink made of barley and sugar

##### **Calculating Sodium and Potassium Content of Diet**

The compiled food composition table was entered to software package, nutri survey to create dietary data base and to calculate nutrient composition of the food. The data were entered, analysed and converted to amount of intake per individual per day.

##### **Identifying usual sodium and potassium intake**

To assess usual sodium and potassium intake national cancer institute (NCI) method was used using SAS 9.4 software. NCI method was selected because unlike the other methods it uses statistical modelling to account variability. The assumptions in this model includes, 24 hour diet data is unbiased (but not error free) and random within and between person variation (normally distributed, with a common variance and independent from those of other people). Skewed distributions of intake handled with transformations. The method predicts 100 average daily intakes by considering the effect of covariates, this helps to calculate

population mean usual intake closer to the truth value and Percent of population with usual intake below/above cutoff points.

Since, sodium and potassium consumed nearly daily by nearly all persons and there is no intake reported as zero in this study, one-part amount only model was used. Accounting for age, sex, day of consumption (weekend and feast day), sickness (decreased appetite) and repeat day, the software estimated population mean usual intake.

Salt intake per day was estimated by multiplying sodium intake per day by 2.5, according to internationally established protocol in line with WHO recommendation.

### **Prevalence of Inadequate Potassium Intake and Excess Sodium to Potassium Ratio**

Prevalence of inadequate potassium intake was calculated by comparing with the least recommended value (3.5 g/day). Prevalence of excess sodium intake was calculated by comparing intake with recommended value (2 g/day). Prevalence of excess salt intake was calculated by comparing intake with recommended value (5 g/day) (5, 10). Prevalence of excess sodium to potassium ratio was compared with one to one ratio (10). SAS software was used for analysis using NCI method.

#### **4.10.2 Urine analysis**

The collected random urine sample from the field was taken to Ethiopian public health institute clinical chemistry laboratory and refrigerated at 2-8 °C until next day for analysis. The sample was vortexed, reduced to sample cup and analysed using cobas 6000 (c501) analyser. Urinary Na and K were determined by using the ion-selective electrode method and urinary creatinine was measured by using enzymatic method.

Estimated 24 hour sodium and potassium excretion was calculated from spot urine sodium, potassium and creatinine measurement adjusted for age, sex, height, weight and BMI using a formula developed by INTERSALT (89) and Tanaka (90). The final results were entered to epi data version 3.1 and analysed using STATA 14 software.

### **INTERSALT formula for Sodium**

Estimated 24-hour urinary Na excretion for **Male** =  $23.51 + (0.45 \times \text{spot Na (mmol/L)}) - (3.09 \times \text{spot Cr (mmol/L)}) + (4.16 \times \text{BMI (kg/m}^2)) + (0.22 \times \text{age (in years)})$

Estimated 24-hour urinary Na excretion for **Female** =  $3.74 + (0.33 \times \text{spot Na (mmol/L)}) - 2.44 \times \text{spot Cr (mmol/L)} + (2.42 \times \text{BMI (kg/m}^2)) + (2.34 \times \text{age (in years)}) - (0.03 \times \text{age}^2 \text{ (years)})$

### **Tanaka formula for Potassium**

Estimated 24 hour potassium (mmol/day) =  $7.59 \times \text{XK}^{0.431}$

$\text{XK} = (\text{spot K (mmol/l)} / (\text{spot Cr (mg/dl)} * 10)) * (\text{predicted 24 h urinary Cr (mg/d)})$

and

Predicted 24 h urinary Cr (mg/d)

=  $(-2.04 \times \text{age (years)}) + (14.89 \times \text{weight (kg)}) + (16.14 \times \text{height (cm)}) - 2244.45$

Where

Spot Na: amount of sodium in the sample urine

Spot K: amount of potassium in the sample urine

Spot Cr: amount of creatinine in the sample urine

Cr: creatinine

Salt intake per day was estimated by multiplying sodium excretion per day by 2.5, according to internationally established protocol in line with WHO recommendation.

## 4.11 Data Quality Management

Data quality were assured before, during and after data collection process

Objective based and standardized questionnaire was prepared. The questionnaire was initially prepared in English then translated in to local language (Amharic) by an individual who have good ability of the two languages then translated back to English by different person to ensure consistency. Training was given for supervisor and data collectors on sampling procedures, techniques of interview and data collection process. Pictures, calibrated equipment's and labelled test tube were used. Height and weight measuring instruments were checked before use. Pilot study was conducted on 14 volunteer individuals from a range of socio-economic and educational level who resides in different ketenas which are not included in the study. After the pilot study ethnicity was removed from questionnaire and some adjustments were done on KAB questions and data collectors were commented to improve their handwriting and way of approach.

There was a close day to day supervision in the data collection process. The questionnaires were checked to ensure completeness and consistency each day and urine collecting tubes were checked for proper label and amount.

The supervisor and the principal investigator together recheck the completeness and consistency before transferring it into computer software. The coded data were entered to epi data software version 3.1 prepared templates. Data cleaning and management was done before analysis.

#### **4.12 Ethical Consideration**

The ethical approval for this study was obtained from the research ethical committee of school of public health, Addis Ababa University; permission letter were written for Addis Ababa regional health bureau and administrative bodies of the respective wereda. A written informed consent was obtained from the participants, after the necessary explanation about the purpose, procedures, benefits, risks, and privacy issues of the study. Participants right on decision of participating in the study or withdrawing at any time and to refuse answer for few or all of the questions were respected. (Annex 1 & 3)

#### **4.13 Dissemination of Results**

The final report of this study will be submitted to Addis Ababa University College of health sciences school of public health. It will also be sent to Addis Ababa regional health bureau. Efforts will also be made to disseminate the result through publication and presentation in scientific conferences.

## **5. Result**

### **5.1 Socio Demographic Characteristics**

Of the total of 294 sampled households, 8 household were not willing to participate resulting a response rate of 97.3%. Ninety households were interviewed twice for dietary evaluation resulting in a total of 386 interviews. Two urine samples were rejected because the urine analyser machine couldn't calculate creatinine and potassium amount for unknown reason.

Table 2 shows the socio-demographic characteristics of the respondents. Females accounted for 54.9% of the total study participants. Most of the study participants (83.1%) were in the age range of 20-39 years with a median age of 30 years and (69%) were married. Family size ranged from 1 to 11 with a median value of 4 individuals per household. The median value for the reported average monthly HH income was 2000 ETB with minimum and maximum income of 150 and 15, 000 birr respectively.

Table 2: Socio-demographic characteristics of study participants in Addis Ababa, Ethiopia, 2018

<b>Variable</b>	<b>Frequency</b>	<b>Percent</b>
<b>Sex</b>		
Male	128	45.1
Female	156	54.9
<b>Age</b>		
20-29	137	48.2
30-39	99	34.9
40-49	34	11.9
50-59	8	2.8
≥60	6	2.2
<b>Educational status (n=283)</b>		
College/university	42	14.8
Secondary (9-12)	97	34.3
Primary (1-8)	101	35.7
Read and/or write	3	1.1
Illiterate	40	14.1
<b>Marital status</b>		
Single	80	28.2
Married	196	69
Separated/divorced/widowed	8	2.8
<b>Religion</b>		
Orthodox	232	81.7
Muslim	26	9.2
Protestant	24	8.4
Other	2	0.7

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<b>Occupation</b>		
Government employee	31	10.9
Private	95	33.4
Merchant	15	5.3
Student	19	6.7
Daily laborer	9	3.2
Unemployed	108	38
Other	7	2.5
<b>Family size (n= 281)</b>		
1-3	95	33.8
4-5	116	41.3
9-11	70	24.9
<b>Average monthly household income (n= 262)</b>		
≤1000 ETB*	80	30.5
1200-2000 ETB*	91	34.8
>2000 ETB*	91	34.7

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\* Ethiopian birr

## 5.2 Sodium and Potassium Intake Measured Using 24 hour Diet Recall and Urine

Table 3 shows the mean intake of sodium and potassium estimated from diet and urine analysis. The mean intake of potassium estimated using 24-h urinary excretion was 1.9(0.4) g/day. The mean usual potassium intake estimated from 24 hour diet recall was 1.9(0.6) g/day.

The mean sodium intake estimated using 24-h urinary excretion was 3.3(0.7) g/day, which is equivalent to 8.2(1.8) g/day of salt. The 24 hour dietary intake data showed a lower mean usual intake of sodium 3.0(0.9) g/day, equivalently to 7.5(2.2) g/day of salt. The mean sodium to potassium ratio was 2.5(1.4).

Table 3: Sodium and potassium intakes and their ratio measured from 24 hour diet recall and spot urine in Addis Ababa, Ethiopia, 2018

<b>Variables</b>	<b>Mean(SD)</b>
<b>Estimated usual intake using 24hr recall</b>	
K (g)	1.9(0.6)
Na (g)	3(0.9)
NaCl (g)	7.5(2.2)
<b>Estimated 24hr excretion from urine</b>	
K (g)	1.9(0.4)
Na (g)	3.3(0.7)
NaCl (g)	8.2(1.8)
Na:K	2.5(1.4)

### 5.3. Prevalence of Inadequate Potassium Intake and Excess Sodium to Potassium Ratio

Table 4 shows the prevalence of inadequate and excess intake. Diet and urine evaluation showed that all the participants' potassium intake was below the recommended amount. The study found that 99.7% and 98.2% of participants had excess sodium intake estimated using dietary recall and urine analysis respectively. Moreover, 90.1% of the participants had excess sodium to potassium ratio.

Table 4: prevalence of inadequate potassium and excess sodium and Na:K intake measured from 24 hour diet recall and spot urine in Addis Ababa, Ethiopia, 2018

Variables	Frequency	Prevalence of inadequate intake	Prevalence of excess intake	95%CI
<b>24hr diet recall</b>				
Na $\geq$ 2(g)	283		99.7	
K <3.5(g)	284	100		
<b>24hr urine excretion</b>				
Na $\geq$ 2(g)	279		98.2	(95.8, 99.3)
K <3.5(g)	284	100		-
Na:K $\geq$ 1	256		90.1	(86.1, 93.1)

#### **5.4 Salt Related Knowledge, Attitudes, and Behavior**

Table 5 shows the Knowledge, Attitudes, and Behavior of study participants about dietary salt. Only five individuals knew there is a recommended maximum amount for daily salt consumption, among them only one individual indicated the correct maximum point. More than half of the respondents perceived that their salt intake is “just the right amount” and responded positively on the importance of lowering salt intake. More than 75% of the study participants don’t add salt at the table while 80.3% added salt during cooking always.

Table 5: Salt related Knowledge, Attitudes, and Behaviour of study participants Addis Ababa, Ethiopia, 2018

<b>Variable</b>	<b>Frequency</b>	<b>Percent</b>
<b>Knowledge variables</b>		
<b>Knowing there is daily salt intake cut off point</b>		
Knows	5	1.8
Don't know	279	98.2
<b>Main source of salt</b>		
Salt added during cooking and/or during eating	220	77.5
Processed food	6	2.1
Natural food source	19	6.7
Don't know	39	13.7
<b>Knowing a high salt diet could cause a health problem</b>		
Knows	256	90.1
Don't know	28	9.9
<b>Health problems related to high salt diet (n=256)*</b>		
High blood pressure	223	87.1
Osteoporosis	6	2.3
Stomach cancer	58	22.7
Kidney stone	106	41.4
None of the above	6	2.3
All of the above	4	1.6
I don't know	5	1.9
<b>Attitude variables</b>		
<b>Perception of own salt consumption</b>		
Far too much	2	0.7
Too much	25	8.8
Just the right amount	160	56.3
Too little	73	25.7

Far too little	15	5.3
Don't know	9	3.2
<b>Perceived importance on lowering salt intake</b>		
Not at all important	18	6.3
Somewhat important	18	6.3
Neutral	14	5
Important	165	58.1
Very important	69	24.3
<b>Behavior variables</b>		
<b>Adding salt to food during eating</b>		
Never	221	77.8
Rarely	42	14.8
Sometimes	21	7.4
<b>Adding salt to food during cooking</b>		
Always	228	80.3
Often	50	17.6
Sometimes	6	2.1
<b>Taking actions to control salt intake</b>		
Action taken	192	67.6
Action not taken	92	32.4
<b>Actions taken to control salt intake (n=192)*</b>		
Avoid/minimize consumption of processed foods	42	21.9
Look at the salt or sodium labels on food	3	1.6
Do not add salt at the table	82	42.7
Buy low salt/sodium alternatives	15	7.8
Do not add salt /decreasing the amount during cooking	59	30.7
Use spices other than salt when cooking	4	2.1
Avoid eating out	8	2.8

\*multiple answers were possible.

## 6. Discussion

The aim of this study was to estimate the level of potassium and sodium intake and to assess salt related knowledge, attitude and behavior among adult populations of Addis Ababa. Face to face interview was conducted using questionnaire. Twenty four hour diet recall data and urine sample were taken. The result showed a very low potassium consumption and high prevalence of inadequate potassium intake. The intake of sodium and its ratio with potassium is high with high prevalence of excess intake. More than half of the respondents perceived that their salt intake is “just the right amount”. Majority of the respondents (80.3%) added salt during cooking always. More than two third of the respondents reported they are taking actions to lower their salt intake.

The mean salt intake in this study from 24 hour diet recall found to be 7.5 g/day, which is higher than the recommended amount. This finding is not consistent with a previous study in Addis Ababa, which used 24 hour diet recall data. This inconsistency may be because we used different food composition table since Ethiopian food composition table is not complete this forced us to borrow another country’s food composition table (60). Different amount of intake is reported in the previous studies in China, Australia and Belgium, this difference is attributed to difficulty of quantifying discretionary salt intake, incomplete or/and inaccurate food composition table, demerits of dietary recall and difference in the diversity of diet (47, 48, 64).

This study found a relatively lower amount of salt consumption from diet recall compared with the urine finding. This is because diet recalls most of the time results in under-estimation of intake. Salt intake depends on the amount of food intake especially in foods which undergo some alteration (non-raw foods). So if there is under estimation of intake it is likely to get low figures for salt consumption (91, 92).

Salt consumption estimated from urinary excretion in the current study was 8.2(1.8) g/day. This finding is consistent with the previous study in the urban setting of the country which uses a similar method with mean excretion of 8.3(0.1) g/day. The proportion of population above the recommended value was 98.2% and 97.5% in our study and the previous study respectively (61). Comparable finding also reported from the most recent study in South Africa (56). A slight difference is observed in the prevalence of excess salt intake in Benin,

this may be because the study includes the urban and rural part of the country (58). In a systematic review done in sub-Saharan African countries reported that intake in the rural setting is lower than urban setting this is explained by westernization of cities and towns, salty packed foods and fast foods high in salt are more accessible in the urban (24). Inconsistent higher finding also reported from china, this may be explained by their culture of consuming salty sauces beside the usage of cooking salt (64, 65).

Potassium intake from 24 hour diet recall in our study was 1.9 g/day and no adequate intake was reported. This finding is much lower than the least recommended amount. It is because in Ethiopia, consumption of fruit and vegetable is very low. We found that only two participants (0.7%) had adequate fruit and vegetable intake, which are main source of potassium. Prevalence of fruit and/or vegetable consumption in urban areas of Ethiopia was 0.9% (76). A 3.1 and 3.2 g/day mean potassium intake is reported from South Korea for the age group of 19-39 years and 40-59 years respectively, they justify this intake comes from white rice, kimchi, vegetable and fruits, which are not common foods in the Ethiopian setting (66). Similar finding is reported from China which used 3 consecutive 24 hour diet data (64).

This study found 1.9(0.4) g/day mean potassium excretion and all the values were below the recommended amount. A similar finding is reported from Mozambique 1.9(0.8) g/day with an inadequate prevalence of 96.3% (57). A relatively higher potassium intake was reported from the sub-Saharan country Benin, this may be due to the rural communities are included in the study hence, availability of fresh fruits, vegetables and beans is relatively well in the rural area especially if there is home gardening. Another explanation could be as participants in Benin study were told to abstain from going to work and to stay in health care centers in the day of urine collection this might have altered the participants' dietary habits (58). Potassium intake reported from New Zealand is higher than the current study; this can be explained as they didn't exclude hypertensive patients. Even though, they didn't mention the type of medication they took some hypertensive drugs alter potassium excretion (62). Similar findings to our study also reported from existing literatures (65, 67, 68).

The study finding for sodium to potassium ratio was 2.5(1.4) g/day mean intake with 90.1% prevalence of excess intake compared with a one to one ratio, which is considered beneficial for health considering if an individual consumes sodium and potassium at the levels

recommended in the WHO guideline. Our finding is consistent with previous studies (64, 67). Inconsistent findings reported from New Zealand, South Korea and Benin. This inconsistency is attributed to the above mentioned reasons for each nutrients difference, which affects the ratio (58, 62, 66).

This study finding showed higher ratio of the two nutrients which puts the population at risk of hypertension and CVD. The ratio of the two nutrients is the most influential than the effect of either nutrients independently, it has been suggested that individuals with diets that are low in potassium are particularly vulnerable to the hypertensive effects of high sodium intake. In reviewing results high amount of sodium finding only may not be as severe as a high sodium to potassium ratio, because high sodium intake might be accompanied by a well potassium intake which gives a lower ratio of the two nutrients (17-19, 27-29, 81).

Knowledge on daily cutoff point is much lower than the other studies, since there is nothing done in our setting to create awareness it is likely to get a lower figure (42, 44). Nine out of ten individuals knows that a high salt diet could cause a serious health problem among them majority mentioned blood pressure. This finding is comparable with published studies (53, 82, 84).

A consistent finding is reported on the perception of owns salt intake to be “just the right amount ” (93) and too much or far too much(84). Beside the high prevalence of excess salt intake lower proportion of the population believed their intake to be high, because peoples believe an adequate salt is depend on their taste. This finding is not in concordance with previous studies (42-44, 82) . The potential reason might be due to the presence of salt reduction initiation in those countries.

Majority of participants agrees in the importance of lowering salt intake. As a result 67.7% took actions to lower their intake. This finding is higher than the previous study in the country. Actions taken to lower salt intake in the two studies are somehow different. This may attribute to the study setting variation in which the current study includes only urban population (84).

Our finding on salt usage during cooking is consistent with a previous study in Ethiopia. However, there is discrepancy on salt usage at the table before eating. Even though it is unlikely to get this much prevalence for salt usage at the table in the country where most of the time salt added to the food during cooking, this may be due to the inclusion of salty sauce usage beside the discretionary salt at the table which is not included in the current study(84). Our finding is consistent with the study finding of Angola and India the majority of participants stated that salt was always added in preparing food at home(43, 53).

## **7. Strength and Limitation of the Study**

### **Strength of the Study**

To the best of the author's knowledge this is an original study which gives baseline information about the two nutrients ratio in the country. In this study, discretionary salt usage was quantified which helps us to get a good image of the actual salt intake. A combination of biochemical and dietary assessment were used to assess micronutrient intake, which decreases the effect of measurement error. Population usual intake was estimated using NCI method, which is the best method as this method considers many factors which affects intake. All days of the week were represented equally during data collection to adjust for a day to day variation in intake. As this quality of the study decreases the effect of covariates, it approximates the estimated intake to the truth value.

## **Limitation of the Study**

This study has limitations that need to be acknowledged. First, we used self-reported dietary data, which may be different from actual behaviour and may result most of the time in under reporting. To overcome this problem we used pictures and food weighing scale during portion size estimation and respondents were probed for snacks, fruits and outdoor consumption. Second, Ethiopian food composition table is not complete regarding sodium and potassium content of diet this forced us to borrow values from another country food composition table which decrease the reliability of the dietary data base. To mitigate this problem we borrowed as few values as possible. Third limitation of the study is the usage of spot urine. Even though, it is known that spot urine analysis does not give a stable estimate for individual but it provides a reliable estimate at the population level. Forth, the formula used to estimate 24 hour electrolyte excretion from spot urine wasn't validated in our country. Even though it is not validated in our country we used formulas which had a relative good result during validation studies among heterogeneous population including Africa.

## **8. Conclusion and Recommendation**

### **Conclusion**

In conclusion, the mean intake of potassium was much lower than the recommended value, resulting a high prevalence of inadequate intake. There was a high prevalence of excess sodium intake and the mean intake was also high. The ratio of the two nutrients is higher than what is recommended to be beneficial for health, which put the population at risk of hypertension and CVD. Salt related knowledge, attitude and behaviour found to be low as many participants were unaware of their high salt intake.

### **Recommendation**

Based on the study findings the following recommendations were forwarded

#### **For policy makers**

- Nutritional policy to decrease salt consumption and to increase potassium intake
- Finding options in the fortification of salt with iodine in a way that we can get an adequate amount of iodine with minimal intake of salt
- Awareness creation on healthy foods and healthy behavior

#### **For the general community**

- The community should be careful on their salt usage and try their best to include fresh fruits and vegetables in their diet

#### **For researchers**

- Further studies with repeated 24 hour urine analysis will be more reliable
- Studies in validating the existing formulas to estimate 24 hour Na and K excretion or even developing a formula for our setting which will be very useful when we evaluate the effectiveness of our intervention for the future, since 24 hour urine collection is very burdensome.

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## **Annexes**

### Annex I: Information sheet

Hello my name is ..... I am here on behalf of Semira Mitiku post graduate student of Addis Ababa University School of public health. She is doing a research on body sodium to potassium ratio of Addis Ababa adult population whose age is 20 and above years old. She has received permission from Addis Ababa University and the respective wereda to conduct this study. You're selected for this study by chance because your age is above 20 years old and resident of Addis Ababa. You will participate if you give me your consent after reading and understanding the following notes about the study.

- The purpose of the study is to estimate body sodium to potassium ratio of Addis Ababa adult population.
- If you agree to participate in the study I will conduct an interview for 30-40 minutes and the interview will include questions about your socioeconomic status, your knowledge attitude and behaviour toward dietary salt, your dietary intake of the previous day, height and weight measurement will be taken and you will be asked to give 5 ml urine.
- The result of this study will help policy makers for making decision regarding controlling potassium and sodium intake of population, so that you and your family will get benefit from the intervention in the future.
- During the interview there is no risk or discomfort while participating and also there is no payment for your participation.
- Your participation is voluntary and you can skip any question that you don't want to answer and also you can ask any questions you have.
- The record of this study will be kept private. Any personal information about you will not be recorded and all the information you provided is strictly confidential.
- You can contact the principal investigator for any question or concern you have and if you need to clarify the question you can ask me at any time of the interview.

### **Address of the principal investigator**

**NAME:** Semira Mitiku



Annex III: Information sheet in local language (Amharic)

የመረጃ መስጫ ቅጽ

እንደምን አደሩ/ዋሉ ስሜ.....ይባላል። በአዲስ አበባ ዩኒቨርሲቲ በ ህብረተሰብ ጤና አጠባበቅ ትምህርት ክፍል ተማሪ የሆነችውን ሰሚራ ምትኩን ወክቼ ነው። እድሜያቸው ከ 20 አመት በላይ በሆኑ የአዲስ አበባ ህብረተሰብ ክፍሎች የሰውነት ሶዲየም እና ፖታሺየም ንጥረ ነገሮችን ምጣኔ በተመለከተ ለምትሰራው ጥናት የመረጃ ሰብሳቢ ነኝ። ከአዲስ አበባ ዩኒቨርሲቲ ና ከተመረጡት ክፍለ ከተሞች ፌቃድ አግኝታለች። እርሶ ለዚህ ጥናት የተመረጡት እድሜያዎ ከ 20 አመት በላይ ስለሆነ እና የአዲስ አበባ ነዋሪ ስለሆኑ ነው። ጥናቱ ውስጥ የሚሳተፉት የሚከተለውን መረጃ ከሰማችሁ እና ከተስማማችሁ ብቻ ነው።

- ጥናቱ ዋና አላማ እድሜያቸው ከ 20 አመት በላይ ለሆኑት የህብረተሰቡ ክፍሎች የሰውነት ሶዲየም እና ፖታሺየም ንጥረ ነገሮችን ምጣኔ ለማወቅ ነው።
- ጥናቱ ውስጥ ለመሳተፍ ከተስማሙ ከ 30-40 ደቂቃ ያህል ከእርሶ ጋር ቃለመጠይቅ አካሂዳልሁ። ቃለመጠይቁ ስለ እርሶ ፣ ስለ ጨው ያሉትን እውቀት አመለካከት እና አጠቃቀም፣ ስለትላንት አመጋገብም እንዲሁም ቁመት እና ክብደት መለካት እና ሽንት መስጠትን ያካትታል።
- የዚህ ጥናታ ውጤት መንግስት የ ህብረተሰቡን ሶዲየም እና ፖታሺየም አመጋገብ ሁኔታ ለመቆጣጠር ህጎችን እንዲያወጣ ያግዘዋል። ከዚህም እርሶ እና ቤተሰብም ለወደፊቱ ተጠቃሚ ይሆናሉ።
- ቃለመጠይቅ ውስጥ በመሳተፍ ምንም አይነት ችግርም ሆነ አደጋ አያጋጥሞትም እንዲሁም ምንም አይነት ክፍያ አይጠየቁም።
- ቃለመጠይቁ በእርሶ ሙሉ ፍቃድኝነት ላይ የተመሰረተ ነው መመለስ እማይፈልጉት ጥያቄ ካለ ማለፍ ይችላሉ እንዲሁም ጥያቄ ካሉት መጠየቅ ይችላሉ።
- እርሶ የሰጡን መረጃ ሁሉ በሚስጥር ይያዛል። አንድም የግል መረጃ አይጸፍም።
- እንዲብራራሎት የሚፈልጉት ጥያቄ ካለ መጠየቅ ይችላሉ እንዲሁም የጥናቱን ባለቤት ማግኘት ይችላሉ።

የጥናቱ ባለቤት አድራሻ  
 ስም :- ሰሚራ ምትኩ  
 ስልክ:- 0923256552  
 ኢ-ሜል:- semira.mitiku@gmail.com

Annex IV: informed consent in Amharic

የስምምነት መጠየቂያ /ማረጋገጫ ቅጽ

ከላይ በተሰጡት መረጃ መሰረት በዚህ ጥናት ለመሳተፍ ፈቃደኛ ናት

- 1 አዎ( ቃለመጠይቁ ይቀጥል)
- 2 አይደለሁም ( ምክንያቱን ፅፈህ/ሽ ወደሚቀጥለው ተሳታፊ እለፍ )

በህኪም የተረጋገጠ የደም ግፊት ወይም የስካር በሽታ አለቦት

- 1 አዎ( አመሰግነህ/ሽ ወደሚቀጥለው ተሳታፊ እለፊ)
- 2 አይ ( ቃለመጠይቁ ይቀጥል)

የእርግዝና ወይም የወር አበባ ወቅት ላይ ናት(ለሴት ተሳታፊዎች)

- 1 አዎ( አመሰግነህ/ሽ ወደሚቀጥለው ተሳታፊ እለፊ)
- 2 አይ ( ቃለመጠይቁ ይቀጥል)

ቃለመጠይቅ አድራጊው ስም \_\_\_\_\_

የቃለመጠይቁ ቁጥር \_\_\_\_\_

ክፍለ ከተማ \_\_\_\_\_ ወረዳ \_\_\_\_\_ ቀጠና \_\_\_\_\_ መንደር \_\_\_\_\_

የቃለመጠይቅ የተካሄደበት ቀን \_\_\_\_\_ የተጀመረበት ሰዓት \_\_\_\_\_ ያለቀበት ሰዓት \_\_\_\_\_

መጠይቁ ታይቶል/ ተፈትሾል \_\_\_\_\_

የቃለመጠይቁ ውጤት

- 1. ሙሉ በሙሉ የተሟላ
- 2. በከፊል የተሟላ
- 3. ተሳታፊው ልተገኘም

በተቆጣጣሪዎች ተረጋግጧል ስም \_\_\_\_\_ ፊርማ \_\_\_\_\_

Annex V: Questionnaire

Section 1: Identification

Now I would like to ask you about your socio-economic characteristics

No	Questions	Coding	Skip
101	Respondent's status	Husband .....1 Wife .....2 Child.....3 Other (specify).....4	
102	Sex	Male .....1 Female .....2	
103	How old are you now (in completed year)	.....years old	
104	What is the highest level of school you attended?	College/university.....1 Secondary (9-12).....2 Primary(1 -8).....3 Read and write.....4 Illiterate.....5	
105	What is your marital status?	Single.....1 Married.....2 Separated.....3 Divorced.....4 Widowed.....5	
106	What is your religion?	Orthodox Christian.....1 Muslim.....2 Protestant.....3 Catholic.....4 Other specify.....	
107	What's your occupation	Government Employee.....1 Private.....2 Merchant.....3 Student.....4 Daily laborer.....5 Unemployed.....6 Other specify.....	

108	How much is your household family size including you?	.....	
109	How much is average monthly household income? (interviewer – household income is any type of income, like-salaries, wages, retirement income, rent income, investment income, family monetary support )	.....birr	

**Section 2: Questionnaire on Knowledge, Attitudes, Behavior toward Dietary Salt**

Now I would like to ask you about your Knowledge, Attitudes, and Behavior toward Dietary Salt

No	Questions	Coding	Skip
201	How often do you add salt to food at the table?	Never .....1 Rarely .....2 Sometimes .....3 Often .....4 Always .....5	
202	How often is salt added in cooking in the food you eat at home?	Never .....1 Rarely .....2 Sometimes .....3 Often .....4 Always .....5	
203	How much salt do you think you consume? (READ LIST)	Far too much.....1 Too much.....2 Just the right amount.....3 Too little.....4 Far too little.....5	

		Don't Know.....6 Refused.....7	
204	Do you know there is a daily cut off point for salt intake?	Yes .....1 No .....2	
205	If <b>yes</b> for the above question How much is the cutoff point for daily salt intake?	< 5gram/day.....1 > 5gram/day.....2 I don't know.....3	
206	Which of the following do you think is the source of salt in your diet?	Salt added during cooking or at the table....1 Salt from processed foods such as breads...2 Salt from natural food sources.....3 All .....4 Don't know .....5	
207	Do you think that a high salt diet could cause a serious health problem?	Yes.....1 No .....2 Don't know.....3 Refused .....4	if the response is other than 'yes' go to question number 209
208	If Yes in the above, what sort of problem? multiple answer is possible  (Interviewer- don't read the list just ask 'what else?')	high blood pressure.....1 osteoporosis.....2 stomach cancer.....3 kidney stones.....4 none of the above.....5 all of the above.....6 don't know.....7 refused.....8	

209	How important to you is lowering the salt/sodium in your diet?	Not at all important.....1 Somewhat important.....2 Neutral .....3 Important .....4 Very important.....5	
210	Do you do anything on a regular basis to control your salt or sodium intake?	Yes.....1 No .....2 Don't know.....3 Refused .....4	if the response is other than 'yes' skip question number 211
211	If answer is Yes in the above, what do you do? multiple answer is possible (Interviewer- don't read the list just ask what else?)	Avoid/minimize consumption of processed foods.....1 Look at the salt or sodium labels on food.....2 Do not add salt at the table.....3 Buy low salt /sodium alternatives.....4 Do not add salt when cooking.....5 Use spices other than salt when cooking.....6 Avoid eating out.....7 Other (specify) _____	



**Description of foods and ingredients.**

<b>Food or drink</b>	<b>Description and cooking Method</b>	<b>Amount prepared (using equipment )</b>	<b>Amount t eaten (using equipment)</b>	<b>Weighed equivalent (in gram)</b>
	Ingredient and cooking method  List of ingredient and their amount			
	Ingredient and cooking method  List of ingredient and their amount			
	Ingredient and cooking method  List of ingredient and their amount			
	Ingredient and cooking method  List of ingredient and their amount			
	Ingredient and cooking method  List of ingredient and their amount			
	Ingredient and cooking method  List of ingredient and their amount			
	Ingredient and cooking method			

	List of ingredient and their amount			
Probe for alcohol: 1. Yes 2. No Did you add salt at the table? 1. Yes 2. No If Yes how much.....equipment .....gram		Probe for sickness: 1. Yes 2. No If yes, did sickness affect appetite? 1. Yes 2.No If yes, how? 1. Increase 2. Decrease		
Was food intake unusual? 1. Yes 2. No If yes, how was it unusual? Was it a feast day? 1. Yes 2. No Was it a market day? 1. Yes 2. No Was it a fasting day? 1. Yes 2. No		Probe for tablets: 1. Yes 2. No If yes 1.Iron 2. Vitamins 3. Other supplements 4. Anti-malaria		

**Section 4: anthropometry measurement**

Now I will take your height and weight measurement

Please record the measurement to the nearest one decimal

301	Height	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> cm	
302	Weight	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> kg	

**Section 5: urine collection**

Now I would like to ask you to give me urine with this tube till the marked point

Time .....:.....

5ml of urine collected?

Yes -----1

No -----2

Annex VI: Questionnaire in Amharic

መጠይቅ በአማርኛ

ክፍል 1: መለያ- በቀጣይነት ስለ እርስዎ አንዳንድ ጥያቄዎች እጠይቃለሁ

ቁጥር	ጥያቄ	ኮድ	ዝልል
101	መላሹ	አባወራ.....1 እማወራ.....2 ልጅ.....3 ሌላ ካለ ይገለጽ.....4	
102	ጾታ	ወንድ.....1 ሴት.....2	
103	ስንት አመቶት ነው (በ ሙሉ አመት)	.....አመት	
104	ከፍተኛ የትምህርት ደረጃዎ ስንት ነው	ኮሌጅ/ዩኒቨርሲቲ .....1 ሁለተኛ ደረጃ (9-12) .....2 የመጀመሪያ ደረጃ(1-8) .....3 ማንበብ እና መጻፍ.....4 አልተማርኩም.....5	
105	የጋብቻ ሁኔታ	ያላገባ.....1 ያገባ.....2 የተለያዩ.....3 የተፋታ/የተፋታች.....4 የሞተባት/የሞተብት.....5	
106	ሓይማኖቶች ምንድን ነው	አርቶዶክስ.....1 ሙስሊም.....2 ፕሮቴስታንት.....3 ካቶሊክ.....4 ሌላ ካለ ይገለጽ.....	
107	የስራ አይነት	የመንግስት ሰራተኛ.....1 የግል.....2 ነጋዴ.....3 ተማሪ.....4 የቀን ሰራተኛ.....5 ስራ የለኝም.....6 ሌላ ካለ ይገለጽ.....	

108	የቤተሰብ ብዛት እርሶን ጨምሮ ስንት ነው		
109	አማካይ ወርሃዊ የቤተሰብ ገቢ ምን ያክል ነው (ለ መረጃ ሰብሳቢ- የትኛውንም አይነት ገቢ ያካትታል፤ ደሞዝ፣ ጡረታ፣ የኪራይ ገቢ፣ የንግድ ገቢ፣ ከቤተሰብ የሚላክ ገንዘብ)	_____ ብር	

ክፍል 2: ከ ጨው ጋ በተያያዘ ያለውን እውቀት አመለካከት እና አጠቃቀም ለመለካት የተዘጋጀ መጠይቅ

አሁን ስለ ጨው ያሎትን እውቀት አመለካከት እና የአጠቃቀም ልምዶችን አጠይቆታለሁ

No	Questions	coding	Skip
201	ምግብ ከቀረበ በሃላ ምን ያክል ጊዜ ጨው ይጨምራሉ	በፍጹም .....1 በጣም አልፎ አልፎ .....2 አንዳንዴ.....3 ብዙ ጊዜ.....4 ሁል ጊዜ.....5	
202	በቤት ውስጥ ምግብ ስታበስሉ ምን ያክል ጊዜ ጨው ትጨምራላቸዋል	በፍጹም .....1 በጣም አልፎ አልፎ .....2 አንዳንዴ.....3 ብዙ ጊዜ.....4 ሁል ጊዜ.....5	
203	ምን ያክል ጨው እየተመገብኩ ነው ብለው ያስባሉ (ዝርዝሩን አንቢብላቸው)	በጣም ብዙ.....1 ብዙ .....2 ትክክለኛ መጠን .....3 ትንሽ.....4 በጣም ትንሽ .....5 አላውቅም.....6	
204	በቀን እንድንመገበው የተቀመጠ የጨው ገደብ እንዳለ ያውቃሉ	አዎ.....1 አይ.....2	

		እኔንጃ.....3	
205	ለተራ ቁጥር 204 መልስ አዎ ከሆነ በቀን እንድንመገበው የተቀመጠ የጨው ገደብ ምን ያክል ነው	< 5 ግራም በቀን.....1 > 5 ግራም በቀን.....2 አላውቅም.....3	
206	አመጋገባችን ላይ ጨውን ከየት የምናገኝ ይመስሎታል	ስናበስል እና ስንመገብ ከምንጨምረው ጨው.....1 ከታሸጉ እና የምርት ሂደታቸው ካለቀላቸው ምግቦች(ዳቦ).....2 በተፈጥሮ ከምግቦች ላይ ከምናገኘው ጨው.....3 ሁሉም.....4 አላውቅም.....5	
207	ብዙ ጨው መመገብ ከፍትገና የጤና ችግር እንደሚያስከትል ያውቃሉ	አዎ.....1 አይ.....2 እኔንጃ.....3	ምላሹ ከ “አዎ” ሌላ ከሆነ ወደ ጥያቄ ቁጥር 209 እለፊ
208	ለተራ ቁጥር 206 መልስ አዎ ከሆነ ብዙ ጨው መመገብ ምን ዓይነት የጤና ችግር ያስከትላል  ከአንድ በላይ መልስ መስጠት ይቻላል (ዝርዝሩን አታንብቢላቸው “ሌላስ” እያልሽ ጠይቂያቸው)	የደም ግፊት.....1 የአጥንት መሳሳት .....2 የጨው ካንሰር.....3 የኩላሊት ጠጠር.....4 ሁሉንም.....5 ከተዘረዘሩት ውስጥ የለም.....6 አላውቅም.....7	
209	ከሚመገቡት ምግብ ላይ የጨው መጠንን መቀነስ ምን ያክል ጠቃሚ ነው ብለው ያስባሉ	ምንም ጥቅም የለውም.....1 ትንሽ ጥቅም አለው.....2 ጥቅምም ጉዳትም የለውም.....3 ጥቅም አለው.....4 በጣም ጠቃሚ ነው.....5	
210	በተደጋጋሚ የጨው አመጋገብን ለመቀነስ ጥረት ያደርጋሉ	አዎ.....1 አይ.....2 እኔንጃ.....3	ምላሹ ከ “አዎ” ሌላ ከሆነ ጥያቄ ቁጥር 201ን እለፊው

211	<p>ለተራ ቁጥር 210 መልስ አዎ ከሆነ ምን ያደርጋሉ? ከአንድ በላይ መልስ መስጠት ይቻላል (ዝርዝሩን አታንብቢላቸው “ሌላስ” እያልሽ ጠይቂያቸው)</p>	<p>የታሸጉ ምግቦችን መመገብ በመቀነስ/በማቆም.....1 የምግቦችን የጨው መጠን ከማሸጊያው ላይ በማንባብ.....2 ምግብ ከቀረበ በሃላ ጨው ባለመጨመር .....3 ትንሽ የጨው/የሶዲየም መጠን ያላቸውን አማራጭ ምግቦችን በመግዛት .....4 ምግብ ሳበስል ጨው ባለመጨመር.....5 ምግብ ሳበስል ከጨው ውጪ ያሉ ቅመሞችን በመጠቀም .....6 ውጪ መመገብ በማቆም .....7 ሌላ ካለ ይገለጽ _____</p>	
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የምግብና ወህዶች ገለፃ ፎርም

አሁን ደግሞ ከላይ የዘረዘሩልኝ ምግቦች የአባሳሰል ዘዴያቸው፣ ወህዶችና የወህዶችን መጠን፣ አይነትና ምንጭት አንድተመገቡ በዝርዝር ይነግሩኛል፡፡

የምግብ/መጠን ጠቅላይ ዝርዝር ና አይነት	የምግብ/መጠን ገለፃ ለምሳሌ የአባሳሰል ዘዴ (ይህን መረጃ ለመስጠት ወህዶች፣ የወህዶችን አይነትና መጠን እና የአባሳሰል ዘዴውን በጥልቁ ይጠይቁ )	የተዘጋጀው ምግብ መጠን (በመለኪያ)	የተበላው ምግብ መጠን (በመለኪያ)	የተበላው ምግብ መጠን (በግራም )
	ወህዶችና የአባሳሰል ዘዴ፡  የወህዶች ዝርዝርና መጠናቸው (በመለኪያ/ግራም)			
	ወህዶችና የአባሳሰል ዘዴ፡  የወህዶች ዝርዝርና መጠናቸው (በመለኪያ/ግራም)			
	ወህዶችና የአባሳሰል ዘዴ፡  የወህዶች ዝርዝርና መጠናቸው (በመለኪያ/ግራም)			
	ወህዶችና የአባሳሰል ዘዴ፡  የወህዶች ዝርዝርና መጠናቸው (በመለኪያ/ግራም)			
	ወህዶችና የአባሳሰል ዘዴ፡  የወህዶች ዝርዝርና መጠናቸው (በመለኪያ/ግራም)			
	ወህዶችና የአባሳሰል ዘዴ፡  የወህዶች ዝርዝርና መጠናቸው (በመለኪያ/ግራም)			
	ወህዶችና የአባሳሰል ዘዴ፡  የወህዶች ዝርዝርና መጠናቸው (በመለኪያ/ግራም)			
	ወህዶችና የአባሳሰል ዘዴ፡  የወህዶች ዝርዝርና መጠናቸው (በመለኪያ/ግራም)			

	የወህደቶቹ ዝርዝር ና መጠናቸው.(በመለኪያ/ግራም)			
አልኮል ጠጥተው ነበር አዎ.....1 አይደለም.....2 ምግብ ከቀረበ በኋላ ጨው ጨምረው ነበር አዎ.....1 አይደለም.....2 አዎ ከሆነ ምን ያክል.....በመለኪያ .....በግራም	ታመው ነበር? አዎ.....1 አይደለም.....2 ህመሙ የአመጋገብ ሁኔታ ቀይሮ ነበር? አዎ.....1 አይደለም.....2 አዎ ከሆነ እነዴትኑ የቀየረ? ጨመረ.....1 ቀነሰ.....2			
የነዚህ ምግቦች አመታኝነት ያልተለመደ ነው? (የግብዣ/ድግስቀን፣የገበያቀን፣የጾምቀን) አዎ.....1 አይደለም.....2	መዳኒት ወስደው ነበር? አዎ.....1 አይደለም.....2 አዎ ከሆነ ምን አይነት መዳኒት ነው የወሰዱት?			

**ክፍል 4: ቁመት እና ክብደት መለኪያ**

(እባኩ የልኬቱን ውጤት ሲጽፉ ከነጥብ በሃላ ያለውን ቁጥር ወደ አንድ ቁጥር ያጠጋጉት )

301	ቁመት	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> ሴንቲ ሜትር	
302	ክብደት	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> ኪሎ ግራም	

**ክፍል 5: የሽንት ናሙና**

አሁን በምሰጠት እቃ ምልክቱ ድረስ ሽንት ይሰጡኛል

ሰዐት.....:.....

5ሚሊ ሊትር ሽንት ተወስዳል

አዎ -----1

አይ -----2

## **Annex 7: Anthropometric measurement guideline**

### **Measuring height**

Position the board on a firm surface against a wall

Step 1-Ask the participant to remove their:

- footwear (shoes, slippers, sandals, etc)
- head gear (hat, cap, hair bows, comb, ribbons, etc).
- any fancy or high hairdos may have to be pressed.

Step 2-Ask the participant to stand on the board facing you.

Step 3-Ask the participant to stand with:

Back of head, shoulder blade, buttock, and heels against the back board

- feet together
- place arms on the side

Step 4-Ask the participant to look straight ahead and not tilt their head up.

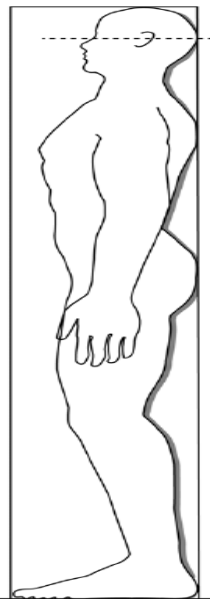
Step 5- Make sure eyes are the same level as the ears.

Step 6- Move the measure arm gently down onto the head of the participant and ask the participant to breathe in and stand tall.

Step 7- Read the height in centimetres at the exact point to the nearest 0.1 cm.

Step 8- Ask the participant to step away from the measuring board.

Step 9- Record the height measurement in centimetres



## **Weight measurement**

Make sure the scales are placed on a firm, flat surface.

Turn on the scale and wait until the display shows 0.0.

Step 1-Ask the participant to remove their footwear (shoes, slippers, sandals, etc) and socks. They should also take off any heavy belts and empty out their pockets of mobiles, wallets and coins.

Step 2- Ask the participant to step onto scale with one foot on each side of the scale.

Step 3- Ask the participant to:

- stand still
- face forward
- place arms on the side and
- wait until asked to step off.

Step 4- Record the weight in kilograms to the nearest 0.1 kg

## **Annex 8: Urine sample collection guideline**

### **Urine sample collection**

Write down the time of collection

Step 1- Label the urine collecting container with code and give the container to the participant and tell them

“When you go the bathroom (toilet) void urine (pee) into the container. Once the container is full to the marked point finish voiding in the toilet. Screw on the cap tightly”

Step 2- Put the container in the zip closable plastic bag

# CURRICULUM VITAE

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## *Personal information*

**Name:** SemiraMitiku

**Address:** Mob. : +251923256552

**Email:** [semira.mitiku@gmail.com](mailto:semira.mitiku@gmail.com)

**Date of Birth:** January 1, 1993

**Sex:** Female

**Marital Status:** Single

**Nationality:** Ethiopian

## *Educational background*

- Graduated from Bahir Dar university July, 2015 GC.
  - Holding BSc in Nursing
  - Years attended from November 2011 to July 2015 GC.
- Secondary School
  - Yekatit 12 preparatory School (Addis Ababa)
  - Years attended from 2009 to 2011 G.C

### **Merits Received**

- Ethiopian General Secondary school leaving Certificate with 4.00 GPA
- Ethiopian Higher Education Entrance Certificate with Great Distinction
- Awarded as Honors 1<sup>st</sup> Class in female Bachelor Degree of nursing at BahirDar university

### **Professional Experience**

I am working at Black lion specialised hospital as a junior professional Nurse since June 21, 2016

In the Chemotherapy preparation and administration unit at oncology centre

### **Skills**

- Interpersonal communication skill and team leading ability
- Data collection, analysis and report writing.
- Excellent presentation skill
- Basic computer skill

### **community and professional involvement**

- Gender club, in organizing and supporting female students in tutoring and assisting in Various ways at Bahirdar University.

### **Languages**

<b>Language</b>	<b>Speak</b>	<b>Read</b>	<b>Write</b>	<b>Understand</b>
<b>Amharic</b>	Excellent	Excellent	Excellent	Excellent
<b>English</b>	Excellent	Excellent	Excellent	Excellent

