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Assessment of Cooking Practices and Associated Risk Factors for Chronic Diseases in Bossa Addis Kebele, Jimma, Ethiopia

Alganesh Tola[2] and Abrar Sualeh[1*]

[1]*Jimma Agricultural Research Center, Jimma, Ethiopia*
[2]*Holeta Agricultural Research Center, Holeta, Ethiopia*

**Corresponding author*

Abstract

Cooking is the process of producing safe and edible food by preparing and combining ingredients, and applying heat. Assessment of cooking practices and associated risk factors for chronic diseases in Bossa Addis Kebele, Jimma, Ethiopia. The objective of the assessment was to generate baseline information that will assist to conduct further detailed research on the household cooking practices and associated risk factors for chronic diseases. Structured questionnaire was prepared, pretested and used to collect data. The collected data was subjected to SPSS for analysis. In the present study women spend more time on cooking providing food followed by daughters for the households in the family. 74 % of the respondent households were aware and 26 % of the respondent households were not aware of health risks associated with utilization of cooking energy sources. 93.5 % of the respondents are not aware of health risks for chronic diseases associated with cooking methods and only 6.5 % of the respondents replied that they know about diseases such as gastritis can arise due to consumption of some foods such as 'doro wot' that is cooked for very long time with a lot of saturated cooking oils and butter. The households responded that the smoke from biomass fuel affects the lung of the food cookers as well as the surrounding family members nearby during cooking.

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Keywords

Chronic diseases, cooking, households, risk Factors.

Introduction

The discovery of fire pushes human being to start food cooking. Some researchers believe that cooking was invented over 2.3 million years ago, but others argue it is a more recent concept, being invented only 40,000 years ago. Despite these opposing views, it is clear that cooking has been around for a long time and continues today to play a fundamental role in daily life throughout the world. Cooking is the process of producing safe and edible food by preparing and combining ingredients, and applying heat. It is a means of processing food, without which many foods would be unfit for human consumption. It is also important for human being as it favors safety by destroying food poisoning organisms and increases edibility and digestibility. Cooking can cause changes in the color, flavor and texture of foods that allows us to create foods that we derive pleasure from eating.

In most Ethiopian community, the responsibility of food cooking practices is mostly given to mothers. The basic food cooking practices are based on the family economic background and cultural behavior cooking methods and

use of related ingredients, tools and appliances is different (Kramer *et al.,* 2012). The majority of the Ethiopian households and societies are sticking to the traditional eating patterns of a typical old style of eating of 'Injera' a flat bread and stews made of pulses. Though there are many traditional foods pertinent to different ethnic groups. Occasionally stews made of cattle meat, chicken, sheep and goats are also used with 'Injera'. Yet, Ethiopia as one of the developing countries is going through a transition which is reflected through some changes in lifestyles and dietary habits of the people.

There are many reasons why home is the location associated with significant risks of food borne illnesses. The greatest proportion of the food we eat is prepared at home, thereby increasing the opportunities for food handling errors to occur. Raw unwashed vegetables, dripping raw meat, as well as cooked ready-to-eat foods are common in home refrigerators. At least two studies have reported that the kitchen is more heavily contaminated with fecal coli forms than bathrooms (Rusin *et al.,* 1998; Ojima *et al.,* 2002). There are the following key considerations that need to be followed to ensure food safety and quality during food preparation namely: cleanliness, separation of raw and cooked food, cooking food thoroughly using appropriate cooking method, storage of food at safe temperature and use of safe water and raw materials and use of safe and hygienic energy source for cooking. Every food handler in the food preparation area must maintain a high level of personal cleanliness. Food hygiene and food safety includes hand washing before eating, feeding children, preparing food and after using the toilet. Effective hand washing is the most importantly practice to help prevent harmful bacteria from spreading from people`s hands to food, work surfaces and equipment Gliszczyńska *et al.*, 2006). These conducts is important in decreasing gastrointestinal pathogen transmission and growth in food (Haughn *et al.,* 1991). So giving attention to improve household cooking practices and handling of raw and processed foods is vital.

Food cooking methods is one of the basic importance in home environment. In different African countries including Ethiopia, the basic food preparation methods that are used by most families comprises of boiling, steaming and frying. In order to enhance the flavor, preferred condiments are added to the food during cooking (Molotja, 2008). In Ethiopia, besides the above mentioned cooking methods baking, stewing, and roasting etc stir frying followed by boiling are commonly practiced by different ethnic households (Personal Observation). Heating causes oxidative and thermal degradation, resulting in the formation of oxidized and polymerized compounds with higher polarity and, thus, modifying the nutritional properties of dietary fat and fried food (Gao-feng *et al.,* 2009). Similar studies by Cieslik *et al.,* (2007) also revealed that it is known that cooking induces significant changes in chemical composition, affecting the bioavailability and content of chemo-preventive compounds in vegetables. Cooking methods were shown to affect the contents of nutrient and health-promoting compounds such as vitamin C, *carotenoids*, *polyphenols*, and *glucosinolates* in broccoli.

Cooking practices may be associated with risk factors for chronic diseases of households generally in two ways. The first risk which may affect food processer due to biomass of smokes that comes from the fuel. As research shows in Ethiopia, 94% energy demand for food cooking is fulfilled by wood, charcoal, branches, animal dung and agricultural residues, which all produce smoke and harmful emissions when burning (Kooser, 2014). The extensive use of biomass fuels for cooking and home heating in developing countries have adverse health effects (Viegi *et al.,* 2004). According to the report of Bruce *et al.,* (2000) it is estimated about 1.5 to 2 million deaths per year worldwide to indoor air pollution, mostly (1 million) occurring in children younger than five years of age due to acute respiratory infections, but also in women due to chronic obstructive pulmonary disease and lung cancer (Ezzati and Kammen, 2002). According to Kumlachew *et al.,* (2014) the consequences of using traditional fuels like charcoal are multifaceted; among which financial, environmental and health consequences can be mentioned.

The second one is the formation of harmful substances during food cooking. Some research suggests that regularly consuming charred, well-done meat may increase risk of pancreatic cancer and breast cancer. Cooking at high heat can also produce a chemical reaction between the fat and protein in meat, creating toxins that are linked to the imbalance of antioxidants in the body and inflammation, which can lead to an increased risk of diabetes and cardiovascular diseases. The first contributions at European level to the evidence of acrylamide presence in foods demonstrated that it is formed as a result of a reaction between amino acids, namely asparagines and reducing sugars, particularly glucose and fructose as part of the Maillard reaction (Mottram *et al.,* 2002; Stadler *et al.,* 2002). Dietary acrylamide intake may increase the risks of kidney and breast cancer (Hogervorst *et al.,* 2008) and laboratory

tests on animals proved that acrylamide has genotoxic and neurotoxic effects, causing gene mutation and DNA damage, and it may present a health hazard for humans (Mojska *et al.*, 2010).

Currently, there is no documented information on households' cooking practices and associated risk factors for chronic diseases in Jimma town in general and in Bossa Addis Kebele in particular. Therefore, the objective of the assessment was to generate baseline information that will assist to conduct further detailed research on the household cooking practices and associated risk factors for chronic diseases in Bossa Addis Kebele of Jimma.

Materials and Methods

Study Area

The study was conducted in Bossa Addis kebele which is one of the 13 kebeles in Jimma town. The kebele is sub-divided in to five groups called zones. Jimma town is found in Southwest part of Oromiya Regional State of Ethiopia. It is at 355 km from Addis Ababa in the southwest of the country. The human population of Bossa Addis kebele is estimated to be 10,562 people of which 4728 people are males and 5272 people are female. The youth comprised 30 % of the residents and 70 % comprised adults and elderly people according to the secondary information obtained from the office of the Kebele.

Sampling Techniques and Sample Size

Systematic sampling technique was used to select study participants for this assessment. The majority of the interviewee was purposively selected to be women with the objective of collecting reliable information. This was based on the fact that the majority of household activities including cooking are the responsibility of women in the society. The households representatives were identified by considering the number of household in the kebele administrative area. Respondents per zone was selected randomly and the sampling interval was at approximately 20 to 30th household was visited to get the required information from the respondents.

Data Collections and Analysis

Structured questionnaire was prepared, pretested and used to collect qualitative and quantitative data on the cooking practices and associated risk factors for chronic diseases. After data collection, the data were checked for completeness and consistency. The relevant data was coded, and entered into a computer and later subjected to SPSS for analysis. Those quantitative data were analyzed using the general linear model procedures and the qualitative data were analyzed using descriptive statistics of SPSS (2016).

Results and Discussion

The results are discussed based on the demographic data, household cooking practices, raw materials used for cooking, knowledge of respondents about effect of cooking on health on chronic diseases.

Demographic Characteristics

Bossa Addis kebele is administratively divided in to five zones. During random sampling the respondents' distribution was six from Zone 1; five respondents from zone 2; four, nine and nine respondents from zone 3, 4, and 5, respectively. The gender distribution of the respondents showed that most of the respondents, 90.3 % were females and only 9.3 % were males (Table 1). In the present study women spend more time on cooking providing food for the family. The educational status of the respondents recorded during the survey revealed that more than 41.9 % of the respondents were certificate holders and above and 12.9 % first degree holders. Only 16.1% of the respondents were unable to read and write. 22.6 % of the respondents attended primary school and 19.4% had completed high school. The result of the job status of the respondents shows that 41.9% of the interviewee was government employee followed by 25.8 % retail traders who buy and sale goods to generate income for their household expenditures (Table 1). The marital status of the respondents indicated the majorities (67.7%) of the households comprised of male headed households, 12.9 % were widowed women, 22.6% were female headed households and 9.7% of the respondents were divorced due to different reasons (Table 1).

Responsibility for Cooking Among Family Members

In the present study, the food preparation and cooking duty are performed by women (65 %), daughters (26 %), husbands (5 %) and house maids (4 %), respectively (Table 2). From this study it is clearly indicated that the majority of food preparation and cooking is done by women. The manner of food preparation and cooking is traditional and there are no family meal plans/guidelines. Another similar report from South Africa by Myeza *et*

al., (2015) also indicated that an average woman is likely to spend more time providing care for her family and preparing food. According to the respondents boys/ sons do not take part in food preparation and cooking practices in the study. Another report that supports this finding revealed that girl Childs/daughters in Ethiopia are victim of son preference and suffers from unequal division of labor (Haragawoin and Embet, 2003).

Places of Cooking in the Households

According to the respondents, 58 % the households prepare and cook their foods in the separate private kitchen, 29 % cook and prepare food in shared kitchen and 13 % of the households cook their food in the living/ dining room (Table 2). Similar study conducted in Debre Markos reported that more than half of the households (52.7%) had separate indoor kitchens outside the house with one window and with ventilation conditions and in 6% of the households, the kitchens were found attached to the living houses. About (59.1%) of the respondents were cooking in their living room (Kumilachew *et al.*, 2014). Hence, the current finding is in agreement with the previous work. Despite the utilization of different places of cooking, the households were not aware of the impact of the hygiene and standards of the cooking places on the safety of the foods cooked to human being. Every kitchen activity is done on the mud floor and there is no standard kitchen.

Energy Sources for Cooking

According to the current report by the respondents in Bossa Addis, the majority of the households (90.6 %) use charcoal as primary energy source for cooking food followed by fire wood (71.9 %). Whereas only 13 % of the respondents use electricity and 3.1 % use animal dung as primary energy source (Figure 1). Similar study conducted in Debre Markos revealed that almost 95 % of the populations in Debre Markos utilize traditional energy sources for cooking food (Kumilachew *et al.*, 2014). A study done in Ethiopia by Guta (2012) also showed that about 77% of annual biomass consumption in Ethiopia is met from fuel wood followed by animal dung (13%) and crop residue (9%), respectively. In the current study the respondents associate the rare utilization of electricity with intermittent connection and power fluctuation. They associated the decreasing trend in the utilization of cow dung with the decrease of livestock from the surrounding as a result of urbanization. GIZ expert recommendation Quoted by Kumilachew *et al.*, (2014) stated that using clean energy sources for cooking purposes saves time, easy to use, no negative health effects; despite it has high initial investment costs.

Smoke from biomass combustion produces a large number of health-damaging air pollutants, including respirable particulate matter, carbon monoxide (CO), nitrogen oxides, formaldehyde, benzene, 1,3 butadiene, polycyclic aromatic hydrocarbons, and many other toxic organic compounds (Vinod mishra *et al.*, 2005). In developing countries, where large proportions of households rely on biomass fuels for cooking and space heating, concentrations of these air pollutants tend to be highest indoors. The fuels are typically burned in simple, inefficient, and mostly unvented household cook stoves, which, combined with poor ventilation, generate large volumes of smoke indoors. In such settings, daily average and peak exposures to air pollutants often far exceed levels recommended by the World Health Organization (WHO, 1997). Exposure levels are usually much higher among women, who tend to do most of the cooking (Behera *et al.*, 1988). Levels of CO in homes using biomass fuels are sometimes high enough to result in carboxyhemoglobin levels comparable to those in smokers (Behera *et al.*, 1988). Exposure to CO has been associated with retarded fetal development and adverse pregnancy outcomes, including prenatal mortality and reduced birth weight (Garvey and Longo, 1978).

Water Sources for Cooking

According to the respondents in the current study tap water is used by more than 90 % of the respondents followed by combination of tap and spring water, tap and river water, tap water and water from wells etc, respectively depending on the availability of water (Figure 2). As it was revealed by the respondents, they seek different water sources regardless of its safety due to the unreliability of the tap water. A report by Vittorio (2011) recommends source and quality of water available at the household level for food preparation and cooking has to be safe and clean. The same study revealed that 2 million people die annually for causes related to unsafe water, poor sanitation and hygiene. Hence, the water quality should be investigated cautiously.

Types of Cooking Pots

In the study area, 84 % of the respondents use metal cooking pots and about 16 % of the respondents use both metal and clay pots for cooking. (Figure 3). More than half of the cookware ever sold in the world is made of

aluminum. Aluminum is so popular due to its low price and quick heating. It has been reported that the uses of aluminum utensils for cooking provides an important route for aluminum metal to enter food and consequently to consuming human bodies (Semwal, 2006). There has been many evidence reported that Aluminum has a toxic environmental impact of considerable importance (Mohammad *et al.*, 2011). The respondents in the current study are not aware of the quality of cooking wares and its leaching impact in to food during cooking. Consequently, they use any cheap metal pots purchased from local markets.

Types of Cooking Oils

According to the respondents 84 % of the households in the study area use saturated cooking oils and only 16 % use both saturated and unstarated cooking oils in the preparation and cooking of their family diets (Figure 4). The respondents reported that they regularly purchase the cooking oils at subsidized price from Bossa Addis Kebele office. Purchase of cooking oils in Bossa Addis depends on the availability and distribution by the kebele. Sometimes it is distributed in bulk in big plastic containers of 20 litres capacity and they share among groups of 4-5 people. Other times it comes with 3-5 litres capacity plastic containers. The saturated cooking oils/ palm oils used in the study areas are branded as viking, cheif, hayat etc. All brands are soilds at room temperature. From the current study, it is clearly observed that all households consume palm oil. While the consumption and utilization of unsaturated fats is very limited. According to the respondents there is low level of awareness about health risks related to palm oil. Besides, the respondents reported that the unsaturated fats are not affordability by average household. In the past, palm oil was attacked as "saturated" since it contains 44% palmitic acid and 5% stearic acid, and thereby allegedly raises blood cholesterol and increases the risk of cardiovascular disease (Imoisi *et al.*, 2015). Unfortunately, the allegation is based more on myths rather than on facts as it takes little consideration of basic lipid nutrition or the advent of emerging new data (Chong and T.K.W. Ng, 1991).

Another study by Annamaria *et al.*, (2015) revealed that palm oil represents the most widely used vegetable oil in the world. It is found in supermarket products ranging from margarine, cereals, sweets and backed goods. Palm oil rich diet determines weight-gain and hepatic lipid accumulation compared to unsaturated fat diet such as olive or safflower oil. Besides, there is now considerable evidence that, in addition to the known risk factors, dietary fat intake plays an important role in determining cancer risk for decades, epidemiological studies indicated a positive association between total fat intake and risk of breast, colorectal and prostate cancers (Annamaria *et al.*, 2015). The same study revealed that there is convincing evidence that palmitic oil consumption contributes to an increased risk of developing cardiovascular diseases.

Types of spice used for food flavouring

In the study area, different types of herbal, seeds, barks or root and tubers of spices are used depending on the desired flavor and type of food to be cooked. 45.2% of the respondents use leaves of basil, coriander, rosemary and rue for their cookings. Whearas Rosemery alone, rue and basil, 'koseret', basil and coriander were used by 9.7 % of respondents, respectively. Oregano, basil, rosemary spices were used by 6.5 % of the respondents, while 19.4% of the respondents reported that they do not use any herbal spices for cooking (Table 4). Among the seeds of spices used by the respondents, 45.2% of the household use cororima, black & white cumin and fenugreek for seasoning of their foods. Whearas 16.1% and 12.9% of the households use only coriander and black cumin, respectively (Table 4). 'Mekelasha' is a mixture of cinnamon, clove and other exotic spices prepared mixed together and is used by 64.6% of the respondents for seasoning of stew and some special foods prepared for special ceremonies. 25.8% of the respondents never use 'mekelesha' in their cooking, while 9.7% respondents use mixture of cinamon and clove as 'mekelesha' for seasoning their cooking (Table 3).

Different combinations of tuber spices such as onions, garlic, ginger and turmeric are used by 58.1% of the respondents in the study area, While 16.1 % of the respondents use garlic and onion. 9.7 % of the respondents use only ginger and onion from tuber spices. Whereas 3.2 % of the respondents use only ginger and garlic. While turmeric, onion and garlic are used by 12.9 % of the respondents in the study area (Table 3). Although spices are used primarily as flavoring and seasoning agents in foods, many spices possess significant antimicrobial activity. In all instances, antimicrobial activity is due to specific chemicals or essential oils. It would be difficult to predict what antimicrobial effects, if any, are derived from spices as they are used in foods; the quantities employed differ widely depending on taste and the relative effectiveness

varies depending on product composition (James, *et al.*, 2005). In the current study, the respondents use spices for flavoring and seasoning purposes and are not aware of the antimicrobial effects of different spices. Hence, their antimicrobial effects and the health benefits from utilization of spices need to be optimized. The respondents indicated that preference for spices depends on the choices of the respondents.

Food Cooking Practices in Bossa Addis Kebele

Meat products cooking practices

In the study area, the cooking methods of meat various based on the type of meat used by the households. According to the respondents cattle meat 'wot' and poultry/chicken 'wot' are prepared using stir frying followed by stewing/boiling. 100 % of the respondents practice making spicy 'doro wat' that takes longer hours of cooking at high temperature. Some respondents mentioned that ''If 'Doro wot' is not cooked for longer time, it does not be tasteful and attractive to eat''. Sheep and goat meat is stirred fried followed by stewing by 41.9 % of the respondents. Mostly any 'wot' /stew is prepared by stir frying onion and garlic with palm oil and sometimes powder of fenugreek is added. The stir frying continues until the color becomes light brown. At this stage, hot pepper powder is added and stirs frying and addition of drops of water is continued until the hot paper is believed to be done. 58.1% of the respondents use stir frying followed by stewing for sheep and goat meat (Table 4). Generally, according to the respondents long time and high temperature cooking is practiced. According to the respondents the size of the meat cut determines the cooking time. Research results in Europe and the United States have found acrylamide in certain foods that were heated to a temperature above 120^{o}c, but not in foods prepared below this temperature (Stadler *et al.*, 2002). Pan-frying method of cooking should be done at a lower temperature. Research shows that frying meat at a higher pan temperature, which saves only two minutes of cooking time, produces three times the heterocyclic amines (HCA) content of meat cooked at medium temperatures. Consumption of HCAs is mostly clearly linked to cancers of the colon and stomach.

Cereals cooking methods

Some of the common food types prepared from cereals are 'Injera', bread and porridge. The types of cereals used as raw materials for the preparation of Injera range from *Eragrostis tef*, maize, sorghum etc depending on the socio economic back ground of the households. According to the respondents, 100 % of the households bake bread and 'Injera', respectively. 31 % of the households make porridge by consecutive stirring with adding boiled water frequently until cereal porridge is done after which it is served hot (Table 5).

Cooking methods for pulses

In the study area, different types of pulses such as faba bean, field pea, lentil and chickpea, climbing beans are used either as whole pulses, grounded or in flour forms for making different types of stews. Besides, the climbing beans are used for making soups. Whole pulses such as chickpea are also used as 'nifro' and roasted 'qolo' or 'ashuk'. Hence, their cooking methods vary depending on the type of cooked product desired. 38.7% of the respondents prepare pulse stew from the whole pulses by boiling before stewing.

According to the respondents, 100 % of the respondents used stir frying followed by stewing for making of 'shiro' and lentil 'wot', respectively (Table 5). To prepare pulse stew chopped onion is stir fried with palm oil. Each time drops of water are added. When the onions turn brown, either hot pepper or turmeric powders are added to make 'key wot' and 'alicha wot', respectively. At the last when the pulses are done desired spices especially 'mekelesha', salt and traditional ghee are added for taste and desired flavor. Finally, the pot is removed from fire source after which the stew is ready to be served with flat bread known as 'injera'. Boiling of whole pulses of faba bean and chickpeas to make 'nifro' is practiced by 54.8% of the households. Occasionally Kolo/Ashuk is prepared from beans and mostly chick pea. 38.7% of the respondent households boil and roast chick pea for 'kolo' making. While 38.7% directly roast and use chick peas and beans for kolo making. 19.4% of the households sock for some hours and roast the beans and chick peas to make kolo.

Soaking and boiling of beans before roasting is advisable to help beans to absorb water and shorten the roasting time. During soaking, the water is dispersed into the starch granules and protein fractions of beans, which facilitate processes, such as gelatinization and protein de-naturation, which softens the texture (Siddiq and Uebersax, 2012). Boiling is a quick method of heat transfer that uses currents for the movement of uniform heat in food. (Taiwo and Akanbi, 1997). Color change and attractive flavor is an indicator of determining doneness of pulses during roasting.

Cooking methods for leafy vegetables and tomatoes

Vegetables are plants or parts of plants that can be used as foods and source of nutrition. More than 93% of the households stir fry vegetables such as *Brasica spp*. (kale). Similarly, stir frying of cabbages, Swisschard and tomato is widely practiced by 96.8 %, 96.8 % and 96.8 %, respectively, in the study area. Simmering of kale, Swisschard, tomato and cabbage is practiced by 3.2 %, respectively for each vegetable in the households (Table 6). Boiling of kale is practiced only by 3.2 % of respondents. But, boiling of vegetables is a quick and convenient method of cooking. The disadvantage of boiling vegetables is that it results to leaching of nutrients from food (Myeza, 2016). During boiling of vegetables great care must be taken by reducing the amount of water used and time. The respondents mostly depend on changes in color, flavor, texture and general appearance during cooking to check the doneness of vegetables. In a study conducted on effects of different cooking methods on health-promoting compounds of broccoli by Gao-feng YUAN1 (2009) frying caused 67% loss of the initial carotenoid concentration, boiling, stir-frying/boiling, stir-frying, and microwaving led a great loss of chlorophyll in broccoli. Nutrient and health-promoting compounds in broccoli are significantly affected by domestic cooking. All cooking treatments, except steaming, caused great losses of chlorophyll and vitamin C. In the same report, in contrast, steaming did not cause any significant loss of chlorophyll content. All cooking treatments caused significant decreases of total soluble proteins and soluble sugars while steaming obtained the best retention. According to current study, stir frying is the highly practiced cooking method for most vegetables. Therefore, it is important to cook vegetables for minimum amount of time and use appropriate cooking method such as steaming not to lose essential nutrients of vegetables.

Cooking practices for roots and tubers

About 97 % of the respondents of the respondents stir fry beetroot and carrot, respectively. Again 96.8 % of the respondents stir fry Irish potato with carrot and other leafy vegetables such as cabbage are also added and cooked together. Only 3.2% simmer beetroot and carrot. About 97 % of the respondents revealed that Irish potato is cooked using different methods based on the type of final product desired by family members. 3.2% of the households boil Irish potato for direct consumption without further processing. Boiling was used for taro, yam and sweet potato by 96.8%, 100% and 100 % of the respondents, respectively (Table 6). Another study by Fabbri and Crosby (2016) also revealed that boiling is the preferred method of cooking for most root and tubers crops, with 79% of the sample reporting preference for this method. Another information from http://healthyeating.sfgate.com/boiling stated that if one boils vegetables one may be destroying the essential nutrients and not receiving all of the available health benefits. The factors that affect the nutrient availability in your vegetables are water, heat and time.

Doneness of Cooking/Cooking Time

During cooking the responsible person for cooking uses different techniques adapted either from experience or culture. In the current study 38.7 % of the respondents rely on guessing to determine the doneness of cooking. 32.3 % look for changes in the color to determine its doneness and 19.4 % check the doneness using the flavor of the food. Very few respondents 9.7 % determine doneness of a food through their own personal experience (Table 7).

Cooking Practices and Associated Health Risks for Chronic diseases

Health risks from energy sources used for cooking

In the surveyed households 74 % of the respondent households were aware and 26 % of the respondent households were not aware of health risks associated with utilization of cooking energy sources such as fire wood, charcoal and cow dung (Table 8).In the present study 55 % of the respondents were aware and 45 % of the respondents were not aware about the environmental pollution from utilization of traditional energy sources for cooking (Table 8). In a study conducted in Debre Markos by Kumlachew Geremew (2014), 42.1% of the respondents were able to name most of the accepted traditional cooking energy utilization related health problems such as cough, irritation of eyes, and breathing related problems.

Table.1 Demographic characteristics of respondents in Bossa Addis Kebele

Characteristics	Category	Percent
Gender	Male	9.7
	Female	90.3
Educational status	Degree and above	12.9
	Diploma	16.1
	Certificate	22.3
	Elementary school	22.6
	Illiterate	16.1
	Unemployed	19.4
	Salaried employ	41.9
Job status/ occupation	Business/trade	25.8
	Daily Labor	12.9
Position in the household	Male headed	67.7
	Female headed	22.6
	Daughter	6.5
	Others	3.2
Marital status	Married	67.7
	Single	9.7
	Widowed	12.9
	Divorced	9.7

Table.2 Responsibility for cooking and places of cooking in Bossa Addis Kebele

Characteristics	Category	Percent
Responsiblity for cooking	Wife	65.0
	Husband	5.0
	Daughter	26.0
	House maids	4.0
Places of Cooking	In the living room	13.0
	In the shared kitchen	29.0
	In the separate private kitchen	58.0

Table.3 Types of spices used for cooking in Bossa Addis

Characteristics	Category	Percent
Herbal spices	Basil, Coriander, Rosemary, Rue	45.2
	Rosemary	9.7
	Rue, basil	9.7
	Koseret, Basil, Coriander	9.7
	Oregano, basil, rosemary	6.5
	None	19.4
Seed spices	Cororima, black & white cumin, fenugreek	45.2
	Black cumin	12.9
	Rue	6.5
	Cororima	9.7
	Fenugreek and coriander	9.7
	Coriander	16.1
Barks of spices	Mekelasha (Mixed spices prepared together)	64.6
	Cinamon and clove	9.7
	Do not use	25.8
Tuber spices	Onions, garlic, ginger , turmeric	58.1
	Garlic, onion	16.1
	Ginger, onions	9.7
	Ginger, garlic	3.2
	Turmeric, onion and garlic	12.9

Table.4 Cooking methods for different meat products

Cooking type	Food type			
	Beef 'tibs'	Beef'wot'	Sheep and goat meat	Poultry meat
	%	%	%	%
Stir frying followed by stewing	0	100	41.9	100
Frying	100	0	58.1	0

F = Frequency

Table.5 Cooking practices of Cereals and Pulses in Bossa Addis

Cooking type	Food type						
	Genfo/ Porridge	Injera	Bread	Shiro wat	Lentil wat	Beans	Kolo/ Ashuk
	%	%	%	%	%	%	%
Stirring with adding water frequently	100	0	0	0	0	0	0
Baking	0	100	100	0	0	0	0
Stir frying followed by stewing	0	0	0	100	100	6.5	0
Boiling	0	0	0	0	0	54.8	3.2
Boiling, deep frying and stewing	0	0	0	0	0	38.7	0
Boiling and roasting	0	0	0	0	0	0	38.7
Soaking and roasting	0	0	0	0	0	0	19.4
Roasting	0	0	0	0	0	0	38.7

Table.6 Cooking practices for vegetables, roots and tubers in Bossa Addis

Cooking type	Food type									
	Brasicca/ Kale	Cabbage	Swiss chard	Tomato	Irish potato	Sweet potato	Taro	Yam	Beet root	Carrot
	%	%	%	%	%	%	%	%	%	%
Stir frying	93.6	96.8	96.8	96.8	0	0	3.2	0	96.8	96.8
Boiling	3.2	0	0	0	3.2	100	96.8	100	0	0
Simmering	3.2	3.2	3.2	3.2	0	0	0	0	3.2	3.2
Other method	0	0	0	0	96.8	0	0	0	0	0

Other method = Stir frying potato with carrot

Table.7 Determination of doneness/ cooking time for foods

Variable	Valid Percent
Guessing	38.7
Food color change	32.3
Experience	9.7
Food flavor change	19.4

Table.8 Knowledge cooking practices and associated health risks for chronic diseases

Variable	Valid Percent	
	Yes	No
Knowledge on health risk factor associated with use of fire wood, charcoal and animal dung as sources used for cooking	74	26
Knowledge about environmental pollution as a result of using local energy sources for cooking	55	45

Table.9 Knowledge on cooking practice and associated health risks for chronic diseases

Variable	Valid Percent	
	Yes	No
Have you/your family member ever got sick due to improper cooking practice?	6.5	93.5
Can you mention the name of disease you/your family member ever encountered?	9.7	90.3

Fig.1 Energy sources used for cooking foods

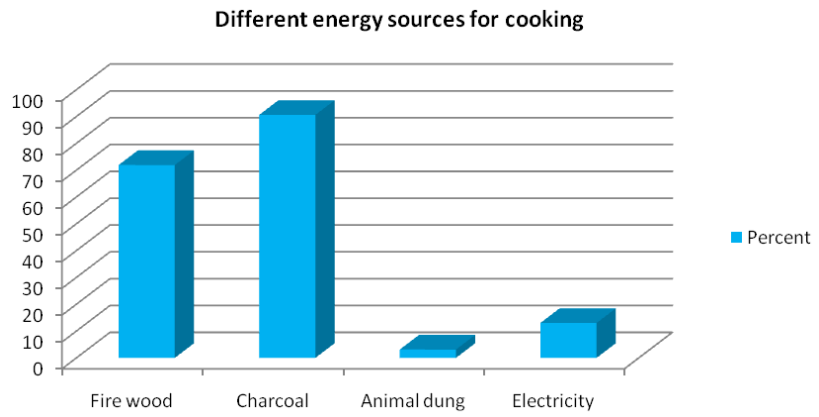


Fig.2 Water sources used for food preparation and cooking

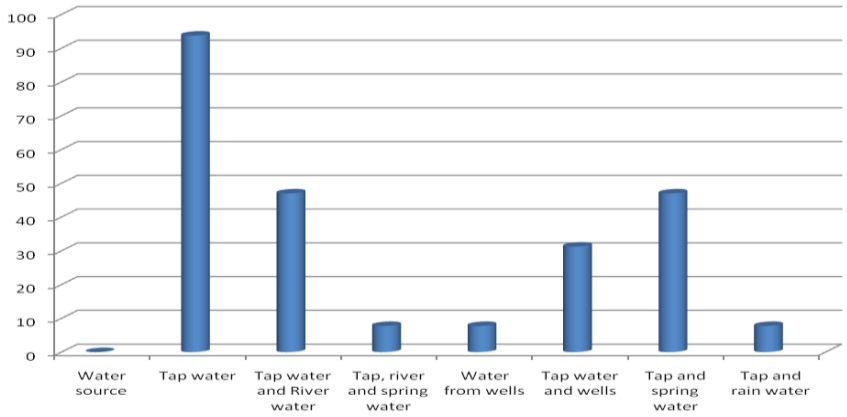


Fig.3 Type of pots used for cooking in the household of Bossa Addis

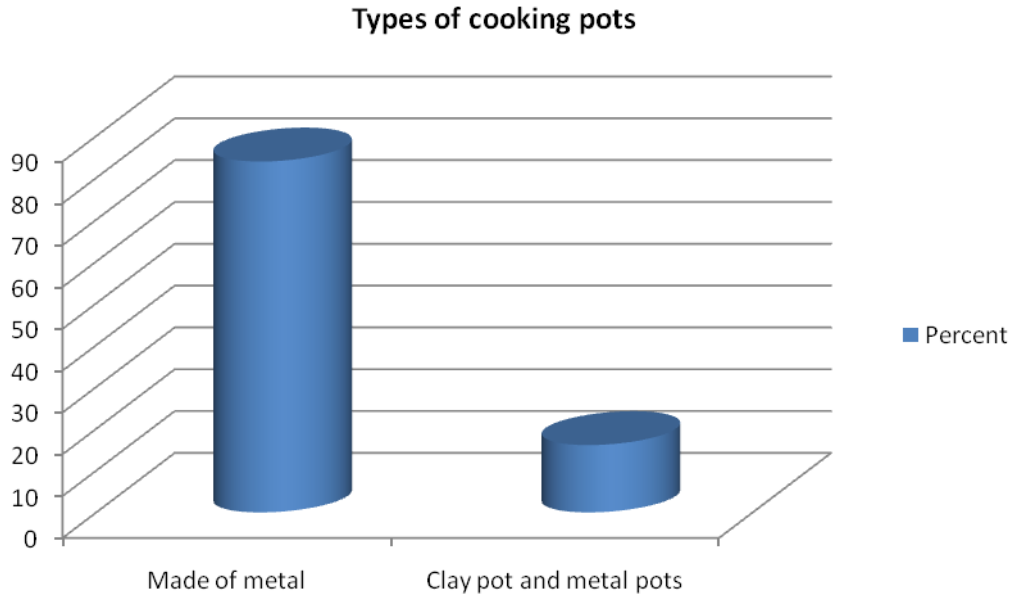
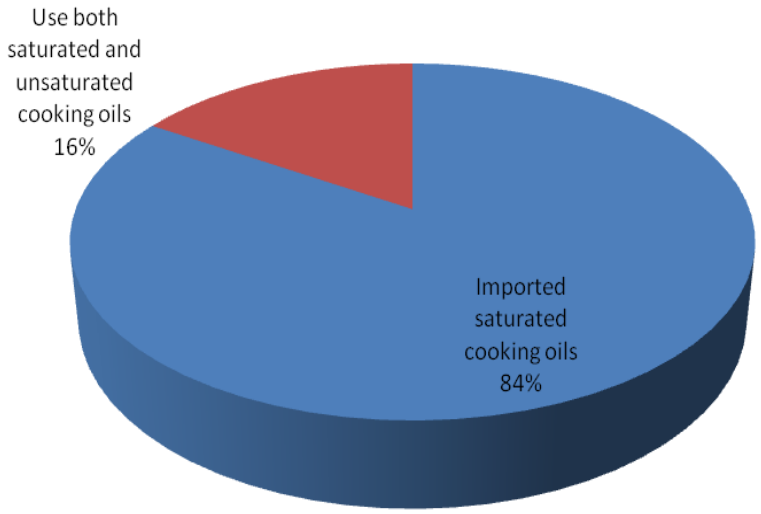


Fig.4 Cooking oils used by the households in Bossa Addis



In the study it was also reported that 89% of the respondents mentioned smoke from charcoal, 91% of the respondents stressed smoke from firewood and 89% of the respondents reported that smoke from animal dung and leaves disrupt one's health. Similarly, in the current study most of the respondents reported the risk of suffocation from charcoal and irritation of eyes from smokes from charcoal and wood smokes.

In addition smoke is another health risk explained by the respondents which comes from biomass fuel. As they respond the smoke affect the lung of the food cooker as well as the surrounding family member nearby during cooking.

Cooking methods used and associated health risks for chronic diseases

In the current study, 93.5 % of the respondents are not aware of health risks for chronic diseases associated with cooking methods and only 6.5 % of the respondents replied that they know about diseases such as gastritis can arise due to consumption of some foods such as 'doro wot' that is cooked for very long time with a lot of saturated cooking oils and butter.

When the respondents were asked to name a disease that the respondents or the family have encountered only 9.7 % replied about gastritis. While 90.3 % of the respondents replied that they do not know about any risk of chronic disease that occurs due to cooking practices (Table 9). They mentioned that when stews are stir fried and stewed for long time it gets well done and it tastes delicious.

Some of the important risk factor during cooking is formation of acrylamide which is a chemical that can form in some foods during high-temperature cooking processes, such as frying, roasting, and baking (Mottram *et al.*, 2002). Asparagines are amino acids that is found in many vegetables. They are found with higher concentrations in some varieties of potatoes. When asparagine is heated to high temperatures in the presence of certain sugars, asparagine can form acrylamide. High-temperature cooking methods, such as frying, baking, or broiling, have been found to produce acrylamide (Mottram *et al.*, 2002), while boiling and microwaving appear less likely to do so. Longer cooking times can also increase acrylamide production when the cooking temperature is above 120 degrees Celsius (Gertz and Klostermann, 2002). Studies in rodent models have found that acrylamide exposure poses a risk for several types of cancer (Friedman, 2003). A series of case-control studies have investigated the relationship between dietary intake of acrylamide and the risk of developing cancers of the oral cavity, pharynx, esophagus, larynx, large bowel, kidney, breast, and ovary (Pelucchi *et al.*, 2006).

In the present study women spend more time on cooking providing food followed by daughters for the households in the family. The majority of the households use charcoal as primary energy source for cooking food followed by fire wood. The major reasons for this high utilization were wrong perception about cost of cooking energy sources, insufficient knowledge about the consequences of smokes from biomass fuel. Only few of the respondents use electricity. There is low level of income about utilization of electricity and power

fluctuation. The majority of the households prepare and cook their foods in the separate private kitchen, followed by shared kitchen and the living rooms, respectively. Generally there are no standard kitchen interms of genral housekeeping and facility. Water source for food preparation and cooking in the study area is tap water, spring, river, water from wells depending on the their availability. Generally, the water supply is not reliable and the respondents are not as such aware of the health impact of the cleanliness of water used for cooking. The respondents use metal cooking pots and only few of them use clay pots for cooking. The respondents are not aware of the quality of the cooking wares and its leaching impact into food during cooking. All respondents in Bossa Addis use palm oil/saturated cooking oils and only few respondents use both saturated and unsaturated cooking oils in the preparation and cooking of their family diets. This is due to lack of awareness about the health hazards associated with hydrogenated or saturated cooking oils and the respondents do not afford to buy unsaturated cooking oils. Different types of herbal spices, seeds, barks of trees, root and tubers of spices are used depending on the tradition, desired flavor and type of food to be cooked. The use of spices beyond flavor and taste and the form in which they can be more beneficial is not known to the community.

Generally high temperature and long time cooking is practiced for all food stuff. Stir frying and boiling/stewing and stir frying is used to cook different types of meat. Cereals usually baked while whole pulses are boiled and stir fried and stewed. Those cereals whose covers were removed are stir fried and stewed. While all leafy vegetables are stir fried and the roots and tuber crops are boiled and used. Doneness of the food staff is checked by guessing, food color and flavor changes. The majority of the respondents are not aware of the association between cooking practices and risk factors of chronic diseases. Only some respondents know about suffocation from biomass fuel and irritation of eyes and some gastritis problems associated with consumption of spicy and oily foods. The households responded that the smoke from biomass fuel affects the lung of the food cookers as well as the surrounding family members nearby during cooking.

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