Appetite 143 (2019) 104409

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Dietary patterns and practices in rural eastern Uganda: Implications for prevention and management of type 2 diabetes

Juliet Kiguli[a,*], Helle Mölsted Alvesson[d], Roy William Mayega[b], Francis Xavier Kasujja[b], Anthony Muyingo[g], Barbara Kirunda[b], Elizabeth Ekirapa Kiracho[c], Christine Kayemba Nalwadda[a], Gloria Naggayi[b], Stefan Peterson[c,d,h], Josefien van Olmen[f,i], Meena Daivadanam[d,e,h]

[a] Department of Community Health and Behavioural Sciences, Makerere University College of Health Sciences, School of Public Health, Kampala, Uganda
[b] Department of Epidemiology and Biostatistics, Makerere University College of Health Sciences, School of Public Health, Kampala, Uganda
[c] Department of Health Policy, Planning and Management, Makerere University College of Health Sciences, School of Public Health, Kampala, Uganda
[d] Department of Public Health Sciences Karolinska Institutet, Stockholm, Sweden
[e] Dept. of Food, Nutrition and Dietetics, Uppsala University, Uppsala, Sweden
[f] Institute of Tropical Medicine, Antwerp, Belgium
[g] Department of Internal Medicine, Mbarara University, Uganda
[h] Department of Women's and Children's Health, Uppsala University, Uppsala, Sweden
[i] University of Antwerp, Department of Primary and Interdisciplinary Care, Belgium

ARTICLE INFO

Keywords:
Dietary patterns
Healthy diet
Cooking practices
Food behaviours
Dietary decision making
Prevention
Type 2 diabetes
Uganda

ABSTRACT

Background: The burden of type 2 diabetes in Sub-Saharan Africa is projected to double by 2040, partly attributable to rapidly changing diets. In this paper, we analysed how community members in rural Uganda understood the concept of a healthy or unhealthy diet, food preparation and serving practices to inform the process of facilitating knowledge and skill necessary for self-management and care for type 2 diabetes.

This was a qualitative study involving 20 focus group discussions and eight in-depth interviews among those at risk, patients with type 2 diabetes and the general community members without diabetes mellitus. Data was coded and entered into Atlas ti version 7.5.12 and interpreted using thematic analysis.

We identified three main themes, which revealed, the perceptions on food and diet concerning health; the social dimensions of food and influence on diet practices; and food as a gendered activity. Participants noted that eating and cooking practices resulted in unhealthy diets. Their practices were affected by beliefs, poverty and food insecurity. Women determined which foods to prepare, but men prepared only some of the foods such as delicacies like a rice dish "*pilau.*" New commercial and processed foods were increasingly available and consumed even in rural areas. Participants linked signs and symptoms of illness to diet as they narrated changes from past to current food preparation behaviours. Their view of overweight and obesity was also gendered and linked to social status.

Participants' perception of disease influenced by diet was similar among those with and without type 2 diabetes, and those at risk. People described what is a healthy diet was as recommended by the health workers, but stated that their practices differed greatly from their knowledge. There was high awareness about healthy and balanced diets, but food is entrenched within social and gendered paradigms, which are slowly changing. Social and gender dimensions of food will need to be addressed through interventions in communities to promote change on a society level.

1. Introduction

Type 2 Diabetes Mellitus (T2D) is one of the fastest-growing diseases worldwide, and the number of people affected is estimated to reach 552 million globally, with associated increases in complications and health expenditures (Khazrai, Defeudis, & Pozzilli, 2014). The link between

* Corresponding author. Dept. of Community Health & Behavioural Sciences, Makerere University School of Public Health, New Mulago Hospital Complex, P. O. Box 7072, Kampala. Uganda.
E-mail address: jkiguli@musph.ac.ug (J. Kiguli).

https://doi.org/10.1016/j.appet.2019.104409
Received 14 September 2018; Received in revised form 30 July 2019; Accepted 17 August 2019
Available online 22 August 2019

diet and chronic diseases is well established, both as a cause and an area of focus for prevention strategy (Barrès & Zierath, 2016; Kumanyika, 1990; National Research Council, 1989; Schmidt, 2016; Schwartz, Guwatudde, Nugent, & Kiiza, 2014; WHO, 2003; WHO, 2017; Willett et al., 2006). Unhealthy diet is one of the major risk factors for non-communicable diseases, which includes diabetes (Guwatudde et al., 2015; Herbert, Plugge, Foster, & Doll, 2012; Hu et al., 2001; Mekary, Giovannucci, Willett, Van Dam, & Hu, 2012) (Asif, 2014; Gaziano, 2007) Urbanization in sub-Saharan Africa, leads to the introduction of new food and diet options ((Basu, Stuckler, Mckee, & Galea, 2013). Most studies on the relationship between nutrition and T2D focused on dietary patterns (DPs) (Galbete et al., 2018).

Changes in dietary patterns and nutrient intake that are usually associated with acculturation following urbanization (Popkin, 2002), have been linked to socio-economic development. Its pace in the developing world is faster and earlier than ever before (Popkin & Gordon-Larsen, 2004), leading to a rising burden of non-communicable diseases among the poor.

Although the majority of those affected in sub-Saharan Africa live in urban areas (IDF, 2016; Da Rocha Fernandes et al., 2016; Ogurtsova et al., 2017) still a significant proportion live in rural areas (Chiwanga et al., 2016). In Sub Saharan Africa, diets from urban areas are being adapted in rural areas and influencing food behaviors which in turn affect rural health. This drift has been partly attributed to nutrition transition, a phenomenon progressing more rapidly across urban areas compared to rural ones (Steyn & Mchiza, 2014; Gassasse, Smith, Finer, & Gallo, 2017) coupled with issues related to food insecurity (Cheng et al., 2013). As a result, both poverty and malnutrition (both under- and over-nutrition) co-exist in Sub-Saharan Africa, reflected in their staple diets, which comprise primarily of carbohydrates and very little fruit and vegetables.

Mayega et al. (2012) estimated that 18% of the people aged 35–60 in a predominantly rural setting in Iganga and Mayuge, Eastern Uganda were overweight. Women were substantially more likely to be overweight and obese compared to men. Overweight was found to be associated with urban residence, insufficient physical activity and low dietary diversity. A study conducted by the same group observed that lifestyle changes for healthier living are perceived as “sacrificing a good life” which indicates that people associated larger body size to a good diet, and a feeling of wellbeing (Mayega, Etajak, Rutebemberwa, Tomson, & Kiguli, 2014a). However, the perceptions of people on what is a healthy diet and food practices in this context are unknown. In this study, we explored the common foods and food-related practices in a predominantly rural low-income setting. The main focus was on how the participants understood the concept of a “healthy” or “unhealthy” diet, food preparation, serving practices and dietary patterns.

2. Materials and methods

In this paper, we present part of the findings (on food and food behaviors from Uganda related to the formative phase of a larger multi-site project titled: “A people-centered approach to Self-Management and Reciprocal Learning in the prevention and Management of Type 2 Diabetes (SMART2D) (Guwatudde et al., 2018). These findings further informed the development of a self-management support intervention for type 2 diabetes in rural Uganda.

3. Study setting

The study was conducted in Iganga and Mayuge districts in Eastern Uganda, with a population of almost one million people. Iganga and Mayuge are located 120 Km east of Kampala city. Iganga has a population of 466,200 and Mayuge has 461,200, and about 93% of the population reside in rural areas (Turyatemba, 2011) There are 100 health units of which the majority are government-owned. There is one general hospital which provides referral services and hosts the only diabetes clinic in Iganga district. The other facilities are health centres at levels IV, III and II, of which level IV health centres are responsible for referring patients to the regional referral hospital. Besides, Mayuge district has one private not-for-profit hospital. There is 1 doctor per 100,000 people in Uganda. Mostly, treatment is measuring blood pressure, blood sugar levels and weight, including administering the few available drugs like insulin.

Over 90% of the population in Iganga and Mayuge belong to the Basoga ethnic group while the rest are from neighbouring regions and are of Atesot, Banyole, Samia, and mixed Arab and or Indian origin. There are diverse religions (Protestant 43 (40.6%), Muslim 41(38.7), Catholics 8(7.5%) and others 14 (13.2%) and marital status (Married (79(74.5%). Single 8(7.5%), widowed 12(11.3%) and divorced/separated 7(6.6%)) though most people practise polygyny and live in a patrilocal residence pattern whereby women move to their husband's place after marriage, bringing in outside cultural influence. When a boy marries, his father gives him a piece of land, and he builds his house next to his father's. All houses are in the same compound and meals are shared. They all farm the same land (Boserup, Tan, & Toulmin, 2013; Ester, 1970). Subsistence agriculture is the main economic activity, but some petty trading is common in the peri-urban areas and some rural parts, and fishing is common in the rural lakeshores. The main language in the region is ‘Lusoga’ a Bantu dialect.

4. Study design and participant selection

This is a qualitative study based on FGDs and IDI in two districts of Iganga and Mayuge, Eastern Uganda. It was aimed at analyzing how community members in rural Uganda understood the concept of a healthy or unhealthy diet, foods, food preparation, and serving practices inform knowledge and skills of self-management support and care for T2D. A total of 20 focus group discussions and 8 in-depth interviews. The study included three different types of participants, i.e., those at risk, patients with type 2 diabetes and the general community members without diabetes mellitus.

5. Participants

We conducted 20 focus groups (FGDs) and eight in-depth interviews (IDIs) from June to August 2015. Local leaders helped with community mobilization while medical personnel assisted with selection of T2D patients from the diabetes clinic of Iganga Hospital.

Each FGD had approximately 6–8 participants and were categorized as follows: 1) People at risk (PaR) FGDs (4 Male FGDs, 4 Female FGDs)-S5; 2) FGDs of participants with T2D (4 male FGDs and 4 female FGDs) –S4 and 3) four general community FGDs-S3, which had mixed gender and had participants without T2D. Additionally, eight IDIs (2 for females with diabetes, 2 for males with diabetes)-S7; (2 for PaR female, 2 for PaR male)-S6 were conducted (see Table 1). The interviews for the general community, which were mixed FGDs, were community-based and conducted at the village level while the interviews for the PaR and T2D were health facility-based.

Each FGD had approximately 6–8 participants and were categorized as follows:

1) People at risk (PaR) FGDs (4 Male FGDs, 4 Female FGDs)-S5;
2) FGDs of participants with T2D (4 male FGDs and 4 female FGDs)–S4 and
3) FGDs for the four general community (4 Mixed sex with participants without T2D)-S3.
4) IDIs (2 for females with diabetes, 2 for males with diabetes)-S7;
5) IDIs (2 for PaR female, 2 for PaR male) - S6

We interviewed adults aged 20–60 years and above living in Iganga and Mayuge districts. A total of 106 study participants were purposively invited to participate in focus group discussions (FGDs) and in-depth

Table 1
Study participants.

Site	Participant (by Gender distribution)	Method
Iganga-Mayuge DSS (randomly selected villages, 2 hospitals and other health facilities)	Patients with Type 2 Diabetes and patients at risk factors to type 2 diabetes	**8 IDIs** (2 IDIs for females with diabetes, 2 IDIs for males with diabetes, 2 IDIs for male patients at risk and 2 IDIs with female patients at risk
	Patients with type 2 diabetes and patients at risk	**20 FGDs** 4 FGDs for females with diabetes, 4 FGDs for males with diabetes, 4 FGDs for male patients at risk, 4 FGDs with female patients at risk, and 4 FGDs for the general community, mixed (meaning both men and women)

Table 2
Socio-demographic characteristics of study participants.

Variables	Frequency N = 106	Percentage (%)
Participants		
Patient at risk (PaR) female	28	26.4
PaR male	9	8.5
Type 2 diabetic patient (T2D) female	25	23.6
T2D male	25	23.6
General community	19	17.9
Age		
20–29	3	2.8
30–39	23	21.6
40–49	26	24.6
50–59	40	37.7
60 +	14	13.2
Religion		
Protestant	43	40.6
Muslim	41	38.7
Catholic	8	7.5
Others	14	13.2
Marital status		
Married	79	74.5
Single	8	7.5
Widowed	12	11.3
Separated/divorced	7	6.6

interviews (IDIs. We conducted purposive sampling (Glaser & Strauss, 2017). There were more females 64/106 (60.4%) than males 42/106 (39.6%). The overall median age was 49 years. Most of the participants were married 79/106 (74.5%) see Table 2.

Characteristics of participants at risk of type 2 diabetes (PaR) included a history of hypertension (140/90 mmHg) being on medication for hypertension and being overweight (BMI > 25kg/m2). These participants were recruited purposively from the outpatient department (OPD) clinic at Iganga Hospital. We selected patients suffering from T2D who were receiving care from the diabetic clinic at the hospital. Participants from the community were also purposively selected from the ordinary households to represent members of the general community without T2D and not at risk.

6. Data collection

There were open-ended questions for in-depth interviews which sought to capture participants' perceptions about the interaction between their dietary behaviors and social dimensions of food and risk for type 2 diabetes.

The FGD and IDI interview guides were developed in English, translated from English to Lusoga and back-translated to English and compared to ensure consistency of meaning. Study tools were pre-tested and adjusted before the start of fieldwork to improve clarity. Four research assistants were recruited and trained before pre-testing of tools and contributed to their revision. The researchers and research assistants worked in pairs, one as a note-taker and another as a moderator to conduct the FGDs. One interviewer conducted the IDIs (co-authors/ post-doctoral fellow) who took notes alongside audio recording. At the end of each day, the researchers discussed the issues that arose while comparing notes and identifying areas for further probing. The audio recordings of FGDs and IDIs were transcribed verbatim and translated from Lusoga to English.

7. Data analysis

We analysed qualitative data from both FGDs and IDIs inductively through thematic analysis (Ryan & Bernard, 2003). Interview transcripts were read several times and coded in the software, Atlas.ti version 7.5.12. We identified themes and grouped information to draw patterns and categories. We compared information across FGDs of the same category and gender. We also compared themes in FGDs with experiences of IDIs. Four people, working in pairs, did pile sorting of the themes. Pile sorting helped to sort data, discuss themes and compare information to draw similarities and differences and identify quotes. Thematic analysis (Braun & Clarke, 2006; Ryan & Bernard, 2003) is a way used to identify, analyze and report patterns within data. It is flexible and one can apply inductive strategies (Hennink, Hutter, & Bailey, 2010). This helped to triangulate the data collected and also compare the information.

8. Ethical considerations

Approval for conducting the study was obtained from the Higher Degrees, Research and Ethics Committee of Makerere University School of Public Health (reference number: 426-S1). Further approval was obtained from the Uganda National Council for Science and Technology (reference number: HS 2118-S2). Written informed consent was obtained from all study participants. Confidentiality was emphasised to build trust for responses.

9. Results

The study findings are presented according to three identified themes.

9.1. Theme 1: perceptions of food and diet concerning health

Perceptions refer to knowledge, attitudes, and beliefs toward dietary habits and type 2 diabetes risks. Participants with T2D, those at risk (PaRs) and those in the general community without T2D described a wealth of different types of foods that they consumed regularly. They talked about "locally grown foods" and the "traditional main foods" which predominantly consisted of sweet potatoes, cassava, and maize (corn meal locally known as "posho" which is a dish of maize flour cooked with water to porridge or dough). Besides, they mentioned 'accompanying dishes' such as groundnut paste or beans, vegetables like bitter tomatoes (Solanum Incanum), amaranth, and cabbage. They all also talked about "weekend foods" (what they eat on Saturdays or Sundays) when people eat meat and mentioned foods associated with

specific age groups, such as seasonal fruits being consumed by children as compared to adults and new modern foods like Rolex (chapatti roll), sugar in tea and soda drinks.

One of the major discussions around diet focused on different types of changes in diet and dietary practices over time. All participants described some of the changes in terms of the availability of foods that contributed to perceived good nutrition. For example, some participants near Lake Victoria eat fish in "sauce" form as part of their regular diet; however, they noted that most of the fish are exported, making it difficult for some families to get good nutrition from fish overtime. Sometimes chicken reared at home was either slaughtered for visitors or sold during festival days like "Eid" (an Islamic feast) and Christmas.

Participants also noted a change in traditional ways of preparing food most noticeably from steaming to frying foods. People steamed only the major foods like sweet potatoes, cassava, bananas, but deep-fried the sweets, savories and other accompanying dishes such as pastries, snacks and sauces. Sauces like beef, whether fatty or not were fried in oil and so were all vegetables such as cabbage. Participants commonly perceived these changes in the availability of healthy foods and changes in methods of food preparation as factors that can influence poor health or increase the risk of T2D.

Participants also described the emergence of new foods. New foods were often a mix of new and traditional foods-for example "rolex" or a mix of traditional foods with new ways of food preparation such as cassava being fried as snacks. These new trends included an element of convenience, time- or cost-saving; or the emergence of new tastes and food styles. Participants in seven FGDs, for example, all mentioned that food was cooked in polythene bags due to the reduced availability of banana leaves which were traditionally used to wrap and tie foods and keep the food warm. Hence, relating this as a risk to T2D and other non-communicable diseases.

> *"But where there are no banana leaves, they have polythene bags, you place the food in the 'kavera' (polythene), after putting sticks down in the saucepan, the food will be in 'kavera', you cover it with another kavera and cook."*
>
> *(Female participant, at-risk FGD)*

The "modern foods" included rice and chapatti with beans combination referred to as "*Rolex*," or "*Kikomando*" which means "food for surviving tough times." This term originates from the army title of an elite soldier "Commando." Like the new practice of using plastic bags for cooking, "Rolex" has become a normal part of available foods. Participants, also recognized some potential harms associated with these new practices. Fried "*Rolex*," a form of chapatti with fried egg rolled inside it and beans was reported as a favorite among young people. However, the vegetable oil used for preparation is re-used several times and poorly stored for many days.

Similarly, it was mentioned that "Paracetamol" tablets were added to beans during boiling instead of soaking the beans overnight as traditionally done. This helped reduce the processing and cooking time and was seen as useful since firewood and charcoal were scarce. Though the women described these practices as new or modern, they were also perceived by some participants as harmful.

Deeper probing on the subject of diet patterns elicited the specific qualities of a perceived healthy diet. Healthy diets were described as being varied, nutritious or recommended at the diabetes clinic. Eating a variety of foods was considered healthy as opposed to eating one type of food on a longer-term basis, which qualified as 'bad diet.' Both quality and quantity were considered key to determining healthy eating. Eating small quantities in the right proportion was also described as a characteristic of healthy eating. This applied to most foods, including fruits, and they described over-eating as a habit that was to be avoided. During the FGDs with PaRs, they described their grandparents as having lived longer and healthy lives and attributed this to their practice of eating steamed traditional foods like cassava and unfried sauces. They described traditional diets as healthy and modern diets as unhealthy because of differences in food preparation practices. To them, traditional foods symbolized their ancestor's wellbeing. They explained wellbeing as a marker of happiness and being healthy, i.e., without disease.

FGD participants (both individuals with T2D and PaRs) also used a new term 'balanced diet' to describe a healthy diet. They interpreted this as eating different types of foods to obtain carbohydrates, proteins and vitamins. A balanced diet was interpreted to mean variation in types of foods, quality of food and having regular meals but not in terms of quantity, choice or preference. They also described a balanced diet as being necessary for building the body and immunity. Almost all participants perceived a balanced (or healthy) diet as being necessary for their wellbeing and pointed out that a balanced diet can reduce sugar levels in the body. Some participants (PaRs) associated eating a balanced diet with being financially well off, as it meant being able to afford different food types. They described poverty, sickness and ignorance as three reasons for not eating healthy food or a balanced diet.

> *"First, when you are poor, you cannot buy food. For you mostly buy food when you cannot go to the garden and cultivate. The second issue is sickness. When you are sick, you can't go and cultivate, and so you can't access food. The third one is ignorance; you do not know the benefits of each type of food."*
>
> *(Male participant with T2D, FGD)*

They pointed to low incomes as leading to a poor diet and buying only food within their economic ability, which food was usually carbohydrates and did not satisfy dietary requirements.

Participants (most PaRs) also described certain food practices as leading to ill-health such as the practice of eating large quantities of food (platefuls), especially starchy foods. FGD participants noted that although they viewed eating as a sign of battling hunger and feeling satisfied, overweight people were probably eating excessively, thereby causing their obesity. In both Iganga and Mayuge, participants (T2D patients) said that there were no nutritionists to advise communities on how to prepare healthy meals. One learnt from older members of the family or by observing one's neighbors' or friends'. In this study, participants commonly perceived modern new foods as a factor that can influence risks to type 2 diabetes.

9.2. Theme 2: social dimensions of food and influence on diet practices

The social dimensions of food were described in terms of availability and accessibility; status of foods, including foods considered as delicacies or associated with poverty; and the socialization process around food, such as sharing or serving. In almost all FGDs and IDIs, participants said that choice of foods depended on what was available and accessible to them, i.e., what they locally produced. However, sometimes-staple foods such as maize flour had to be bought because of seasonal variations in food availability. The dry season meant less availability and less diversity in traditional foods and therefore eating more of one food-type daily.

Participants described some foods as being of either high or low status. This was mostly linked to affordability but also to specific food cultures that first became popular in urban areas and then spread to rural areas. High-status foods were those bought using cash; for example, pancakes made out of small sweet bananas and cassava fried in oil are served at tea time, as well as buying fried snacks, a habit from urban areas which has now become common in rural areas. Modern foods like packaged rice and maize flour were considered high status as they were bought using cash in the past. Today, participants preferred the white polished maize flour to the less refined. Fish and meat were not affordable to many families, hence considered as a high-status food. If a person went to the butcher's, he (she) preferably bought the fatty piece of meat rather than a leaner piece. The meat would then be roasted over a charcoal stove or a fire and afterwards cooked in vegetable oil to add taste and aroma. Cooking with oil signified a higher

status meal as oil was bought with cash. In rural areas, the ability to buy cooking oil, which was sold in small sachets of vegetable oil branded *Butto*, was seen as a sign of a higher social status.

Eating rice, as a meal, has noticeably become more popular with the advent of commercial rice farming. In the past, most people consumed only traditional foods. Most participants described a recent increase in the cultivation of cash crops like sugarcane with a corresponding decrease in the cultivation of food crops, leading to food insecurity. Much as bitter tomatoes are available in their gardens, consumption of this was less, because such foods which are a part of many traditional sauces were described as associated with poverty. Some participants also viewed the bitter tomatoes and other bitter-tasting vegetables as helpful in preventing type 2 diabetes.

Participants described different aspects of the socialization process around food, particularly commensality, as an important aspect of their everyday lives. Communities shared meals by sitting together on the floor at mealtimes. In some households, children ate together, from one plate, but that the practice is slowly diminishing. Eating together was believed to be a sign of kinship, community wellbeing and cemented friendships. In the past, food was viewed as a communal or public activity, necessary for the wellbeing of its members. Thus, it was common for food to be cooked in large quantities and offered to any visitors, and even passersby. Today, however, food symbolizes individual economic status, private space and suffering from diseases like T2D. This is reflected in the food serving practices, which has also changed, to each person being served on his/her plate.

> *"Right now we are following the culture of serving food, because if we are all from the same home, and they are going to serve cornbread, you find each one served separately, they serve him with food and sauce on the same plate, he goes and sits alone somewhere and he eats. That is the trend nowadays. People no longer eat together on "lusania" (common plate), all round gathering like they used to do."*
>
> *(Female participant, community, mixed FGD)*

Participants (in some FGDs) talked about different food types and how these vary by serving and eating. Some foods were served on individual plates while others were served on a common plate "*lusania*" for everyone. Foods, which were considered as rare or delicacies like fried rice "*Pilau*" were served and eaten on "*lusania*" and shared to celebrate and teach communal values. On the other hand, common and everyday foods like "*Katogo*" (one pot dish of bananas with beans/meat or groundnuts), sweet potatoes or cassava need not be served on a common plate (*lusania*) for sharing.

> *"Sometimes, it depends on the food; if, for example, the food is a mixture of cassava and beans (Katogo), every child is served on a separate plate. But if it is bananas, it is placed at the centre where one can grab and eat. However, when I serve rice on the same plate, the children finish it fast", the woman says. "No I won't manage them together; I rather serve every child alone."*
>
> *(Male participant, at risk, FGD)*

9.3. Theme 3: Food is gendered and cultural

Participants perceived overweight as being due to overeating. However, participants from all FGDs perceived that being overweight or 'fat' was because one was living a stress-free life and seen as a status of wealth. They said: "being fatter was better." If a woman was overweight, it was strongly associated with having good looks, contentment and peace of mind. The community perceived and viewed this culturally as a sign and symbol of being wealthy and beautiful. Similarly, an overweight man with a pot-belly was considered wealthy and successful. Being thin was associated with poverty, HIV/AIDS and social problems.

> "… a *man who is well-fed has a big belly, and eats well because his wife cooks well for him"*
>
> *(Female participant, at risk, FGD)*

Participants also described gendered aspects related to the different food-related processes from procuring or purchasing food to preparation and serving. Procurement of food seemed to have both gender and power dimensions. Male PaRs reported that cultural beliefs influenced power relations in households and contributed to families not eating a healthy diet. They emphasised that men, as the decision-makers in families, could choose to sell off all the foods produced by the family, making it difficult for the family to consume healthy meals.

> *"… in this part of the world, the husband is the sole decision-maker in all matters, including those regarding the farm, he decides what to plant next after every harvest – say, groundnuts or soya beans in this season. Even when the home has some egg-laying chicken, the man may decide to sell all of the hens yet that same household may have children suffering from diseases of malnutrition like kwashiorkor."*
>
> *(Male participant, at risk, FGD)*

Female diabetes patients from all four FGDs agreed that gender-power differences existed concerning the process of buying food. They argued that an urban woman has a chance to buy the food she likes because she works and earns a wage. The rural woman, on the other hand, may not have a source of income to enable her to buy her choice of food.

> *"Here, the woman does not decide. In the village, the man decides on our behalf. We are not like those living in the city. The city woman works, so she earns some money which enables her to decide on what to buy for food. In the village, one can't buy matooke (green cooking bananas) because we have no jobs."*
>
> *(Female participant with T2D, FGD)*

In contrast, food preparation was primarily seen as the responsibility of women and seemed to be viewed by the male participants as an activity they had little control over and one that often contributed to unhealthy diets. Men in the FGDs said that they could not control events in their kitchens as the women were the ones who cooked. For example, even though they could buy meat (irregularly), the women still prepared the food and added ingredients like excess fat or salt.

Similarly, women also added sugar cane molasses to sweeten the tea, to save on expenditures in large families. Special foods such as "Pilau," were prepared by men, but no one blamed the men for adding oil. The introduction of modern foods, i.e., rice, chapatti "Rolex," further exemplifies the switching of gender roles. The participants of the community FGDs noted that the best "Rolex" chapatti makers came from Iganga and were men.

Participants also described various gendered dimensions related to the serving of food. Across all FGDs and IDIs, participants had the same description of the process of serving food. The man, as head of the household, is served first and also given the largest and most savory portion. For example, if the dish is fish, the husband gets the fish head, which is considered to be a delicacy, while the rest of the family eat the other parts of the fish. The man of the house is not only believed to be strong and very important, he is also considered to be the one who works harder than anyone else to provide for his family.

> *"… you give him (husband) because he is the owner of the home; you must give him the big portion, because its tradition, the wife gets the next portion and the children get the least (savory) portions."*
>
> *(Female participant, with T2D, FGD)*

In addition to the various gendered dimensions of the different food-related processes, female participants, unlike males, reported several factors as barriers to a healthy diet. First, ignorance (illiteracy) was reported as a key factor in preventing families from eating a healthy diet, i.e., people are unaware of the right composition of a healthy diet.

> "*Ignorance is the key. I don't know how it is prepared; I don't know what*

a balanced diet is; I don't know therefore I need to be sensitized. There are those who are well off, but you find the child has yellow hair, a sign of kwashiorkor. The parent of such a child may be selling soybeans, groundnuts and even greens and tomatoes, what she may not know that by feeding her child with this, the sickness will disappear."

(Female participant, with T2D, FGD)

Second, they described that lack of food decreased dietary diversity, i.e., makes the families consume only one type of foodstuff, particularly during a drought that leads to famine.

"Nowadays, we have famine almost all the time, such famine that no one can afford to avail himself with those kinds of diet foods that you are talking about, in times like these you find a family feeding on just cassava for breakfast, lunch and supper. The only variations may be in having boiled cassava or cassava flour, and so there is limited ability, and the person cannot afford to access these other foods."

(Female participant, at risk, FGD)

Third, they described some cultural beliefs that prevented people from eating a healthy diet. For instance, women and children were not allowed to eat chicken, eggs and gizzards, which are considered highly nutritious. So the gizzard is often reserved for the male head of the household. Similarly, in some ethnic groups like the *"Bachwezi,"* people do not eat fish.

"*I say that culture refuses women to eat chicken, claiming that a woman should not eat eggs."*

(Female participant, community mixed FGD)

"Aaahhh! This culture. It is slowly fading away but still exists in some homes. As a woman, you don't eat chicken and eggs, you don't give children eggs. If you give a child eggs it should be a secret."

(Female participant, community mixed FGD)

10. Discussion

This paper describes perceptions on food and the link to social, cultural, gender and economic aspects which influence diet in a rural setting where chronic diseases like T2D coexist with infectious diseases and undernutrition. A key finding is that participants described healthy foods, in a manner that agreed with current scientific literature, as being varied, nutritious and balanced with a need to regulate portion sizes. However, they experienced multiple constraints and could not always follow health eating practices. Secondly, eating was found to be influenced by the social and cultural context and the socialization process surrounding food and eating practices often dictated what was consumed. Lastly, the gender and power dynamics around decision making and food procurement and preparation practices was a major factor in shaping the societal practices around food which also influenced the type of food that finally reached the table.

While there are conflicting world views on what does or does not constitute a healthy diet, scientific evidence agrees to a large extent that healthy diets are nutritious, diverse and balanced and that portion sizes are as important as nutritional facts about any given food (Roberto & Khandpur, 2014). However, the mismatch between what we know and what we do is also well known and that is predominantly what we see among our participants in the present study. Participants identified a balanced diet as one of the characteristics of a healthy diet and further qualified that a balanced diet meant eating not just a variety of foods, but balancing the different food components such as fruit, starches and vegetables. This is in line with prevalent and evidence-based knowledge about the need for dietary diversity and balance between the major food components (carbohydrates, proteins, fats, vitamins and minerals) in order to maintain health (Kennedy, 2004; Lawton et al., 2008; Ley, Hamdy, Mohan, & Hu, 2014).

Lack of money was described as the most common reason for unhealthy diets. It was also the reason why participants described eating one type of food at all meal times, for example sweet potatoes or corn meal, when in season. One participant described 'poverty, sickness and ignorance' as the three reasons for not eating healthy food. According to Wilson (2010), wealth and poverty have profound effects on diet, nutrition and health. Iganga and Mayuge are prone to poverty and food insecurity (Mugabi, 2010), and no different from other areas in the association with food insecurity (Waal, 1989). People consumed what they had, regardless of the fact that it could lead to an unhealthy diet. The fact that processed foods like sugar have become more affordable as they cost less than US$1 (UG Shs.3500) per kilo in rural Uganda, and the increasing trend towards modern foods is part of the global phenomenon of nutrition transition, attributed as a major driver for NCDs such as T2D (Maire, Lioret, Gartner, & Delpeuch, 2002).

Excessive eating or large portion sizes and eating too much of the same thing was also described as unhealthy. Studies globally have shown relationships between the increasing burden of obesity with increased food portion size (Rolls et al., 2002, 2004). This implies that people who tend to consume high energy foods in large quantities stand a higher chance of developing T2D and other food related complications. Portions were changing as was the types of food, with certain foods such as fish becoming more rare due to increasing exports while the local population ate the fillet bones (Namisi, 2000). It was noted that local government forbade fishermen to catch small immature fish, consequently fish consumed at home was negligible. Similarly, food habits were also adopted from urban to rural areas with increased use of oils in food preparation. Cooking with fat was common even among the poor. There has been increased uptake of oils and increased consumption of fried foods such as fried cassava snacks in rural Iganga and Mayuge. Low consumption of protective foods such as fish and high consumption of oils and fats are associated with higher prevalence of T2D and other NCDs (Hu et al., 2001).

The social meaning of food was found to be complex and was linked to everyday aspects such as availability and accessibility as well as to deeper meanings around status of foods and the sharing and serving of food. Culture is also intricately linked to perceptions of self and body image. Traditionally people tend to think in terms of the "fatter the better" and this also allows people to see weight gain as positive even though they are at risk for diseases like T2D. Cultural respect of wealthy people is tied to the politics of body size and image, making people think and expect that the better you look externally, the more access you have to happiness, thus promoting the culturally acceptable version of bodily perfection (Mayega et al., 2012, Mayega et al., 2014b). This was seen as a marker of social status (Mayega et al., 2012, Mayega et al., 2014b) and overweight or obesity was consequently very prevalent.

A person may be aware of a healthy/balanced diet, but may end up eating what the culture or economic status allows them to eat. Culture, diet and lifestyle behaviour are intimately linked (Brown et al., 2016). Therefore, it may be difficult to give up eating certain foods when food is eaten together as meals are often cooked together for the family. While describing the ethnological perspectives on the role of food in human life, Nordström et al. talks about food as culture, relation, identity and power (Nordström, Coff, Jönsson, Nordenfelt, & Görman, 2013). They infer that "the eating community and the meal are the basic foundation of all societies" and that "there is no culture without food." However, food cultures are dynamic as found in the present study with the change from commensality and shared meals to individual plates and status foods. Luxury foods for example, were often attributed a higher status such as cooking oil, particularly the branded variety (*butto*). Attributed values of certain foods also justified how they were used (Daivadanam, Wahlstrom, Thankappan, & Ravindran, 2015b) such as the use of expensive oils in making frying sauces that accompanied main meals or the lack of use of freely available bitter tomatoes which are often associated with poverty.

The social dimension of food was also described as rapidly changing and affecting the rural lifestyles, mainly due to influence from urban

and the global lifestyle. Participants (both T2D patients and PaRs) viewed their diets as including both traditional and modern foods, i.e., steaming and boiling versus deep frying and use of fast cooking ingredients. This increasing new influence of modern foods and cooking modes, indicate food movements and dietary transference, similarly described in the work of Appadurai who says that food is constructed, globalized and transferable (Appadurai, 2001). Rice was originally foreign, and in the past eaten as a special dish on festive days in urban areas in Uganda. However, today rice and corn meal could be consumed by rural households as a main meal. Boundaries are demystified as food crossed from defined geographical borders and across ethnic identities; national cuisines consequently become more imagined or invented than real (Appadurai, 1988, 2001; Catherine Henderson, 2014; Hiroko, 2008). Anderson, describes food as becoming a 'real part of ones' identity at a deeper level' (Anderson, 2014). While this is not a novel thought, we don't often consider the impact of changing lifestyles on identity and consequently health. The modern versions of traditional foods and the other changes we see could be a way of reinventing and maintaining key facets of food and cultural identity that could otherwise die down. That many of these changes are detrimental to health due to the increased use of oils or other unhealthy cooking practices is a fact that needs to be addressed and this has been successfully attempted in other parts of the world. The nutrition transition in South Korea for example, is described as unique. They have been quite successful in reviving and maintaining their traditional low-fat and high-vegetable diet through concerted efforts from the government, nutrition specialists and other private organisations (Lee, Popkin, & Kim, 2002).

This study also found that food was gendered, food was prepared by different sexes and served according to the type of food and position or social status. Women prepared daily meals like sweet potatoes while men prepared delicacies and occasion foods like *pilau* and *rolex (kikomando)*. Daily meals are for few people and family consumption whereas delicacies and occasion foods are prepared for many people and require strength, where men are seen as stronger. Men's entry into the kitchen and the differentiation of domestic 'everyday' cooking from other types of cooking such as for special dishes, special occasions or as a profession has been described within different cultural contexts (Gvion, 2011; Neuman, Gottzén, & Fjellström, 2017). Contemporary Swedish men on the one hand saw their participation in cooking activities as intertwined with accomplishments of masculinity, a way to maintain their hetero-social relationships and assume parts of domestic responsibility (Neuman et al., 2017). Among Palestinian men who were citizens in Israel on the other hand, it was described as an attempt to maintain the sanctity of 'home' cooking and traditional cuisines while at the same time being an expression of power and domination over women (Gvion, 2011). This is reflected in our study where fast foods were mainly prepared by men for commercial purposes. This explained why men had entered this domestic sphere because earning or breadwinning is also associated with power, decision making and social status.

Gender and power are inherently linked and earning an income or breadwinning gives more decision-making power to the individual who is able to provide for others. An urban woman for example has the option to buy the foods she likes because she earns her own wages, unlike the rural woman who may not have her own income. Men as breadwinners wielded more decision-making power in almost all aspects of food except the actual cooking. Food preparation at home was primarily seen as the responsibility of women and seemed to be viewed by the male participants as an activity they had little control over and one that often contributed to unhealthy diets. Consequently, this allowed for apportioning of blame for unhealthy diets as men often blamed the women for using oil to deep fry all sauces even vegetables. The gender and power dynamics also influenced the type and amount of food served to each member of the household. The men as heads of households are usually served the biggest and best parts of the meal for example the gizzard of a chicken. Such practices also supported gender-biased cultural beliefs that did not allow women and often children to eat the most nutritious portion of meals, such as chicken, eggs and gizzards. However, implied and actual decision-making power are often not the same. In a study in rural Kerala, India, Daivadanam, Wahlström, Thankappan, and Ravindran (2015a) found that food related decisions were regarded more or less as women's domain, but women made decisions that prioritised the needs and preferences of their spouse and children. Failure to do that would often result in spousal displeasure and unhappy children which women in traditional societies are culturally programmed to avoid. Food, eating and food decision making have been identified as important areas of study to understand its link to health and ill-health in diverse settings (Mintz & DU Bois, 2002; Daivadanam et al., 2015a).

The link between diet and T2D (and other NCDs) is well-established (Kraemer et al., 2016) and the findings of this study present several avenues for addressing risk factors for NCDs and intervening to reduce their prevalence. The Barker hypothesis proposed more than 25 years ago, argued that individuals who faced starvation *in utero*, often due to prevailing poverty and undernutrition were more likely to become overweight as adults, and suffer from obesity-related diseases such as cardiovascular problems and diabetes (Almond & Currie, 2011; Edwards, 2017). The NCD risk Factor (NCD-risC) Collaboration recently demonstrated that more than 80% of the rise in mean Body Mass Index (BMI) in some low- and middle-income regions (LMICs), including Sub-Saharan Africa, was due to increases in rural BMIs. They show that BMI of men was increasing at the same rate or faster in rural areas than in cities in these regions, while the gap in BMI between urban and rural areas for women has been closing or reversing (Bixby et al., 2019). It becomes important therefore, to address food and eating habits in areas that have experienced long periods of poverty and food insecurity to avoid flipping the coin to excessive consumption and diseases of overnutrition.

11. Implications for T2D prevention and management

Our study results on food and types of diet were that a lot of carbohydrates were consumed. Programmes should target sensitization about healthy diets and the modification which may improve or reduce T2D.

We found that the social context of food is complex but can be targeted in behavioral change strategies that may prevent T2D.

We also found that food was gendered and increased consumption was influenced by power relations between men and women, and therefore approaches taking gender into account could yield benefits in preventing T2D.

"Fatter is better" as a predisposing factor to T2D is a major identifier for being at risk with T2D in this population and therefore this perspective needs to be addressed by creating nutritional advice. The cultural identity domain serves primarily as the intervention points of entry for developing strategies and can occur at the level of persons, extended family members, or neighborhood (Boserup et al., 2013).

12. Methodological considerations

The study used FGDs and IDIs which strongly brought up participants' perceptions and experiences on food and dieting. This helped emphasize the story line of what could be done to avoid non-communicable diseases like T2D in many developing countries where the disease burden is on the rise especially in Africa. The study enrolled participants from two different districts including the demographic surveillance site (DSS) and indicated triangulation of sources of data, methods and cultural settings.

13. Conclusion

Food-related practices and behaviors are closely linked to the risk of

T2D and other NCDs and recent publications have focused on rural obesity as one of the drivers for NCDs in Sub-Saharan Africa. The increasing availability of affordable modern energy-dense and processed foods together with the association of overweight with affluence, beauty and good health increases the likelihood of a faster transition to T2D and other NCDs. This paper found that constraints to healthy eating were embedded in the everyday social and cultural context around food and the socialization process that governed the rural life and food practices in Uganda. This ranged from lack of money and lack of decision-making power; to the changing social processes due to urban influences and the focus on the individual; to the gender-power relations around decision making related to food that governed who ate what. As food is entrenched within social, cultural and gendered values, and these are dynamic and changing. Along with addressing the 'health' quality of food, the social and cultural aspects of food and the implications of gender and power dynamics on food preparation and consumption have to be specifically addressed in a contextually appropriate manner in health interventions to tackle the rising burden of T2D.

Declaration of conflict of interest

The contents of this article are solely the responsibility of the authors and do not have any conflict of interest nor reflect the views of the funders of the SMART2D Project.

Author contributions

All SMART2D Uganda team participated in the design of the question guides and data collection (RWM, BKT, EKK, JK, DG, FXK, and GNK).

Contribution to the paper

The study was designed as part of the SMART2D project Principal Investigators (Sweden, Uganda, and South Africa).

JK: Conception of the work; the acquisition, analysis, and interpretation of data; supervisory, and drafting the manuscript.

HMA: Conception of the work; analysis, and interpretation of data; and critical revision of the manuscript.

RWM: Conceptualization, actualization, and drafting.

FXK: design, review, conceptualization.

AM: Analysis, review, drafting.

BKT: Conceptualization, Design, drafting, analysis.

EKK: Conceptualization, drafting and supervisory.

GN: Conceptualization, actualization, and drafting.

CNK: Analysis, review, drafting.

SP: Design, drafting, analysis.

JVO: Conceptualization, drafting and supervisory.

MD: Conception of the work; analysis, and interpretation of data; and critical revision of the manuscript.

All authors approved the final version of the submitted manuscript; and agree to be accountable for all aspects of the work.

Acknowledgement

This study was conducted as part of the SMART2D project funded by the European Commission's Horizon 2020 Health Coordination Activities (Grant Agreement No 643692) under call "HCO-05-2014: Global Alliance for Chronic Diseases: prevention and treatment of type 2 diabetes". The Uganda site was co-funded by the Swedish International Development Cooperation Agency (SIDA) capacity-building grant to Makerere University 2015–2010 Project #HS 343.

We thank Makerere University, the funders, SIDA and the various principal investigators especially work package 2 leaders who designed the formative component in the smart2d project. We are grateful to the research team. Thanks also go to the clinical officers in charge of the diabetes clinic, local government leaders at the Mayuge and Iganga districts, the District Health Officers (DHO, the fieldwork mobilisers and study participants for availing time to participate in the study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2019.104409.

List of abbreviations

AIDS	Acquired Immuno Deficiency Syndrome
BMI	Body Mass index
DHO	District Health Officer
FGDs	Focus Group Discussions
HIV	Human Immune Virus
IDIs	In- Depth Interviews
OPD	Out Patient Department
PaR	People at Risk
SMART2D	Self-management and reciprocal learning in the prevention and management of Type 2 diabetes
T2D	Type 2 diabetes Mellitus

References

Almond, D., & Currie, J. (2011). Killing me softly: The fetal origins hypothesis. *The Journal of Economic Perspectives : A Journal of the American Economic Association, 25*, 153–172.

Anderson, E. N. (2014). *Everyone eats: Understanding food and culture.* NYU Press.

Appadurai, A. (1988). How to make a national cuisine: Cookbooks in contemporary India. *Comparative Studies in Society and History, 30*, 3–24.

Appadurai, A. (2001). *Globalization.* Duke University Press.

Asif, M. (2014). The prevention and control the type-2 diabetes by changing lifestyle and dietary pattern. *Journal of Education and Health Promotion, 3*, 1.

Barrès, R., & Zierath, J. R. (2016). The role of diet and exercise in the transgenerational epigenetic landscape of T2DM. *Nature Reviews Endocrinology, 12*, 441.

Basu, S., Stuckler, D., Mckee, M., & Galea, G. (2013). Nutritional determinants of worldwide diabetes: An econometric study of food markets and diabetes prevalence in 173 countries. *Public Health Nutrition, 16*, 179–186.

Bixby, H., Bentham, J., Zhou, B., DI Cesare, M., Paciorek, C. J., Bennett, J. E., et al. (2019). Rising rural body-mass index is the main driver of the global obesity epidemic in adults. *Nature, 569*, 260–264.

Boserup, E., Tan, S. F., & Toulmin, C. (2013). *Woman's role in economic development.* Routledge.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*, 77–101.

Brown, S. D., Ehrlich, S. F., Kubo, A., Tsai, A.-L., Hedderson, M. M., Quesenberry, C. P., et al. (2016). Lifestyle behaviors and ethnic identity among diverse women at high risk for type 2 diabetes. *Social Science & Medicine, 160*, 87–93.

Catherine Henderson, J. (2014). Food and culture: In search of a Singapore cuisine. *British Food Journal, 116*, 904–917.

Cheng, S., Kamano, J., Kirui, N. K., Manuthu, E., Buckwalter, V., Ouma, K., et al. (2013). Prevalence of food insecurity in patients with diabetes in western Kenya. *Diabetic Medicine, 30*, e215–e222.

Chiwanga, F. S., Njelekela, M. A., Diamond, M. B., Bajunirwe, F., Guwatudde, D., Nankya-Mutyoba, J., et al. (2016). *Urban and rural prevalence of diabetes and pre-diabetes and risk factors associated with diabetes in Tanzania and Uganda, Vol. 9* 2016.

Da Rocha Fernandes, J., Ogurtsova, K., Linnenkamp, U., Guariguata, L., Seuring, T., Zhang, P., et al. (2016). IDF Diabetes Atlas estimates of 2014 global health expenditures on diabetes. *Diabetes Research and Clinical Practice, 117*, 48–54.

Daivadanam, M., Wahlström, R., Thankappan, K., & Ravindran, T. S. (2015a). Balancing expectations amidst limitations: The dynamics of food decision-making in rural Kerala. *BMC Public Health, 15*, 644.

Daivadanam, M., Wahlstrom, R., Thankappan, K. R., & Ravindran, T. K. (2015b). Balancing expectations amidst limitations: The dynamics of food decision-making in rural Kerala. *BMC Public Health, 15*, 644.

Edwards, M. (2017). The barker hypothesis. In V. Preedy, & V. B. Patel (Eds.). *Handbook of famine, starvation, and nutrient deprivation: From biology to policy*. Cham: Springer International Publishing.

Ester, B. (1970). Women's role in economic development. *American Journal of Agricultural Economics, 53*, 536–537.

Galbete, C., Nicolaou, M., Meeks, K., Klipstein-Grobusch, K., De-GRAFT Aikins, A., Addo, J., et al. (2018). Dietary patterns and type 2 diabetes among Ghanaian migrants in europe and their compatriots in Ghana: The RODAM study. *Nutrition & Diabetes, 8*, 25.

Gassasse, Z., Smith, D., Finer, S., & Gallo, V. (2017). Association between urbanisation and type 2 diabetes: An ecological study. *BMJ global health, 2*, e000473.

Gaziano, T. A. (2007). Reducing the growing burden of cardiovascular disease in the developing world. *Health Affairs, 26*, 13–24.
Glaser, B. G., & Strauss, A. L. (2017). *Discovery of grounded theory: Strategies for qualitative research.* Routledge.
Guwatudde, D., Absetz, P., Delobelle, P., Östenson, C.-G., OLMEN Van, J., Alvesson, H. M., et al. (2018). Study protocol for the SMART2D adaptive implementation trial: A cluster randomised trial comparing facility-only care with integrated facility and community care to improve type 2 diabetes outcomes in Uganda, South Africa and Sweden. *BMJ Open, 8*.
Guwatudde, D., Mutungi, G., Wesonga, R., Kajjura, R., Kasule, H., Muwonge, J., et al. (2015). The epidemiology of hypertension in Uganda: Findings from the national non-communicable diseases risk factor survey. *PLoS One, 10*, e0138991.
Gvion, L. (2011). Cooking, food, and masculinity: Palestinian men in Israeli society. *Men and Masculinities, 14*, 408–429.
Hennink, M., Hutter, I., & Bailey, A. (2010). *Qualitative research methods.* Sage.
Herbert, K., Plugge, E., Foster, C., & Doll, H. (2012). Prevalence of risk factors for non-communicable diseases in prison populations worldwide: A systematic review. *The Lancet, 379*, 1975–1982.
Hiroko, T. (2008). Delicious food in a beautiful country: Nationhood and nationalism in discourses on food in contemporary Japan. *Studies in Ethnicity and Nationalism, 8*, 5–30.
Hu, F. B., Manson, J. E., Stampfer, M. J., Colditz, G., Liu, S., Solomon, C. G., et al. (2001). Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. *New England Journal of Medicine, 345*, 790–797.
IDF. (2016). *IDF diabetes atlas - Home.* [Online]. Available: http://www.diabetesatlas.org/, Accessed date: 6 February 2016.
Kennedy, E. (2004). Dietary diversity, diet quality, and body weight regulation. *Nutrition Reviews, 62*, S78–S81.
Khazrai, Y., Defeudis, G., & Pozzilli, P. (2014). Effect of diet on type 2 diabetes mellitus: A review. *Diabetes/metabolism research and reviews, 30*, 24–33.
Kraemer, K., Cordaro, J. B., Fanzo, J., Gibney, M., Kennedy, E., Labrique, A., et al. (2016). 3 Diet and Non-Communicable Diseases: An urgent need for new paradigms. *Good nutrition: Perspectives for the 21st century* (pp. 105–118). Karger Publishers.
Kumanyika, S. (1990). Diet and chronic disease issues for minority populations. *Journal of Nutrition Education, 22*, 89–96.
Lawton, J., Ahmad, N., Hanna, L., Douglas, M., Bains, H., & Hallowell, N. (2008). 'We should change ourselves, but we can't': Accounts of food and eating practices amongst British Pakistanis and Indians with type 2 diabetes. *Ethnicity and Health, 13*, 305–319.
Lee, M. J., Popkin, B. M., & Kim, S. (2002). The unique aspects of the nutrition transition in South Korea: The retention of healthful elements in their traditional diet. *Public Health Nutrition, 5*, 197–203.
Ley, S. H., Hamdy, O., Mohan, V., & Hu, F. B. (2014). Prevention and management of type 2 diabetes: Dietary components and nutritional strategies. *The Lancet, 383*, 1999–2007.
Maire, B., Lioret, S., Gartner, A., & Delpeuch, F. (2002). [Nutritional transition and non-communicable diet-related chronic diseases in developing countries]. *Sante, 12*, 45–55.
Mayega, R. W., Etajak, S., Rutebemberwa, E., Tomson, G., & Kiguli, J. (2014a). 'Change means sacrificing a good life': Perceptions about severity of type 2 diabetes and preventive lifestyles among people afflicted or at high risk of type 2 diabetes in Iganga Uganda. *BMC Public Health, 14*, 864.
Mayega, R. W., Makumbi, F., Rutebemberwa, E., Peterson, S., Ostenson, C. G., Tomson, G., et al. (2012). Modifiable socio-behavioural factors associated with overweight and hypertension among persons aged 35 to 60 years in eastern Uganda. *PLoS One, 7*, e47632.
Mekary, R. A., Giovannucci, E., Willett, W. C., Van Dam, R. M., & Hu, F. B. (2012). Eating patterns and type 2 diabetes risk in men: Breakfast omission, eating frequency, and snacking–. *American Journal of Clinical Nutrition, 95*, 1182–1189.
Mintz, S. W., & DU Bois, C. M. (2002). The anthropology of food and eating. *Annual Review of Anthropology, 31*, 99–119.
Mugabi, N. (2010). *Micro-credit utilization and its impact on household income: A comparative study of rural and urban areas in Iganga district.* Makerere University.
Namisi, P. W. (2000). *Socio-economic implications of the fish export trade on the Fishers and fisheries of Lake Victoria in Uganda*.
National Research Council. (1989). *Diet and health: Implications for reducing chronic disease risk.* National Academies Press.
Neuman, N., Gottzén, L., & Fjellström, C. (2017). Masculinity and the sociality of cooking in men's everyday lives. *The Sociological Review, 65*, 816–831.
Nordström, K., Coff, C., Jönsson, H., Nordenfelt, L., & Görman, U. (2013). Food and health: Individual, cultural, or scientific matters? *Genes & nutrition, 8*, 357–363.
Ogurtsova, K., Da Rocha Fernandes, J., Huang, Y., Linnenkamp, U., Guariguata, L., Cho, N., et al. (2017). IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Research and Clinical Practice, 128*, 40–50.
Popkin, B. M. (2002). An overview on the nutrition transition and its health implications: The bellagio meeting. *Public Health Nutrition, 5*, 93–103.
Popkin, B. M., & Gordon-Larsen, P. (2004). The nutrition transition: Worldwide obesity dynamics and their determinants. *International Journal of Obesity and Related Metabolic Disorders, 28*(Suppl 3), S2–S9.
Roberto, C. A., & Khandpur, N. (2014). Improving the design of nutrition labels to promote healthier food choices and reasonable portion sizes. *International Journal of Obesity, 38*(Suppl 1), S25–S33.
Rolls, B. J., Morris, E. L., & Roe, L. S. (2002). Portion size of food affects energy intake in normal-weight and overweight men and women. *American Journal of Clinical Nutrition, 76*, 1207–1213.
Rolls, B. J., Roe, L. S., Meengs, J. S., & Wall, D. E. (2004). Increasing the portion size of a sandwich increases energy intake. *Journal of the American Dietetic Association, 104*, 367–372.
Ryan, G. W., & Bernard, H. R. (2003). Techniques to identify themes. *Field Methods, 15*, 85–109.
Schmidt, H. (2016). Chronic disease prevention and health promotion. *Public health Ethics: Cases spanning the globe*. Cham: Springer.
Schwartz, J. I., Guwatudde, D., Nugent, R., & Kiiza, C. M. (2014). Looking at non-communicable diseases in Uganda through a local lens: An analysis using locally derived data. *Globalization and Health, 10*, 77.
Steyn, N. P., & Mchiza, Z. J. (2014). Obesity and the nutrition transition in sub-saharan Africa. *Annals of the New York Academy of Sciences, 1311*, 88–101.
Turyatemba, J. (2011). *Iganga-mayuge DSS at the helm of research.* Makerere University School of Graduate Studies.
Waal, A. D. (1989). *Famine that kills: Darfur, Sudan, 1984-85.* Clarendon Press.
WHO (2003). *Diet, nutrition, and the prevention of chronic diseases: Report of a joint WHO/FAO expert consultation.* World Health Organization.
WHO (2017). *Diabetes.* [Online]. Available: http://www.who.int/mediacentre/factsheets/fs312/en/, Accessed date: 25 July 2019.
Willett, W. C., Koplan, J. P., Nugent, R., Dusenbury, C., Puska, P., & Gaziano, T. A. (2006). Prevention of chronic disease by means of diet and lifestyle changes. *Disease control priorities in developing countries*(2nd ed.). The International Bank for Reconstruction and Development/The World Bank.
Wilson, C. (2010). 'Eating, eating is always there': Food, consumerism and cardiovascular disease. Some evidence from Kerala, south India. *Anthropology & Medicine, 17*, 261–275.