Original Research Article

Exploring urban dietary pattern in Nigerian households: A case for nutrient adequacy

Abstract

Aims: To identify dietary patterns of urban households in Southwest, Nigeria and explore their links with nutrients adequacy.

Study design: Cross sectional household-level data, from the two urban locations selected through a multistage random sampling procedure in southwest Nigeria was employed.

Place and Duration of Study: Urbanhouseholds were sampled in South west zone of Nigeria between October to November, 2017.

Methodology: Socio/demographics were documented using a descriptive analysis.The pattern of food subgroups was determined econometrically using the factor analysis, while the test for differences was examined using Mann Whitney U.

Results: Using factor analysis, five distinct dietary patterns emerged named as vitamin A, modern, protein, roots, and cereals patterns with 50.7% variance contribution rate. The vitamin A rich food dietary pattern explained 12.8 % of the total variance and the pitch in diet quality of this factor was explained mostly by dark leafy vegetables and fruits.The fourth and fifth factors which accounted for 9.2% and 7.5% of total variance, respectively characterised by high intakes of roots/tubers (0.69), plantain (0.57) and cereals (0.79) are food rich in dietary energy.Consumption frequency revealed that a higher intake of vitamin A foods was associated with LUA, while HUA had more intake of spices (46.3%), oil (44.5%) and beef products (41.3%). Both urban locations had a lower intake of iron rich foods (dairy, poultry and organ meat) which suggestlikely risk of heme iron deficiency. Dietary energy intake in form of cereals (52.3%) was higher in HUA with tubers (14.6%) in LUA. The test of difference across the two locations revealedsignificant disparitiesin the observed dietary pattern with respect to vitamin A food, beef meat, spices and poultry at 5% level.

Conclusions: Urban disparity in dietary patternis evidenced inthis paper. However, the different dietary patternacross urban locations were associated with some nutritional outcomes. Although, both dietary patterns had healthful elements of the diets, low consumption of iron rich foods was observed. Programmes focusing on the prevention of diet-related chronic diseases in this population should balance the identified pattern of consumption with iron rich foods.

Keywords: dietarypattern, factor analysis, urban households, food items,nutritional status

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1. Introduction

That factors such as income growth, urbanization, changing socioeconomic position and food retail modernization tend to influence dietary shifts is well known (Hiza et al., 2013; Mayen, et al., 2014; Weitherm-Heck et al., 2019,Ikudayisi et al., 2019).However,the direction of the association and extent of influence is not consistent among countries. This is as a result of the nutritional transitionphase, level of economic development, cultural and social contexts prevailing in eachcountry (Perez-Tepayo, et al., 2020).Evidence suggests that changing diets and urban lifestyle factors are associated with decline in nutrition quality and diet related chronic diseases (Eme et al., 2020). This incidence mostly in urban areas thus, presents a platform to empirically look into level of nutrient adequacy through urban household dietary pattern. This will help proffer policies for improved nutrition sensitive programming through responses from household dietary pattern. A broader picture of food and nutrient consumption, often referred to as dietary pattern may be more predictive of diet related diseases risk than individual food or nutrient (Crespedes and Hu, 2015). It describes the overall diets with respect to the foods items, food groups, and nutrients included with associated frequency and the quantity habitually consumed. Therefore, profiling food frequency consumption of households characterized by the usual intake of eating habits have become a focus in food policy programs (UNWFP, 2015; Omage and Omuremu, 2018).

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Methods for defining dietary pattern includes the a priori approach which uses numerical indexes, different scoring and weighting schemes to measure adherence to a dietary pattern. This method has been predefined on the basis of previously recommended scientific evidence (Crespedes and Hu, 2015). In line with this approach, Omage and Omuemu (2018) and Perez-Tepayo et al. (2020) used Dietary Diversity scores, Healthy Eating Index in defining dietary pattern in Nigeria and Mexico, respectively. Another approach is the posteriori, that empirically defines common patterns of foods that tend to be consumed together using multivariate analytical tools (the principal components analysis, factor analysis etc)(Yang, et al., 2016). this tends to explain the largest variation in dietary pattern outcomes (Auma, et al., 2019; Salmani, et al., 2020). For instance, Sodjinou et al., (2009) examined the dietary patterns of urban Beninese adults and explore their links with overall diet quality and socio-demographics using cluster analysis. Two distinct dietary patterns revealed a 'traditional' and transitional type. The 'transitional' type were predominantly from the upper socioeconomic status or born in the city. It had a significantly higher percentage of energy from fat and in cholesterol but lower in fibre.The 'traditional diet' was associated with higher healthy score in consumption of fruits and vegetables. Using principal component analysis, Kehoe et al., (2014) identified two diet patterns among Indian children. The 'snack and fruit' pattern was characterised by frequent intakes of snacks, fruit, sweetened drinks, rice and meat dishes and leavened breads. The 'lacto-vegetarian' pattern was characterised by frequent intakes of finger millet, vegetarian rice dishes, yoghurt, vegetable dishes and infrequent meat consumption.

Extraction of factors of the dietary patterns by principal component analysis was employed by de Lanerolle-Dias et al., (2015) among Sri Lankan adolescent girls. Two dietary patterns were identified; a convenience-based dietary pattern with higher factor loadings for starchy foods and a traditional pattern with higher factor loadings for rice, tubers and potatoes, vegetables and dark green leafy vegetables. Using rural urban dichotomy, urban adolescents followed a convenience based dietary pattern with associated risk of overweight and higher body fat than a rural girl. Wang, et al., (2014) used factor analysis to establish dietary patterns among Chinese adults in Baoji and explore the association between these dietary patterns and chronic diseases. Five dietary patterns were identified with protective effects with protein, balanced, and beans dietary patterns on chronic diseases compared to the prudent and traditional patterns. To explore evidence for dietary transitions and identify how environmentally sustainable women's dietary patterns in Uganda are, principal component analysis was performed by Auma et al. (2019). Four dietary patterns explained 23.6% of the variance. Urban residence was positively associated with "transitioning, processed, low environmental impact" and "animal-based high environmental impact" patterns; but negatively associated with the "plant-based low environmental impact" pattern. A traditional, high-fat dietary pattern with medium environmental impact persists in both contexts. These findings provide some evidence that urban women's diets are transitioning.

Most of the studies on dietary diversity pattern in developing countries focused on specific population like women, children, adults with little attention on households which makes up the fabric of the society and lies at the centre of most policies. Identifying household characteristics of diets can serve as a basis for formulating nutritional interventions and public-health policies aimed at improving the diets of populations. Most importantly, analysis of household dietary patterns which considers particularly urban population give a more comprehensive impression of the food consumption habits. This may be better at predicting the risk of diseases than the analysis of rural urban dichotomy as the joint effect might hide some important information which would be better identified separately.

Using household level data from urban areas of southwest, Nigeria, this paper analyses the nutritional implications of the dietary shift empirically by exploring the dietary pattern, particularly within urban areas using factor analysis approach. As dietary patterns are likely to vary, a comparative study was done to know the possible differences in eating patterns derived from different populations using Mann Whitney U test. This is necessary as a result of differences in the stages of nutritional transition, changing food preferences and socioeconomic statusprevailingwithin the urban population.

2. 1 Material and methods

A cross-sectional survey was administered to 438 households randomly selected through a multi-stage sampling from two urbanising states in southwest, Nigeria. Choice of southwest zone was based on the level of urbanization in the area (Ikwuyatum, 2016). The selected states, Oyo and Ekiti are representative of high urban areas (HUA) and low urban areas (LUA), respectively. The most urbanized location within each of the sampled states was purposively selected on the basis of their administrative procedures and urban activities. Households were randomly sampled from the Enumeration Areas (EAs) mapped by National Population Commission. The EAs represented the primary sampling units used for 2006 population census in Nigeria. The data provided information about household head's socioeconomic characteristics, types of food eaten and the frequency of consumption of each the food items by households over the period of seven days.Based on nutritional capabilities, six (6) key food groups was further disaggregated into 16 subgroups. The specific food subgroups included in the survey are cereals, pastas, tubers, plantain, pulses, beef meat, poultry, organ meat, fish, eggs, dairy/milk, oils, spices, dark green leafy vegetables, fruits and other vegetables.A four-point rating scale used for the consumption frequency of the food items include: seldom/never=1, 1-2 times/week=2, 3-5 times/week=3, 6-7 times/week=4.The frequency-based dietary indicators would offer a quick way to assessingconsumption of foods rich in both macro- and micro- nutrients, particularly, protein, vitamin A and hem iron.

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2.1.1 Model specification

Consumption levels of different food items in a week could be assessed by their variations and covariations using factor analysis. Factor analysis refers to a statistical technique that summarizesthe relationships between original variables in terms of smaller setof derived variables called factors or components (Hardy and Bryman, 2004). It defines the covariance relationships among correlated variables and reveals the underlying casual structure based on some unobservable factors, in this case, factors peculiar to urban areas food consumption pattern (Mulaik, 2010; Hair et al. 2013). These underlying factors possibly exert causal influence among the variables but their impact is hidden and cannot be measured directly. The model is given as

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\begin{aligned}
r_1 &= \alpha_{11}P_1 + \alpha_{12}P_2 + \ldots + \alpha_{1m}P_m + e_1 \\
r_2 &= \alpha_{21}P_1 + \alpha_{22}P_2 + \ldots + \alpha_{2m}P_m + e_2 \\
&\ldots \\
r_k &= \alpha_{n1}P_1 + \alpha_{n2}P_2 + \ldots + \alpha_{nm}P_m + e_3
\end{aligned}
\qquad (1)
$$

where r_i(i=1, …, k) denotes standardized variables with mean of zero and variance equal one,

$\alpha_{11}, \alpha_{12}, \ldots, \alpha_{n1}$ are the factor loadings of these variables,

$P_1, P_2, \ldots, P_m$are standardizeduncorrelated common factors, and

$e_i$are the error terms which are independently distributed.

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Bartlett's Test of Sphericity (BTS) was also examined and the sampling adequacy was verified by Kaiser–Meyer–Olkin (KMO) test. Varimax rotation method was used to explore the factor structure of food component. This approach helps to improve and simplify the interpretability of components by maximizing the dispersion of loadings within factors. The main criteria for verifying the factor structure to extract from all the factorswas decided using the Kaiser's criteria (eigenvalue>1 rule) and the Scree plot (Salmani et al., 2020).

Mann-Whitney U-test was employed to establish the level of consistency in dietary pattern acrossthe two urban locations.Although, *T-test* is most widely used statistical tools to test the difference between two means. However, due to unequal data size obtained for the two areas (HUA=282 and LUA=156), the assumptions underlying the *t*-test are not met, then the non-parametric equivalent tests, may be used (Nadim, 2008). The Wilcoxon ‐ Mann ‐ Whitney test is a non-parametric test that test the null hypothesis that two samples come from the same population (Shier, 2004). It compares two independent groups that do not require large

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normally distributed samples and requires all the :observations to be ranked as if they were from a single sample.It is calculated as

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$$U = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1 \quad (2)$$

$$E(U) = \mu_U = \frac{n_i n_2}{2} \quad (3)$$

$$Var(U) = \sigma_U^2 = \frac{n_1 n_2 (n_1 + n_2 + 1)}{12} \quad (4)$$

$$Z = \frac{U - \mu_U}{\sigma_U} \quad (5)$$

where n_1 = sample size for HUA; n_2 = the sample for LUA; R_1 = the sum of the ranks of the HUA sample, σ^2_U = the variance of the Mann–Whitney U, and μ_U = the mean of the Mann Whitney U. The null hypothesis (H_0) stipulates that the two groups come from the same population. It requires that the two independent groups are homogeneous and have the same distribution. The level of significance as determined by the Z value and the *P*-value based on the normal approximation determines the decision either to reject or accept the null hypothesis.

3.1 Results and Discussion

Summary statistics of household heads and the mean values of food expenditure across the two urban areas are presented in Table 1. Result revealed that majority of the household heads were male with a higher percentage in HUA (70 %). Age of household heads across the two locations (about 47 years) were similar. Household size averaged at five persons in LUA and with four persons in HUA. About three-quarters of household heads had tertiary education but more educated house heads were inHUA (81.0 %). Average monthly income for household heads in LUA (₦48,848.85) was lower thanthose of HUA (₦53,144.87) which suggestsincome differentials. This might likely be attributed to variation in economic opportunities and uneven urban social processes across the two urban areas. From the occupational structure, more than half of household heads were into formal employments. In general, findings suggest that the socioeconomic status of household heads are not uniform within the urban areas considered and this might influencetheir household food consumption pattern. The weekly food expenditure estimates revealed thathouseholds in LUA expended more money on staple foods (₦4510.18) thanthose of HUA. The increase in intake of food sourced from grains, roots and tubers might be linked to its availability and affordability. There was a decrease in the intake of staples among households in HUA which suggests that sedentary nature of urban lifestyles often with less physical activities might be linked to the reduced caloric intake in comparison to LUA. However, an increase in expenditure on non-staple foods (pulses, milk, meat, fish, eggs, vegetables and fruits)was observed among HUA households (₦6336.50) relative to the LUA.As observed by Ikudayisi and Omotola (2019) andDrewnowski and Poulain, (2018), changing affluence and concern for food quality with

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Table 1: Statistics of Urban Household Heads

Variables	Description	Low Urban Area (LUA) N=156		High Urban Area (HUA) N=282	
		Mean	Standard Deviation	Mean	Standard Deviation
Sex	Household is male headed or otherwise (female headed)	0.67	0.47	0.70	0.46
Age	Age of household head in years	47.25	9.60	47.32	11.99
Household size	Number of persons in the household	4.70	1.54	4.29	1.56
Educational status	Household head level of education being formal(primary, secondary and tertiary) or otherwise(non-formal)	0.77	0.42	0.81	0.40
Average monthly income	Income earned by household head on a monthly basis in Naira	48848.85	16794.25	53144.87	18465.58
Occupational status	Occupational type of household head is in formal sector(government worker, private organizations) or otherwise (traders, farmers, artisans)	0.69	0.46	0.64	0.48
Staple food expenditure	Amount expended on staple foods by households in a week (Naira)	4510.18	2323.46	3511.10	1577.49
Non-staple food expenditure	Amount expended on non-staple foods by households in a week (Naira)	5298.14	2603.58	6336.50	3087.89

The factor analysis was performed using SPSS Statistics 20. The sampling adequacy criterion (KMO = 0.745) and BTS tests ($\chi2$ = 787.52; *P*< 0.000) showed that the data was adequate for factor analysis. The adequacy was similarly observed by Salmaniet al., (2020) and Wang et al., (2014). The communality values indicated how much variance of each variable factor extraction can reproduce. There is no commonly agreed threshold for a variable's communality, however, it is appropriate that the extracted factors should account for at least 50% of a variable's variance (Hair,et al., 2006). The result from table 2 showed that eight food items had values above the threshold, which implies that their shares are more than half in their variability with other variables.

Five factors were extracted from the scree plot (Figure 1) out of 16 food components. The factors with eigenvalue above one revealed the maximum variance each factor contributed the most to the explanation of the variance in the food dataset. The varimax rotation method loaded five factors (Table 2). The values of the factor loading greater than .50 were reported and operationalised for the 16 food items following Hair et al. (2005) guideline for practical significance of more than ±0.5. A positive loading designates positive association with the

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factor, while a negative loading designates negative association with the factor, and the larger the loading of a given food item to the factor, the greater the contribution of that food item to a specific factor (Wang, et al., 2014). Each factor generated some distinct food categories which explained the different aspects of urban food consumption pattern. The five patterns identifiedexplained 50.7% of the dietary intake variance in the 16 food subgroups. The first component explained about 12.8%of the total variance and the fifth component had the least variance (7.8%). Factors were named according to the nutritional value of the food which represented the nature of each factor.

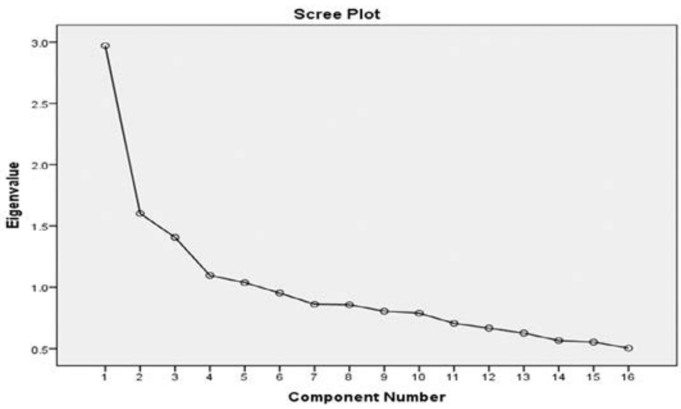

Figure 1: Scree plot of factor loadings of 16 food items

The vitamin A rich food dietary pattern explained 12.8 % of the total variance and was characterized by high intakes of dark green leafy vegetables (0.78), fruits (0.75) and vegetables(0.58) (Table 2). This reflects the extent to which households source formicronutrient adequacy. The findings strengthened the viewpoint presented in the previous studies(Sodjinou, et al. 2009; Auma, et al., 2019) about the increase in intake of fruits and vegetables among urban residents. Similarly, Aggarwal et al. (2011) reported that thepitch in diet quality of this factor was explained mostly by dark leafy vegetables and fruits.This finding followedpreviousstudies that have identified this dietary pattern as effective in significantly improving micronutrients status and reduction of many chronic diseases (Esfahani, et al., 2011;Wang, et al., 2014; Auma, et al., 2019).

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The secondcomponentwas represented by four strongly loading variables;spices (0.71); beef meat (0.60),dairy (0.55) and oils (0.54)termed ‘modern’ dietary pattern. The combination of these subgroups accounted for 11.4% of the total variance in their consumption frequency.This dietary pattern is somewhat similar to the‘balanced’ dietary pattern identified by Wang, et al., (2014) with a comprehensive intake of protein, carbohydrate and fat and oil. The high intake of beef meat and fat/oil foods could be attributed probably to living in urban areas and relatively highly-educated household heads sampled. This finding was supported by Adetunji and Rauf (2012) and Guo, (2016) among urban households in Nigeria and Asia, respectively.The nutritional implication of this dietary patterns characterized by high intakes of red meat, refined oils, and fried foods might be associated withincreased risk of some diseases. This was regarded as ‘transitional diet’ by Sodjinou et al., (2009)with a significantly higher percentage of fat and subsequent rise in cholesterol in Benin. However,this dietary

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Thethird most important factor was assessed through two food items: poultry (0.80) and organ meat (0.71) which accounted for about 9.5% of the total variance. The ‘protein’ based dietary pattern are also a source of micronutrient called heme iron. This result had likely finding with Wang, et al., (2014) who identified their protein dietary pattern to be positively associated with factor loadings of organ meats (0.713) and poultry (0.692).The fourth and fifth factors which accounted for about 9.2% and 7.5% of total variance, respectively are referred to as staple dietary pattern. It was characterized by high intakes of roots/tubers (0.69), plantain (0.57) and cereals (0.79). They are basically foods rich in dietary energy.This finding corroboratesIkudayisi et al. (2019) and Erhabor and Ojogho (2011), who reported thatcereal-based foods had the highest food consumption sharein most urban areas of Nigeria. Also,many households in Africa and Asia consumed sufficient dietary energy which are predominantly plant-basedas reported by Kuku et al., (2015), Holmes, et al.(2018).This staple dietary pattern showed some similarities to the “roots, tubers and plantain” dietary pattern foundin Ghana (Galbete, et al., 2017);in Uganda (Auma, et al., 2019). Also, it was similar to traditional dietary pattern rich in whole grainsin China (Wang, et al., 2014).Findings from the identifiedfive factors revealed the urban dietary pattern which highlights important nutrients adequacy with respect to level of micronutrients (vitamin A and hem iron), macronutrients (protein) and dietary energy (staples) consumption.

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Table 2: Factor analysis rotated component matrix (Varimax rotation)

		Factors				
	Communalities	1	2	3	4	5
Dark green leafy vegetables	0.638*	**0.777**				
Fruits	0.587*	**0.750**				
Other vegetables	0.459	**0.580**				
Eggs	0.401	0.388	0.348			
Spices	0.549*		**0.705**			
Beef meat	0.415		**0.602**			
Dairy/milk	0.446	0.346	**0.553**			
Fat/oils	0.402		**0.539**			
Poultry	0.665*			**0.795**		
Organ meat	0.573*			**0.710**		
Tubers	0.528*				**0.692**	
Plantain	0.460		0.346		**0.569**	
Pulses	0.495				0.494	-0.466
Fish	0.540*	0.419		-0.365	0.446	
Cereals	0.648*					**0.794**
Pastas	0.307					0.338
Variance explained (%)		12.83	11.40	9.52	9.16	7.80
Total variance (%)	50.7%					
KMO	0.745					
Barlett’s test of sphericity (BTS)	747.524***					

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Note:BTS *** significant at 1%. Communalities: * values above the 0.5 threshold.Factor loadings above 0.50 are in bold.

Table 3 presented the percentage distribution of household consumption frequencies across the two locations based on the identified dietary pattern.In the vitamin A category, the consumption of fruits and vegetables was more pronounced in LUA than those of HUA. This might probably be that the former been less urbanised have better access to foods in their natural state and cheaper to afford.As regards food items in second category, low intake of milk/dairy was found to be a major problem in both locations. However, in HUA, spices (46.3%) and beef meat (41.3%) was well consumed which followedsimilar finding by Ikudayisi et al., (2019)that urban households expended more money on meat and its products. This was also evident in their food expenditure on non-staple (HUA) compared with LUA (Table 1).

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From the protein category, poor protein intake remains the predominant problem in the two locations as shown by their consumption frequency. The reduced intake of these iron rich foods in LUA − poultry (73.2%) and organ meat (78.8%) −might be attributed to dietary cost of these foods which are more expensive coupled with income differential in urban areas. This finding followed Aggarwal et al., (2011) who asserted that the social gradient in diet quality may be explained by diet cost among lower socioeconomic strata. The cost effect might be responsible for the rising prevalence of anaemia and protein deficiency particularly among urban poor. Similarly, Gaiha et al., (2014) reported that high rates of anaemia have been attributed to a diet that is heavily concentrated on starchy staples like rice and wheat relative to iron-rich foods like green leafy vegetables and meat, fish, or poultry products. Although, the dietary pattern suggests protein had a higher loading in urban diets, however, the food frequency level further revealed the extent of consumption which showed variation in their intake of foods rich in heme iron.

Across the two locations, level of consumption of cereals increased along the scale with greater percentage in HUA (52.0%). This could be attributed to the fact that cereals are predominant food in urban food basket because of convenience and ease of food preparation (Kuku et al., 2015; Ikudayisi and Omotola, 2019). However, considering the two extremes in the frequency scale for tubers and plantains, there was a decline in their frequency of consumption. This suggests lesser intake of dietary energy by consumers across the two locations.Socioeconomic position of household heads, desire for lesser caloric and diversified diets might be responsible for such variations. In sum, findings suggest an improvement in intake of vitamin A rich food, however, households were still vulnerable to some micronutrients (hem iron) and macronutrients (proteins).

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A Mann Whitney U test was performed to examine the differences in the dimensions of dietary pattern for food subgroups based on nutritional implications with factor loadings above 0.50 in the two locations. There was a statistically significant difference at $\alpha = 0.05$ in the selected food subgroups as shown by their P values. From the results in Table 3, all the food items invitamin A category was significant at 5% level,which implies differences in frequency of consumption of those food items across the two locations. A higher intake of vegetables associated with urban dietary pattern may explain why it was significantly associated with diet quality. Thus, underscoring the importance of these foods in urban household dietary pattern across the two locations. Promoting fruits and vegetables consumption would therefore appear as a promising strategy for the prevention of nutrition-related chronic disease in this population.

Finding a statistically significant difference between the two locations with respect to fruits/vegetables (5%),spices (5%), beef meat (5%), poultry (5%) and plantain (1%) revealed the relevance of these foods in supply of micronutrients and energy in urban food consumption. With the exception offood items such as dairy/milk, fat/oil, organ meat, tubers and cereals, it is evident from the result that households in each of the two locations viewed their dietary pattern differently to some extent. The different perspectives on dietary pattern across the locations can again be explained based on the locational and socio-economic differences of respondents. It is important to establish that across the urban areas considered, fruits/vegetables, spices, beef meat appear prominently in the pattern of frequency of food consumed. However, in thequest for diversified diets,without care for moderation in the high intake of the modern dietary pattern (spices, fat/oil and meat), there could be an incidence of high risk of overweight and obesity.

Table 3: Percentage distribution of consumption frequency of food subgroups

	Locations	**1 %**	**2 %**	**3 %**	**4 %**	**Wilcoxon-Mann Whitney U**	**Asymptotic Significance**
Vitamin A							
Dark green leafy vegetables	*LUA*	24.2	8.3	32.5	35.0	32163.500	0.059**
	HUA	32.0	10.7	27.8	29.5		
Fruits	*LUA*	20.4	11.5	17.2	51.0	31973.000	0.039**
	HUA	21.4	11.4	32.0	35.2		
Other vegetables	*LUA*	14.6	4.5	17.8	63.1	31818.000	0.022**
	HUA	13.5	7.1	31.0	48.4		
Spices/oils/protein							
Spices	*LUA*	41.4	3.8	16.6	38.2	59396.000	0.054**
	HUA	31.3	7.1	15.3	46.3		
Beef meat	*LUA*	31.2	6.4	28.0	34.4	58894.000	0.020**
	HUA	20.6	4.3	33.8	41.3		
Dairy/milk	*LUA*	44.6	14.6	23.6	17.2	60518.500	0.331
	HUA	45.6	8.5	19.2	26.7		
Fat/oils	*LUA*	23.6	7.6	24.8	43.9	60200.00	0.214
	HUA	13.5	7.8	34.2	44.5		
Protein/Iron							
Poultry	*LUA*	73.2	8.9	9.6	8.3	59078.500	0.015**
	HUA	61.6	11.4	16.0	11.0		
Organ meat	*LUA*	78.8	6.4	6.4	8.3	61092.500	0.923
	HUA	78.6	6.1	6.4	8.9		
Staples							
Tubers	*LUA*	29.3	26.1	29.9	14.6	32731.500	0.155
	HUA	31.3	29.5	32.7	6.4		
Plantain	*LUA*	42.0	19.7	22.9	15.3	58554.000	0.010***
	HUA	31.0	14.9	37.4	16.7		
Cereals	*LUA*	4.5	7.6	38.9	49.0	60253.500	0.208
	HUA	2.1	2.8	42.7	52.3		

Items measured on a 4-point consumption frequency scale (1=seldom/never; 2=one-two times/week; 3=three-five times/week; 4= six-seven times/week). Statistical significance: ***1%; **5%.

4. Conclusion and policy recommendation

This cross-sectional study identified dietary pattern based on food groups in a representative sample ofurban households in Nigeria. Using factor analysis, five distinct dietary patterns emerged named as vitamin A, modern, protein, roots, and cereals patterns with 50. 7% variance contribution rate. Significant differences between the two urban locations with respect to fruits/vegetables (5%), spices (5%), beef meat (5%), poultry (5%) and plantain

(1%) revealed the relevance of these foods in supply of micronutrients and energy in urban diets.Urban disparity in dietary patterns was found in this study, and differentdietary patterns were associated with some nutritional outcomes. Without care for moderation in the high intake of the westernization dietary pattern (spices, fat/oil and beef), there could be increase in the risk of overweight/obesity while the low iron-rich food structure could increase the risk of anaemiaamong residents of less urbanized areas.The observed responses from dietary pattern serves asa benchmark to evaluate the health effects of adherence todietary guidelines by urban household's intake of macro and micronutrients. It also broadensthe conceptual understanding of urban dietarypracticesin relation to diet related disease outcomes. The findings can guide in nutrition intervention and public enlightenment on dietary strategies.

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Comment [a27]: Standardize the quotations as required by the magazine. Dates, points etc., Review all.

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