

## Dietary Patterns of the Iteso Community living in Amagoro Division of Western Kenya

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**Abstract:** Kenya is especially experiencing a rise in the incidences of non-communicable diseases. A healthy diet is important in the prevention and management of such diseases. This study was therefore designed to describe the dietary patterns of the Iteso community, the main inhabitants of Amagoro in Western Kenya. The study provides background knowledge on possible diet and health intervention that would help to improve health status. This was a cross sectional survey involving 260 women aged between 15 - 90 years. First, focus group discussions and key informant interviews were conducted to establish cultural and social aspects surrounding food and people's common views towards food. They also helped generate a food list that was used in designing a food frequency questionnaire. This was then followed by a household survey using a pretested structured questionnaire administered through interviews. The results showed that the diet of these people was generally starch-based and was limited in protein. The common food being porridge prepared from maize which is deficient especially in essential amino acids like tryptophan and lysine. Foods were mostly consumed thrice a day. Thin porridge or black tea was popular for breakfast and stiff porridge for lunch and supper. There is therefore need to develop strategies that seek to increase the availability of protein sources and diversify carbohydrate sources. Improving income sources would help in meeting nutritional needs without people having to sell their protein-rich foods for money. The population also needs to be educated on possible adjustment of stiff porridge to relish ratio.

**Key words:** Dietary patterns, Iteso community, Amagoro in Western Kenya

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### I. Introduction

As a result of the rising cases of non-communicable diseases in Kenya [1], emphasis has been placed on the need to understand the foods and culture of the indigenous people in order to be able to effectively develop and implement health promotion activities [2]. A healthy diet is important in reducing the incidences of such diseases [2,3,4] especially by identifying and promoting intake of staple foods that are culturally-acceptable [5]. The Kenyan population is divided along ethnic, geographical as well as economical backgrounds. Consequently, the dietary patterns vary considerably among the different ethnic groups [2, 6, 7]. For example the Kamba, Luo and Maasai of Kenya have considerably different dietary patterns [7]. However, despite the diverse dietary patterns, food insecurity is a major challenge facing majority of Kenyans irrespective of their ethnicity [1, 4, 7, 8]. This challenge also justifies the need to describe the various dietary patterns [4,7] since it will enable the government to know the extent of the problem and devise policies to address them [2,4].

Government interventions must be targeted to specific populations since most indigenous people are located in rural and remote areas. In addition, there are differences in local food sources and socio-cultural characteristics [2]. For example in most parts of Kenya food preparation is mainly done by women [8, 9, 10]. They are responsible of growing or purchasing food [9]. Consequently, they are responsible in making decisions relating to food including the choice of food, its source, preparation and consumption [8]. The choice of food as well as the amount to be consumed may be influenced by socio-demographic characteristics of the households such as household sizes, employment status and level of education [11].

Amagoro division which is located in the northern part of Busia County in Western Kenya is mainly composed of the Iteso people who belong to the Nilotic-speaking group [9]. Karp and Karp conducted a study between 1969 and 1971 in Amukura division of Busia County which is also inhabited by the Iteso [9]. These anthropologists described the Iteso culture including the foods consumed but did not clearly describe the frequencies of consumption of various foods neither did they specify the average serving sizes for various foods. Nonetheless there is a possibility in changes in dietary patterns considering they conducted their study 46 years ago. Modernization which has been shown to influence cultural values, socio-economy and education in the households [12] may also have imparted on the dietary patterns of these people.

Despite the known association between dietary and various health outcomes [3], data on food consumption patterns among the poor populations of Kenya is not readily available [4]. This study therefore aimed at describing the dietary patterns of the Iteso community living in Amagoro division of Western Kenya.

This will provide background knowledge for possible association between diet and health especially with regard to non-communicable diseases among the Iteso community.

## **II. Materials And Methods**

### **2.1 Study design**

This was a cross-sectional study. The survey was conducted among women aged 15 – 90 years drawn from households located in Amagoro division of Busia County in Western Province of Kenya. The study used a structured pretested questionnaire to collect information through self-reporting. The interviews were conducted at the participants' home. Focus group discussions and key informant interviews were also conducted in the area.

### **2.2 Study area**

Amagoro division is located in Teso North District of Busia County in Western Kenya. Its administrative headquarter is in Amagoro town. It is bordered by Bungoma district to the North and East, Teso South district in the South and Republic of Uganda in the West. The division has nine administrative locations, namely; Okuleu, Kokare, Amoni, Osajai, Kocholia, Kamolo, Kamuriai, Amagoro and Akadetewai. According to the population census of 2009, the division has a population of 58, 207 (29, 843 female and 26, 364 male) and an area of 114.3 square kilometers. It has a total of 12, 478 households. The participants were drawn from three locations which were purposefully selected from the nine locations. These were locations with many households, located to the north (Osajai), south (Kamolo) and central (Amagoro). The participants were then proportionately distributed among these locations depending on number of households in each location.

### **2.3 Sample size calculation**

The sample size for the survey was calculated according to the formula adopted from Fox, Hunn and Mathers [13] namely:  $N = P (100\% - P) / (SE)^2$ . N= the desired sample size; P= Proportion of the main dietary component (carbohydrates) in the diet (80%). SE= the confidence interval of 5% divided by 1.96. In this case the SE= 2.55 and therefore N=246. Allowing 10% attrition, a total of 270 households participated in the study and 260 proceeded to analysis having been duly completed.

### **2.4 Ethical considerations**

This study was approved by Kenyatta National Hospital and University of Nairobi Ethics, Research and Standards Committee. Participants gave an informed consent and for those below 18 years, consent was sought from the guardian/parent. The inclusion criteria included being female, residing permanently in the household, sound vision, hearing and memory, understands the questions, agrees and signs consent to participate. The exclusion criteria were poor vision, hearing and memory or being ill [14].

### **2.5 Sampling procedures and data collection**

#### **2.5.1 Household dietary survey participants**

The survey involved women simply because according to Food and Agriculture organization of the United Nations the questionnaires administered at household level should target the person most responsible for preparing meals in the household [15]. This responsibility is mainly performed by women in the Iteso community [9].

From the nine locations in Amagoro division, three locations were sampled for this study. First the locations with less than 1000 households (HHs) were eliminated and this included Okuleu, Kokare and Kamuriai. Of the 6 locations left, three are located along the Kenya – Uganda highway (Kocholia, Amagoro and Akadetewai). Amagoro which is located in the middle of the highway was sampled from this group. Two more locations were sampled from the remaining 3 (Amoni, Osajai and Kamolo) which are located in the interior. To the south of Amagoro were Amoni and Kamolo. Kamolo was sampled since it was more interior and had the highest number of households. To the North of Amagoro and most interior was Osajai location which was also sampled. Therefore the three locations that participated in this study included Amagoro (central), Osajai (north) and Kamolo (south).

The sample size of 270 HHs was proportionately distributed among the three locations. To determine the sample size per location, the number of HHs in that location was divided with the total number of HHs in the division (three locations) and multiplied by the target sample size required for the study (270 HHs). The number of households in Osajai, Amagoro and Kamolo were 1125, 1753 and 1589 respectively and as a result 68, 106 and 96 households were selected respectively from the three locations. These households were later proportionately distributed in 2, 3 and 3 sub-locations per location respectively.

Dietary assessment was conducted by face-to-face interviews at the participants' home using pretested structured questionnaires. A semi-quantitative food-frequency questionnaires (FFQs) were administered to the

women. The women were asked about their food intake in the past one year. The FFQ contained 54 locally available food items, for which frequency of consumption (times per day, week, month or year) was assessed. In order to accurately assess the amounts of specific foods consumed, the trained interviewers carried some household measures including cups, bowls and spoons. All the ingredients were also recorded including their amounts.

### **2.5.2 Focus group discussion participants**

A maximum of 10 participants each from a different household were recruited on voluntary basis from each location. Each focus group discussion (FGD) consisted of between 6-10 women and a moderator. Each location had 2 FGDs conducted in the local church. A pretested moderators' guide was used and data was taken by recording and note taking. The key areas covered included the food consumption patterns in the area and their knowledge on diet in relation to disease.

### **2.5.3 Key informant interviews participants**

In addition to the FGDs, key informant interviews (KIIs) provided preliminary information about the foods consumed in the area including the cultural aspects surrounding food consumption. The key informant interviews (KII) participants were sampled purposively to ensure that the composition of final sample reflects the representatives from the various categories of institutions and people in the study area. Fifteen key informants including a doctor, a clinical officer, nutritionist, social development officer, nurse, religious leaders, teachers, public health officer, agricultural officer, political leader and assistant chiefs were interviewed. A pre-tested KIIs moderators' guide was used and data was collected through recording and note taking.

## **2.6 Data analysis**

The analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 20.0 and Microsoft Excel. Data analysis procedure for the food frequency questionnaire was adopted from a previous study as described below [16]. A Consumption frequency score (CFS) for each food item was calculated as the number of times the food item was consumed per week. A frequency of once weekly received a score of 1, consumption of once daily received a score of 7, with other values scaled accordingly.

The foods were classified into 13 categories as follows: cereals; roots, tubers and plantains; vegetables; fruits; meat; eggs; fish and poultry; legumes, nuts and seeds; milk and milk products; oils and fats; sweets, other soft beverages. There was no distinction made between organ meat and flesh meat. The CFS for each food group was calculated as the sum of CFSs of food items in the respective food group. Food items and food groups were categorized for consumption frequency of 'at least daily', 'at least weekly' or 'at least monthly', using criteria for CFS which was set at 7, 1 and 0.25, respectively. For each food group, the percentage of individuals consuming the food group on a daily, weekly and monthly basis was determined. Daily consumption was represented by those with a CFS of that food group being  $\geq 7$ . Thus, individual diet diversity scores were generated for daily, weekly and monthly time periods based on the 13 categories of food. Individual food variety scores were calculated as the number of food items (out of 54 food items) consumed on a daily, weekly or monthly basis, respectively. This was computed per day, per week and per month. Descriptive statistics were used in analyzing and characterizing the survey participants. The data was presented in frequencies including percentages; and by mean including standard deviation. Data from focus group discussions and key informant interviews was transcribed, summarized and key/repeated phrases noted.

## **III. Results And Discussion**

### **3.1 Characteristics of the participants**

Majority of the participants were from the Iteso community (>90%) and married (90%). The average household size was 6 persons with a range of 1 to 10. Their mean age (years) and mean BMI ( $\text{kgm}^2$ ) was  $37.1 \pm 14.8$  and  $22.7 \pm 3.44$  respectively. The participant's average income level was KES 2438 $\pm$ 2592 which mainly came from subsistence farming (69.6%). Very few (<20%) received post primary education while 13.5 % had no formal education. These results are shown in TABLE 1. In general, the enrolment of women in post primary education is low and consequently few get into formal employment [17]. It's no wonder that the household incomes are below \$50 per month despite the relatively large household size. All these participants fall under the Kenya's low income [18]. Many rural communities in Kenya live on less than one dollar a day [8, 19]. More than 50% of the participants were unemployed and obtained their income primarily from subsistence farming. Although under nutrition has been reported to be especially prevalent among children below 5 years in different parts of the country including rural western Kenya [16, 20, 21], cases of under nutrition were reported in about 7% of the participants (adults) in this study. This points out on the issue of food insecurity which is also being faced by a majority of Kenyans [1, 4, 7, 8].

**Table 1:** Characteristics of the study participants

Variables	Categories	Frequencies	
		n	%
Age (years)	15-34	175	67.3
	35-64	77	29.6
	≥65	8	3.1
Marital status	Single	16	6.2
	Married monogamous	195	75
	Married polygamous	39	15
	Divorced/separated	5	1.9
	Widowed	5	1.9
Household size	1-3 members	42	16.2
	4-6 members	141	54.2
	7-10 members	77	29.6
Ethnicity	Iteso	237	91.2
	Abaluhya	17	6.5
	Others	6	2.3
Level of education	Never gone to school	35	13.5
	Primary education	176	67.7
	Secondary education	46	17.7
	Higher	3	1.2
Employment status	Unemployed	135	51.9
	Self employed	65	25
	Informal employment	59	22.7
	Formal employment	1	0.4
Main source of household income	Salary/wages	23	8.8
	Farming (subsistence)	181	69.6
	Business (small-scale)	43	16.5
	Other	13	5
Family monthly income (KES)	0-5000	232	89.2
	5001-10000	24	9.2
	10001-16000	4	1.6
Body mass index (kgm <sup>2</sup> )	Underweight	18	6.9
	Normal weight	182	70
	Overweight	52	20
	Obesity	8	3.1

Table 1 was adapted from Ebere, Kimani and Imungi (22)

### 3.2 Diet diversity and food consumption frequencies

#### 3.2.1 Consumption of various food types

Individual food variety scores were computed and results shown in TABLE 2. On average the participants consumed 5±3 different types of foods in a day. However it is important to note that different types of fruits consumed contributed to the relatively higher value. This is because it emerged in the focus group discussions (FGDs) that participants consumed mostly three meals per day and snacks were not a major part of their diet. Nonetheless relatively similar foods were consumed during lunch and supper. Due to this shortcoming, it was prudent to analyse the food groups instead of focusing on individual foods. The results on food groups are shown in Fig 2.

**Table 2:** Distribution of participants with regard to variety of foods consumed

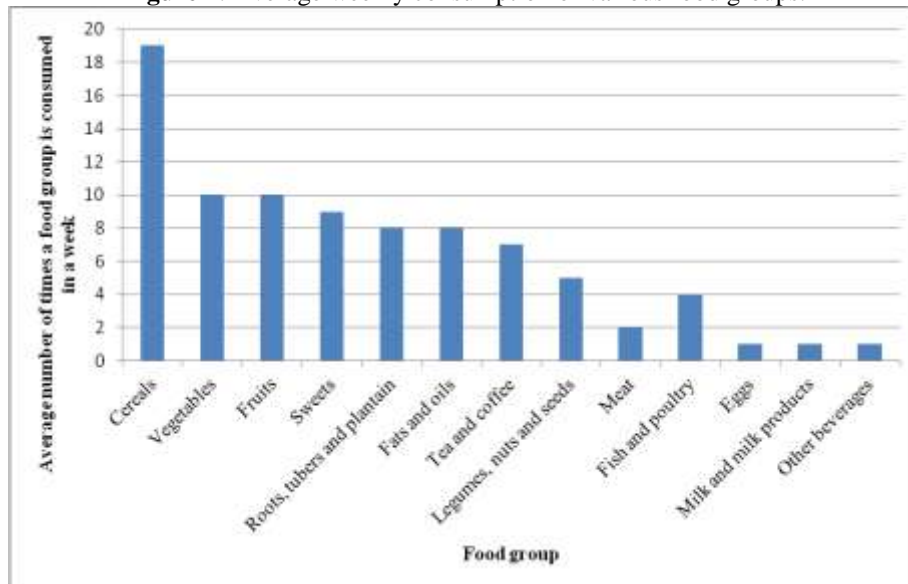
Number of foods	Frequency of consumption n (%)		
	At least daily	At least weekly	At least monthly
Lowest food diversity (≤ 3 foods)	73 (28.1)	21 (8.1)	45 (17.3)
Medium food diversity (4-5 foods)	95 (36.5)	34 (13.1)	46 (17.7)
High food diversity (≥6 foods)	92 (35.4)	205 (78.8)	169 (65.0)
Mean food types	5±3	9±4	7±3

#### 3.2.2 Consumption of the various food groups

Diet diversity describes the frequency by which different food groups were consumed. On a weekly basis cereals were consumed more than 18 times on average. Meat, eggs and milk were consumed not more than

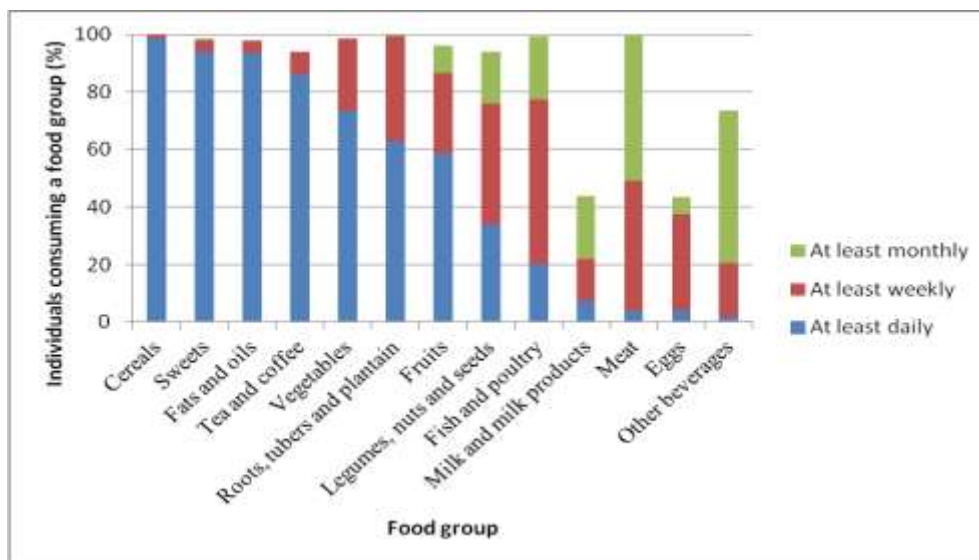
twice a week on average. Food groups consumed at least weekly included cereals; vegetables; fruits; sweets; roots, tubers and plantain; fats and oils; tea and coffee. These results are shown in Fig 1.

**Figure 1:** Average weekly consumption of various food groups.



As expected the food group mostly consumed on a daily basis in this population was cereals [16]. These results are shown in Fig 2. This is because their chief carbohydrate source is stiff porridge mainly prepared from whole maize flour. Stiff porridge is consumed at least twice a day by a majority of the population; for lunch and supper. Sometimes a thin porridge prepared from the same flour is consumed at breakfast. The sweets were mainly the table sugar used in tea and sugarcane which supplemented the Iteso meals [9].

**Figure 2:** Consumption of various food groups



The most frequently consumed foods included maize, sugar, fats and oils, tea, vegetables and fruits. Milk, eggs and meat are expensive and are only consumed by few people. Sugar and tea as well as fats and oils are used every other day on average. Fat and oils are majorly used in the preparation of vegetables or meat and is frequently part of the daily diet. Vegetable consumption is high mainly because it's cheap and majority plant them on their own farms.

The traditional diet of stiff porridge prepared from maize flour is accompanied mostly by green leafy vegetables (more than ten different leaf types). The vegetable is boiled in sour milk or is sometimes flavored with ash filtrate made from the ashes of certain leaves [9]. The overall food consumption pattern seems to be limited in protein despite the fact that the households produce legumes. The frequency of consumption of

protein foods (legume, meat, milk and eggs) was very low. This could be due to high levels of poverty as demonstrated by high unemployment and low income as well as low level of education. Household income is suggested to have higher impacts on meat consumption [23]. Increase in household income has also been associated with increased consumption of roots and tubers as well as fruits especially in rural populations [24]. In Amagoro, most household rely on subsistence farming as a source of food and income. Some of these protein sources can be got from own farms but they rather sell these products for money instead of own consumption.

### **3.2.3 Frequency of consumption of various stiff porridge preparations**

The main staple in this population was stiff porridge (*ugali*) with 240 (92.3%) households consuming it on a daily basis and 20 (7.3%) consuming it at least weekly. “*We are all alive because of ugali*”, Jane emphasized in a FGD. “*Ugali is strength*”, the women concurred. The stiff porridge is mainly prepared from whole maize meal but also from sifted maize meal, cassava, sorghum, millet or any combination thereof [25]. The frequency of consumption of various stiff porridge preparations followed the order whole maize > cassava-sorghum > cassava-sorghum-millet > sifted maize > cassava-millet. The most preferred *ugali* is prepared from whole maize while cassava based is popular during the famine season when maize stocks have run out and also due to the fact the maize is more expensive as opposed to cassava. The cassava-based *ugali* is either made from a mixture of cassava and millet or sorghum or both millet and sorghum depending on what is available. However the popular mixture is cassava and sorghum. This is because millet is expensive unless it is harvested from own farm. Thus, the choice depends on preference, availability and affordability. In most rural areas, the type of food consumed mainly depends on the households’ own production [8, 11, 25]. “*What we eat in our homes depends mainly on what is available on our own farms*” concurred the women in FGDs and also the key informants.

## **3.3 Food consumption patterns in life cycle of Iteso people**

### **3.3.1 Food for infants**

The infants are breastfed until the recommended age of six months although a few participants argued that some mothers do not produce enough milk. Irrespective of the appropriate weaning period, milk is the first food to be introduced followed by porridge (*uji*) although some are given porridge straight away due to inaccessibility of milk. The *uji* is usually prepared from composite flour containing millet, maize, sorghum, soya beans, groundnuts, silver fish etc depending on the availability. This composite flour porridge is believed to boost energy and improve the health of the baby especially its ability to fight disease. Other foods may include mashed Irish potatoes, pawpaw, avocado, green bananas, pumpkins, pumpkin leaves mashed with potatoes, a mixture of pumpkin, potatoes and carrots and also other foods from the family table.

### **3.3.2 Food for toddlers, children, teenagers and adults**

Generally toddlers, children, teenagers and adults consumed a variety of traditional foods and special recommendations applicable only for infants, pregnant and lactating women. Foods are normally consumed three times in day; breakfast, lunch and supper. However some people skip breakfast and only eat twice a day especially during times of scarcity. Snacks are not part of the daily meals. Nonetheless fruit or sugarcane can be eaten if it’s available on own farm, sometimes black tea with or without accompaniment can be taken as a snack. “*What is eaten in the home depends mainly on what is available on the farm*”. The sick people eat depending on their appetite although what they request for must be available in the home. In most cases, the best they can get is eggs, fruits and plain millet porridge in addition to the usual family diet. Also foods which are considered to be easily chewed and swallowed such as rice, plantain or Irish potatoes may be offered. For diabetes patients, the women recommend porridge prepared from finger millet. This is in agreement with a study conducted earlier in which the women had recommended whole milled maize, finger millet and sorghum grains for porridge preparation for people suffering from diabetes mellitus type 2 and cardiovascular diseases [25].

#### **3.3.2.1 Breakfast foods**

Foods commonly consumed for breakfast are black tea or thin porridge [9]. Black tea is the most popular since majority cannot afford milk. Tea is consumed with sweet potatoes or cassava. Other foods that can be consumed with tea especially in times of plenty (harvest season) include roasted maize, groundnuts, arrow roots, yam, soya beans, plantains, maize and beans mix, *chapatti*, eggs, bread or *mandazi*. Tea and porridge were flavored with sugar. In addition porridge may be flavored with milk, sugar, lemon juice or sometimes margarine. The porridge is prepared mainly from maize or millet and also from composite flour made from maize, soya beans, sorghum, groundnuts, beans or millet. The commonly consumed thin porridge was prepared from whole maize since millet is expensive and is therefore only consumed when it’s harvested in the home. Thin porridge is believed to boost appetite and has since been used for complementary feeding especially for children and invalid [25].

### 3.3.2.2 Meals for lunch and supper

The most common food for lunch and/or supper was stiff porridge (*ugali*) [9, 25]. *Ugali* is usually consumed with a wide variety of local green leafy vegetables or meat [25]. Poultry and fish (especially silver fish popularly known as *omena*) may also accompany *ugali*. Most of the vegetables are simply boiled and sometimes flavored with sour milk and groundnut and/sesame paste but *amurere* (soft and slimy green leafy vegetable) is usually cooked with ash filtrate (*abalang*) and flavored with fresh milk and groundnut and/or sesame paste in addition to salt. During the famine season, the popular vegetable is cowpeas leaves cooked with *abalang* and preferably flavored with groundnut paste and/or fresh milk. This way no cooking oil is required. Other foods that can be consumed for lunch include sweet potatoes and cassava which are eaten with black tea or local vegetables; plantain; rice with Irish potatoes; beans or green grams mashed sweet potatoes and mixture of maize and beans. Beans dishes are only prepared when beans are in season because of its high price. There is no difference between the foods consumed at lunch and supper times. In most cases the left over vegetables at lunch time are used for supper. In this case only *ugali* is freshly prepared.

### 3.3.3 Foods for pregnant and lactating women

Pregnant women are discouraged from the traditionally distilled brew (*chang'aa*) and black tea. The lactating women are given plenty of white tea and thin porridge prepared from plain millet or composite flour. They also eat stiff porridge with roast meat or chicken, although this special diet lasts for only 3 days after delivery to help the mother regain her energy. Apart from thin porridge, other foods believed to boost milk production include sugarcane, groundnuts, sesame seeds, local alcoholic brew (*busaa*), bone soup and local green leafy vegetables prepared with sour milk and groundnut and/or sesame butter. Cowpeas leaves and any vegetable prepared from *abalang* are not recommended for lactating women. These are believed to lower milk production.

### 3.3.4 Food for special occasions

Different groups of people have different unique variety of foods and the social settings in which some of these foods are consumed are of great significance [2]. For example special occasions such as weddings and visiting in-laws demand special foods. During weddings *mandazi*, white tea, carbonated soft drinks, water, brown stiff porridge (prepared from cassava, millet and sorghum), *elumuch* (prepared from smoked-dried meat, sour milk, sesame and/or groundnut paste), rice, meat, cake, chapatti, chicken, *pilau* (spiced meal prepared from rice and meat and sometimes with added green peas and Irish potatoes), liver, carbonated soft drinks, local alcoholic brew (*busaa*), groundnuts and sesame seeds. A mixture of local green vegetables specially boiled and flavored with sour milk, peanut and/or sesame butter.

### 3.4 Average Serving Size

On average two cups (250 ml) of tea or one cup of porridge was consumed. A serving of stiff porridge was about 500g on average. The average food portion sizes of some of the other foods are as shown in TABLE 3. A large portion of stiff porridge was consumed alongside a small amount of relish [9, 25]. These serving sizes are as shown in TABLE 3.

**Table 3.** Average food portion sizes of selected foods consumed in Amagoro

Food	Average portion size
Stiff porridge	500g
Thin porridge	1 cup (250ml)
Tea	2 cups
Ground nuts	110 g (3 handfuls)
Beans	4 cups
Chapatti	3 chapattis (255g )
Rice	1 bowl (350 g)
Mandazi	3 mandazi (150g)
Kales	100g
Cowpea leaves	100g
Local vegetables	200g
Beef stew	3 pieces (90g)
Sweet potato	4 pieces (560g)
Boiled cassava	4 pieces (400g)
Silver fish	1 cup (170g)

### 3.5 Proximate composition of some foods consumed in Amagoro division

Proximate analysis was conducted using AOAC methods of analysis and results on selected foods are as shown in TABLE 4. Cowpea leaves and silver fish had high energy content mainly because of the vegetable oil added during cooking. Beans (rose coco) were also prepared using vegetable oil while white rice (Mwea pishori), cassava and sweet potatoes were simply boiled using portable water and salt added to taste. The composition was expressed in “grams per 100g” reported on dry weight basis.

**Table 4.** Proximate composition and energy content for some foods consumed in Amagoro

Sample name	Moisture (%)	Fat (%)	Protein (%)	Fibre (%)	Ash (%)	Carbohydrates (%)	Energy (Kcal/100g)
Ugali (whole maize) <sup>2</sup>	66.14±1.50	2.74±0.05	1.65±0.35	2.04±0.50	1.48±0.05	92.09±0.27	403.70
Ugali (millet)	65.06±1.15	0.94±0.15	2.49±0.05	3.86±0.25	3.03±0.05	89.87±0.30	385.62
Ugali (sorghum)	63.16±0.20	2.22±0.12	1.11±0.11	3.20±0.25	2.20±0.02	90.17±0.25	391.50
Ugali (cassava)	71.63±1.00	2.61±0.16	1.52±0.14	1.23±0.10	2.33±0.20	92.46±0.25	401.87
Ugali (cassava-millet)*	68.34±0.50	1.07±0.25	1.67±0.02	3.00±0.15	1.64±0.15	92.80±0.50	392.15
Ugali (cassava-sorghum)* <sup>2</sup>	68.09±0.10	1.85±0.40	1.50±0.60	2.63±0.20	2.23±0.06	91.79±0.12	395.07
Ugali (cassava-sorghum-millet)*	65.70±0.13	1.79±0.03	1.55±0.10	2.24±0.15	2.51±0.20	92.07±0.24	395.07
Ugali (sifted maize meal)	69.03±0.60	2.13±0.15	7.65±0.05	1.19±0.03	0.77±0.05	88.34±0.30	457.66
Cowpeas leaves <sup>2</sup>	80.17±0.25	36.86±0.05	17.85±0.25	15.23±0.12	11.20±0.06	18.86±0.05	509.34
Silver fish <sup>2</sup>	61.89±0.24	18.00±0.25	33.59±1.10	1.99±0.03	11.99±0.10	34.45±0.03	438.14
Sweet potatoes <sup>1</sup>	66.96±0.50	0.12±0.30	2.94±0.60	2.97±0.35	3.66±0.05	90.04±0.03	378.94
Cassava <sup>1</sup>	63.67±0.25	3.70±0.15	4.82±0.15	3.22±0.45	3.17±0.10	78.81±0.45	374.26
Rice	70.00±1.00	3.30±0.05	8.90±0.44	1.07±0.35	1.20±0.02	86.60±0.12	413.84
Beans	71.43±0.50	7.56±0.20	27.23±0.30	5.18±0.50	3.92±0.02	56.12±0.15	411.80

<sup>1</sup> & <sup>2</sup> Adapted from Ebere, Imungi and Kimani (26) and (27)

\*The ratios for cassava to millet, cassava to sorghum and cassava to millet to sorghum were 3:1, 3:1 and 4:1:1 on weight by weight basis respectively. Higher ratio of cassava to the cereal grains has been documented in an earlier study conducted in Busia County although these researchers did not specify whether the ratios were on weight or volume basis [25]. This is especially important since these foods are normally priced on volume basis locally.

### IV. Conclusion

The diet of this population is highly starch-based presented in form of porridge. The porridges may be prepared from whole maize, cassava, finger millet and sorghum either singly or in any combination thereof. The people suffering from non-communicable diseases such as diabetes mellitus type 2 consume porridge prepared from whole finger millet despite the fact that the glycemic indices of some of these meals remain unknown. The stiff porridge is mostly consumed alongside a small portion of green leafy vegetables. The diet is therefore generally limited in protein. These women need to be empowered through improved access to education and employment so that they improve their income levels. This would help them meet nutritional needs without people having to sell their protein-rich produce for money. There is also need to diversify dietary carbohydrate sources and educate the women on possible adjustment of stiff porridge to relish ratio in order to improve the households' nutritional status. Further research should focus on determining the glycemic indices especially of those meals recommended for diabetes patients.

### References

- [1]. H.R. Mohajan, Food and nutrition scenario of Kenya, *American Journal of Food and Nutrition*, 2(2), 2014, 28-38, doi:10.12691/ajfn-2-2-3.
- [2]. H.V. Kuhnlein, B. Erasmus, D. Spigelski and B. Burlingame (Eds.), Indigenous peoples' food systems and well-being, interventions and policies for healthy communities. Food and Agriculture Organization of the United Nations Centre for Indigenous Peoples' Nutrition and Environment, Rome 2013, 5-9. ISBN 978-92-5-107433-6. <http://www.fao.org/docrep/018/i3144e/i3144e.pdf>.
- [3]. DGAC, Dietary patterns are defined as the quantities, proportions, variety or combinations of different 28 foods and beverages in diets, and the frequency with which they are habitually consumed. Scientific report on the 2015 dietary guidelines advisory committee (DGAC). Part D. Chapter 2: Dietary Patterns, Foods and Nutrients, and Health Outcomes, 2015, <https://health.gov/dietaryguidelines/2015-scientific-report/PDFs/07-Part-D-Chapter-2.pdf>
- [4]. A.C Ofwona, An analysis of patterns of food consumption among households in Kenya, *Journal of Emerging Trends in Economics and Management Sciences (JETEMS)* 4(1), 2013, 111-113.
- [5]. J.M. Mattei, V. Malik, N.M. Wedick, F.B. Hu, D. Spiegelman, W.C. Willet and H. Campos (2015), Reducing the global burden of type 2 diabetes by improving the quality of staple foods: The global nutrition and epidemiologic transition initiative. *Globalization and Health*, 2015; 11:23. doi 10.1186/s12992-015-0109-9.
- [6]. R.K. Oniang'o and A. Komokoti, Food habits in Kenya: The effect of change and attendant methodological problems, *Appetite* 32, 1999, 93-96, Article No. appe.1998.0201, Available at: <http://www.idealibrary.com> (Accessed on 20<sup>th</sup> May 2017).



- [7]. A.W. Hansen, D.L. Christensen, M.W. Larsson, J. Eis, T. Christensen, H. Frijs, D.L. Mwaniki, B. Kilonzo, M.K. Boit, K. Borch-Johnsen and I. Tetens, Dietary patterns, food and macronutrient intakes among adults in three ethnic groups in rural Kenya, *Public Health Nutrition*, 14(9), 2011, 1671-9, doi: 10.1017/S1368980010003782.
- [8]. S. Oiyee, J. Ole Simel, R. Oniang'o and T. Johns, The Maasai food system and food and nutrition security. *Indigenous Peoples' food systems: the many dimensions of culture, diversity and environment for nutrition and health*; 2009, 231-249. Food and Agriculture Organization of the United Nations Centre for Indigenous Peoples' Nutrition and Environment [ftp://ftp.fao.org/docrep/fao/012/i0370e/i0370e12.pdf](http://ftp.fao.org/docrep/fao/012/i0370e/i0370e12.pdf) (accessed on: 10<sup>th</sup> March, 2017).
- [9]. I. Karp and P. Karp, Social Aspects of Iteso Cookery. From Jessica Kuper, (ed.), 'The Anthropologists' Cookbook. *Routledge, and Kegan Paul*, 1977, 100-106.
- [10]. W.M. van Steenberg, J.A. Kusin and S.R. Onchere, Household activities and dietary patterns, In: *Maternal and child health in rural Kenya: an epidemiological study*, edited by J.K. Van Ginneken and A.S. Muller, London, England, Croom Helm, 1884, 1984, 31-42.
- [11]. I. Macharia, A. Orr and C. Schipmann, Cereals consumption patterns in Kenya. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Nairobi, 2012, Available at: <http://hope.icrisat.org/wp-content/uploads/2015/11/Cereal-Consumption-Pattern-in-Kenya.pdf> (Accessed on 20<sup>th</sup> May 2016).
- [12]. J.V. Mensah, Effects of modernization on the socio-cultural aspects of families in Ajumako-Enyan-Essiam District in Ghana, *International Journals of Economics, Commerce and Management*, 4(4), 2016, 820-841.
- [13]. N. Fox, A. Hunn, A and N. Mathers, N, Sampling and sample size calculation. Leeds: The National Institute for Health Research- Research Design Service for the East Midlands / Yorkshire & the Humber, 2009, Available at: [http://www.webpages.uidaho.edu/ed571/571-Modules/M3/NIHS-Sampling\\_Sample\\_Size\\_calculation.pdf](http://www.webpages.uidaho.edu/ed571/571-Modules/M3/NIHS-Sampling_Sample_Size_calculation.pdf).
- [14]. M. Moretto, M. Tadono, A. Neri, M. Guariento, Associations among self-reported diabetes, nutritional status, and socio-demographic variables in community-dwelling older adults, *Revista de Nutricao Campinas* 27, 2015, 653-664.
- [15]. FAO, Food and Agriculture Organization of the United Nations and Food and Nutrition Technical Assistance Project (2008) *Guidelines for Measuring Household and Individual Dietary Diversity*. FAO, Rome, 2008.
- [16]. J. Fanzo, R. Remans, P.M. Pronyk, J. Negin, J. Wariero, P. Mutuo, J. Masira, W. Diru, E. Lelerai, D. Kim, B. Nemser, M. Muniz, C. Palm, P. Sanchez, S. Ehrlich Sachs and J.D. Sachs, A 3-year Cohort Study to Assess the Impact of an Integrated Food- and Livelihood-based Model on Undernutrition in Rural Western Kenya. In Brian Thompson and Leslie Amoroso (Eds) *Combating Micronutrient deficiencies: Food-Based approached*. Ville delle Terme Caracalla, Italy: The Food and Agriculture Organization of the United Nations and CAB International, 2011, 76-91.
- [17]. E. Onsomu, Profile of Women's Socio- Economic Status in Kenya, *Institute of Economic Affairs – Kenya*, 2008, ISBN: 9966-7183-3-8.
- [18]. KNBS, Kenya National Bureau of Statistics. Economic survey, 2005. Available at: [www.knbs.or.ke](http://www.knbs.or.ke) (Accessed on: 7/10/ 16).
- [19]. H. El-busaidy, M. Dawood, A. Kasay, C. Mwamlole, N. Koraya and H. Parpia, How Serious is the Impact of Type II Diabetes in Rural Kenya? *The Open Diabetes Journal* 7, 2014, 1-4.
- [20]. D.K. Ngare and J.N. Muttunga, Prevalence of malnutrition in Kenya, *East African Medical Journal*, 76 (6), 1999, 376-380.
- [21]. A.M. Kwena, D.J. Terlouw, S.J de Vlas, P.A. Phillips-Howard, W.A. Hawley, J.F. Friedman, J.M. Vulule, B.L. Nahlen, R.W. Sauerwein and F.O ter Kuile, Prevalence and severity of malnutrition in pre-school children in a rural area of Western Kenya. *American Journal of Tropical Medicine and Hygiene*. 68(4), 2003, 94-99.
- [22]. R.A. Ebere, V.N. Kimani and J.K. Imungi, Prevalence of diabetes mellitus type 2 and its association with demography, socio-economy and nutritional status for women of Amagoro division in western Kenya. *IOSR Journal of Nursing and Health Science*. 6(3), 2017, 51-57.
- [23]. H.K. Bett, M.P. Musyoka, K.J. Peters and W. Bokelmann, Demand for meat in the rural and urban areas of Kenya: A focus on indigenous chicken. *Economic Research International; Volume 2012 (2012)*, Article ID 401472, 10 pages <http://dx.doi.org/10.1155/2012/401472>.
- [24]. M.P. Musyoka, M.M. Kavoi and J.M. Omiti, Food consumption patterns and distributional welfare impact of import tariff reduction on cereals in Kenya, *African Journal of Agricultural and Resource Economics*, 9(3), 2014, 183-199.
- [25]. W.G. Wanjala, A. Onyango, M. Makayoto and C. Onyango, Indigenous technical knowledge of thick (ugali) and thin (uji) porridges consumed in Kenya, *African Journal of Food Science*, 10(12), 2016, 385-396.
- [26]. R.A. Ebere, J.K. Imungi and V.N. Kimani, Glycemic indices and sweet potatoes consumed in western Kenya. *Food Science and quality management*. 63, 2017, 7-12.
- [27]. R.A. Ebere, J.K. Imungi and V.N. Kimani, Glycemic responses to stiff porridge (ugali) meals consumed in western Kenya. *Food Science and quality management*. 63, 2017, 55-63.