



Assessment of the Effect of Covid-19 Pandemic Lockdown Dietary Diversity among Urban Households in Jos, Plateau State, Nigeria

Solomon Folorunso^{1,a,*}, Ruth Alabi^{1,b}, Omolola Stephen-Adamu^{2,c}, Godfrey Onuwa^{3,d}

¹Department of Agricultural Economics & Economics, University of Jos, Nigeria.

²Nigeria Social Insurance Trust Fund, Central Business Area, P.M.B,446, Garki, Abuja, Nigeria.

³Department of Agricultural Extension and Management, Federal College of Forestry, Jos, Plateau State, Nigeria

*Corresponding author

ARTICLE INFO

Research Article

Received : 29-09-2022

Accepted : 25-01-2023

Keywords:

Covid-19 lockdown
Dietary Diversity
Urban Households
Plateau State
Nigeria

ABSTRACT

Dietary diversity became a global concern in improving health conditions through the habit of food group consumption by adding health dimension to the issue of food calorie consumption. Access to nutritionally adequate and good quality diet is essential to human health, productivity and work output. However, despite the various concerns by governments all over the world on ensuring that every household can at least provide three square meals per day, food insecurity continues to be a major development problem across the globe. This study assessed the effect of COVID-19 pandemic lockdown on households' dietary diversity in Jos Metropolis, Plateau State, Nigeria. A multistage sampling technique was used to select 265 households. Data was collected using well-structured questionnaire. The analytical techniques were; Descriptive statistics, Dietary Diversity index and Z-Statistics Test. Gender, age, household size, education, marital status, cooperative membership and access to credit were the socioeconomic characteristics described. Result indicate that 86% of the households had low food dietary diversity while 14% of the households had high food dietary diversity before and after the pandemic lockdown. Similarly, 18% of the households had low calorie consumption while 82% of the households had high dietary diversity before and after the pandemic lockdown. Cereals, legumes/grains, oils/fat, roots and tubers, sugar and honey and meats were the most common food consumed by the households daily before and after the COVID-19 pandemic lockdown. Result further indicate that the pandemic lockdown had effect on the dietary diversity and food consumption patterns of the urban households. It can be concluded that the understanding of the effect of the COVID-19 pandemic lockdown on dietary diversity and food consumption patterns of households is important in developing policy measures such as social safety nets, home feeding programmes, the school feeding programme, conditional cash transfers schemes and improved marketing channels that will help mitigate against households falling into food insecurity during similar pandemic in the future.

^a solocom2012@gmail.com

^{id} <https://orcid.org/0000-0003-3952-9692>

^c lola.o.richard@gmail.com

^{id} <https://orcid.org/0009-0007-1999-9247>

^b ruthomolara5@gmail.com

^{id} <https://orcid.org/0009-0007-8644-4647>

^d onuwig@gmail.com

^{id} <https://orcid.org/0000-0001-5657-9427>



This work is licensed under Creative Commons Attribution 4.0 International License

Introduction

Dietary diversity became a constant global concern in ameliorating health disorders through the habit of food group consumption by adding health dimension to the issue of food calorie consumption. Access to adequate and nutritionally good and quality diet is essential to human health and productivity (Savy et al., 2005). Diverse diets refer to a variety of foods from different food groups (vegetables, fruits, grains, and animal source foods, etc.), which provide balanced nutrients that advance healthy growth and development. The increase in the variety of foods between and within food groups has the capability in ensuring adequate intake of essential nutrients to promote

good health (Savy et al., 2005). Similarly, Kennedy et al., (2009) affirmed in his finding that a diet, which is adequately diverse, could be a reflection of nutrient adequacy as well as the cases of food insecurity prevention. Arimond and Ruel, (2004) in their findings reported that many households' diets in Africa are dominated with plant-based, consisting largely of starchy staples (which contain low number of micro-nutrients that are often not easily absorbed) with little or no proteins of animal origin and few fresh fruits and vegetables. An Understanding of food diversity consumption is critical in various areas. A variety of diets as conceived by nutritionists are generally essential

component of high-quality diet; which have high correlation with adequacy of protein and micro-nutrients intake as well as the prevention of excessive intake of other nutrients such as fat and chronic diseases (Ruel, 2002; Johns and Sthapit, 2004).

Concerns for food security is the bedrock in the development process for every country to wither the vicious cycle of poverty among the teeming populace of developing and developed countries. Food security is one of the focus of Sustainable Development Goal (SDG) where SDG's focus is specifically on food by seeking to end hunger, achieve food security and nutrition improvement and promotion of sustainable agriculture. However, several other goals relate to difficulties in the food system such as poverty reduction where food plays key roles in consumption and production. Despite the various concerns by governments all over the world on ensuring that every household can at least provide three square meals, food insecurity has continued to be a major problem of development across the globe, thus undermining people's health, productivity, and often their very survival (Smith and Ali., 2007). Low income distribution plays significant roles in the occurrence of food inaccessibility among people in the developing countries. (Metu et al., 2016) in their study estimated that about 60% of the general populace, majority of which reside in rural areas, live on less than US\$1.25 per day (World Bank, 2013) while 80% of their daily income being spent on food consumption. This means that income is critical in making rural households acquire nutritious food.

Among the numerous development problems faced by Nigeria, food insecurity ranks topmost. The national per capita food growth is 19.57% and the production of major food items in Nigeria has not been sufficient to satisfy the demand for an increasing an estimated population of 212,907,083 (NPC., 2006). Simona, (2020) reported that between 2018 and 2020 on average, 21.4% of Nigeria's population experienced food insecurity. In the past years, the prevalence of severe food insecurity among the Nigerians has been increasing, the demand for food is rising together with a very fast growing population. Food insecurity therefore remains a major challenge in Nigeria (Hall, 2002). Idachaba (2006) also reported that many households and individuals in Nigeria merely eat for Survival. The fight against food insecurity therefore demands an integrated set of actions (Food Security Magazine (FSM), 2006). Food security which added a dimension "stability" as the short-term indicator of the ability of food systems to withstand shocks, whether natural or man-made (FAO, 2009). The quantity of food available must not only be proportionate on the aggregate, but there must also be per-capita adequacy at all times. The main goal of food security for individuals is the ability to obtain adequate food needed at all times, and be able to utilize the food to meet the body's needs. Agriculture is an important tool and vehicle for reducing the effects of household food insecurity, unemployment and poverty which are major problems in urban areas in Nigeria (Moore, 2000). FAO (2020) projected the global trend in food insecurity and estimated the prevalence and number of people undernourished for the period 2000-2002, 2017-2019 and reproduced the FAO projection estimates for 2028-2030 period. It also opined that by 2050, the planet is

expected to have about 9 billion people, many of whom will live in cities far from where food is grown which will require a global food system that can feed all of them in a sustainable way.

Problem Statement

The Covid-19 pandemic and subsequent lockdown created health and economic crises that threatened food and nutrition security. COVID-19 has devastated the labor market. Lockdowns, movement restrictions, and reduced demand have resulted in widespread job losses and pay cuts. Income losses reduced access to food, especially for the poor and vulnerable, who spend proportionally more of their income on food and it has an outsize effect on incomes of informal enterprises and workers, who make up the majority of the agricultural sector. It has disrupted both global and domestic agri-food supply chains. Although the impact on international supply chains has been limited so far and global food markets being well-supplied and stable. This COVID-19 induced lockdown has directly affected food systems through impacts on food supply and demand, and indirectly through decreases in purchasing power due to the inability of the working population to work. The capacity to produce and distribute food, and the intensification of care tasks, all of which has strongly affected Nigerian households' capacity to meet the nutritional needs of its members (FAO, 2020). The lockdown due to the pandemic imposed serious restrictions and limitations to food access, both physically, socially and economically by the households. This in turn posed serious hardship to households, which resulted in unplanned adjustment on food intake by all age categories. There have been no research efforts in Plateau State to assess the impact of the COVID -19 pandemic on the food security status of urban households, hence this research.

This study is significant in the current parlance of development economics, most of these studies have not attempted to use the Covid-19 lockdown to determine its effect on the food security status of households. Studies into food security have become increasingly important due to world development focus on it as a panacea for ending poverty, hunger, reducing diseases, improving education, equity, restoring the environment and global collaboration. A deeper understanding of the characteristics of vulnerable groups would provide an empirical basis for social policy, there by strengthening both the analytical and operational content of Nigerian poverty reduction programs in general and the study area in particular. This study therefore provides an approach on what can be done to help the current food insecure households to be food secure and to reduce the likelihood of the vulnerable from falling into food insecurity in the future. Policy makers and planners will also draw lesson on designing effective strategies to reduce not only current food in adequacy faced by households but also exposure to future food insecurity in the event of future outbreak of pandemic.

Objectives of the Study

The broad objective of the study was to assess the effect of Covid-19 pandemic lockdown dietary diversity among urban households in Jos, Plateau State, Nigeria while the specific objectives were to;

- determine the socioeconomic characteristics of households in the study area,
- determine the food consumption pattern,
- determine households' dietary diversity score and
- determine the effect of Covid-19 pandemic lockdown on food dietary diversity of the urban households.

Materials and Methods

Study Area

The study was conducted in Jos metropolis (comprising of Jos North and South), Plateau State of Nigeria (NBS., 2012).

Sampling Technique

Multi-stage sampling technique was employed in the selection of households in the study area; with this sampling technique, 142 households in Jos North and 123 households in Jos South giving a total of 265 households.

Method of Data Collection

Primary data was used for this study. The data was collected with the use of well - structured questionnaire aided by oral interview schedule designed according to the specific objectives of the study. Data of households' calorie was collected before and after the lockdown period, which was from 10th April to 13th June, 2020.

Validation and Reliability of the Research Instruments

Content validity was used to measure the adequacy of the instrument items in this study. Content validity in this context sought to determine the relevance and adequacy of items included in the instruments. Using the Jury Method (Kerlinger, 1973), the entire instrument was subjected to the scrutiny of relevant experts. Each of the experts was requested to independently give his expert opinion on the relevance and adequacy of the items with respect to the objectives of the study. Various questions of the data collection instrument were scrutinized in terms of how relevant they are to the specific objectives of the study as well as how the prepared questions exhaustively cover the specific objectives of the study. Furthermore, the data collection instrument was examined against the background of its adequacy in regard to the accomplishment of the objectives of the study.

An instrument is considered reliable when it consistently produces the same result when applied to the same sample many times (Osuala, 2005). The test-retest method of affirming instrument reliability was employed for this study. It was computed by calculating the correlation coefficient between two distributions of test scores obtained at two different times on the same respondents. The instrument was trial tested on 34 respondents drawn from two districts in Jos North and Jos South Local Government Area. The information obtained from the responses to the instrument were analyzed using product-moment correlation analysis. High value of mean product-moment correlation coefficient of 0.816 indicated high reliability of the instrument.



Figure 1. Map of Plateau State Showing the Local Government Areas;

Table 1. Sample Size Plan

| L.G.A | Jos North | Jos South | Total |
|----------------|-----------|-----------|---------|
| District | Gwong | Du, Gyel | |
| Sample Frame | 95079 | 82303 | 177,382 |
| Sample size | 142 | 123 | 265 |
| Percentage (%) | 0.075 | 0.075 | 0.15 |

Source: National Population Commission (NPC)., Plateau State, Nigeria

Table 2. Table of reliability testing

| | |
|----------------------------------------------|-------|
| Cronbach's Alpha | 0.52 |
| Cronbach's Alpha Based on Standardized Items | 0.816 |
| N of Items | 34 |

Analytical Techniques

Descriptive statistics was used to achieve objective 1 and 2, Dietary Diversity Index (DDI) was used to achieve objective 3 and Z-statistics was used to achieve objective 4.

Descriptive statistics

Descriptive such as Percentages, mean, frequency distribution, and tables was used to describe the socioeconomic characteristics of the households

Household Dietary Diversity Score

Dietary diversity was measured by summing the number of foods or food groups consumed over a reference period. The Household dietary diversity score which ranges between 0-12 was ranked accordingly into High Dietary Diversity (6-12) and Low Dietary Diversity (0-5) (FAO,2008). HDDS indicator for sample population was also measured by the sum of HDDS of households divided by the total number of households. The twelve (12) food groups that was included in the HDDS include: Cereals, roots and tubers, Vegetables, Fruits, Meat, poultry, offal, Eggs, Fish and sea foods, Legumes, nuts and seeds, Milk and milk products, Oil and Fat, Sugar/honey, condiments, Beverages (FAO, 2007).

Food Dietary Diversity

Food Dietary Diversity was employed as a qualitative measure of food consumption. High Food Diversity which ranges between (6-12) result of 95% was obtained while Low Dietary Diversity which ranges between (0-5) Of 5% was obtained among the agro pastoralists in the study area. Ruel (2006) have shown that households that engage in farming may have access to relatively cheaper food, and to a wider variety of particularly nutritious foods, such as vegetables and products of animal origin (milk, eggs, meat). Also, direct access to food may allow households to consume greater amounts of food and a more diversified diet, richer in valuable micro nutrients. This ultimately have a positive impact on the food security and poverty situation of the households.

The food diversity of their household is then classified into three levels: lowest dietary diversity (≤ 3 food group), medium dietary diversity (4 and 5 food groups) and highest dietary diversity (≥ 6 food groups).

Table 3. Distribution of household Dietary Diversity

| High diversity ¹ | Medium diversity ² | Lowest-diversity ³ |
|-----------------------------|-------------------------------|-------------------------------|
| Spices | Spices | Spices |
| Seeds | Seeds | Seeds |
| Oil and Butter | Oil and Butter | Oil and Butter |
| Vegetables | Vegetables | |
| Beans | Beans | |
| Milk | | |

1: (≥ 6 food groups); 2: (4 and 5 food groups); 3: (≤ 3 food groups)

$$CDD = \frac{DDAL - DDBL}{DDAL} \times 100$$

Where;

CDD : % Change in Dietary Diversity

DDAL: Dietary Diversity After Lockdown

DDBL: Dietary Diversity Before Lockdown

Effect of the COVID-19 pandemic on food security and this was actualized with the use of Z-statistics specified as follows;

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}} \quad (1)$$

Where

Z : calculated z-value

\bar{X}_1 : mean of households' food dietary diversity score before COVID 19 pandemic lockdown

\bar{X}_2 : mean of households' food dietary diversity score after COVID 19 pandemic lockdown

S_1 : Standard deviation of households' food dietary diversity score before the pandemic lockdown.

S_2 : Standard deviation of households' food dietary diversity score after the COVID-19 pandemic lockdown

n_1 : number of households' food dietary diversity score before the COVID-19 pandemic lockdown.

n_2 : number of households' food dietary diversity score after the COVID-19 pandemic lockdown.

Results and Discussion

Gender of Respondents

Table 4 shows that 53 percent of the households are headed by men, while 47 percent are headed by women. In their study, Eyob (2012) noted that the gender dimension of the households reveals that they are primarily headed by men. Male dominance implies that men are more efficient and reliable to make strong decisions, care for the family, and provide shelter for the family as compared to their female counterparts. These characteristics are important in making most men the head of their households. It was observed during the survey that the female-headed households were those that their husband stays in another city and those that were widowed.

Age of Respondents

Table 5 shows that respondents aged 20-29 (31%), 30-39 years (34%), 20-29 years (31%), and 40-49 years (23%) had the highest percentages, while those aged >60 years had the lowest percentages (3%). The respondent's mean age was 36. This agrees with the study of Abubakar (2010) who claimed that household heads are in their prime years and are less subject to food poverty. This means they'll put their youthful energy into productive activities and have access to cash, either through cooperative loans or bank savings, making them less vulnerable to food shortages during pandemics. Also, this suggests that the household heads were young and economically active and viable to engage in agricultural activities. The age of a farmer plays a significant role in their productivity as the majority of farmers in Nigeria operate on a small scale with the use of crude implements which requires energy and strength for its operation.

Marital Status of Respondents

Tables 6 indicated that majority of the household are married (50.6%), followed by single (49.6%) while the least household were widow (2.0%) and divorced (0.4%). This was also observed by Egwue et al. (2020) in their research stated that married household tends to have large family due to members living with them either as their children or extended families. This suggests that this study targeted the right population for this research as food security research requires households.

Household Size of Respondents

Table 7 shows that 74 percent of the respondents have household size range of 1-5 while 22 percent have household size range from 6-10. The least household size is within the range of 11 to 15 family members (4.0%). According to Egwue et al. (2020), they observed that rural households tend to have large family size though this was in contrast to the small household size in this study which might be connected to the fact that the survey site is an urban household with several government parastatals in their locality which might have given them some level of exposure through sensitization that small family size enjoy better economic and social lives. The implication is that household with small family size will spend less on feeding, education, health care and other living expenses on their dependents. Although, household with large family base might have the tendencies to engage in farming activities without the need to hire labour which can boost the income of the family.

Educational Status of Respondents

Table 8 shows majority of the household heads (73%) had the highest level of education, followed by primary education (68%) while the least was secondary education (20%). This is in agreement with the findings of Agboola, (2004). The result from this study suggests that level of literacy was relatively high among the household heads. The higher level of education is expected to assist household heads for skill set in adopting innovation on best agricultural practice, acquiring new jobs and stratify people with higher socio-economic status.

Table 4. Distribution of respondents based on gender

| Gender | Frequency | Percentage |
|--------|-----------|------------|
| Male | 129 | 53 |
| Female | 116 | 47 |
| Total | 245 | 100 |

Source: Field Survey, 2021.

Table 5. Distribution of respondents based on age

| Age | Frequency | Percentage |
|-------|-----------|------------|
| <20 | 1 | 0.4 |
| 20-29 | 75 | 30.6 |
| 30-39 | 83 | 33.9 |
| 40-49 | 56 | 22.9 |
| 50-59 | 22 | 9.0 |
| >60 | 8 | 3.3 |
| Total | 245 | 100 |
| Mean | 36 | |

Source: Field Survey, 2021.

Table 6. Distribution of respondents based on marital Status

| Marital status | Frequency | Percentage |
|----------------|-----------|------------|
| Married | 124 | 50.6 |
| Single | 115 | 49.6 |
| Widow | 5 | 2.0 |
| Divorced | 1 | 0.4 |
| Total | 245 | 100 |

Source: Field Survey, 2021.

Table 7. Distribution of respondents based on households size

| Household size | Frequency | Percentage |
|----------------|-----------|------------|
| 1-5 | 182 | 74 |
| 6-10 | 52 | 22 |
| 11-15 | 11 | 4 |
| Total | 245 | 100 |

Source: Field Survey, 2021.

Table 8. Distribution of respondents based on education Level

| Educational level | Frequency | Percentage |
|-------------------|-----------|------------|
| Primary level | 20 | 68 |
| Secondary level | 47 | 19 |
| Tertiary level | 178 | 73 |
| Total | 245 | 100 |

Source: Field Survey, 2021.

Table 9. Distribution of respondents based on primary occupation

| Primary occupation | Frequency | Percentage |
|--------------------|-----------|------------|
| Civil Servant | 64 | 26 |
| Farming | 37 | 15 |
| Business | 60 | 24 |
| Artisanhip | 27 | 11 |
| Others | 57 | 23 |
| Total | 245 | 100 |

Source: Field Survey, 2021.

Occupation of Respondents

Table 9 shows that civil servant constitute the major primary occupation of the households (26%), followed by business men and women (24%) while others, farming and artisanhip constitute 15%, 23% and 11%. This agrees with the study of Abubakar (2010), "An Empirical Analysis of Households' Food Security in Gombe State, Nigeria," who

observed that majority of the household heads are mainly civil servant and business men and women. The implication is that since the community is surrounded by federal government institution, this suggest that majority of the households are likely to get white collar jobs.

Cooperative Membership of Respondents

Table 10 shows that the majority of the households have no membership (68%) of the cooperative society while only few households have membership (32%) of the cooperative society. This is in agreement with the research of Egwue et al. (2020) observed low participation of cooperative society among rural households. The implication is that cooperative association help households head/farmers to pool their resources together to enjoy the economies of scale and also assist them financially. The implication is that cooperative association help households head/farmers to pool their resources together to enjoy the economies of scale and also assist them financially.

Credit Access of Respondents

Table 11 shows that in terms of having access to credit facilities, majority of the households have no access to credit facilities (64%) while only small proportion of the households have access to credit facilities (36%). This suggests low credit accessibility as reported by Egwue et al. (2020) in their research titled "Assessment of Rural Households Food Insecurity During Covid-19 Pandemic in South-East Nigeria". The implication is that using personal fund hinders and determine households/farmers' level of operation. This could be the reason why the farmers were operating on a small-scale level as the personal fund is not enough to operate on large-scale farming.

Households' Food Consumption Pattern

As shown further in Table 5, cereals, legumes/grains, oils/fat, roots and tubers, sugar and honey and meats are the most common food consumed by the household daily before and after the COVID-19 pandemic lockdown. Cereals (11.76% and 14%), others (10% and 11.86%), oil/fat (10% and 10.23%), and legumes/grains (10% and 10.08%). The result further indicated that food classes such as Cereals, Root and Tuber crops, fruits, egg, legumes/grains, fats and oils and vegetables were consumed less frequently before the pandemic lockdown than after the lockdown while food classes such as Sugar and honey, milk, meat, fish and others food classes were consumed more frequently before the pandemic than after the pandemic lockdown. This may be attributed to the fact that most urban households had exhausted their incomes during the lockdown in the purchase of expensive foods. This is in agreement with the findings of Hirvonen (2020) titled "Food and Nutrition Security in Addis Ababa, Ethiopia During COVID-19 Pandemic" who opined that Cereals and legumes are the most consumed food during the pandemic. The implication of low consumption of vegetable (5.66%) in this study might be connected to COVID-19 risk. The low consumption of meats, fish, milk and sugars might be connected taboos due to COVID-19 which may affect demand for specific classes of foods. Also, the decline in consumption of specific classes of food could be concentrated among households that had larger negative income shocks related to COVID-19. In addition,

relative prices for different types of foods could have changed; for example, if vegetables and meat became more expensive either for reasons related to COVID-19 or for other reasons, households may have reduced their demand for those foods and instead consumed cheaper staples (alternatively, prices for staples could have dropped).

Table 10. Distribution of respondents based on membership of cooperatives society

| Membership of cooperatives society | Frequency | Percentage |
|------------------------------------|-----------|------------|
| Non-membership | 167 | 68 |
| Membership | 78 | 32 |
| Total | 245 | 100 |

Source: Field Survey, 2021.

Table 11. Distribution of respondents based on access to credit facilities

| Access to Credit Facilities | Frequency | Percentage |
|-----------------------------|-----------|------------|
| No access | 156 | 64 |
| Access | 89 | 36 |
| Total | 245 | 100 |

Source: Field Survey, 2021.

Table 12. Food consumption pattern of households before and after covid-19 lockdown.

| | A | L | B | L |
|-----------------------------|--------|-------|-------|-------|
| Kinds of food consume daily | | | | |
| Cereals | 263 | 14.11 | 245 | 11.76 |
| Roots and tubers | 244 | 13.11 | 177 | 8.50 |
| Fruits | 122 | 6.52 | 106 | 5.09 |
| Sugar/honey | 128 | 6.84 | 199 | 9.55 |
| Egg | 98 | 5.28 | 124 | 5.95 |
| Legumes/grains | 225 | 12.07 | 210 | 10.08 |
| Vegetables | 69 | 3.70 | 118 | 5.66 |
| Oils/fats | 199 | 10.66 | 213 | 10.23 |
| Milks | 65 | 3.51 | 139 | 6.67 |
| Meats | 153 | 8.22 | 173 | 8.31 |
| Fish | 109 | 5.84 | 132 | 6.34 |
| Others | 189 | 10.13 | 247 | 11.86 |
| Total | 1863.2 | 100 | 2083* | 100 |

A: After; L: Lockdown; B: Before; * Multiple responses allowed.

Table 13. Household dietary diversity score before and after covid-19 lockdown.

| Household Food Dietary Diversity | AL | | BL | |
|---------------------------------------|-----|-----|-----|-----|
| | F | % | F | % |
| High household food dietary diversity | 201 | 82 | 35 | 14 |
| Low household food dietary diversity | 44 | 18 | 210 | 86 |
| Total | 245 | 100 | 245 | 100 |

AL: After Lockdown; BL: Before Lockdown; F: Freq.

Households' Dietary Diversity Score

The households' dietary diversity score before and during the Covid-19 pandemic are as shown in Table 6 indicate that 86% of the households had low food dietary diversity before the pandemic lockdown while 14% of the households had high food dietary diversity before the pandemic lockdown. Similarly, 18% of the households had low calorie consumption after the pandemic lockdown while 82% of the households had high dietary diversity after the pandemic lockdown. The Low Dietary diversity percentage had reduced from 86% before the pandemic

lockdown to 18% after the pandemic lockdown while the High Dietary Diversity percentage had increased from 14% to 82%. The change in Dietary Diversity among the Low Dietary Diversity reduced by 337.77% while the change in High Dietary Diversity increased by 82.92%. This could be attributed to the fact that direct access to quantity, more diversified and richer diets valuable in micro and macro nutrients foods increased significantly after the pandemic lockdown when compared to before the pandemic lockdown, which may be due to the fact that farmers whose harvested produce which had been stockpiled in the store could now do so after the lockdown. This ultimately had a positive impact on the food security and poverty situation of the households. This is in contrast to the report of Ruel (2006) who observed that households that engaged in farming may have access to relatively cheaper food, and to a wider variety of particularly nutritious foods, such as vegetables and products of animal origin (milk, eggs, meat). Though the limited access to food during this study was connected to the pandemics because of restriction in movement which affected transportation of food product from different State of the country. The household dietary diversity score is usually used to reflect food accessibility (Swindale and Bilinsky, 2006). Access to food is a critical component of food security and plays a vital role in health and health disparities. Several studies have demonstrated that the HDDS is inversely associated with the risk of malnutrition which suggest that most of the household in Jos environs are at risk of malnutrition.

Conclusion and Recommendations

This study assessed the effect of COVID-19 pandemic lockdown on households' dietary diversity in Jos Metropolis, Plateau State, Nigeria. The result of the study indicated that socioeconomic characteristics such as gender, age, education, household size, membership of cooperatives and access to credit were identified and described. The result also indicated that 86% of the households had low food dietary diversity before the pandemic lockdown while 14% of the households had high food dietary diversity after the pandemic lockdown. Similarly, 18% of the households had low calorie consumption after the pandemic lockdown while 82% of the households had high dietary diversity after the pandemic lockdown. The result further shows that cereals, legumes/grains, oils/fat, roots and tubers, sugar and honey and meats are the most common food consumed by the household daily before and after the COVID-19 pandemic lockdown. Cereals (11.76% and 14%), others (10% and 11.86%), oil/fat (10% and 10.23%), and legumes/grains (10% and 10.08%). The result further indicated that food classes such as Cereals, Root and Tuber crops, fruits, egg, legumes/grains, fats and oils and vegetables were consumed less frequently before the pandemic lockdown than after the lockdown while food classes such as Sugar and honey, milk, meat, fish and others food classes were consumed more frequently before the pandemic than after the pandemic lockdown. Having found the presence of variation in dietary diversity and food consumption patterns during Covid-19 lockdown among households, it can be recommended that the understanding of the effect of the COVID-19 pandemic lockdown on dietary diversity and food consumption patterns of households is important

in developing policy measures such as social safety nets, home feeding programmes, conditional cash transfers schemes and improved marketing channels that will help improve food access and mitigate against households falling low food consumption requirement during similar pandemic lockdown in the future.

Acknowledgment

The authors hereby use this medium to appreciate the respondents for their cooperation and support in supply valuable information without which this study would not have been possible.

References

- Abubakar MI. 2010. Analysis of Cowpea Production under the National Programme on Food Security in Argungu Local Government Area of Kebbi State, Nigeria. *Nigerian Journal of Basic and Applied Sciences*, 16(2): 31- 42.
- Agboola PO. 2004. Analysis of Food Insecurity and Coping Strategies among Farming Household in Osun State. Unpublished PhD Thesis. University of Ibadan, Nigeria.
- Arimond M, Ruel M. 2004. Dietary Diversity is Associated with Child Nutritional Status: Evidence from 11 Demographic and Health Surveys 2004., *Journal of Nutrition*, 13 (4): 2579-2585.
- Egwue OL, Agbugba IK, Mukaila R. 2020. Assessment of Rural Households Food Insecurity during Covid-19 Pandemic in South-East Nigeria. *International Journal of Research Granthaalayah*, 8(12): 182-194. <https://doi.org/10.29121/granthaalayah.v8.i12.2020.2713>.
- Ewodage R. 2020. COVID-19: How We Plan to Implement Social Distancing in Lagos Markets, Transport System Sanwo-Olu. <https://www.channelstv.com/2020/03/22/covid19-how-we-plan-to-implement-social-distancing-in-lagos-markets-transport-system> Downloaded 26/2/2021
- Food and Agriculture Organization (FAO). 2002. The State of Food Insecurity in the World 2001. Food and Agriculture Organization, Rome
- Food and Agriculture Organization (FAO). 2009. Declaration of the World Food Summit on Measuring Food Security Using Household Expenditure Surveys. Food Security in Practice technical guide series Washington, D.C. International Food Policy Research Institute. Food Security. FAO, Rome.
- Food and Agriculture Organization (FAO). 2020. Anticipating the Impacts of COVID-19 in Humanitarian and Food Crisis Contexts. Rome. <https://doi.org/10.4060/ca8464en> Downloaded 18/2/2020
- Food and Agriculture Organization (FAO). 2007. Comprehensive Food Security and Vulnerability Analysis (CFSVA). West Bank and Gaza strip.
- Food Security Magazine 2006. Summit on Food Security in Africa. Good Governance Sustainable Food Security, Pp. 3-5.
- Foster-Greer J, Thorbecke, E. 1986. A Methodology for Measuring Food Poverty Applied to Kenya. *Journal of Development Economics*, 24: 59-74.
- Global Hunger Index (GHI). 2020. Global, Regional, and National Trends - Global Hunger Index - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels. *Global Hunger Index*. <https://www.globalhungerindex.org/results.html>
- Hirvonen K, Belay M, Bart M, Seneshaw T. 2020. Food Marketing Margins during the COVID-19 Pandemic: Evidence from Vegetables in Ethiopia. International Food Policy Research Institute-Ethiopia Strategy Support Program working paper no. 150. https://www.who.int/nutrition/nlis_interpretation_guide.pdf
- Idachaba FS. 2006. Good Intentions are not Enough. Collected Essays on Government and Nigerian Agriculture. The Agricultural Policy Process. University Press PLC., 1: 12-14.
- Johns T, Sthapit BR. 2004. Biocultural diversity in the sustainability of developing country food systems. *Food and Nutrition Bulletin* 25(2): 143-155.
- Kennedy G, Nadia F, Chiara SI, Brouwer D. 2009. Dietary Diversity as a Measure of the Micronutrient Adequacy of Women's Diets: Results from Bamako, Mali Site. Washington, DC. Food and Nutrition Technical Assistance II Project, FHI 360.
- Kerlinger FN. 1973. Foundations of behavioral research. New York: Holt, Rinehart and Winston, Inc.
- Metu AG, Okeyika KO, Maduka OD. 2016. Achieving sustainable food security in Nigeria: Challenges and way forward. 3rd International Conference on African Development Issues (CUICADI 2016). Retrieved from <http://eprints.covenantuniversity.edu.ng/6653/1/icadi16pp182-187.pdf>.
- Moore LJ. 2000. Shoreline mapping techniques. *Global Hunger Index (GHI), 2020. Global, Regional, and National Trends - Global Hunger Index - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country levels. Global Hunger. Journal of Coastal Research* 16(1):111-124.
- National Bureau of Statistics (NBS). 2012. Socio-economic Survey on Nigeria. First Quarter Report, NBS, Abuja, Nigeria.
- National Population Commission (NPC). 2006. Population and Housing Census of the Federal Republic of Nigeria, Volume 2, Federal Government Printers, Lagos.
- Nigeria Centre for Disease Control (NCDC). 2020. COVID-19 guidance for safe mass gatherings in Nigeria. www.covid19.ncdc.gov.ng
- Osuala EC. 2005. Introduction to Research Methodology (3rd Edition, Nigeria: African ANA- FEP Publishers Limited.
- Ruel MT. 2002. Is dietary diversity an indicator of food security or dietary quality? A review of measurement issues and research needs, *Food Consumption and Nutrition, Discussion Paper No. 140*.
- Ruel MT. 2006. Can Food-Based Strategies Help Reduce Vitamin A and Iron Deficiencies? A Review of Recent Evidence. *Food Policy Review* 5. 2001. Washington, D.C.: International Food Policy Research Institute.
- Savy M, Martin-Prevel Y, Sawadogo P, Kameli Y, Delpuech F. 2005. Use of variety/diversity scores for dietary quality measurement: relation with nutritional status of women in a rural area in Burkina Faso. *European Journal of Clinical Nutrition* 59 (5):703-716.
- Smith LC, Ali S. 2007. Measuring Food Security Using Household Expenditure Surveys. Food Security in Practice. Technical Guide Series Washington, D.C. International Food Policy Research Institute
- Swindale A, Bilinsky, P. 2006. Household Dietary Diversity Score(HDDS) for Measurement of Household Food Access: Indicator Guide. Washington, D.C. Food and Nutrition Technical Assistance Project, Academy for Educational Development Available at: http://www.fantaproject.org/sites/default/files/resources/HDDS_v2_Sep06_0.pdf
- Varrella S. 2020. Coronavirus (COVID-19) in Italy: Statistics and Facts. <https://www.statista.com/topics/6061/coronavirus-covid-19-in-italy/>.
- Wang Y, Di Y, Ye, J, Wei W. 2020, Study on the Public Psychological States and its Related Factors During the Outbreak of Coronavirus Disease 2019 (COVID-19) in Some Regions of China. *Psychol. Health Med.* 30, 1-10. doi: 10.1080/13548506.2020.1746817
- World Health Organization (WHO). 2020. Coronavirus disease 2019 (COVID-19) Situation Report - 90. Geneva WHO. www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports.
- Worldometer 2020. COVID-19 Coronavirus Pandemic. Dover, Delaware. Available at: www.worldometers.info/coronavirus/ Downloaded 26/2/2021