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*Full Length Research Paper*

## **Portion and Serving Sizes of Commonly Consumed Foods, in Ibadan, Southwestern Nigeria**

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### **ABSTRACT:**

The concept of portion size of foods consumed at a sitting and the serving sizes are important in efficient conduct of food consumption or dietary intake studies. A descriptive cross-sectional study design was adopted in Ibadan South-West and Ibadan North West local Government Areas of Oyo state and an interviewer-administered questionnaire including a 24-hour dietary recall section was the main tool for data collection. Portion sizes were determined from weight equivalents of each food type consumed, average portion sizes for each food type were determined using the statistical package for social sciences (SPSS) version 16, and nutrient intakes were determined using an adapted Total Dietary Assessment (TDA) software. Amounts of starchy food and fruits that will provide 15g carbohydrate, vegetables that will provide 5g carbohydrate, meat that will provide 7g protein and 5g fat were considered “a single serving” based on the food exchange list. Serving sizes were then expressed in easily recognizable household measures. Portion and Serving Sizes of commonly consumed Nigerian foods were thus determined. Four hundred and thirteen (413) adult males and females, with a mean age (SD) of 41.5 (14.4) yr participated in this study and majority (76.27%) were married. Occupation included traders (38.26%), artisans (27.20%) and private company workers (10.17%). Overall, subjects consumed a number of servings that ranged from a minimum of 2.4 (Maize pap) to a maximum of 18.4 servings (Semolina) in the cereal and grain group; a minimum of 0.9 (fried plantain) to a maximum of 6.5 (*Lafun*) within the starchy root and tuber group; 1.4 (*Moinmoin*) to 4.5 (cooked beans) in the legume group. Serving sizes determined: a serving of the various foods as expressed in household measures include; 1.3 slices of bread, 13.5 tablespoons of *Ewedu* soup, 5 tablespoons of vegetable oil stew, and 2/3 a small wrap (73.7g) of yam-based *Amala*, amongst others. This knowledge of “serving sizes” in relation to the nutrient content if well-known, is useful to individuals as a tool to better determine amounts of foods eaten to ensure nutrient adequacy, promote health and reduce the risk of developing diet-related chronic diseases.

**Key words:** portion sizes, serving sizes, Nigerian foods, dietary recall, diet-related chronic diseases

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### **INTRODUCTION**

Food consumption surveys are essential for investigating diet-disease relationship, identifying population groups at greater risks of inadequate and excessive intake of

nutrients, formulating food and nutrition policies to reduce those risks, selecting appropriate nutrition intervention programmes, monitoring the success and cost effectiveness of such programmes, predicting the adequacy of food supply, monitoring trends in food usage, estimating exposure to contaminants, and

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determining group compliance with dietary standards (Buzzard, 1994). Information from food consumption surveys can also be used to design food and nutrition educational tools and implement dietary guidelines aimed at reducing the risk of diet related diseases. For example, reports from United States Nationwide Food Consumption surveys form the basis for the establishment of standard 'serving sizes' used on federal nutrition education tools such as the nutrition facts label and the food guide pyramid that help individuals make choices on types and portions of food to eat for continued or improved health (USDA, 2000). While the serving sizes on the nutrition facts label, developed by the Food and Drug Administration and Control (FDA) for food labels, specifically provide detailed nutritional information on a food for easy comparison with similar foods (Young & Nestle, 2003; USDA, 2000); the serving sizes on the food guide pyramid, developed by the United States Department of Agriculture (USDA) in 1992, provide a guiding tool for Americans to select appropriate portion sizes of foods from each food group for daily nutrient recommendations to be met.

These serving sizes also serve as tools for use in controlling portion sizes as part of a weight loss and weight management programme, and as useful tools for dietitians to better manage diet-related chronic diseases (CDC, 2006). Daily Recommended Serving sizes for a variety of foods providing necessary macronutrients (carbohydrate, protein and fat) and micronutrients (vitamins and minerals) are listed on the food pyramid in such a way that the largest number of servings is found at the base of the pyramid (for the bread, cereal, rice and pasta group), while the foods to be consumed sparingly appear at the tip of the pyramid (for the fat, oil and sweets), (Cleveland et al, 1997). This arrangement helps individuals to control the amount of energy, fat, saturated fat, cholesterol, sugar or sodium in a particular diet, while allowing for variety in the diet.

In general, the knowledge of serving sizes of various foods is useful to individuals as a tool to better determine amounts/portion sizes of the various foods to eat to ensure nutrient adequacy, promote health and reduce the risk of developing diet-related chronic diseases (CDC, 2006). In Nigeria however, the concept of "serving sizes" is alien, and according to Ledikwe et al (2005) is wholly necessary in ensuring that individuals do not consume energy and nutrients in inadequate or excess of requirements. Inadequate or excess energy and other nutrients in an individual's diet can contribute to poor health and the risk of developing chronic diseases (CDC, 2006). The prevalence of malnutrition and diet-related chronic diseases in Nigeria is high (NFCNS 2001, Adeoye, 2009) and until the knowledge and skill to

adequately determine portions that are appropriate to energy and nutrient requirements is acquired, these problems and attendant health implications may continue to be significant public health challenge.

While a lot of studies have documented the prevalence of malnutrition in population groups and reported inadequate dietary intakes, very little information exists on portion and serving sizes [which have been found to be strong predictors of adequate nutrient intakes (Azadbakht, 2005 cited in Sanusi, 2010)], of commonly consumed Nigerian foods. In Nigeria, standardized units of food measure for quantifying cooked foods are scarce (Smith et al, 1995). To date, data on serving sizes or standardized measures of local cooked food are almost non-existent, the term 'serving, is also rather vague, subjective and undefined for Nigerian foods. It thus becomes necessary to identify standardized food measures and define serving sizes for commonly consumed local Nigerian foods, with a view to generating data that will be useful to individuals in the determination of appropriate portion sizes that will not only ensure nutrient adequacy, promote health and reduce the risk of developing obesity and other diet related diseases; but will also ensure the adoption of a healthy diet plan as part of weight loss and weight management programme.

This study was therefore designed to determine portion and serving sizes of commonly consumed Nigerian foods in two selected Local Government Areas of Oyo State Nigeria.

## **MATERIALS AND METHODS**

### **Study Design**

This was a descriptive cross-sectional study to determine portion sizes and serving sizes of commonly consumed Nigerian foods in two selected Local Government Areas of Ibadan, Oyo State Nigeria.

### **Location and period of study**

This study was carried out in two selected local Government Areas in Ibadan, Oyo state: Ibadan North West and Ibadan South West Local Government Areas. These were selected by a simple random sampling technique and data collection was carried out from June to September 2011.

### **Subjects/Participants**

Subjects were non-institutionalized apparently healthy adult males and females, over 20 years of age residing in households in Ibadan South West and North West Local Government areas of Ibadan, Oyo State Nigeria.

### Sample Size Determination

The minimum sample size was calculated according to the formula:

$$n = z^2 pq / d^2$$

Where, n = the desired sample size (when the population is greater than 10,000)

z = the standard normal deviate set at 1.96 (approximately 2.00)

p = the proportion in the target population estimated to have a particular characteristic. If there is no reasonable estimate, 50% will be used

q = 1.0-p

p = degree of accuracy desired, set as 0.05

Applying the formula given above, the sample size proposed is:

$$n = (2)^2(0.50) (0.50) / (0.05)^2 = 400$$

### Sampling

Seventeen respondents were selected from each of the 12 wards in Ibadan South-West Local Government Area, while 19 respondents were selected from each of the 11 wards in Ibadan North-West Local Government Area, using a systematic random sampling probability technique; 1 eligible respondent with knowledge about household income or meal preparation in the household was selected per household. Information on the total number of houses in each ward was collected from the Oyo State Valuation Office; appropriate intervals were used to select houses per ward.

### Inclusion Criteria

The Study included all subjects:

1. Who gave informed consent to participate in the study?
2. Who were apparently healthy and not on medication,
3. Who were residents of that location, and were neither homeless nor institutionalized,
4. Whose consumption was not affected by ill health, fasting, national holidays, or festive celebrations?

### Data Collection

Ethical approval was obtained for this study from the Institutional Review Committee of University of Ibadan and University College Hospital, Ibadan. Permission was obtained from the Local Government Areas; informed consent was also obtained from the participants.

An interviewer administered questionnaire was used to collect information in the study, Data collected included the following:

- Demographic and socio economic factors  
These included household identification, household size, age, highest educational level attained by the head of household, primary occupation of the household head, estimated monthly income of households and methods of refuse and sewage disposal.
- Dietary assessment  
A 24 hour diet Recall was conducted to obtain information on subjects' food intake. It was conducted by trained interviewers at the home of the subjects. Subjects were asked to recall all food eaten and beverages taken in the previous 24 hrs prior to the interview.  
Measuring guides (household measures) and food models were used to aid the respondent in estimating amounts of foods consumed at a sitting/portion size.

### Determination of Average Portion Sizes

Average amounts/portion sizes, of amounts consumed daily of each food type reported by all subjects were determined using a statistical software package (SPSS Version 16)

### Determination of Nutrient Content of Mean Portion Sizes

The nutrient content of determined mean portion sizes consumed daily of each food type were determined, using a food composition database (Total Dietary Assessment tool). Amounts of carbohydrates, proteins and Fat (in grammas) and other nutrients (expressed in units appropriate to the nutrient) were determined.

### Determination of Serving Size Content

The serving size content was determined for each food type (using definitions of "a single serve" of various foods on the food exchange list).

### Expression of Serving Size in Household Measure

Serving sizes of the various types of foods were expressed in easily recognizable household measures (table spoons, serving spoons, cups, & milk tins).

### Statistical Analysis

Inferential statistics was carried out using the Statistical Package for Social Sciences (SPSS) Windows software version 16, to test associations or relationships between important sample characteristics. Pearson chi square was used to test association between the socio demographic factors and portion size

**RESULTS**

This Study included 413 male and female adult subjects of which (204)49.39% were from Ibadan South West Local Government Area, (209)50.61% were from Ibadan North West Local Government area. 69.73% of the subjects were recruited from the high density areas, while 28.09% were from the medium density areas and 2.18% were from the low density areas. Majority of the

subjects (76.27%) were married and 57.14% had attended secondary schools. The predominant occupation included: Traders (38.26%), Artisans (27.20%), and Private Company workers (10.17%). About a quarter of the subjects (27.36%) reported a monthly income of between 10,000 and 19,999 naira, while another 25.67 reported a monthly income of between 20,000 and 29,999 Naira (see Table 1).

**Table 1:**  
Socio-Demographic Characteristics of Respondents

Characteristics	Ibadan South West LGA N (%)	Ibadan North West LGA N (%)	Total N(%)
<b>Type of Population</b>			
High Density	136 (66.67)	152 (72.72)	288 (69.73)
Medium Density	68 (33.33)	48 (22.97)	116 (28.09)
Low Density	-	9 (4.31)	9 (2.18)
<b>Sex</b>			
Male	104 (50.98)	95 (45.45)	199 (48.18)
Female	100 (49.02)	114 (54.55)	214 (51.82)
<b>Marital Status</b>			
Single	28 (13.73)	42 (20.10)	70 (16.95)
Married	162 (79.42)	153 (73.21)	315 (76.27)
Separated	4 (1.96)	5 (2.39)	9(2.18)
Widow/widower	10 (4.90)	9 (4.31)	19 (4.6)
<b>Educational Level</b>			
No formal Education	8 (3.92)	17 (8.13)	25 (6.05)
Primary	44 (21.57)	48 (22.97)	92 (22.28)
Secondary	116 (56.86)	120 (57.42)	236(57.14)
Tertiary	36 (17.650)	24 (11.48)	60 (14.53)
<b>Occupation</b>			
Unemployed	12 (5.88)	11 (5.26)	23 (5.57)
Religious Teacher	7 (3.43)	-	7 (1.69)
Farmer	2 (0.98)	4 (1.91)	6 (1.45)
Driver	4 (1.96)	6 (2.87)	10 (2.42)
Trader	70 (34.31)	88 (42.11)	158 (38.26)
Artisan	57 (27.94)	57 (27.27)	114(27.60)
Private Company Worker	22 (10.78)	20 (9.57)	42(10.17)
Retired civil Servant	7( 3.43)	9( 4.3)	13 (3.87)
Civil Servant	19( 9.31)	7 (3.35)	26 (6.30)
Banker	1( 0.49)	3(1.44)	4 (0.97)
Business man or woman	3(1.47)	4 (1.91)	7 (1.70)
<b>Estimated Monthly Income</b>			
Below 10,000	27 (13.24)	34 (16.26)	61 (14.77)
10,000-19,999	47 (23.04)	66 (31.58)	113 (27.36)
20,000-29,999	59 (28.92)	47 (22.49)	106 (25.67)
30,000-39,999	35 (17.16)	30 (14.35)	65 (15.74)
40,000-49,999	11( 5.40)	6 (2.87)	17 (4.12)
50, 000 & above	25 (12.25)	26 (12.44)	51 (12.35)

Portion sizes of foods commonly consumed by all participants from both Ibadan North West and South West local Government areas are shown in Table 2. Maize pap had the highest mean intake (526.41g) followed by Jollify rice (476.49g) and white rice (420.09g) as these foods were consumed in larger portion sizes than other foods. Fried plantain had the lowest mean intake (38.92g). Next to Maize pap, EBay

had the highest “maximum” value of portion sizes reported (1200g).

The nutrient composition of the portion sizes of the foods commonly consumed in addition to energy (kcal), macronutrients (protein, carbohydrate, and fat) and micronutrients (vitamin A vitamin C, riboflavin, calcium, iron) are shown in Table 3.

**Table 2:**

Average Portion Sizes of the Commonly Consumed foods

Food	N (%)	Minimum (g)	Maximum (g)	Mean (g)	SD
<b>CEREALS AND GRAINS</b>					
<i>Rice and its products</i>					
White rice	229 (55.45)	100	1000	420.09	182.23
Jollof rice	47(11.38)	175	980	476.49	184.15
Maize pap	53(12.83)	225	1350	526.41	247.43
Maize mould (Eko)	47 (11.83)	75	900	394.68	196.43
Tuwo maize	3 (0.73)	150	300	200	86.60
<i>Wheat and its products</i>					
White bread	179 (43.34)	20	540	217.44	76.78
Semolina	19 (4.6)	150	750	378.95	168.59
<b>ROOTS AND TUBERS</b>					
<i>Yam and its products</i>					
Yam (boiled)	43 (10.41)	26.25	450	163.20	79.98
Yam flour (Amala)	165(39.95)	100	900	376.02	161.18
Yam (pounded)	7(1.69)	300	500	350	86.60
<i>Cassava and its products</i>					
Cassava flour (lafun)	42 (10.17)	150	750	379.52	157.15
Fufu	32 (7.75)	100	700	347.81	123.78
Garri	33(7.9)	12	230	89.61	42.38
Eba	72 (17.43)	150	1200	395.83	175.43
<i>Plantain</i>					
Fried Plantain	37 (8.95)	10	100	38.92	22.49
<b>LEGUMES AND PRODUCTS</b>					
Boiled beans	48(11.62)	75	750	236.20	137.25
Bean pottage	83 (20.10)	30	840	290.12	153.80
Akara	38 (9.20)	30	300	121.45	60.59
MoinMoin	70(16.95)	50	780	198.36	122.35
<b>SOUPS</b>					
<i>Draw soups</i>					
Ewedu	151(36.56)	25	300	112.09	57.60
Ogbonno	4 (0.96)	37.50	150	75	53.03
<i>Vegetable Soup</i>					
Efo riro	63(15.25)	45	450	167.98	85.86
Egusi and Efo	53(12.83)	63.75	340	154.88	71.79
<b>STEW</b>					
Vegetable oil stew	333(80.62)	15	300	69.50	43.21
Palm oil Stew	162(39.25)	15	240	67.55	41.50
<b>FRUIT</b>					
Banana	6(1.45)	50	600	233.33	204.12
Orange	10(2.42)	100	480	218	107.68
<b>ANIMAL PRODUCTS</b>					
Lean Beef	172 (41.64)	20	200	77.33	41.20
Egg	36 (8.72)	50	100	55.55	15.93
Whole Milk	56(13.56)	11.25	135	36.34	19.30



The mean portion size of semolina yielded the highest energy (1364.22kcal), followed by the mean portion of Jollify rice (739.99 kcal) and the mean portion of white rice (546.92 kcal). As indicated in the table, portion size averages of *Ego rare* (vegetable soup), *Egos* and *Ego*, bean porridge, *Minoan* and palm oil stews yielded high Vitamin A values: 21,797.08 RE, 20,207.19

RE, 12,350.41 RE, 15,869.79 RE, and 5,317.54 RE respectively.

The number of servings contained in the average food portion sizes (using the food exchange list strategy), and weight of “single servings” in grams are presented in Tables 4-7.

**Table 3:** Nutrient Content of Average Portion Sizes

Food	Mean Portion size (g)	Energy	Prot (g)	Carb (g)	Fat (g)	A-RE (RE)	vitC (mg)	B2 (mg)	Ca (mg)	Iron (mg)
<b>CEREALS &amp; GRAINS</b>										
<i>Rice and its products</i>										
White rice	420.0	546.92	13.23	121.03	1.09	285.66	--	--	14.24	6.26
Jollof rice	476.4	739.99	13.06	142.61	13.01	324.01	--	--	14.15	6.19
Maize pap	526.4	158.55	3.68	35.32	0.32	357.96	--	--	14.16	1.63
Maize mould (Eko)	394.6	179.97	4.62	39.90	0.24	382.84	--	--	11.84	1.85
Tuwo maize	200	201.28	2.34	47.26	0.32	--	--	--	106	1.04
<i>Wheat and its products</i>										
White bread	217.4	450.10	18.92	96.33	5.44	2.17	1.09	0.63	204.39	6.94
Semolina	378.9	1364.2	48.05	275.99	3.98	0	0	2.16	64.42	16.52
<b>ROOTS &amp; TUBERS</b>										
<i>Yam and its products</i>										
Yam (boiled)	163.2	146.06	0.39	36	0.05	35.90	--	--	2.64	1.45
Yam flour (Amala)	376.0	317.40	1.13	77.20	0.45	146.65	--	--	7.67	3.38
Yam (pounded)	350	362.21	1.96	86.87	0.77	--	--	--	12.53	3.64
<i>Cassava and its products</i>										
Cassava flour (lafun)	379.5	397.36	0.65	97.65	0.46	588.26	--	--	62.51	3.76
Fufu	347.8	364.40	0.83	89.28	0.45	20.87	--	--	42.15	4.83
Garri	89.6	84.58	0.17	20.86	0.05	83.34	--	--	12.50	0.86
Eba	395.8	373.62	0.75	92.15	0.24	368.12	--	--	55.22	3.80
<i>Plantain</i>										
Fried Plantain	38.9	97.90	0.57	14.04	5.16	37.30	5.67	0.02	1.26	0.26
<b>LEGUMES &amp; PRODUCTS</b>										
Boiled beans	236.2	378.56	27.52	64.25	1.28	297.61	--	--	14.62	2.93
Beans porridge	290.1	471.47	21.41	67.19	13.01	12350.	--	--	14.91	3.54
Akara	121.4	266.76	14.68	28.84	10.29	319.41	--	--	9.74	1.49
MoinMoin	198.3	216.53	12.04	20.95	9.40	15869.	--	--	13.63	2.16
<b>SOUPS</b>										
<i>Draw soups</i>										
Ewedu	112.0	47.35	7.82	2.20	0.80	9390.9	--	--	0.13	0.13
Ogbonno	75	-	9.09	-	6.84	9850.5	--	--	0.57	0.13
<i>Vegetable Soup</i>										
Efo riro	167.9	202.23	10.21	15.47	11.05	21797.	--	--	0.45	0.20
Egusi and Efo	154.8	316.26	21.53	22.36	15.64	20207.	--	--	0.12	0.74
<b>STEW</b>										
Vegetable oil stew	69.5	57.74	2.56	1.80	4.48	57.74	--	--	0.01	0.09
Palm oil Stew	67.5	95.32	2.44	0.87	9.12	5317.5	--	--	0.01	0.17
<b>FRUIT</b>										
Banana	233.3	214.66	2.40	54.67	1.12	18.67	21.23	0.23	14	0.72
Orange	480	225.60	4.51	56.40	0.58	100.80	255.36	0.19	192	0.48
<b>ANIMAL PRODUCT</b>										
Beef (Lean)	73.3	182.43	24.19	0	8.76	0	0	0.21	7.88	2.74
Powdered whole Milk	36.6	22.31	1.20	1.69	1.21	11.27	0.34	0.06	43.24	0.02
Boiled Egg	55.5	86.10	6.99	0.62	5.89	93.32	0	0.28	27.77	0.66

**Table 4:**  
Serving Size Content of Commonly Consumed Starchy Food and Legumes

Food	Mean portion size (g)	Carb (g)	Number of servings	One Serving (g)
<b>Cereals and Grains</b>				
<i>Rice and its products</i>				
White rice	420.09	121.03	8.1	51.9
Jollof rice	476.49	142.61	9.5	50.2
<i>Maize and products</i>				
Maize pap	526.41	35.32	2.4	219.3
Maize mould ( <i>Eko</i> )	394.68	39.90	2.7	146.2
Tuwo maize	200	47.26	3.2	62.5
<i>Wheat and its products</i>				
White bread	217.44	96.33	6.4	34.0
Semolina	378.95	275.99	18.4	20.6
<b>ROOTS AND TUBERS</b>				
<b>Yam and its products</b>				
Yam (boiled)	163.20	36	2.4	68
Yam flour ( <i>Amala</i> )	376.02	77.20	5.1	73.7
Yam (pounded)	350	86.87	5.8	60.3
<b>Cassava and its products</b>				
Cassava flour ( <i>lafun</i> )	379.52	97.65	6.5	58.4
Fufu	347.81	89.28	6.0	58.0
Garri	89.61	20.86	1.4	64.0
Eba	395.83	92.15	6.1	64.9
<b>Plantain</b>				
Fried Plantain	38.92	14.04	0.9	43.24
<b>LEGUMES AND PRODUCTS</b>				
Boiled beans	236.20	64.25	4.3*	54.9
Bean porridge	290.12	67.19	4.5*	64.5
<i>Akara</i>	121.45	28.84	1.9*	63.9
<i>MoinMoin</i>	198.36	20.95	1.4*	141.7

\*legumes are grouped as starchy vegetables on the food exchange list, as they yield the same energy(80cal), carbohydrate (15g), and protein (3g) per serving, as cereals, bread, grains and other starches.

\*\*The weight of one serving was calculated by dividing the portion size in grammes of food by the number of servings contained in the food.

**Table 5:**  
Serving Size Content of Commonly Consumed Soups and Stews

Vegetable Soup	Mean portion size (g)	Carbohydrate (g)	Fat (g)	Number of servings	One Serving (g)
<i>Efo riro</i>	167.98	15.47	11.05	3.1 <sup>++</sup>	54.2
<i>Egusi and Efo</i>	154.88	22.36	15.64	4.5 <sup>++</sup>	34.4
<b>Draw soups</b>					
<i>Ewedu</i>	112.09	2.20	0.80	0.44 <sup>++</sup>	254.8
<i>Ogbonno</i>	75	--	6.84	1.4 <sup>#</sup>	53.6
<b>Stew</b>					
Vegetable oil stew	69.50	1.80	4.48	0.9 <sup>#</sup>	77.2
Palm oil Stew	67.55	0.87	9.12	1.8 <sup>#</sup>	37.5

<sup>++</sup>Number of Servings calculated based on the definition of 1 vegetable exchange serving on the food exchange list(1 vegetable exchange "serving" contains 5g carbohydrate, 2 gram protein, no fat, and 25 calories)

<sup>#</sup>Number of servings calculated based on the definition of 1 fat exchange "serving" on the food exchange list. A fat exchange yields 5grammes of fat and 45 calories

In the cereal and grain food group, Semolina had the highest number of servings consumed (18.4 servings), followed closely by *Jollify* rice (9.5 servings), white Rice (8.1 servings), white wheat Bread (6.4), *Two* maize (3.2), Maize Mould / *Aged / eke tutu* (2.7) and Maize pap (2.4). In the root and tuber food group; cassava flour had the highest number (6.5) of servings consumed, followed closely by *EBay* (6.1), *FIFO* (6.0), pounded yam (5.8), yam flour (5.1), Garry (1.4), and Fried Plantain (0.9). In the legume food group, Beans porridge had the highest number of servings consumed, followed closely by boiled beans (4.3), *Ankara* (1.9) and *Minoan* (1.4). The number of servings contained in the mean portion sizes of soups and stews consumed by the population studied (Table 5). The number of servings consumed in the vegetable group was higher for *Egusi* (4.5 servings) than for *Efo riro* (3.1 serving), also palm oil stew had a higher number of servings (1.8 servings) than vegetable oil stew (0.44 servings). A mean portion of Ogbonno soup weighing 37g contained 1.4 servings (Table 5).

**Table 6:**  
Serving Size Content of Commonly Consumed Fruits

FRUIT <sup>a</sup>	Mean portion size (g)	Carbohydrate (g)	Number of servings	Serving Size
Banana	233.33	54.67	3.6	64.81
Orange	480	56.40	3.8	126.3

<sup>a</sup>Number of servings calculated based on the definition of "One Fruit Exchange" on the Food exchange list. A fruit Exchange yields 15grams carbohydrate per serving

**Table 7:**  
Serving Size Content of Commonly Consumed Animal Products

Animal Product	Mean portion size (g)	Fat (g)	Number of servings	A Single Serving (g)
Beef (Lean) <sup>b</sup>	77.3	8.76	2.9	26.65
Egg (Cooked) <sup>c</sup>	55.55	5.89	1.2	46.29

<sup>b</sup>Number of Servings calculated based on the definition of "one lean meat exchange" on the Food exchange list

<sup>c</sup>Cumber of Servings calculated based on the definition of "one medium fat meat exchange" on the food exchange list

As indicated in Table 6, subjects consumed more servings from oranges (3.8) than from banana (3.6) and in the meat/protein group (Table 7), Subjects consumed more servings from lean meat (1.8) than from egg (1.2).

## DISCUSSION

Portion sizes have been shown to be strong predictors of adequate nutrient intakes (Azadbakht, 2005). Serving sizes were determined in this study with a view to generating information that will be useful to individuals in the determination of appropriate portion sizes that will not only ensure nutrient adequacy, promote health and reduce the risk of developing diet-related chronic diseases; but will also assist in the efficient conduct of dietary intake studies. This study showed that consumed largest portion sizes in the cereals and grain groups, were white Rice, Jollof Rice, and Maize Pap. Over 55% consumed Rice; this is similar in other parts of Nigeria and indeed the whole of West Africa (Lopriore and Muelhoff, 2003).

Also processed foods such as bread constituted a large portion of the diet with over 43% subjects reporting consumption of bread; this is consistent with findings of Delisle, (1990), who reported that Bread constituted a large portion of the urban diet due to its convenience, availability and low cost.

Portion sizes of root and tuber group were next in values to the cereal and grain group: these as expected rank second in frequency of consumption to Cereals and grains, in urban areas of West Africa except in times of economic crises when strong positive correlations have been observed between income and consumption of root and tuber crops when urban poor households show an increased dependency on roots and tubers as cheap sources of energy (Delise, 1990).

Legumes form a substantial part of the African diet, as they are usually included in the diet to complement starchy staples (Oniango, 2003), however, as expected, as income increases plant based protein in diets are replaced by animal protein (WHO, 2003).

While Ogbonno soup had the highest average portion size amongst the soups, it was the least frequently consumed soup, this is not surprising, as ogbonno is more popular in the south eastern part of Nigeria (Kayode, 2010). Frequency of Fruit consumption was low and portion sizes barely exceeded the WHO daily recommendation. While there was no positive correlation between fruits consumption and income (WHO, 2003; Oniango, 2003), the finding in this



**Table 8:** Serving Sizes Expressed in Commonly Used Household Measures

Food	Serving Size in grammes	Serving Size expressed in easily recognizable measure	Serving Size expressed in household measure
<b>CEREALS AND GRAINS</b>			
<b>Rice and products</b>			
White rice	51.9	--	1.75 heaped Table spoons
Jollof Rice	50.2	--	1.3 heaped Table spoons
<b>Maize and products</b>			
Maize pap	219.3	10 Naira (raw)	0.5 (500 ml cup)
Maize mould/eko	146.2	1small wrap (10 Naira)	--
Tuwo maize	62.5		
<b>Wheat and Wheat product</b>			
White bread	34.0	--	1.3 thin slices
Semolina	20.6	1/8 [small wrap (50 naira)]	
<b>ROOT AND TUBERS</b>			
<b>Yam and products</b>			
Boiled Yam	68	--	1.75 small thin slices
Yam flour/Amala	73.7	2/3 [small wrap (20 Naira)]	3 Table spoons
Pounded yam	60.3	1/3 [small wrap* (50 Naira)]	1.125 Table spoons
<b>Cassava and products</b>			
Cassava Flour/lafun	58.4	1/3 [small wrap* (20 Naira)]	2.3 Tablespoons
Fufu	58.0	1/3 [small wrap* (20 Naira)]	1.3 Table spoons
Garri	64.0	2/3 of a milk tin	5.3 Table spoons
Eba	64.9		2.5 Table spoons freshly prepared
Fried plantain	43.24	80 Naira fried plantain + 1/3(10 Naira plantain)	8.3 medium slices
<b>LEGUMES</b>			
Beans(boiled)	54.9	--	1.5 heaped Table spoons
Beans Porridge	64.5	--	2 Table spoons
Akara	63.9	20 Naira + 1/8 (N10)	--
Moinmoin	141.7	1.5 [small wrap (N20)]	0.75 peak milk tin
<b>SOUPS</b>			
<b>Vegetable soup</b>			
Efo riro	54.2	2/3 serving spoons	2.5 Tablespoons
Egusi and efo	34.4	2/5serving spoons	1.6 Tablespoons
<b>Draw soups</b>			
Ewedu	254.8	3.5 serving spoons	13.5 Table spoons
Ogbonno	53.6	3/4 serving spoon	2.75 Tablespoons
<b>STEW</b>			
Vegetable oil stew	77.2	1.3 serving spoons	5 Table spoons
Palmoil stew	37.5	2/3 serving spoon	2.5 Table spoons
<b>FRUITS</b>			
Banana	64.81	1.25Small Peeled Bananas	--
Orange	126.3	1 small peeled Orange	--
<b>ANIMAL PRODUCTS</b>			
Meat	26.65	1 small meat [20 Naira]	--
Egg (boiled)	46.29	1 egg [N25]	--

\* Small wraps of Pounded Yam, *Fufu*, and *Lafun* are equivalent to half “*igbako*”; and equivalent in weights to 180g, 175g, and 175g of Pounded Yam, *Fufu* and *Lafun* respectively

study is consistent with studies that link urbanization with a low fruit consumption.

The method employed by the USDA in the determination of serving sizes took four factors into consideration: typical portion size from food

consumption surveys, ease of use, nutrient content and tradition (USDA, 2000).

The first three factors were put into consideration in this study in determining portion and serving sizes. A serving in the starchy food groups was considered to be

the amount of food that provides 15g carbohydrate; while in the vegetable group, amount of food that provides 5g carbohydrate; a serving of stew provides 5g fat, and a serving of meat provides 7g protein and 3g fat. Cereal and grains group were consumed in the highest number of servings while these servings do not directly compare with the pyramid servings developed by the USDA (1992), they are similar. The number of servings recommended in the food guide pyramid is highest in the cereals and grain group (6-11 servings), while fewer number of servings are recommended from protein rich foods such as legume and nuts (2-3 servings) (USDA, 2002). In the starchy food group, it is observed that the higher the carbohydrate content of the food, the higher the number of servings the food provides.

The weights in gram of “single servings” of some foods determined in this study are similar to the weights reported by Fadupin (2009). Like the serving sizes on the food guide pyramid, serving sizes determined in this study have been expressed in household measures rather than gram for convenience and ease of recognition. Fractions (quarter, half, two third), sizes (small, medium and large) and household measures have been used in describing serving sizes of foods elsewhere (USDA 2002).

In conclusion, consumption pattern in this study showed a wide range in each food group. Also Serving sizes of commonly consumed foods in the various food groups are described in weight and household measures. A Knowledge of these “serving sizes” in relation to nutrient content will equip individuals with the skill necessary to determine portions appropriate for energy and nutrient requirements. This knowledge is also essential in health promotion and disease prevention therefore efforts should be made in ensuring that these concepts become integrated into communications in health and nutrition education and training.

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