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The Impact of Fruits and Vegetables Consumption on Healthy Living of the Elderly in Ikire South West, Nigeria

Olomo Jerome Abiola
Department of Hospitality Leisure and Tourism Management,
School of Applied Sciences, Federal Polytechnic, Ede, Osun State, Nigeria
Email:jabiola2011@yahoo.com

Abstract - The adequate consumption of fruits and vegetables on the menu list has been considered healthy and desirable globally by all nations. In USA, myplate.gov supports that one-half the plate should be fruits and vegetables. Dietary fiber is adequately sourced from fruits and vegetables and its intake reduced drastically at a low level the incidence of cardiovascular diseasing and obesity.
This study reviewed fruits and vegetables into groups based on their chemical structures and function. 200 elders were studied in Ikire, South West, Nigeria making use of multi stage sampling procedures. The health behaviour, fruit and vegetable consumption habits and the nutrition of the elderly were assessed using health, socio-demographic and anthropometric indices. This study discussed how the elderly made use of both the traditional and orthodox medicine for the sustenance of their healthy living.
Data was collected through a pretested self administered questionnaire and analyzed using descriptive statistics and chi-square test. The mean age of respondents was 60.0 + 5.5 years, 57.3% were males while 42.7% were females. Fruits and vegetables consumption was high among females than males. Educational campaigns and behavioural change communication on healthy nutrition and lifestyles among the elderly were advocated.

Keywords: Fruits, Vegetables, elderly, healthy, living, consumption

1. Introduction

Diets enriched in fruits and vegetables are globally recommended for their health promoting properties, as historically fruits and vegetables have high concentrations of vitamins, especially vitamins C and A; minerals, especially electrolytes; and recently phytochemicals antioxidants (Slavin & Lloyd 2012). Certain fruits and vegetables are rich sources of vitamin C (citrus, fruits, strawberries, green pepper, white potatoes) but these sources are spread over many fruits and vegetable categories. Other fruits and vegetables including avocado, corn, potatoes and dried beans, are rich in starch whereas sweet potatoes are mostly sucrose not starch (Hornick & Weiss 2011). Most countries of the world dietary recommendations, include fruits and vegetables for all ages especially the elderly, for sustainable healthy living (Palafox – Carlos, Ayala – Zavala, Gonzalez – Aquilar 2011).

According to the Dietary guidelines for Americans 2010, nutrients of concern in the American diet include potassium, dietary fiber, calcium, and vitamin D, (Murphy, Barraj, Herman, Bi, Cheatain & Randolph 2011). Fruits and vegetables are generally low in energy density and often are good sources of fiber and potassium, but the nutritional contribution of standard servings of fruits and vegetables varies widely (Mariott, Olsho, Hadden & Connor 2010). The Nutrition Labeling and Education Act (1990) required that all packaged foods include the nutrition facts panel. Nutrition facts must include total dietary fibre (TDF); insoluble and soluble fibre also may be listed but are not required unless claims are made (OudeGriep, Gelejinse, Kronhout, Ocke & Vershcud). Research conducted in the U.S. confirmed that most analytical schemes to measure dietary fibre are chemical and enzymatic extraction procedures where the TDF method or Prosky method has become the standard method for the measurement of

dietary fibre in the United States (Wedick, Pan, Cassidy, Rimm, Sampson, Rosner, Willett, Hu, Sun & Van Dam 2012).

Elderly individuals require adequate and sufficient nutrition to maintain functional capacity, live independent lives within their people and communities (Ledoux, Hingle & Baranowski 2011). Dietary fiber is essentially the indigested carbohydrates in the diet (Slavin 2008). Soluble fiber was considered to have beneficial effects on the elderly as serum lipids and insoluble fibers were linked with laxation benefits (Hyson 2011). Furthermore, scientific evidence support that soluble fibers lower cholesterol and insoluble fibers increases stool weight while many fibre sources are mostly soluble but still enlarge stool weight such as oat, bran and psyllium (Jogunola & Awoyeni 2010).

Most fruits and vegetables are good sources of insoluble fiber, not soluble fiber. Diets of the African population tend to differ between rural and urban dwellers. Studies have shown that rural dwellers diets are low in fats and sugar but high in carbohydrate and fiber (Arulogun & Owolabi 2011:1). Processing can either increase or decrease the fibre content of a fruit or vegetable; peeling fruits or vegetables will lower the fibre content (Blumberg, Heaney, Huncharek, Scholl, Stampfter, Viethy, weaver & Zeisel 2010). A serving of grape fruit without any associated membrane contains much less fibre than a grape fruit serving with membranes (0.4 vs 1.4g/serving); home cooking generally has a negligible effect on fiber content, while cooking, in general may even increase the fibre content of a product if water is driven out in the cooking process (Potocka & Moscioka 2011).Baking or other heat treatments (e.g. extruding) used in food processing will also increase the fiber content of the product as researched in Germany in 2012 (FAO 2012).Increasingly, research indicates that additional properties, such as viscosity and fermentability, are important characteristics in terms of the physiological benefits of fibre (WHO 2013b). To investigate the impact of the consumption of fruits and vegetables on the sustenance of healthy living among the elderly in Ikire, Osun State, Nigeria.

2. Methods

This study was conducted in Ikire, Ayedaade Local Government Area of Osun State, South West, Nigeria. The study area is dominated by Yoruba ethnic group engaged in farming; many are government work educated civil servants and artisans engaged in professional vocations. The people resident in the study area are accustomed to starchy food, and vegetable consumption with fresh fruits, spinach vegetables, cassava, yam and palm oil products in their meals.

2.1 Sample Size and Sampling Procedure

Sample size: The sample size, n, was determined using Fisher's Formula (Vaughan & Morrow 1989); $n = z^2 PQ/d^2$

Where P is the prevalence of the attribute, a 1-P i.e, the proportion of the population that does not have the characteristic.

Z is the standard normal deviate for the 95% confidence level (1.96).

D is the precision i.e. The level of accuracy desired or sampling error or one half of the width of the confidence interval (usually set at 0.05).

The Mini Nutritional Assessment (Borne, Lambert & Steyn 2002), review of the literature on the nutritional status of the elderly by the Nestle Nutrition Institute found that 9% of the elderly had some form of malnourishment. The researcher adopted this percentage as proportion of the population having the characteristic being measured (P). A 95% level of confidence was chosen (i.e., = 0.05), which is the value for d in the formula).

This gave a sample size of 159. An error consideration of 20% was allowed for which provided a total sample of size of 191. This number was rounded up to the nearest hundred such that the final sample size was 200.

2.2 Sampling Procedure

The population for the study was made up of male and female people aged 60 years of age and above and resident in Ikire at the time of the study. A random sampling procedure was adopted for the study. Respondents were sampled from two third of the residents in the local government area, following guidelines from the World Health Organisation 6 (WHO) sampling manual (Vaughan & Morrow 1989). Four wards in the local government area were involved in the recruitment of the respondents for the study equitably consisting of 50 (fifty) per ward. Two third of elderly from the target study area were chosen totaling 200 respondents.

2.3 Data Collection

Data collection for the study involved using trained interviewers to administer semi-structured questionnaires in Ikire, Ayedaade Local Government, Osun State, South West, Nigeria, during the morning and afternoon hours of the day at the residences of the respondents. The questionnaires contained both open and closed-ended questions. The questionnaires captured the demographic and non-demographic characteristics of the respondents consisting of food security and food habits. Also, the questionnaire considered health seeking actions of the elderly. Each item in the study was scored one point where the respondent was vulnerable in relation to nutrition. The standard of the nutrition screening initiative was adopted to interpret the score of the respondent where 10% was regarded as not vulnerable, 10-30% as moderately vulnerable and greater than 30% as highly vulnerable (Guigoz 2006).

2.4 Anthropometric Measurements

The anthropometric measurements for the study were obtained using international standards and procedures. Height and weight of the elderly were measured using stadiometer and bathroom scales.

Pre-test: A pre-test was carried out in Ikire, Ayedaade Local Government, Nigeria to ensure the validity of the standard of the study questionnaire. The questionnaires were administered to 50 (fifty) elderly people. The data were documented and analysed with the SPSS software (Statistical Package). The results were used to revise the questionnaire and plan the definitive fieldwork. The post test of the elderly was necessitated to ascertain the impact of consumption of fruits and vegetables in the sustenance of healthy living in the study area.

3. Results

Socio-demographic characteristics and health seeking behaviour of the elderly $\geq$ 60 years living in Ikire Ayedaade Local Government, Osun State South west, Nigeria.

Table 1: Socio-demographic characteristics of the respondents

Variables	Frequency	Percentage
Age of respondents		
60-69 years	91	45.5
70-79 years	59	29.5
80-85 years	50	25.0
Total	200	100
Average: 74 yrs		
Sex		
Male	77	38.5
Female	123	61.5
Total	200	100

Education:		
No formal education	95	47.5
Primary school	70	35.0
Junior secondary /college	27	13.5
Tertiary institution	2	1.0
Religious /Quranic	6	3.0
Total	200	100
Marital status		
Married	115	57.5
Widow/widower	81	40.5
Separated	4	2.0
Total	200	100
Occupation		
Petty trader	102	51.0
Artisan	21	10.5
Retiree with limited skill	20	10.0
Farming	19	9.5
Retiree with skill	7	3.5
Business men	4	2.0
Religious work	9	4.5
Caterer	3	1.5
Civil servant	2	1.0
Pensioner	4	2.0
Others with no specific work	9	4.5
Total	200	100

Table 1 shows the average age of 200 respondents was 70 years and all respondents were more than 60 years of age, thus meeting WHO elderly classification (ACC/SCN 2000). Forty -five45% of the respondents in the study were between 60 and 69 years and thirty percent (30%)were aged between 70 and 79 years.

3.1 Food habit and health of the respondents

The food habit of the elderly carried out in the study indicated that more than half had food preferences, take fruit daily (61%) eat thrice daily (63%) and patronized food vendors (50%), 35% have the habit of skipping meals 19% drink alcohol and few were smokers as shown in table 2.

Table 2 Food habit of the elderly

Variables Food habits	**Frequency (n)**	**Percentage %**
Those with food preferences	189	94.5
Daily fruit intake	121	60.5
Eat at least three times daily	126	63.0
Patronize food vendors	100	50.0
Eat in-between meals	101	50.5
Those who skip meals	70	35.0
Those on alcohol	38	19.0
Smokers	9	4.5
Health condition		
Daily medication	78	39.0
Good smelling ability	134	67.0
Physically disable	23	11.5

Problem of digestion	12	6.0
Problem of constipation	11	5.5
Poor appetite	48	24.0
There with fever	16	8.0
Eye problem	108	54.0
Poor denture	45	22.5
Problem with swallowing		
Rate of attendance to health facility 1 x / month	41	20.5
Swallowing problems	8	4.0
On minerals or food supplement	139	68.5

Note: No total in view of multiple responses

Table 2: Percentage distribution of food habit and health condition of respondent.

The habit of daily fruit intake over the years had a negative relationship with frequency of illness/attendance in hospitals ($r = .017$ $P < 0.05$), constipation ($r = 0.15$; < 0.05), digestion ($r = -0.20$; $P<0.05$) and fever ($r=-0.25$; $P<0.05$).

3.2 Health seeking behaviour of the respondents

The study identified health seeking behaviours of the respondents. A large proportion (38%) paid visits to at last one health care facility as shown in table 3. Almost 36.5% of the respondents were unaware of the presence of any health facility within their environment, and 30.5% considered the facilities given them to be inadequate. A total of 27.5 respondents preferred traditional medicine to orthodox especially those with no formal education, as a result of cost and use of local herbs. 11.5% could not describe their health challenges, to doctors. 38% attended medical check-ups.

Table 3: Health Behaviour of the respondents

Variable	**Frequency**	**Percentage**
Routine medical check up		
Yes	76	38
No	124	62
Total	200	100
Follow doctor's prescription		
Yes	177	88.5
No	23	11.5
Total	200	100
Check for fake drugs		
Yes	139	69.5
No	61	30.5
Total	200	100
Awareness of orthodox health facility		
Yes	127	63.5
No	73	36.5
Total	200	100
Preference for traditional health facility		
Yes	55	27.5
No	145	72.5
Total	200	100
Check for expiry date on drugs		
Yes	152	76
No	48	24
Total	200	100

3.3 Nutritional Status vulnerability, food security and health behaviour

The presence of risk factors for malnutrition is referred to as nutritional vulnerability. In this study, the differences between the sexes, as regards the male nutritional vulnerability score was higher than that of the female score (15 compared to 13; P <0.05). Most of the elderly are in the category of food insecurity, especially women than men (FAO 2012). The elderly males were less exposed to factors of nutritional vulnerability than their female counterparts (r=0.44; P<0.05).

Table 4: Relationship between Food Security and Nutritional Vulnerability

Food security vulnerability	**(100% (NV)**	**10-30% (MV)**	**>30% (HV)**	**Total**
Food secure % 	9 18	39 76	3 6	51 100
Mid FI % 	8 10	58 71	16 19	82 100
Moderate FI % 	0 0	38 75	13 25	51 100
Severe % 	0 0	9 56	44 39	100 200
Total % 	17 8.5	144 22	39 19.4	200 100

NV = Nutritional Vulnerability; MV= Moderately Vulnerable; HV= Highly vulnerable
FI = Food Insecurity
Body Mass Index (BMI) and health problems

Less than half of the elderly population in this study was within the normal nutritional status (19.2% for males; 25.1% for females). A total of 15% of the respondents were obese. A significant higher proportion of men (3%) than women (2.9%) were obese. Therefore, the BMI relates significantly with routine check up; food security and nutrition knowledge (P<0.05).

Table 5: Weight of respondents

Sex	**Underweight**	**Normal**	**Overweight**	**Obese**	**Total**
Male %	10 12.98	39 50.65	25 32.47	3 3.90	77 100
Female %	10 10	51 45	33 29.00	29 16	123 100

Table 6: Kcal, TDF, IDF, and SDF and potassium in the top seven consumed vegetables and fruits in standard servings listed for NLEA serving sizes.

Common fruit/vegetable	**Serving**	**Kcal**	**TDF**	**IDF G**	**SDF**	**Potassium Mg**
Potato, boiled	1med, 167g	144	3.0	1.6	1.4	348
Lettuce	1 cup, 57g	8	0.7	0.6	0.1	80
Tomato	NLEA 148g	27	1.8	1.6	0.2	351
Onion	NLEA 148g	47	1.3	0.8	0.5	176
Carrot	NLEA 85g	30	2.5	2.1	0.4	201
Green cabbage	1 cup 89g	22	2.2	1.7	0.1	151
Banana	1med, 118g	105	3.1	2.1	1.0	422
Watermelon	NLEA 280g	84	1.1	0.8	0.3	314

Orange	NLEA 154g	75	3.4	1.4	2.0	256
Grape fruit	NLEA 154g	65	2.5	0.9	1.6	208

Source: USDA and USDHHS release (2010)

Table 7: TDF, IDF, and SDF in juices

Food	**Unit**	**G**	**TDF**	**IDF**	**SDF**
Apple juice	1 cup	248	0.25	0.17	0.97
Black currant juice	1 cup	240	1.44	0.50	0.94
Grape juice	1 cup	253	1.26	0.76	0.51
Grape fruit juice	1 cup	247	0.25	0.05	0.20
Orange juice	1 cup	249	0.75	0.50	0.25
Papaya juice	1 cup	250	1.50	0.80	0.70
Pineapple juice	1 cup	250	0.75	0.67	0.07

A research carried out by Roe (1991) a vegetarian theorist who professed to follow Pythagoras, the ancient philosopher revealed that diet should be part of an ascetic lifestyle (Roe 1991). However, beneficiary vegetarianism was also symbolic of a commitment to health and social reform. According to Southgate a renowned researcher in UK, the nature and variability of human food consumption and the role of plant foods in these relationship cannot be underestimated (Southgate 1991). A follow up of the research indicated that a wide range of plant food is consumed including most parts of the plant, such as fruits, seeds, leaves, roots, and tubers. Studies have shown that many plant species collected estimating >130 species were consumed by North American Indians (WHO 2011c).

Table 8: Compositional features of fruits and vegetables

Features of Plant Foods	**Fruits**	**Legumes g/100g edible matter**	**Leafy vegetables**	**Roots and tubers**
Water	61.0-89.1	74.6-80.3	84.3-94.7	62.3-94.6
Protein	0.5-1.1	5.7-6.9	0.2-3.9	0.1-4.9
Fat	Trace-4.4	1.0-1.5	0.2-1.4	0.1-0.4
Sugar	44.34.8	1.8-3.2	1.5-4.9	0.5-9.5
Starch	Trace-30	5.4-8.1	0.1-0.8	11.8-31.4
Dietary fiber	2.0-14.8	4.5-4.7	1.2-4.0	1.1-9.5
Energy, ktal	90-646	247-348	65-177	297-525
Micronutrient	Vitamin C,K,Mg Carotenoids	B vitamins, vitamin C,K, Mg, P, Fe	Vitamin C, folate carotenoids, Ca, Fe	Carotenoids
Toxic constituents	Cyanogenetic glucosides in seeds	Hemoaglutonins, lectins, trypsin inhibitors	glucosinolates	glucosinolates

Fruits have a high water content and low level of proteins and fat, while the protein is concentrated in the seeds and is resistant to digestion in the small intestine and bacterial degradation in the large intestine (Freisling, Slimani, Boutron-Ryantt at Glavel-Chafelon 2012). It was further revealed in researches that fruits, contain mostly sugars and fibers such as pectin that are extensively fermented in the intestine and also fruits are sources of vitamin, C and potassium (Cate, Caillet, Doyon, Sylvain & Lacroix 2010). Legumes are higher in protein than other vegetables but contain toxic plant metabolites, including saponins and lectins (Dauchet, Amouyel, Hercberg & Dallogeville 2006). Roots and tubers are important sources of energy as starch. However, some roots such as cassava contain toxic secondary metabolites and require soaking in water before they are safe to consumer (USDA & USDHHS 2010). The Institute of Medicine IOM recommended Adequate Intake (AI) OF 14g of fiber, for each 1000Kcal of energy consumed for all individuals from 1 year of age throughout the remainder of lives (IOM 2002). The study set AI at 21 and 30 g/d for women and men aged $\geq$51 years based on lower median energy intakes for older adults.

Table 9: Protective and adverse components of fruits and vegetables linked to health outcomes

Protective	**Adverse**
Dietary fibre	Aflatoxin
Vitamin C	Pesticides
Vitamin E	Nitrates
Carotenoids	Alar
Avenoids	Goitrogens
Folic acid	Enzyme inhibitors
Selenium	Phenotic compounds
Dithiolthiones	Saponins
Glucosinolates	Inositol hexapyhosphate
Indoles	
Isothiocyanates	
Conmarins	
Phenols	
P[rotease inhibitors	
Plant sterols	
Isoflavones/lignans	
Saponins	
Inositol hexaphosphate	
Allium compounds	
limonene	

Table 7 illustrates a wide range of compound beyond the dietary fiber that have been linked to lower incidence of chronic diseases especially cancer and CUD (Cardiovascular disease). Also there are compounds in fruits and vegetables that have been linked to adverse health events. Compounds like phenols are listed in both the protective and adverse lists. The role of vegetable and fruit consumption in cancer prevention is generally consistent and supportive of current dietary recommendations (Ukeatwellpate 2011). Research further ascertain that fruits and vegetable consumption is associated with decreased blood pressure (Rijal 2007).

3.4 Discussion

In the study it was discovered that the removal of fiber from food and its physical disruption can result in faster and easier ingestion, decreased safety and disturbed glucose homeostatis. Furthermore, insulin and glucose responses depend on both the glucose and fiber content of the fruit.
The bio availability of compounds in fruits and vegetables may be altered by the physical property of the fruit or vegetables. The solid meal also decreased hunger more than a liquid meal with added fiber.

4. Conclusion and Recommendations

Epidemiologic studies from the research investigations supported that dietary fiber is linked to less cardiovascular disease (CVD) and probably has a role in obesity prevention. Fiber is most concentrated in dried fruits and cooked vegetables, just because water is removed and fiber concentrated. Nutrients in fruits and vegetables such as dietary fiber, poly-phenols, all provide support for the biological plausibility that fruits and vegetable play in health.

It is recommended that serving of fruits and vegetable is most ideal for the elderly as supported by the dietary guidance in this study. The intakes of fruits and vegetables should be widely promoted both for the content of fiber and other nutrients. However, whenever possible, the entire fruit or vegetable i.e. peel and membrane should be consumed to increase fiber consumption.

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