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Consumption of ultra-processed foods and dietary patterns of children (6-12 years) in Obowo local government area Imo state, Nigeria

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Abstract
Background: Ultra-Processed Foods are packaged formulation resulting from several sequences of industrial processes; they are manufactured entirely from substances derived from foods and additives used to imitate sensory properties of foods and disguise unpalatable aspects of the final product.
Objectives: This study examines the consumption of ultra-processed foods and dietary patterns of children (6-12 years) in Obowo L.G.A, Imo State.
Methods: The study was a cross-sectional study. A multi-stage sampling technique was used to select a total of 440 respondents for the survey. Data on socioeconomic/demographic characteristics, consumption of ultra-processed foods and dietary pattern of the respondents were collected using structured and validated questionnaires. The IBM SPSS version 23.0 was used to analyze the data. Data obtained were described using frequency and percentage.
Results: Half (50.8%) of the respondents were females. Majority of the respondents (70.3%) were between the ages of 10-11 years and 90.2% of them were Christians. Most of the respondent's fathers (70.7%) completed only secondary education, while 60.9% of their mothers completed only secondary education. Majority of their fathers (70.7%) were traders and earned between ₦50,000-₦69,000 in a month, while most of their mothers (90.2%) were traders and earned between ₦50,000-₦69,000 in a month. Majority of the children (70.7%) were fed three times daily. Majority (70.7%) of the respondents consumed ultra-processed foods/drinks and most of them (59.0%) consumed it because it was always available. Most of the school children (88.3%) consumed snacks.
Conclusion: This study showed a high daily consumption of some ultra-processed foods like instant noodles, biscuits and soft drinks by the children. There is a need to raise awareness of healthy eating behaviors targeted at school children.

Keywords: Dietary patterns, ultra-processed foods, children, Imo State, Nigeria

Introduction

Ultra-processed foods and drinks are ready-to-eat products that are made up entirely or mostly from substances extracted from food (Oils, fats, sugar, proteins), derived from food constituents (hydrogenated fats, modified starches), or synthesized, based on organic materials (dyes, flavorings, flavor enhancers and additives) used to alter the food's sensory properties (Monteiro, 2009) [8]. These food products are designed to be extremely palatable and convenient, are often sold in large portion sizes. Ultra-processed foods averagely have higher energy density, higher free sugar content and less fiber than natural or minimally processed foods (Canella *et al*., 2014) [2]. Substances found in ultra-processed products include some directly extracted from foods, such as casein, lactose, whey, and gluten, and some derived from further processing of food constituents, such as hydrogenated oils, hydrolysed proteins, soy protein isolate, invert sugar and high fructose corn syrup. Classes of additive found in ultra-processed products include dyes and colours, colour stabilizers, flavours, flavour enhancers, non-sugar sweeteners, and processing aids such as carbonating, firming, bulking and anti-bulking, defoaming, anti-caking and glazing agents and emulsifiers (Monteiro *et al*., 2018) [9]. Common attributes of ultra-processed products are hyper-palatability, sophisticated and attractive packaging, multi-media and aggressive marketing to children (Louzada *et al*., 2015) [4]. A dietary pattern is the nature, quality, quantities, and proportion of different foods and drinks in a population's diet.

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The dietary pattern commonly describes the food shared by population, communities, or families. It is determined by the physical environment, tradition, religion, availability, affordability and choice. Consumption of ultra-processed foods has been pointed out as a risk factor for increasing obesity among both children and adolescents (Louzada *et al*., 2015) [4]. The relationship between consumption of specific ultra-processed foods such as soft drinks and diet-related chronic non-communicable diseases is well documented (Micha *et al*., 2015) [7]. Children are characterized by many physiological changes and formation of lifelong eating habits (WHO, 2004) [16]. Eating habits acquired during infancy, childhood and adolescence, whether healthy or not, are likely to be maintained throughout life (Mendonça *et al*., 2016) [5]. Ultra-processed foods can have deleterious effects if consumed in inadequate amounts. Increased intake of ultra-processed foods and drinks by children are major contributors to obesity (Mistry and Puthussery, 2015) [6]. The high palatability, availability and the aggressive marketing of ultra-processed foods make them preferred substitutes for children. Another exacerbating factor is that the introduction of these products has been occurring very early in children's diets, even before 12 months of age (Moodie *et al.,* 2013) [10]. Ultra-processed foods, especially energy-dense foods high in sugar, fat and salt, is gradually displacing home-prepared meals and the consumption of fresh fruit and vegetables in typical diets. Thus, this study was carried out to assess the consumption of ultra-processed foods and dietary pattern of children in Obowo L.G.A in Imo State.

Materials and Methods
Area of study
The study was carried out in Obowo Local Government Area in Imo State. Obowo is a Local Government Area in Imo State, Nigeria. Its headquarters is in Otoko. Other towns in the LGA include Amanze, Umuagu, Umungwa, Umulogho, Odenkwume, Okwuohia, Amuzi, Alike, Avutu and Umuokeh. Obowo is located about 45 minutes' drive from Owerri capital and less than 30 minutes away from Umuahia. Obowo Local Government Council came into existence the sequel to the May 1989 creation of Local Governments in Nigeria. The Local Government has about twenty-two autonomous communities. The major economic activity for majority of the population is trading, civil service and subsistence farming. Livestock farming is also common among some of the inhabitants.

Population of the study: The population of the study were children between the ages of 6-12 years in Obowo Local Government Area, Imo State.

Sample size determination: The sample size was determined using the total population size of children in Obowo Local Government Area, Imo State, which is 44,055 according to National Population Commission.

$$\text{Sample size (n)} = \frac{N}{1+N\,(e)2}$$

n = Sample size
N = Total Population size (44,055)
e = Precision or sampling error (0.05)^2

$$n = \frac{44055}{1+44055\,(0.05)2}$$

$$n = \frac{44055}{44056\,(0.0025)}$$

$$n = \frac{44055}{1101.4} = 399.9 \approx 400$$

Sample size was rounded up to 440 to make up for drop outs and incorrectly filled questionnaires.

Sampling procedure: A multi-stage sampling technique was used to select the respondents. In the first stage, Obowo Local Government Area was purposefully selected as the study area. The list of all the primary schools in Obowo L.G.A was gotten from the local government. A simple random sampling technique was used in the selection of 10 schools that were used for this study. The third stage was the use of the class registers to obtain the list of pupil aged 6-12 years in all the classes, systematic random sampling was used to select the respondents from the list. A total number of 44 children were selected from each school to make a total of 440 respondents for the study.

Informed consent: Permissions were obtained from the local government area and the school authorities in all the schools selected before the commencement of the research. A consent letter was given to the parents of each respondent informing them of the objectives of the study. Consent was obtained from all authorities before the commencement of the study commences.

Data collection: A well-structured and validated questionnaire was used in collecting the data from the respondents.

Questionnaire Design: A pretested, structured questionnaire was constructed in three sections, Section A: Socio-economic data/ Demographic characteristics of the respondents; Section B: Dietary pattern and consumption of ultra-processed foods and drinks by the respondents; Section C: Food frequency questionnaire of Ultra processed foods.

Dietary Assessment: A food frequency questionnaire which consisted of a list of all the ultra-processed foods in the study area was used to assess the consumption of ultra-processed foods by the respondents.

Statistical analysis
Statistical analysis was performed using the IBM Statistical Package for Social Sciences version 23.0. Descriptive statistics (Frequency and percentage) was used to determine the socio- economic, demographic characteristics and consumption of ultra-processed foods of the respondents.

Results
The socio-demographic characteristics of the children are shown in Table 1. Result revealed that half of the respondents (50.2%) were female, while 49.8% were male. More than half of the respondents (57.5%) were between 10-11 years old, while 13.9% of them were 12 years. About 87.7% of the respondents were from the Igbo tribe, while 12.3% of them were from the Yoruba tribe. Most (87.7%) of

the respondents were Christians. Most of the children (80.4%) lived with both parents, while 9.8% lived with only their father. More than half of the respondents (51.1%) had a family size of 3-4 persons, while 48.9% had 5 persons and above in their family. Additionally, 37.5% of the households lived in a two room apartment, 31.8% of the households lived in a three room apartment, while 30.7% lived in a flat. Table 2 shows the socio-economic characteristics of the parents. Majority of the fathers (60.2%) completed only secondary education, while 53.2% of mothers completed only secondary education. Meanwhile, 57.7% of the fathers were traders, while 14.5% of them were civil servants. Majority of the mothers (65.0%) were also traders.

Table 1: Socio-demographic characteristics of the Children.

Variables	Frequency	Percentage
Gender		
Male	219	49.8
Female	221	50.2
Total	440	100
Age (Years)		
6-7	65	14.8
8-9	61	13.9
10-11	253	57.5
12	61	13.9
Total	440	100
Class		
Primary 1-2	62	14.1
Primary 3-4	61	13.9
Primary 5	256	58.2
Primary 6	61	13.9
Total	440	100
Ethnic group		
Igbo	386	87.7
Yoruba	54	12.3
Total	440	100
Religion		
Christianity	386	87.7
Traditional	54	12.3
Islam	0	0
Total	440	100
Who do you live with?		
Parents	308	7.0
Only father	61	13.9
Grandparents	71	16.3
Total	440	100
Family size		
3-4 persons	225	51.1
5 persons and above	215	48.9
Total	440	100
How many rooms you live in		
Two rooms	165	37.5
Three rooms	140	31.8
Flat	135	30.7
Total	440	100

However, most of the fathers (56.6%) earned between ₦50,000 and ₦69,000 monthly, while 49.3% of the mothers earned between ₦50,000 and ₦69,000 in a month.
Table 3 shows the food habits and dietary pattern of the respondents. Majority of the respondents (60.2%) ate three times in a day, while few (16.4%) ate four times and above in a day. Most of the children (65.7%) skipped their meals.

Table 2: Socio-economic Characteristics of the Parents.

Variables	Frequency	Percent
Father's education		
Primary	103	23.4
Secondary	264	60.2
Tertiary	72	16.5
Total	440	100
Mother's education		
Primary	134	30.5
Secondary	234	53.2
Non-formal	72	16.4
Total	440	100
Father's occupation		
Civil servant	64	14.5
Farmer	61	13.9
Trader	254	57.7
Others	61	13.9
Total	440	100
Mother's occupation		
Trader	286	65.0
Farmer	123	8.0
Civil servant	31	7.0
Total	440	100
Father's monthly income		
₦ 30,000 - ₦ 49,000	61	13.9
₦ 50,000 - ₦ 69,000	249	56.6
₦ 70,000 - ₦ 79,000	63	14.3
₦ 80,000 - ₦ 99,000	67	15.2
Total	440	100
Mother's monthly income		
₦ 30,000 - ₦ 49,000	95	21.6
₦ 50,000 - ₦ 69,000	217	49.3
₦ 70,000 - ₦ 79,000	67	15.2
₦ 80,000 - ₦ 99,000	61	13.9
Total	440	100

Additionally, 56.6% of the children who skipped their meals skipped mostly their lunch. Most of the respondents (65%) ate in-between meals. However, 50.7% of the respondent who ate snacks in between meals mostly ate pastries, 28.0% ate fruits in between meals, while 13.6% took carbonated drinks in between meals. Majority of the respondents (63.6%) went to school with snacks, 63.6% of them usually went with biscuits.
Table 4 shows the frequency of consumption of ultra-processed foods. About 17.7% of the respondents consumed sardine once a week, while 16.4% consumed it 2-3 times daily. About a third of the respondents consumed Coke (35.2%), Fanta (33.9%), Mirinda (40%), Pepsi (21.1%), and Smoove drink (14.1%) daily. About 30.7% of the children consumed the cake daily, 56.6% consumed it once weekly. About 42.0% of the respondents consumed chocolates once in a week, while 28.8% consumed it daily. Additionally, 45.0% of the respondents consumed cookies once in a week, while 32.0% consumed it daily. However, 81.1%, 75%, 83.7% and 76.7% of the respondents rarely consumed shawarma, hotdogs, pizza and pringles respectively. Biscuit (44.0%), ice cream (44.8%) and noodles (52%) were consumed daily by the respondents. The respondents consumed prawn crackers (12.5%), candies (21%), spaghetti (23.4%), jam (26.6%), corned beef (24.8%), sausages (26.6%), Gesha (12.7%) and condensed milk (21%) 2-3 times weekly.

Table 3: Food habit and dietary pattern of the respondents.

Variables	Frequency	Percent
Frequency of feeding in a day		
Two times	103	23.4
Three times	265	60.2
Four times and above	72	16.4
Total	440	100
Do you skip meals?		
Yes	289	65.7
No	151	34.3
Total	440	100
If yes, meals skipped		
Lunch	249	56.6
Dinner	0	0.0
Breakfast	40	9.0
None	151	34.3
Total	440	100
Do you eat in between meals?		
Yes	286	65.0
No	154	35.0
Total	440	100
If yes, what kind of food do you eat		
Pastries	223	50.7
Fruits	123	28.0
Carbonated drinks	60	13.6
Nuts	34	7.7
Total	440	100
Do you go to school with snacks?		
Yes	280	63.6
No	160	36.4
Total	440	100
If yes which snacks		
Biscuit	280	63.6
Bread	52	11.8
Beans cake (Moi moi)	108	24.6
Total	440	100

Discussion

In this study, there were more female respondents' than male. This is in agreement with the findings of Oguizu and Celestine (2021) [12] who reported more males than females in the households studied. Majority of the respondents were Christians and were from the Igbo ethnic tribe. This was expected as the southeastern part of Nigeria is dominated by the Igbo tribe and Christians. More than half of the children lived with their parents and had a family size 3-4 persons. This is similar to NDHS (2018) [11] report that 75% of children under age 18 in Nigeria lived with both parents and had an average household size of 4.7 persons. One third of the children lived in a flat apartment with their parents. Living condition is an important factor influencing the nutritional and health status of a person. More than half of the respondents' fathers and mothers completed secondary education. Education is one of the most important aspects of social and economic development. Education improves capabilities and is strongly associated with various socioeconomic variables such as lifestyle and income for both individuals and societies (NDHS, 2018) [11]. Most of the respondents' parents were traders and middle-income earners. The high number of traders observed in the study area may have been so because the South-East region is known for being the trading and commercial hub of Nigeria. This supports (NDHS) 2018 [11] report that 65% women and 86% of men age 15-49 in Nigeria are currently employed. Majority of the respondents ate three times a day. This is consistent with the study conducted by Olumakaiye et al. (2010) [14] where most of the children ate three times per day. The meal skipped by most of the children was lunch. It is disturbing to know that children were skipping meals as this can have an adverse effect on their growth and development. The economic situation in Nigeria keeps getting worse as most households are no longer able to provide basic needs like foods for their children. Some of the respondents who ate in-between meals said they ate pastries, only few ate fruits. This is similar to the study of Fadeiye and Adekanmbi (2020) [3]. Most of the children went to school with biscuits as snacks. This is in agreement with the report of Subramani et al. (2021) [15]. More than one third of the children consumed Coke and Fanta drinks, cake and cookies daily. One quarter of the children consumed biscuit ice-cream and Mirinda drink daily. The high daily consumption of these ultra-processed foods could be because they are delicious and easy to find everywhere. Boyland, Nolan and Kelly (2016) [1] reported that children may have a higher demand of ultra-processed foods because of a greater promotion through marketing and advertising targeted at children. Instant noodles were very popular among the children with more than half of the children consuming it daily. The high consumption of Instant noodles may be because it is palatable, affordable and convenient to prepare. Katmawati and Ulfah (2016) [13] reported a high consumption of instant noodles among children.

Table 4: Food Frequency of Consumption of Ultra-processed Foods.

Variables	Daily		Once weekly		2-3 times weekly		Rarely		Total	
	No	%	No	%	No	%	No	%	No	%
Burger	0	0.0	0	0.0	0	0.0	440	100	440	100
Sardine	0	0.0	78	17.7	72	16.4	290	66	440	100
Coke	155	35.2	185	42.0	33	7.6	67	15.2	440	100
Cake	135	30.7	227	56.6	0	0.0	78	17.7	440	100
Chocolate	124	28.8	185	42.0	0	0.0	131	29.7	440	100
Cookies	141	32.0	196	45.0	103	23.4	0	0	440	100
Shawarma	0	0.0	80	18.2	0	0.0	360	81.8	440	100
Hotdog	111	25.2	0	0.0	0	0.0	329	75	440	100
Pringles	0	0.0	103	23.4	0	0.0	337	76.7	440	100
Biscuit	192	44.0	123	28.0	61	13.9	64	14.5	440	100
Ice cream	197	44.8	171	38.9	72	16.4	0	0	440	100
Pizza	72	16.4	0	0.0	0	0.0	368	83.7	440	100
Candies	125	28.4	92	21.0	92	21.0	131	29.8	440	100
Prawn crackers	55	12.5	55	12.5	185	42.0	145	33	440	100
Noodles	228	52.0	72	16.4	140	31.8	0	0	440	100
Spaghetti	0	0.0	103	23.4	0	0.0	146.1	76.6	440	100
Jam	123	28.0	117	26.6	86	19.5	114	25.9	440	100
Macaroni	135	30.7	0	0.0	0	0.0	305	69.4	440	100
Fanta	149	33.9	86	19.5	92	21.0	113	25.7	440	100
Mirinda	176	40.0	165	37.5	99	22.5	0	0	440	100
Pepsi	93	21.1	154	35.0	123	28.0	70	16	440	100
Sweets	0	0.0	61	13.9	124	28.2	255	58	440	100
Corned beef	31	7.0	109	24.8	35	8.0	265	60.2	440	100
Smoove drink	62	14.1	61	13.9	222	50.5	95	21.6	440	100
Sausage	117	26.6	117	26.6	55	12.5	151	34.3	440	100
Gesha	55	12.5	56	12.7	92	21.0	237	53.9	440	100
Condensed milk	55	12.5	92	21.0	56	12.7	237	53.9	440	100

Conclusion
This study showed a high daily consumption of some ultra-processed foods like instant noodles, biscuits and soft drinks by the children. Some of the children skipped their lunch. This is disturbing as skipping meals can have an adverse effect on the growth and development of children. There is a need to raise awareness of healthy eating behaviors and the long term adverse effect of ultra-processed food consumption among children.

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