ajfand SCHOLARLY, PEER REVIEWED
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
Volume 23 No. 5
May 2023
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Afr. J. Food Agric. Nutr. Dev. 2023; 23(5):23263-23284 https://doi.org/10.18697/ajfand.120.21990

DIETARY DIVERSITY DURING COVID-19 PANDEMIC: A CASE OF HOUSEHOLDS IN LURAMBI AND MALAVA SUB-COUNTIES, KAKAMEGA COUNTY

Musotsi AA[1]*, Ali U[2], Mungai A[2] and Z Maingi[1]

Anne A. Musotsi

*Corresponding author email: amusotsi@mmust.ac.ke

[1]Department of Nutritional Sciences- Masinde Muliro University of Science and Technology, Kakamega, Kenya

[2]Department of Economics- Masinde Muliro University of Science and Technology, Kakamega, Kenya

ajfand SCHOLARLY, PEER REVIEWED
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
Volume 23 No. 5
May 2023
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

ABSTRACT

Dietary diversity is a qualitative and proxy indicator of food security status. Social, physical, economic and biological factors, among others, may impact positively or negatively on the dietary diversity of a population. The aim of this study was to explore the food and dietary diversity in Malava and Lurambi sub-Counties of Kakamega County during COVID-19 pandemic. A descriptive survey design was used for data collection. The sample size was 200 households. A questionnaire that was designed and developed using KoBo Collect and synchronized to Open Data Kit (ODK) server was used to collect data. Data was analyzed using Statistical Package for Social Sciences Version 26.0 to generate descriptive and inferential statistical data. Independent t-test statistics for mean differences was used to determine differences in Household Dietary Diversity Scores (HDDS) between Lurambi and Malava sub-Counties. The study results showed that grains and grain products and all other starchy foods recorded the highest HDDS (100%), followed by dark green leafy vegetables (90.1%) and fruits (46.7%). Foods with the lowest HDDS were meat and meat products (16.5%) and other vegetables (19.7%). Lurambi sub-County had a higher dietary diversity score during COVID-19 pandemic as compared to Malava sub-County. The HDDS scores showed that the dietary diversity for Lurambi sub-County was 3.8 and that of Malava sub-County was 3.2. The T-test results were significant at p= 0.02, <0.05 at 95% CI. However, both sub-Counties had overall, a low HDDS as they did not reach the recommended dietary diversity of consuming foods from at least five food groups. Consequently, the overall low HDDS in both sub-Counties could imply that households did not have access to nutritious food during the COVID-19 pandemic. The study concluded that during COVID-19 pandemic, households in Kakamega had low HDDS and hence, establishing strategies for enhancing dietary diversity to improve food access during and beyond any pandemic was key.

Key words: Dietary diversity, COVID-19, household food access, food security

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

INTRODUCTION

Food accessibility is one of the dimensions of food security [1]. There has been an increase in global advocacy for healthy dietary choices and embracing dietary diversity at household and individual levels. Dietary diversity is defined as the consumption of foods from different food groups over a given period of time [2]. Dietary diversity is strongly linked to food accessibility by individuals and households, thus making accessibility a very vital dimension. The Household Dietary Diversity Score (HDDS) refers to the number of unique foods household members consume over a given period [2]. The score is a proxy measure to food access, where, marital status, level of education the household head, size of the household, household head income, per capita food expenditure and area of cultivated land are among the factors that have been reported to significantly impact on household food and dietary diversity [3]. It is considered a standard tool that has been used in assessing the economic ability of households to access a variety of foods during a determined period and greatly informs nutrition outcomes [4].

The Food and Agriculture Organization (FAO) developed a guideline for measuring household and individual dietary diversity [5,6]. The Government of Kenya has also developed the Kenya National Nutrition Action Plan that aims at improving the nutrition and dietary diversity for all populations in the Country [7]. Stakeholders and government partners implementing nutrition programs in the country have played a key role in implementing this action plan. The Kakamega County Government has not been left out in the interventions to improve the dietary diversity of her people. Through its County Integrated Development Plan (CIDP), the county has initiated projects supporting agricultural practices to diversify household food production. The County has supported chicken farming, dairy production, fish farming and kitchen gardening [8]. Despite these interventions, the County still depends on imports of the food items from other counties and even neighbouring countries such as Uganda.

Studies reveal that low income groups in Kakamega County cannot purchase adequate food and what they consumed did not meet FAO recommended levels for foods and nutrients [8]. In addition, nutrition status in the county is wanting with 8.6 per cent of the under five children being underweight. The total number of children under 5 years mainly from poor households who are severely or moderately undernourished is 77,444.Thus, low income and poverty are the main cause of food insecurity in Kakamega [8, 9].

https://doi.org/10.18697/ajfand.120.21990

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

In March 2019, COVID-19 was declared a pandemic, affecting populations worldwide. To combat the pandemic, many countries resorted to a lockdown of their borders and even within their borders. This threatened household access to food mainly through losses of income and assets that prejudice the ability to buy food [10]. Further, employment status was adversely affected as employers closed down businesses and laid off staff. Further, restrictions put in place by various governments to control the pandemic, such as travel restrictions and social distancing, led to a reduction in the types and quantity of foods available in the markets as well as limited physical access to markets [10]. This exacerbated the persistent food insecurity situation in some countries and counties, especially in the developing world. Access to organized agricultural markets significantly influences household dietary diversity scores [11]. A study on food access in Sub-Saharan Africa revealed that 39% of households were severely food insecure in terms of food access and 49% of households were likely to be deficient in nutrients during lead periods. In addition, households with a livestock component to their farm had a lower prevalence of severe food insecurity and higher diet diversity scores [12].

This study aimed to explore the dietary diversity in Malava and Lurambi sub-Counties in Kakamega County during the COVID-19 pandemic. The study was motivated by the already precarious food security situation in the County, hence to determine whether households were at risk of food insecurity. The study areas of Lurambi and Malava were deemed relevant because they would provide a snapshot of both urban and rural households of all income groups in the County.

MATERIALS AND METHODS

Study design, setting and population

The study was conducted in Kakamega County, western Kenya using a descriptive survey design. The methodology was deemed useful in establishing the effect of COVID-19 on food diversity at the household level and thus understanding the dynamics influencing food access in Kakamega County. Data were colleted between January and April 2021, which is largely the lean season within the County. The County comprises twelve sub-Counties [8]. The researchers purposively sampled two sub-Counties, Malava and Lurambi, for data collection. Malava sub-County is a rural setting and the major economic activity is food and cash crop farming. A majority of the households have lands where they grow maize as the staple food and sugarcane as a cash crop [8]. Lurambi sub-County, is an urban and peri-urban setting with limited land for agriculture and thus, most

people depend on employment and business for making a living [8]. The selection enabled the researchers to compare variables of the two populations under study.

Sample Size Calculation

According to the Kenya Population and Housing Census 2019, Lurambi sub-County has 52015 households while Malava has 51,083 households [13]. The sample size for thus study was calculated using Fischer's et al formula for populations above 10,000 and determined to be 384 [14]. However, due to the COVID-19 protocols and restrictions, the researchers could not access all the households and/or respondents. Eventually, data collection was done in 200 households only. Because of relative homogeneity of the population base in terms of demographic and economic factors it is considered highly likely that this sample is representative. The target population was households, with the household heads responding to the questionnaires. Wards in each sub-County were used as strata and stratified random sampling was used in selecting the households (Table 1).

Data collection technique

Data was collected using pretested semi-structured questionnaires. The questionnaire was designed and developed using KoBo Collect and synchronized to Open Data Kit (ODK) server. The questionnaire contained sections on socio-demographic and economic data, land ownership and land use, food access and pricing during COVID-19, household coping strategies, foods consumed and changes in dietary patterns as a result of COVID-19. Data collection enumerators were trained on data collection processes using the tool. Data were entered directly into the ODK software which was installed on their mobile phones. The data collected were reflected instantly and reviewed by the research team at the end of the day. To protect enumerators and respondents against COVID-19 during the interview process, sanitizers and masks were used and social distance protocols were observed.

Data analysis

Data was exported to Microsoft Excel Spreadsheet 2016, cleaned and coded. The data were then exported to SPSS Version 26 for statistical analysis. Cross tabulation was used to generate descriptive statistics and percentages used to report the results. Independent t-test statistics for mean differences were used to determine differences in HDD scores between Lurambi and Malava. A low dietary diversity score was considered to be consuming foods from three or less food groups within 24 hours. Four to five food groups was considered medium and six and above food groups was a high HDDS score [5]. Results were presented using tables.

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Ethical considerations

The study was approved by Masinde Muliro University of Science and Technology Ethics Review Committee (REF No: IERC/MMUST/143/2020) and the National Commission for Science Technology and Innovation Kenya (REF Number MMU/COR: 403012(01) and License number: NACOSTI/P/21/8406). The study had an informed consent that addressed all the ethical concerns that could arise and it was explained to the study participants. Data was collected from the household heads who consented to participate in the study. The participants had the option to agree or decline to the interview.

RESULTS AND DISCUSSION

The empirical data and discussion are presented: Socio-demographic and economic characteristics and their effects on HDDS, sources of food before and during COVID-19, market and farm food access during COVID-19, changes in eating patterns, and quality of diet during COVID-19, dietary diversity in Lurambi and Malava sub-Counties and distribution of HDDS. Subsequently, some conclusions were drawn.

Socio-demographic and economic characteristics of households in Lurambi and Malava sub-Counties: the impact on food access during COVID-19

Table 2 shows vaious demographic characteristics of households in Lurambi and Malava. The highest percentage of households are headed by people of age group 41-50 years (33.5%). Most household heads were male (58.5%). A majority of households had 1-5 active male adults (97.5%) as well as female adults at 99%. During the study, no household member had been affected by COVID-19. This is an indication that the household heads as well as the household composition were active members and, therefore, could work to provide food for their households. The household head is the individual recognized by other members of the unit as having authority within and responsibility for the household [15]. Studies have shown that the male headed households are more food secure than the female headed households [15, 16]. According to Felker-Kantor & Wood [15], household food insecurity is associated with the gender of the head of household and with the household's internal composition. It is a positive thing, therefore, that most households in Lurambi and Malava were headed by males. It is expected that such households would have better access to food.

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Occupation-wise, 52.5% of respondents were farmers. Most of the respondents owned the land that they lived on and farmed (71%). Crops grown were mostly vegetables (38%), cereals and legumes, 29.5% and cash crops (29%). Occupation of household members could influence accessibility to nutritious food. It is generally expected that farming households would have better access to nutritious food as compared to non-farming households. A study done by Mutisya *et al.* [17] found that severe food insecurity was highest among households that did not grow any crops and lowest among those households that grew crops for household consumption. Nevertheless, the crops grown in the two sub-Counties are insufficient to ensure access to nutritious food (table 2). This is further supported by a study done by Akadiri *et al.* [16] who found that despite the engagement of the households in agriculture, a majority of them are food insecure, meaning they did not have access to nutritious food. Moreover, according to KCIDP [8], land sizes in the Kakamega County at large have been fragmented due to increase in population density. This would mean that although most respondents are living on their land, it may not be sufficient to carry out agricultural activities that can produce adequate food to support access to nutritious food. During COVID-19, lockdowns were instituted as a measure of controlling the spread of the virus. Hence, households with food in the farms may have had an advantage as they had a fall back. Dietary diversity could be promoted more easily in households that had farms as compared to those that did not.

Unemployment is a challenge in Lurambi and Malava as per the data indicated in Table 2. This corroborates with KCIDP data [8]. Whereas employment opportunities would enhance the purchase of food and hence access, the FAO [5] noted that unemployment is a big challenge to food security. It is particularly severe among the youth, who are more likely than adults to be unemployed. In addition to the high unemployment rates, underemployment and inactivity represent another major challenge, especially for women and youth. Many existing jobs are of low quality, informal, underpaid and insecure [5]. During COVID-19, there were job losses attributed to lock downs and global economic recession. This exacerbated the unemployment situation and destroyed sources of livelihood for many people. The effect was evident in households where coping mechanisms had to be instituted (Figure 2).

Monthly household income reported was KES 20,000 and below for on-farm income (53%) and off-farm income (51.5%). A majority of respondents had a higher income from non-farm activities (40,000-60,000 KES) category at 25% as compared to 35.5% on-farm income of below 3,000 KES. Household income has a relationship with food access and food security. A majority of income from non-

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

farm activities are wage earners who are Jua Kali artisans, cottage industries and boda boda riders [8]. Others engage in mining, forestry, brick making and construction works. Women are also employed as house helps [8]. On-farm income is from the sale of farm produce, mainly vegetables. The level of income of households in Lurambi and Malava can be categorized as low. Low income could negatively affect purchase of food. The FAO [5], highlights the importance of income for food accessibility. Sufficient income means that enough money would be allocated to buying of quality and nutritious food. Low income, on the other hand, would require limiting the purchase of such food in order to meet other competing household needs. Thus, the possibility of having lack of access to nutritious food is likely to be high in low income households.

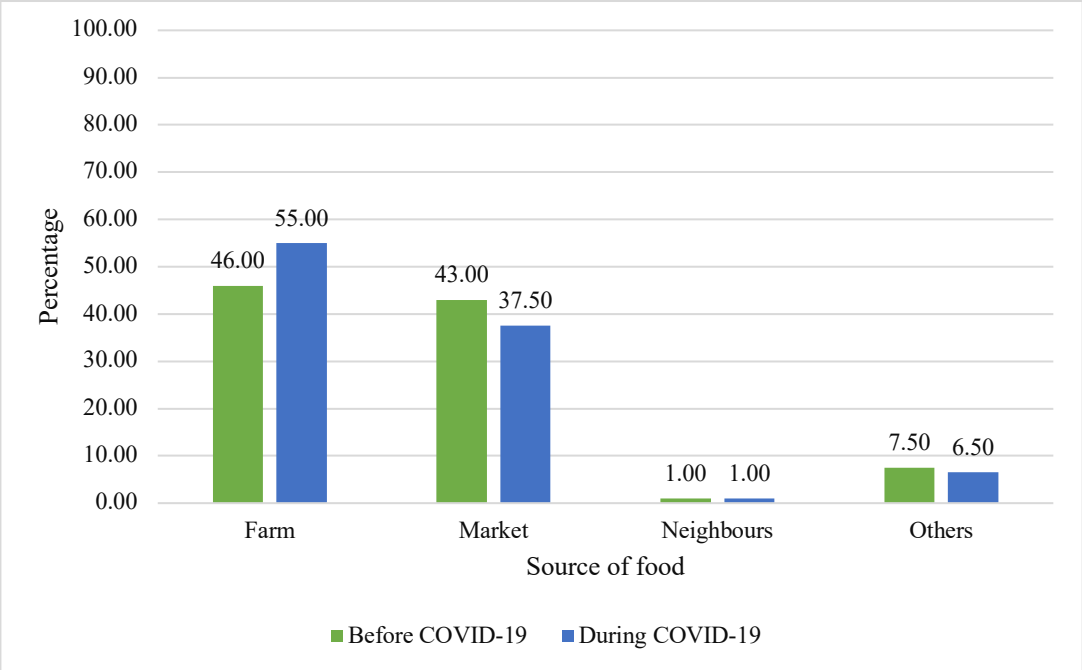
Results showed that 54% of respondents had tertiary level of education. Studies have shown a link between level of education and nutrition knowledge [16, 17, 18, 19]. According to the FAO [18], education has a key role in accessing public information, especially concerning health, nutrition, and hygiene because “it can open the minds of people”. Thus, the level of education of the household head could influence the types of food purchased for the household as well as preparation methods within the household. A study done by Mutisya *et al.* [17], showed that the probability of being moderately or severely food insecure decreases with increased level of education. Attaining an education of tertiary level in 54% of the households means that most household heads were aware of the importance of nutritious foods. This was advantageous for the households, particularly during COVID-19 where knowledge on dietary interventions played a key role in prevention and treatment.

Sources of food before and during COVID-19

Data on the sources of food before COVID-19 showed that 46% of households obtained food from their farms, 43% from the market and 11% from neighbors, friends and extended family members. During the pandemic, the sources of food were 55% from the farms and 37.5% from the market. This indicated an increase in percentage of households who obtained food from their farms during COVID-19 and a reduction in the percentage of those who sourced food from the market. There was also a reduction in percentage of households who obtained food from neighbors, friends and extended family members.

Figure 1 shows how food was accessed before and during COVID-19 in Lurambi and Malava.

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374



*Others include extended family members and friends

Figure 1: Source of food before and during COVID-19 pandemic

The trend could be attributed to restrictions in movement during COVID-19 thus household members were spending more time at home and could produce their own food. Moreover, limited access to the markets could also have contributed to this scenario. Markets are traditional food supply chains among many communities in Kenya. Restrictions on movement during COVID-19 would cause an interruption in the food supply chain. This argument resonates with findings of a study that found that restrictions during COVID-19 not only disrupted the food supply chain but also contributed negatively to global poverty and food security [20]. Farms and home gardens are very vital in enabling food access in households [8]. They enable access to food during lean seasons and may also contribute to household incomes through sale of farm products. Since a majority of households in Lurambi and Malava own land, promotion of food production activities such as home gardening would secure food access for the households.

Market and farm food access during COVID-19

Although the farm and the market were the main sources of food in Lurambi and Malava sub-Counties, data showed that access to food during COVID-19 faced a number of challenges. These included access to clean water at 4%, access to less variety of foods at 30.5%, access to food of less quality at 36.5%, limited quantity of food available in the area at 14%, food rationing at 12.5% and having to walk long distances to access food at 0.5% (table 3). Water is essential for food preparation, drinking and for supporting sanitation practices within th household.

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Lack of access to clean water could be a hindrance to food preparation e.g. in preparation of indigenous vegetables where a lot of water is required [23]. Accessibility to less variety of food could hamper HDDS due to lack of diversity. Food quality and quantity are key to nutitional status as they are linked to the type and amount of nutrients provided [17]. Foods that are of poor quality such as those that provide minimal nutritional content, poorly preserved foods and those that are contaminated may provide satiety but not nutritional content. Limited quantity of food may not provide the specific amounts of nutrients required by the body and can lead to nutritional deficiencies [9]. This would exacerbate the prevailing COVID-19 situation.

Changes in eating patterns, and quality of diet during COVID-19

Most of the households (75%) reported that there was no change in their eating patterns during COVID-19. A majority of households (54.5%), however, reported a reduction in the number of meals eaten per day, while 43.5% reported no change in the number of meals.

Figure 2 shows changes that occurred in eating patterns and diet during COVID-19.

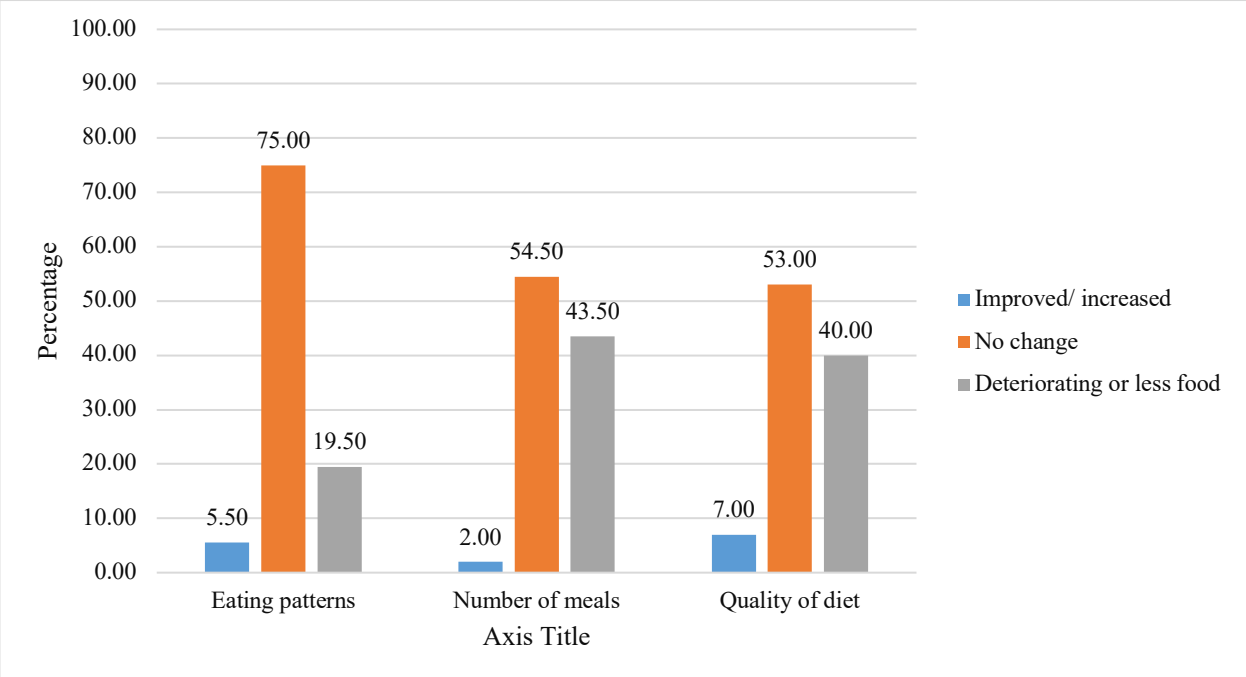


Figure 2: Changes in eating patterns, and quality of diet during COVID-19

Reduction in the number of meals and/or switching to less nutritious/or preferred foods is a coping strategy used in mitigation of food insecurity. This study findings

agree with the findings of a multi-country survey by Jafri *et al.* [10] which found that most respondents modified their diets during COVID-19 pandemic.

Moreover, the quality of diet reflecting the use of fresh nutritious foods deteriorated in 53% of households and improved in only 7% of households. Forty percent of households reported no change in quality of diet. Most of the respondents (73%) were concerned that they would not have enough food during the pandemic. This supports studies by Kansiime *et al.* [21] indicating that food insecurity and dietary quality worsened during COVID-19 among low-income households in Kenya and Uganda, with income-poor households and those depending on low-wage labor being more food-insecure compared to households reliant on land for food access.

Dietary diversity among households in Lurambi and Malava sub-Counties

Dietary diversity was determined using the food groups consumed in the study area during COVID-19. Table 4 presents the findings of food groups consumed. The food groups were based on foods that were commonly consumed in Kakamega County at large. Grains and grain products and other starch foods recorded the highest HDDS in the Lurambi sub-County (100%). This was followed by dark green leafy vegetables at 96.0% and fruits at 63.6%. Legumes, pulses, nuts and seeds were at 42.4% and other vegetables at 34.3%. Foods with the lowest HDDS were milk and milk products at 28.3% and meat and meat products at 17.2%. A similar trend was observed in Malava, with the highest HDDS for grains and grain products and all other starch foods (100%). Dark green leafy vegetables at 84.2% and milk and milk products at 53.4%. HDDS for fruits was 35.7%, while legumes, pulses, nuts and seeds were 23.8%. Foods with the lowest HDDS were meat and meat products at 15.8% and other vegetables at 5.0%. Comparing HDDS in the two area, Lurambi had a higher dietary diversity score as compared to Malava sub-County.

The high HDDS for grains and starchy food and green leafy vegetables in both Lurambi and Malava could be attributed to the meal culture of the local people [22] as well as the crops produced in farms [8]. The staple food of the people comprises ugali (stiff porridge), accompanied by indigenous vegetables. This agrees with studies that found that in Kakamega County ugali was the staple food, accompanied by vegetables [9, 23]. This study revealed that during COVID-19, HDDS for the two groups of food: grains and grain products and all other starch foods and dark green leafy vegetables was not adversely affected. This is beneficial as the vegetables contribute to household food security and nutrition. Other studies have also confirmed the importance of indigenous leafy vegetables in food security, nutrition and health of consumers [24, 25, 29]. The findings of this

study confirm the importance of grains and starchy foods and green vegetables to the meal culture of the people of Lurambi and Malava, and Kakamega County at large. Besides, grains and starchy foods are essential for providing energy [27] while indigenous vegetables (green leafy vegetables) provide vitamins, minerals and useful phytochemicals [23, 24, 25, 29]. Therefore, it is positive that accessibility to these food groups was unaffected during COVID-19.

Malava had a higher HDDS percentage for milk and milk products than Lurambi. This could be attributed to the size of land owned by households, that was found to be larger in Malava as compared to Lurambi [8]. A larger size of land would favor the rearing of animals due to provision of fodder. According to Kakamega CIDP [8], Lurambi sub-County has the highest population density of 1305 people/km^2 while Malava has 632 people/km^2. This implies that the population density is relatively high in Lurambi, thus putting pressure on land for settlement. Access to milk is essential as milk is a high biological value protein that can enhance body building and repair worn out tissues [27, 30]. During COVID-19, milk and other protein foods would play a major role in boosting immunity and regeneration of body cells thus speeding up recovery from illnesses [27, 28]. However, the low consumption of milk and milk products in both sub-Counties could have a negative implication on individual health and nutrition status of individuals.

Household dietary diversity score for meat and meat products was found to be very low in both sub-Counties. Other research revealed that 46% , of households in Kakamega County consumed meat [9]. This is a negative reflection of food and nutrition security in the County with regard to meat and meat products. COVID 19 may have exacerbated the situation as results from this study showed an even lower percentage of meat consumption (17.2% for Lurambi and 15.8% for Malava). Meat and meat products are high biological value proteins with more amino acids than plant proteins. Being first-class proteins, they contribute to bodybuilding as well as iron stores in the body [27]. Insufficient protein-rich food intake may lead to micronutrient deficiencies in children and hypoproteinemia in adults. Paradoxically, in Kakamega County at large is home to the Luhya ethnic group, which prides itself in love for chicken consumption. According to Kakamega CIDP [8], the production of chicken stands at 959,746 for indigenous chicken and 73,876 for indigenous chicken. If these chicken and chicken products were consumed frequently in households, it would help increase the HDDS and eventually help to improve food security and nutrition.

In addition, fruits and other vegetables (non-green vegetables) was very low in Malava sub-County. This could be attributed to a lack of access to these food

groups. Most non-green vegetables such as carrots, cabbage, tomatoes, and others are not produced within the county [8]. The same applies to common fruits such as melon, oranges, pineapples and mangoes. This implies that they have to be imported from other counties. Being a rural sub-County, Malava people do not easily access these vegetables and fruits found mainly in the Kakamega town market. Data in table 6 indicates that a significant number of people (30.5%) found that access to less variety of food was a challenge. The role of fruits in providing vitamins and minerals cannot be underscored [27, 28]. Particularly during COVID-19, fruits could help to strengthen immunity and provide the much-needed vitamin C. Therefore, households should strive to provide a variety of fruits. People in Malava sub-County should be motivated to diversify their food production to include yellow-orange vegetables and fruits.

Distribution of Household Dietary Diversity Score

The study found that Malava sub-County had statistically significantly lower HDDS (3.2 ± 0.95 food groups per day) during COVID-19 pandemic while Lurambi sub-County had 3.8 ± 1.69 food groups per day. The Levenes test of Equality showed that there is no variance between the groups (f=37.221, sig.=0.00) and thus equal variances was not assumed. The independent t-test results showed that t(154.135)=3.295, p=0.001. This indicates that, there was a significant statistical difference in dietary diversity between the two sub-Counties (table 5).

The difference in HDDS between Lurambi and Malava sub-Counties could be attributed to the location. Access to different types of food could have been enabled in Lurambi, where the local people walk to the market as opposed to Malava whose market is in the rural area. This allows access to urbanite markets where food is imported from neighboring counties. The finding agrees with FAO [5], stated that there may be urban-rural differentials in dietary diversity and that variety is often much greater in urban and peri-urban centers where food markets are adequately supplied and easily accessible. At the onset of COVID-19, travel restrictions were put in place and the number of people travelling by Public Service Vehicles (PSVs) was also restricted [9]. This led to increased transport cost, affecting movement within and without regions in Kenya. For Malava residents to get to an urban market (in Kakamega or other), they need to board a PSV. This scenario could have restricted households in Malava from accessing a diversity of foods.

Secondly, the difference in HDDS could be attributed to economic status. Kakamega CIDP [8] shows that income levels in the Malava sub-County are lower than Lurambi. The finding agrees with a study comparing different economic

groups and food access [9]. The study showed that economically low people have poor or lack access to food, thus low food diversity. Although Malava has the land to produce food, they may lack resources such as capital that is required to utilize their land optimally and produce sufficient food.

Generally, the HDDS for both sub-Counties was low. This could imply that households did not have nutritious food during the COVID-19 pandemic. Food insecurity in Kakamega County is perennial and seasonal [9]. The situation has been attributed to small land size and lack of knowledge and information on intensive farming methods [8]. Other research has linked food insecurity to low economic status [9]. Food production in the county is low and cannot sustain households year-round [31].The county depends on neighboring counties of Trans-Nzoia, Nandi, Busia and Bungoma to bridge the gap of insufficient food for the supply of food in the markets. Thus, access to food will be influenced by affordability [31]. COVID- 19 exercabated the situation through measures that were put in place to control the pandemic. Kakamega receives reliable rainfall almost throughout the year [8]. Moreover, the county can produce a diversity of food crops such as maize, millet, sorghum, sweet potatoes, cassava, groundnuts, simsim, bananas, and variety of vegetables and fruits [8, 31] as well as raise animals and poultry. Hence, a medium to high HDDS score of at least 4 to 6 and above food groups is achievable in Lurambi and Malava sub-Counties and the entire Kakamega County.

CONCLUSION

This study revealed that there was low dietary diversity in Lurambi and Malava sub-Counties. A number of socio-demographic and economic factors influenced HDDS. COVID-19 exacerbated the situation by limiting access to markets and obtaining nutritious foods. Hence, community-led interventions such as home gardens could help to sustain access to food in times of crises. There was a difference in dietary diversity between urban and rural areas (Lurambi and Malava) due to market access. Thus, markets play a very important role in providing food and diversifying diets for households. Expanding market access requires innovative interventions such as food marketing apps which can easily be accessed by mobile phones. Moreover, Kakamega County at large should use its resources for targeted household support in order to produce sufficient food, access to nutritious food, improve food security and stabilize HDDS to the expected level.

ajfand SCHOLARLY, PEER REVIEWED
AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT
Volume 23 No. 5
May 2023
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

ACKNOWLEDGEMENTS

The authors would like to acknowledge Masinde Muliro University of Science and Technology through the University Research Fund (URF) who, sponsored the study.

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Table 1: Sample size distribution of households per sub-County

	LURAMBI SUB-COUNTY	NO: OF HH	MALAVA SUB-COUNTY	NO: OF HH
1.	Butsotso East	18	Mugai (Shirugu)	15
2.	Butsotso South	18	Shivanga	16
3.	Butsotso Central	16	South Kabras	17
4.	Shieywe	16	West Kabras	16
5.	Mahiakalo	17	South Kabras	18
6.	Shirere	15	East Kabras	18
	TOTAL	100	TOTAL	100

https://doi.org/10.18697/ajfand.120.21990

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Table 2: Socio-demographic and Economic Characteristics of Households in Lurambi and Malava sub-County

Variable	Categories	n	%
Age of the household head	20-30 years	25	12.5
	31-40 years	47	23.5
	41-50 years	67	33.5
	51-60 years	35	17.5
	61-70 years	26	13.0
	Above 70 years	7	3.5
Gender of the household head	Male	117	58.5
	Female	83	41.5
Level of education	No formal education	35	17.5
	Primary level	57	28.5
	Secondary level	67	33.5
	Tertiary level	41	20.5
Occupation of the household head	Farming	105	52.5
	Entrepreneur	20	10.0
	Small scale business	48	24.0
	Civil servant	17	8.5
	Private sector employee	26	13.0
	Casual worker	23	11.5
	Unemployed	20	10.0
Annual Household on-farm income	Below Ksh. 3,000	31	15.5
	Ksh. 3,000- Ksh. 10,000	33	16.5
	Ksh. 10,001- Ksh. 20,000	42	21.0
	Ksh. 20,001 -Ksh. 40,000	51	25.5
	Ksh. 40,001 - Ksh. 60,000	20	10.0
	Ksh. 60,001 - Ksh. 80,000	11	5.5
	Above Ksh. 100,000	12	6.0
Annual Household off-farm income	Below Ksh. 3,000	30	15.0
	Ksh. 3,000- Ksh. 10,000	31	15.5
	Ksh. 10,001- Ksh. 20,000	42	21.0
	Ksh. 20,001 -Ksh. 40,000	49	24.5
	Ksh. 40,001 - Ksh. 60,000	23	11.5
	Ksh. 60,001 - Ksh. 80,000	22	11.0
	Ksh. 80,001 - Ksh. 100,000	3	1.5
Number of active male adults (16-55 years)	1-5	195	97.5
	6-10	5	2.5
Number of active female adults (16-55 years)	1-5	198	99.00
	6-10	2	1.00
Mode of land ownership	Own the land	142	71.0
	Land belongs to father/mother	24	12.0
	Rented the land	33	16.5
	Leased the land	1	0.5
Main crop grown in the land	Food crops- Cereals and legumes/nuts	7	3.5
	Food crops- Vegetables	76	38.0
	Food crops (Cereals and legumes) and vegetables	59	29.5
	Food crops and cash crops	58	29.0

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Table 3: Challenges on market and farm food access faced during COVID-19

	n	%
Difficulty in accessing clean water	8	4.0
Access to less variety of foods	61	30.5
Access to food of less quality	73	36.5
Limited quantity of food available in your area	28	14.0
Food rationing	25	12.5
Having to walk a longer distance to access food	1	0.5
Other challenges	4	2.0

Table 4: Household Dietary Diversity Score based on the food groups consumed in the area of study

	Lurambi sub-County		Malava sub-County	
	n	%	n	%
Grains and grain products and all other starch foods	99	100.0	101	100.0
Legumes and pulses, nuts and seeds	42	42.4	24	23.8
Meats and meat products	17	17.2	16	15.8
Milk and milk products	28	28.3	54	53.4
Dark green leafy vegetables	95	96.0	85	84.2
*Other vegetables	34	34.3	5	5.0
Fruits	63	63.6	36	35.7

*Other vegetables included cabbage, carrots, pumpkin and cauliflower

ajfand SCHOLARLY, PEER REVIEWED AFRICAN JOURNAL OF FOOD, AGRICULTURE, NUTRITION AND DEVELOPMENT Volume 23 No. 5 May 2023 PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST ISSN 1684 5374

Table 5: T-test distribution of Household Dietary Diversity Score

		Dietary Diversity Score	
		Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F	37.221	
	Sig.	0.00	
t-test for Equality of Means	T	3.312	3.295
	Df	198	154.135
	Sig. (2-tailed)	0.001	0.001
	Mean Difference	0.64	0.64
	Std. Error Difference	0.193	0.194
	95% C.I	0.259	0.256
	Upper	1.021	1.024

REFERENCES

1. **Food and Agriculture Organization (FAO).** Declaration of the World Summit on Food Security Rome, Italy. FAO 2009 November.

2. **Swindale A and P Bilinsky** Household Dietary Diversity Score (HDDS) for measurement of household food access: Indicator guide. *Food Nutr Tech Assist* 2006; 11.

3. **Cordero-Ahiman OV, Vanegas JL, Franco-Crespo C, Beltrán-Romero P and ME Quinde-Lituma** Factors that determine the dietary diversity score in rural households: The case of the paute river basin of azuay province, ecuador. *Int J Environ Res Public Health*. 2021; **18(4):**1–16.

4. **Huluka AT and BA Wondimagegnhu** Determinants of household dietary diversity in the Yayo biosphere reserve of Ethiopia: An empirical analysis using sustainable livelihood framework. *Cogent Food Agric.* 2019; **5(1):**1690829.

5. **Food and Agriculture Organization (FAO).** Guidelines for measuring household and individual dietary diversity. FAO 2013. 1–60 .

6. **Food and Agriculture Organization of the United Nations and USAID's Food and Nutrition Technical Assistance III Project (FANTA).** Minimum dietary diversity for women, Rome FAO 2016.

7. **Ministry of Health, Kenya**. Kenya National Nutrition Action Plan 2018-2022. The Government of Kenya 2018; 1–37.

8. **The Department of Finance, Economic Planning & Investments.** Kakamega County Integrated Development Plan 2018-2022. County Government of Kakamega. 2018; 1–212.

9. **Ombogo JO** Food security problems in various income groups of Kakamega County. *J Nutr Health Food Eng.* 2017; **7(1):**222-226.

10. **Jafri A, Mathe N, Aglago EK, Konyole SO, Ouedraogo M, Audain K, Zongo U, Laar AK., Johnson J and D Sanou** Food availability, accessibility and dietary practices during the COVID-19 pandemic: A multi-country survey. *Public Health Nutr.* 2021; **24(7):**1798–805.

11. **Kihiu NE and F Amuakwa-Mensah** Agricultural market access and dietary diversity in Kenya: Gender considerations towards improved household nutritional outcomes. *Food Policy* 2021; **(100)**102004.

12. **Fravel S, Hammond J, Bogard J, Ngenda M, Etten J, Herrero M, Oosting SJ, de Boer IJM, Lannerstad M, Teufel N, Lamanna C, Rosenstock TS, Pagella T, Vanlauwe B, Dontsop-Nguezet PM, Baines D, Carpena P, Njingulula P, Okafor C, Wichern J, Ayantunde A, Bosire C, Chesterman S, Kihoro E, Rao EJO, Skirrow T, Steinke J, Stirling CM, Yameogo V and MT van Wijk** Food Access Deficiencies in Sub-Saharan Africa: Prevalence and Indications for Agricultural Interventions. *Front. Sustain. Food Syst.* 2019; **104(3):**1-13.

13. **Kenya National Bureau of Statistics.** 2019 Population and Housing Census Volume II. KNBS.

14. **Fisher LD** Self-designing clinical trials. Statistics in medicine. 1998; **17(14):**1551-1562.

15. **Felker-Kantor E and CH Wood** Female-headed households and food insecurity in Brazil. Food Security; the Science, Sociology and Economics of Food Production and Access to Food. 2012; **4(4):**1-13.

16. **Akadiri SS, Nwaka DI and GP Jenkins** Are Female-Headed Households Less Food Secure? Evidence from Nigeria and Ethiopia. AFEA Session—Allied Social Science Association Annual Conference, Philadelphia 2018.

17. **Mutisya M, Ngware MW, Kabiru CW and N Kandala** The effect of education on household food security in two informal urban settlements in Kenya: a longitudinal analysis. *Food Sec.* 2016; **(8):**743–756.

18. **Food and Agriculture Organization.** Education for Rural People and Food Security A Cross Country Analysis. FAO 2007.

19. **Nwokolo EE** The Influence of Educational Level on Sources of Income and Household Food Security in Alice, Eastern Cape, South Africa. *Journal of Human Ecology* 2015; **(0970-9274):**208-217.

20. **Swinnen J** Impact of COVID-19 on Food and Nutrition Security. IFPRI blog series on COVID-19 and food security, 2020.

21. **Kansiime M, Jambo J, Mugambi I, Bundi M, Kara A and C Oduor** COVID-19 Implications on Housholds Income and Food Security in Kenya and Uganda: Findings From a Rapid Assessment. *World Development* 2020 **(137)**.

22. **Oniang'o RK** Contemporary African food habits and their nutritional and health benefits. *Asia pacific Clin. Nutr.* 2013; **12(3):**231-236.

23. **Musotsi AA, Abukutsa O and A Makokha** Changing consumption habits: A case of African indigenous vegetables in Kakamega County, western Kenya. *Afr. J. Hort. Sci.* 2017; **12:** 30-39.

24. **Maseko I, Mabhaudhi T, Tesfay S, Araya HT, Fezzehazion MA and CP Du Plooy** African Leafy Vegetables: A Review of Status, Production and Utilization in South Africa. Sustainability 2018; **10(16):**1-16.

25. **Abukutsa-Onyango MO** African Indigenous Vegetables in Kenya : Strategic Repositioning in the Horticultural Sector Volume 2 of Inaugural lecture. 2010.

26. **Musotsi AA, Makokha A and SM Kilonzi** Quantitative Changes of Ascorbic Acid and Beta Carotene in African Nightshade (Solanum Nigrum) and Spider Plant (Cleome Gynandra) Due to Traditional Cooking Methods Used in Western Kenya. *J Food Nutr Sci Res.* 2019; **1(1):**51–63.

27. **Mahan LK and JL Raymond** The Krause's Food and The Nutrition Care Process (14th Ed.). Elsevier, 2017.

28. **Wardlaw GM and JS Hampl** Perspectives in Nutrition (7th edition). Mcgraw Hill Higher Education. 2007.

29. **Smith FP and P Eyzaguirre** African leafy vegetables: Their role in the World Health Organization's global fruit and vegetable initiative. *Afr. J. Food Agric. Nutr. Dev.* 2007; **7(3):**1–17.

30. **Smirnova A, Konoplev G, Mukhin N, Steinmann U and O Stepanova** Milk as a complex multiphase polydisperse system: Approaches for the quantitative and qualitative analysis. *J Compos Sci.* 2020; **4(4)**.

31. **The Ministry of Agriculture, Livestock and Fisheries (MoALF).** Climate Risk Profile for Kakamega County. Kenya County Climate Risk Profile Series. County Government of Kakamega. 2017.