European Journal of Nutrition & Food Safety

12(8): 33-44, 2020; Article no.EJNFS.59091
ISSN: 2347-5641

Protein Intake of Vegetarians and Non-vegetarians in Port Harcourt, Rivers State, Nigeria

C. A. Orisa[1*] and C. I. Usoroh[2]

[1]Department of Food Science and Technology, Rivers State University, Nkpolu Oroworukwo, Port Harcourt, Rivers State, Nigeria.
[2]Department of Agriculture and Home Economics Education, Faculty of Education, University of Uyo, P.M.B. 1017, Uyo, Nigeria.

Authors' contributions

The study was carried out in collaboration between both authors CAO and CIU. Both authors wrote, read and approved the final manuscript.

Article Information

DOI: 10.9734/EJNFS/2020/v12i830259
Editor(s):
(1) Dr. R. C. Ranveer, Post Graduate Institute of Post Harvest Management, India.
Reviewers:
(1) P. Kumar, Pondicherry University, India.
(2) T. Archana Gaur, AIIMS, India.
Complete Peer review History: http://www.sdiarticle4.com/review-history/59091

Original Research Article

Received 10 May 2020
Accepted 15 July 2020
Published 04 August 2020

ABSTRACT

Objective: The purpose of this study was to investigate the protein intake of vegetarians and non-vegetarians in Port Harcourt, Rivers State.
Methodology: Four objectives and four research questions guided the study. A survey research design was adopted for the study. A sample size of 400 respondents was selected using Taro Yamene formula and purposive sampling techniques. The instrument used for data collection was a questionnaire tagged: Protein Intake of Vegetarians and Non-Vegetarians in Port Harcourt Questionnaire (CPIBVNVQ). The instrument was validated by three experts with a reliability coefficient of 0.56. Data obtained were analyzed using descriptive statistics (frequency, percentage) and findings were presented on tables.
Results: Prevalence of vegetarianism was high in females (53%) than in males (47%). Protein intake by the vegetarians was high (97%) when compared with vegetarians who do not eat proteinous foods (3%). Among the non-vegetarians, 94% eat proteinous foods while 6% do not eat. The study also showed that protein intake is better in non-vegetarians than vegetarians. Higher percentages of non-vegetarians (84.3%) fell sick and got diagnosed of ailments as compared with 17.4% for vegetarians suggesting that the vegetarians experience enhanced immune function.

**Corresponding author: Email: cjorisa@yahoo.com;*

Reduced saturated fat and blood cholesterol was a tool that influenced the respondents in choosing the vegetarian lifestyle with 82.5% for vegetarian and 13.8% for non-vegetarian.
Conclusion: Based on the findings, it was recommended that vegetarians should be encouraged to consume more plant proteins especially soy based foods since they are high biological value protein food comparable to animal products.

Keywords: Vegetarians; non-vegetarians; proteins; diet; eating pattern.

1. INTRODUCTION

There is no life without proteins. It is found in every part of the human body, skin, muscles, hair, blood, body organs, eyes, fingernails and bone [1]. Protein is essential for everyone as it is the most abundant substance in the body, next to water. It is needed for many vital processes in the body and thus needs to be consistently replaced by the consumption of dietary proteins daily. Dietary proteins can be used for building parts of the human body and the degree to which it performs this function is determined principally by the type and relative amounts of amino acids present in the particular protein molecule. According to Winston and Ann [2], the body has the ability to adapt and make some of the amino acids, however, there are eight of the amino acids which cannot be put together in the body and must be supplied by the food we eat. The nutritive value of proteins is determined by the presence in adequate amounts of these eight essential amino acids [3].

Most animal proteins contain all of the essential amino acids in sufficient amounts. The protein of cereals, most beans, and vegetables may contain all the essential amino acids, but the amount in these plant foods is less than recommended [3]. Protein intake for vegetarians is mainly from plant. However, protein from plant sources is of lower nutritive value than that of animal protein consumed by non-vegetarians. A non-vegetarian diet is one that includes animal proteins as well as plant proteins while the strict-vegetarian diet is one that does not include animal protein, sea foods, or products containing these foods [2]. The eating patterns of vegetarians may vary considerably. The lacto-ova vegetarian eating pattern is based on grains, vegetables, fruits, legumes, seeds, nuts, dairy products, and eggs [4]. The lacto-vegetarian excludes eggs as well as meat, fish, and fowl [5]. It is therefore important to characterize how the dietary pattern may differ with respect to protein intake.

Several studies have shown that dietary patterns characterized by lower meat intake are associated with lower risk of disorders such as the metabolic syndrome, diabetes, cardiovascular disease and certain types of cancers [4,5,6]. The characteristic non-vegetarian diet is generally high in saturated fat from animal proteins, simple sugars and energy-dense food, which increases the risk to develop obesity and other ailments. Therefore, the rate of obesity-related and other chronic diseases have become a public health concern [7].

Variations in protein content may account for these differences observed in health outcomes [8,9]. The increase in death rate especially among early and middle-aged adults through cardiovascular disease, hypertension, cancer, diabetes, obesity, kidney disease, renal stones, gallstones, liver disease, and other conditions is a global concern and has received wide attention in most societies [10,11]. These health concerns may not be unconnected with the over-consumption of protein, particularly when linked with saturated fatty acids and over consumption of chemically processed meats [12,13]. Understanding the current trends in dietary patterns and composition will provide valuable information to promote healthy approaches to dietary modification.

There is lack of scientific data investigating the nutrient intake in terms of protein of vegetarians and non-vegetarians and how it affects their health status. To date, no data exist on the protein intake of vegetarians and non-vegetarians in Nigeria and there are no recommendations regarding protein intake for both groups. Therefore, in order to fill the knowledge gap between protein intake of vegetarians and non-vegetarians, this study is to investigate the protein intake of vegetarians and non-vegetarians in Port Harcourt, Rivers State. Data obtained from this study may serve as a first basis in determining specific recommendations regarding the protein intake for vegetarians and non-vegetarians.

2. METHODOLOGY

2.1 Research Design

The study applied a survey research design.

2.2 Study Area

The research was conducted in Port Harcourt. Port Harcourt is the capital and largest city of Rivers State, Nigeria. It lies along the Bonny River and is located in the Niger Delta. It has an area of 369km^2 and an estimated population of 1,865,000 inhabitants, up from 1,382,592 as of 2006 [14,15,16] with 1,148,665 adults aged 20 years and above [17]. It consists of the former European quarters now called Old GRA and New Layout areas (old Port Harcourt Township, Borokiri). The urban area (Port Harcourt metropolis), on the other hand, is made up of the local government area itself and parts of Obio-Akpor accordingly [18]. Port Harcourt features a tropical wet climate with lengthy and heavy rain seasons and very short dry seasons. Only the months of December and January truly qualifies as dry season months in the city. Port Harcourt is one of Nigeria's leading industrial centres.

2.3 Study Population

The population for the study was 1,865,000 respondents which comprised of persons aged 20 years and above, both vegetarians and non-vegetarians, male and female resident in Port Harcourt as at the time of the study.

2.4 Sample Size and Sampling Technique

The sampling size (400) used for this study was calculated using Taro Yamene formula with 95% confidence level. Purposive sampling technique was used for the selection of 400 respondents from their respective offices, houses and churches in Port Harcourt.

2.5 Instrument for Data Collection

The instrument used for data collection was a structured questionnaire tagged: Protein Intake of Vegetarians and Non-Vegetarians in Port Harcourt (CPIBVNVQ). The questionnaire had four sections, A to D and 35 questions. Section A with four questions sought information on the personal data of the respondents; Section B with five questions was geared towards collecting information on different protein consumed by the respondents and the frequency with which they were eaten; Section C with twenty three items sought information on the frequency of consumption of proteinous foods while Section D with three questions sought information on the effects of dietary patterns on the health status of the respondents.

The instrument for data collection was subjected to face validation by three validates from the department of Vocational Education in the Faculty of Education, in the University of Uyo, Uyo. They were expected to access the instruments for appropriateness, ability to measure the objectives and research questions of the study and to reword where necessary to ensure that the instruments would be reliable for data collection. Croabach Alpha analysis was used to determine the reliability of the instrument with a reliability coefficient of 0.56.

2.6 Method of Data Collection and Analysis

The researchers used five research assistants in various parts of the city to administer the questionnaire to the respondents in their respective offices, churches and homes in Port Harcourt. The questionnaires were filled and collected immediately for analysis. Sorting and coding was done on the collected instrument and a retrieval rate of 97% was achieved. Data obtained was analyzed using descriptive statistics: frequency, percentages and presented on tables.

3. RESULTS AND DISCUSSION

3.1 Demographic Characteristics of the Respondents

Table 1 reveals the demographic characteristics of the respondents. The findings show that respondents from 41 – 50 years participated more in the study with the highest frequency of 35.1%.This indicates that the respondents' dietary pattern was not influenced by older siblings, but may have been as a result of religious affiliation or personal decision. This observation may be accounted for by the fact that vegetarianism is not just dietary persuasions, but also reflects a lifestyle [19]. The respondents of 20 – 30 years had the lowest with 11.1%. The study also sampled more females than males in both the vegetarians and non-vegetarians. The ratio of males to females in this study supports the findings in other studies that

vegetarian and vegan diets were frequently chosen by females than males in other countries [19]. This was attributed to the fact that females are more concerned about their body shape and weight than males, and as a result is more interested in trying different diets to achieve this.

Non-vegetarian respondents ranked highest with 59.8% while vegetarians were 40.2%. This is contrary to the initial findings of Bazzano et al. [19] that vegetarians have been shown to be more educated than the non-vegetarians and as such should participate more in academic research. Additionally, majority of vegetarians (57%) were strict vegetarians, 27% were ova-lacto- vegetarians while 16% were lacto-vegetarians. The reason for high strict vegetarians in this study may be attributed to the fact that strict vegetarians believe their daily protein requirement cannot be met through the consumption of dairy products such as milk, butter and cheese, compared to the ova-lacto-vegetarians and lacto-vegetarian who do consume these dairy products. However, in another related study conducted in African-Americans, majority of the vegetarians were lacto-ova-vegetarians (85%), while 15% were strict vegetarians [20]. This implies that it is not more preferred to be a lacto-vegetarian or lacto-ova-vegetarian than a vegan.

3.2 Protein Intake of Vegetarians and Non-vegetarians

Table 2 reveals the comparison of protein intake between vegetarians and non-vegetarians. The vegetarians had a higher intake of protein (97%g) than non–vegetarians (94%). Studies have reported that vegetarians generally have lower intake of proteins compared to individuals who eat meat. Despite this, their intakes were still within an adequate intake range [21,19]. On the other hand, Vegetable protein can supply an individual's protein needs when a variety of foods of vegetable origin are consumed and the energy needs are met [22].

The result reveals that a significant percent of the respondents who are vegetarians base their reasons for not eating protein on health reasons. This is in consonance with the views of Marsh et al. [23] who states that improved health is one of the many reasons people choose to adopt a vegetarian diet and there is now a wealth of evidence to support the health benefits of a vegetarian diet. Also, Belesco [24] and Leitzmann [25] opined that health is the most commonly cited reason for becoming vegetarian. Most people now recognize that vegetarian diets are not only a healthy choice but are likely to protect against diseases. The potential health advantage of vegetarian diet includes a healthy body weight and reduced chronic diseases such as hypertension, obesity and certain cancers. There is good evidence that a vegetarian diet and life-styles have positive effects on weight loss, blood pressure and coronary artery disease [26].

The findings of the study also reveal that a greater percentage of vegetarians prefer plant protein in the place of animal protein. This finding supports the views of Sluijs et al. [27] who stressed that vegetarians usually consume more fruits and vegetables than non-vegetariansand because of their restricted consumption of animal sources of foods, they have lower intake of saturated fatty acids and increased intake of fibre and various kinds of antioxidants,compared to those of non-vegetarian origin. This type ofdiethelps improve antioxidant status lowers oxidative stress andreduces blood lipid levels [28]. Vegetarians generally have a lower body mass index (BMI) and tend to be more health conscious than non-vegetarians [11].

Consumption of vegetable protein such as beans and soy beans was higher (92%, 58%) among the vegetarians than the non-vegetarians (72%, 46%). The inclusion of at least 25 g of soya protein per day as part of a diet low in saturates, can help reduce blood cholesterol levels [29]. However, practical implications of a regular largeconsumption of soya protein products need to be considered with lifestyle issue. Nevertheless, soya protein has a similar protein quality as animal protein [30].

Consumption of nuts such as groundnut and cashew nut was higher among vegetarians (93% and 65%) than the non-vegetarians (74% and 33%). A number of studies have shown increased longevity among vegetarians [31,26]. It is likely that these benefits result of increased consumption of beneficial dietary components including fruit, vegetables, whole grains, legumes and nuts which are rich in dietary antioxidantsand phytochemicals [23]. Adequate energy food intake eaten including a variety of plant foods such as legumes, whole grains, nuts seeds, soy products and vegetables are essential in providing dietary protein [30].

Table 1. Demographic characteristics of the respondents

S/N	Personal Characteristics	Frequency (n=388)	Percentage (%)
1	**Age**		
	20-30 years	43	11.1
	31-40 years	111	28.6
	41-50 years	136	35.1
	51 years and above	98	25.2
	Total	388	100%
2	**Gender**		
	Male	182	47
	Female	206	53
	Total	388	100%
3	**Dietary Pattern**		
	Vegetarians	156	40.2
	Non-vegetarians	232	59.8
	Total	388	100%
4	**Vegetarian Status**		
	Strict vegetarian	89	57
	Ova-lacto vegetarian	42	27
	Lacto vegetarian	25	16
	Total	156	100%

The study also shows that the consumption of nuts (walnuts and tiger nuts) is higher among vegetarians (76% and 83%) in comparison to non-vegetarians (40% and 62%). This finding supports the views of Garcia et al. [18] who asserted that vegetarians maintain a healthier life style due to the consumption of low cholesterol food intake. Gracia et al. [28] further stated that walnuts, macadamia, almonds and cashew nuts have cholesterol-lowering properties, and a beneficial effect on the lipoproteins profile. In a controlledrandomized crossover study by Anderson [32] in 18 normo-cholesterolaemic men, results of the study indicated that diets rich in walnuts decreased total cholesterol.

The finding of the study revealed that none of the vegetarians studied consumed liver, pork, ham, sea foods, snails, fish, goat meat, beef and chicken with a low intake of milk (42%) and egg (28%) while this was observed to be highly consumed by non-vegetarians. This is expected as vegetarianism is the practice of abstaining from the consumption of meat such as red meat, poultry, sea food, and the animal flesh while non-vegetarians are characterized by the frequent intake of animal foods [33,34]. A well-balanced vegetarian diet will normally provide adequate amounts of all the essential nutrients required by the body for any stages of the life cycle. However, some types of vegetarian diet which impose restrictions on some specific foods need to call for suitable alternatives in order to meet the requirements of the individual.

One of the benefits of a lacto vegetarian diet is the silent consumption of dietary fiber and milk intake. Vegetarians also seem to make good use of cereals for e.g. millet mostly consumed on a sometimes basis. Cereals are an important source of many nutrients for populations in all regions of the world, but especially for people living in the developing countries, where the lack of protein-rich foods and economic constraints compel them to rely upon cereals such as maize, sorghum, millet or rice as the staple food of their subsistence diets [35]. Furthermore, the American Cancer Society and the American Heart Association highly recommend vegetarian grains and fruits to meet the requirements of a balanced diet [36].

Surprisingly it was observed that the consumption of soya-based products is not too popular among the vegetarian respondents. This may be because either there has been an overconsumption which resulted in avoidance or a lack in the knowledge of how to prepare new interesting dishes out of soya or simply a dislike of soy foods. Vegetarians should be encouraged to consume more soy based foods since they are high biological value protein food comparable to animal products [37]. Soy foods are very important meal component for those who are still in the growing up phase (adolescents) as they are in need of the 10 essential amino acids to meet their growth spurt [32].

On the whole, nutsand green peas were found to be consumed often by vegetarians. As a good

source of protein, nuts could also be used to add variety to the vegetarian diet. Vegetarians should make the extra effort to eat a variety of nuts. In addition, meat alternatives (veggie burgers and sausages), cheese and yoghurt which are good sources of protein, are used rarely and even not consumed at all by some. High prices of these items can be a limiting factor for their consumption or respondents may not be used to eat such foods.

The high consumption of beans by vegetarians greatly increases their protein intake. Knowledge about the protein content of foods such as beansand cheese was very good among the respondents. However, many respondents believed that vegetarians do not get enough protein in their diet. This may be due to the fact that for sources of protein, the emphasis has always been on protein quality of animal foods and because of this, they might have assumed that most probably vegetarians' de-facto are not getting enough protein.

On the other hand, the majority of the non-vegetarian respondents were found to consume chicken, goat, beef, fish, liver, pork, sea foods, snail and sausage. This is a major source of protein for the non-vegetarians, since the non-vegetarians prefer animal protein to plant protein. Also, the much consumption of milk and dairyproducts by non-vegetarians provide protein with animal source.

Non-Vegetarians seem not to make good use of cereals such as millet. Again, as with the vegetarians, it was observed that the consumption of soya-based products was not too popular among the non-vegetarian respondents. This may be because their ignorance of the nutritional benefits of soya-based products. Again, non-vegetarians should be encouraged to consume more soy based foods since they are high biological value protein food comparable to animal products.

On the whole, nutsand green peas were found not to be consumed often by non-vegetarians. As a good source of protein, nuts could also be used to add variety to the non-vegetarian diet. Also, cheese and yoghurt which are good sources of protein are used rarely by non-vegetarians. High prices of these items can be a limiting factor for their consumption or respondents may not be used to eat such foods. The high consumption of beans by vegetarians greatly increases their protein intake. Knowledge about the protein content of foods such as beans and cheese was very good among the respondents.

3.3 Protein Consumption Pattern by Vegetarians`

Table 3 shows the frequency and percentage of the consumption of proteins by vegetarian respondents in the study area. Findings revealed that 100% of respondents never consume chicken, goat meat, beef and fish. The result also shows that 72% never consume eggs; 11% sometimes eat it; 9% often eat eggs and 8% rarely eat it. Milk was indicated never to have been consumed by 58% of vegetarians; 18% often take milk; 15% sometimes took it and 9% rarely ate it. Findings indicated that beans was often consumed by 50% of vegetarian respondents; 33% sometimes eat beans; 9% and 8% rarely and never consumed beans respectively. Yoghurt had respondents who never consumed it ranking highest with 60%; followed by 19% by those who often eat it while sometimes and rarely consumers were 13% and 8% respectively.

The result also showed that 45% of vegetarians often eat groundnut, 33% for rarely consumers; 15% for sometimes while 7% never consumed groundnuts. Findings indicated that 35% of respondents never consumed cashew nuts; 29% often; 19% rarely and 17% sometimes. Liver had 100% for respondents who never eat it. As regards the consumption of soya beans, the results showed that 42% never eat it; 25% sometimes eat it; 19% rarely and 14% often eat soya beans. Pork had 100% for respondents who never eat it. Findings also showed that green peas ranked highest for respondents who never eat it with 48%; 25% often eat it; 15% sometimes eat it and 12% rarely eat green peas. Cheese was never consumed as indicated by 79% respondents; 13% often eat it; 5% rarely eat cheese and 3% sometimes eat it.

The results revealed that peanut butter was indicated as being never consumed 41%; followed closely with 25% for respondents who often eat it; next to 19%for respondents who sometimes eat it and 14% for those who rarely eat peanut butter. Sea foods, snails and sausage were never consumed by the vegetarians with 100% each. Millet consumption by vegetarians was indicated never, sometimes, rarely and often by respondents with 68%, 15%, 9% and 8% respectively. The Table also showed that walnuts were consumed often by 35% of the vegetarians;

rarely by 26%; never by 24% and sometimes by 15%. From the result, it can be deduced that wheat consumption had 59% for respondents who never eat it; 19% for sometimes; 13% for often and 9% for those who rarely eat it. The results showed that tiger nuts were consumed often by 49% of vegetarians; sometimes by 23%; never by 17% and rarely by 11%.

3.4 Protein Consumption Pattern by Non-vegetarians

Table 4 reveals the frequency and percentage of the consumption of proteins by non-vegetarian respondents in the study area. Findings revealed that 42% of non-vegetarians consume chicken sometimes; 31% often; 20% rarely and 7% never

Table 2. Protein intake of vegetarians and non-vegetarians

S/N	Protein intake	Vegans (f)	(%)	Non-vegans (f)	(%)
1.	**Do you know proteins**				
	Yes	153	98	224	97
	No	3	2	8	3
	Total	156	100%	232	100%
2.	**Do you eat protein foods**				
	Yes	149	97	210	94
	No	4	3	14	6
	Total	153	100%	224	100%
3.	**Reasons for not eating proteins**				
	Health	3	75	10	71
	Other reasons	1	25	4	29
	Total	4	100%	14	100%
4.	**Preferred protein**				
	Animal	0	0	107	51
	Plant	88	59	21	10
	Animal/plant	61	41	82	39
	Total	149	100%	210	100%
5.	**Protein foods eaten**	**(149)**	**(%)**	**210**	**(%)**
	Chicken	0	0	196	93
	Goat meat	0	0	179	85
	Beef	0	0	183	87
	Fish	0	0	199	95
	Egg	42	28	185	88
	Milk	62	42	181	86
	Beans	137	92	152	72
	Yoghurt	59	40	184	88
	Groundnuts	139	93	155	74
	Cashew nuts	97	65	79	38
	Liver	0	0	189	90
	Soya beans	87	58	96	46
	Pork	0	0	111	53
	Green peas	78	52	94	45
	Cheese	32	21	56	27
	Sea foods	0	0	179	85
	Snails	0	0	137	65
	Millet	48	32	12	6
	Sausage	0	0	173	82
	Walnuts	113	76	85	40
	Ham	0	0	109	52
	Wheat	61	41	32	15
	Tiger nuts	124	83	130	62

eat chicken. It also indicated that goat meat is often eaten by 37% of the non-vegetarian respondents; 28% sometimes; 19% and 16% for rarely and never respectively. The table indicates that 47% often eat beef; 25% for sometimes; 15% for rarely and 13% for respondents who never eat beef. Fish ranked highest 49% by respondents who often eat it; 24% rarely; 22% sometimes and 5% for never. The result also shows that 42% often consume eggs; 27% sometimes eat it; 19% rarely eat eggs and 12% never eat it. Milk was indicated to have been consumed often by 37% of non-vegetarians; 32% sometimes take milk; 21% rarely took it and 10% never ate it.

Findings indicated that beans was often consumed by 33% of non-vegetarian respondents; 28% never eat beans; 20% and 19% sometimes and rarely consumed beans respectively. The consumption of soy bean could have some positive effects on immunity [38]. Yoghurt had respondents who rarely consumed it ranking highest with 36%; followed by 29% by those who sometimes eat it while often and respondents who never consumed it were 23% and 12% respectively.

The Table also showed the result of consumers of groundnuts with 32% for respondents who rarely eat it; 30% for often consumers; 26% for never while 12% sometimes consumed groundnuts. Findings indicated that 62% of respondents never consumed cashew nuts; 15% often; 13% rarely and 10% sometimes. Liver had 56% for respondents who often eat it; 19% rarely eat it; 15% sometimes while 10% never eat liver. As regards the consumption of soya beans, the results showed that 54% never eat it; 18% often eat it; 15% sometimes and 13% rarely eat soya beans. Pork had 47% for respondents who never eat it; 24% rarely eat it; 16% often while 13% sometimes eat pork. Findings also showed that green peas ranked highest for respondents who never eat it with 55%; 24% often eat it; 13% sometimes eat it and 8% rarely eat green peas. Cheese was never consumed as indicated by 73% respondents; 11% rarely eat it; 9% sometimes eat cheese and 7% often eat it.

The results revealed that peanut butter was indicated as being never consumed by 69%; followed by 15% for respondents who rarely eat it; next to 9% for respondents who often eat it

Table 3. Frequency and percentage Analysis of proteinous food consumption by vegetarians in the study area

S/N	Frequency of consumption (n= 149)	Never (%)	Rarely (%)	Sometimes (%)	Often (%)
1.	Chicken	149 (100%)	0 (%)	0 (%)	0 (%)
2.	Goat meat	149 (100%)	0 (%)	0 (%)	0 (%)
3.	Beef	149 (100%)	0 (%)	0 (%)	0 (%)
4.	Fish	149 (100%)	0 (%)	0 (%)	0 (%)
5.	Egg	107 (72%)	12 (8%)	17 (11%)	13 (9%)
6.	Milk	87 (58%)	13 (9%)	22 (15%)	27 (18%)
7.	Beans	12 (8%)	14 (9%)	49 (33%)	74 (50%)
8.	Yoghurt	90 (60%)	12 (8%)	19 (13%)	28 (19%)
9.	Groundnuts	10 (7%)	49 (33%)	23 (15%)	67 (45%)
10.	Cashew nuts	52 (35%)	29 (19%)	26 (17%)	43 (29%)
11.	Liver	149 (100%)	0 (%)	0 (%)	0 (%)
12.	Soya beans	62 (42%)	29 (19%)	37 (25%)	21 (14%)
13.	Pork	149 (100%)	0 (%)	0 (%)	0 (%)
14.	Green peas	71 (48%)	18 (12%)	23 (15%)	37 (25%)
15.	Cheese	117 (79%)	8 (5%)	5 (3%)	19 (13%)
16.	Peanut butter	61 (41%)	21 (14%)	29 (19%)	38 (26%)
17.	Sea foods	149 (100%)	0 (0%)	0 (0%)	0 (0%)
18.	Snails	149 (100%)	0 (0%)	0 (0%)	0 (0%)
19.	Millet	101 (68%)	13 (9%)	23 (15%)	12 (8%)
20.	Sausage	149 (100%)	0 (0%)	0 (0%)	0 (0%)
21.	Walnuts	36 (24%)	38 (26%)	23 (15%)	52 (35%)
22.	Wheat	88 (59%)	14 (9%)	28 (19%)	19 (13%)
23.	Tiger nuts	25 (17%)	16 (11%)	35 (23%)	73 (49%)

and 7% for those who sometimes eat peanut butter. Sea foods were consumed often by 49%; rarely by 26%; never by 15% and sometimes by 10%. Snails were never consumed by 35%; sometimes by 32%; rarely by 22% and often by 11%. Millet was indicated never, often, sometimes and rarely by respondents with 90%, 6%, 2% and 2% respectively. Sausages were consumed often by 37%; sometimes by 33%; never by 17% and rarely by 13%. The Table also showed that walnuts were never consumed by 60%; often by 20%; sometimes by 13% and rarely by 7%. From the table, it can be deduced that wheat consumption had 85% for respondents who never eat it; 19% for rarely; 6% for often and 2% for those who sometimes eat it. The results showed that tiger nuts were never consumed by 38%; often by 32%; sometimes by 22% and rarely by 8%.

3.5 Effects of Dietary Patterns on the Health Status

Table 5 reveals the effects of dietary patterns of respondents. Findings indicate that 82.5% of vegetarian respondents' dietary pattern was a tool for reduced intake of saturated fat and cholesterol while 13.8% of non-vegetarians dietary pattern helped in reduced intake of cholesterol and saturated fat. Vegetarian diets are very low in saturated fat, free of cholesterol and rich in soluble fibres which helps slows the absorption of cholesterol and reduces its amount produced by the liver [39,40].

17.4% of vegetarians fall sick while 84.3% of non-vegetarians fall sick. Diagnosed ailments for vegetarians had 11.4% for malaria, 4.0% for typhoid and 0.0% for obesity, liver related issues, heart related issues, kidney related issues, immunity, hormonal imbalance, oedema and osteoporosis. That of non-vegetarians revealed 46.7% for malaria, 17.1% for typhoid followed by 41.4% obesity, 5.2% liver related issues, 3.8% heart related issues, 18.6% kidney related issues, 1.4% immunity, 1.9% hormonal imbalance, 22.4% oedema and 8.15% osteoporosis. The low rate of ailments diagnosed among vegetarians could be attributed to their nature of diet. Compared to non-vegetarians, vegetarians typically have a higher intake of fruits

Table 4. Frequency and percentage Analysis of proteinous food consumption by non-vegetarians in the study area

S/N	Frequency of consumption (n=210)	Never (%)	Rarely (%)	Sometimes (%)	Often (%)
1.	Chicken	14 (7%)	43 (20%)	88 (42%)	65 (31%)
2.	Goat meat	34 (16%)	39 (19%)	59 (28%)	78 (37%)
3.	Beef	27 (13%)	32 (15%)	53 (25%)	98 (47%)
4.	Fish	11 (5%)	50 (24%)	47 (22%)	102 (49%)
5.	Egg	25 (12%)	39 (19%)	57 (27%)	89 (42%)
6.	Milk	21 (10%)	44 (21%)	67 (32%)	78 (37%)
7.	Beans	58 (28%)	39 (19%)	43 (20%)	70 (33%)
8.	Yoghurt	26 (12%)	75 (36%)	61 (29%)	48 (23%)
9.	Groundnuts	55 (26%)	67 (32%)	26 (12%)	62 (30%)
10.	Cashew nuts	131 (62%)	28 (13%)	20 (10%)	31 (15%)
11.	Liver	21 (10%)	40 (19%)	32 (15%)	117 (56%)
12.	Soya beans	114 (54%)	27 (13%)	31 (15%)	38 (18%)
13.	Pork	99 (47%)	50 (24%)	28 (13%)	33 (16%)
14.	Green peas	116 (55%)	16 (8%)	27 (13%)	51 (24%)
15.	Cheese	154 (73%)	24 (11%)	18 (9%)	14 (7%)
16.	Peanut butter	145 (69%)	32 (15%)	14 (7%)	19 (9%)
17.	Sea foods	31 (15%)	55 (26%)	21 (10%)	103 (49%)
18.	Snails	73 (35%)	46 (22%)	68 (32%)	23 (11%)
19.	Millet	188 (90%)	5 (2%)	5 (2%)	12 (6%)
20.	Sausage	37 (17%)	27 (13%)	69 (33%)	77 (37%)
21.	Walnuts	125 (60%)	16 (7%)	28 (13%)	41 (20%)
22.	Wheat	178 (85%)	14 (7%)	5 (2%)	13 (6%)
23.	Tiger nuts	80 (38%)	17 (8%)	46 (22%)	67 (32%)

Table 5. Effects of dietary patterns on the health status of respondents in the study area

S/N	Effects of dietary patterns	Vegetarians (149) (f) (%)	Non-vegetarians (210) (f) (%)
1	Reduced intake of saturated fat and blood cholesterol	123 (82.5)	29 (13.8)
2.	Those who fall sick	26 (17.4)	177 (84.3)
3.	Ailments diagnosed		190 (100)
	Malaria	17 (11.4)	98 (46.7)
	Typhoid	6 (4.0)	36 (17.1)
	Obesity	0 (0.0)	87 (41.4)
	Liver related issues	0 (0.0)	11 (5.2)
	Heart related issues	0 (0.0)	8 (3.8)
	Kidney related issues	0 (0.0)	39 (18.6)
	Immunity	0 (0.0)	3 (1.4)
	Hormonal imbalance	0 (0.0)	4 (1.9)
	Oedema	0 (0.0)	47 (22.4)
	Osteoporosis	0 (0.0)	17 (8.1)

and vegetables. Fruits and vegetables are reported to contain antioxidant nutrients, and phytochemicals, all of which are important for adequate immune function [38]. Adequate amounts of antioxidants such as vitamins C and E has been reported to prevent damage caused by free radicals [41]. The findings of this study further revealed that vegetarians experience enhanced immune function.

4. CONCLUSION

The present study provides data on the protein intakes of vegetarians and non-vegetarians in Port Harcourt, Rivers State. Protein intake varied differently between the two groups. Non-vegetarians had the lowest intakes of cereals such as millet and wheat and higher intakes of animal proteins compared to those of vegetarians. On the other, vegetarians had highest intakes of beans, peas, nuts and cereals. Prevalence of vegetarianism was high in females than in males. Higher percentages of non-vegetarians fell sick and got diagnosed of ailments as compared with vegetarians suggesting that the vegetarians experience enhanced immune function. Reduction in saturated fat and blood cholesterol was a tool that influenced the respondents in choosing the vegetarian lifestyle. Based on the findings, it is recommended vegetarians consume more soy based foods since they are high biological value protein food comparable to animal products. Non-vegetarians should be encouraged to take more of cereals as they are an important source of many nutrients for populations especially for people living in the developing countries, where the lack of protein-rich foods and economic constraints compel them to rely upon cereals.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. William M, Paul FP. The structure and function of skin. 3rd ed. Academic press incorporated, Beaverton: Oregon; 2012.
2. Winston JC, Ann RM. Position of the American Dietetic Association:Vegetarian diets. Journal of American Dietetic Association. 2009;109:1266-1282.
3. Brzezińska M, Kucharska A, Sińska B. Vegetarian diets in the nutrition of pregnant and breastfeeding women. Journal of American Dietetic Association. 2016; 40(238):264-278.
4. Mangels R, Messina V, Messina M. The Dietitian's Guide to Vegetarian Diets, 3rd ed. Sudbury, MA: Jones and Bartlett Learning; 2011.
5. Craig WJ, Mangels AR. Position of the American Dietetic Association: Vegetarian diets. Journal of American Dietetic Association. 2009;109:1266-1282.
6. Swinburn BA, Sacks G, Lo SK, Westerterp KR, Rush EC, Rosenbaum M, Luke A,Schoeller DA, DeLany JP, Butte NF, Ravussin E. Estimating the changes in energy flux that characterize the rise in obesity prevalence. American Journal of Clinical Nutrition. 2009;89:1723-1728.

7. Shridhar K, Dhillon PK, Bowen L, Kinra S, Bharathi AV, Prabhakaran D. The Association between a Vegetarian Diet and Cardiovascular Disease (CVD) risk factors in india: The indian migration study. PLoSOne. 2014;9(10):e110586. DOI: 10.1371/journal.pone.0110586
8. Tripkovic L, Lambert H, Hart K, Smith CP, Bucca G, Penson S, Chope G,Hyppönen E. Comparison of vitamin D2 and vitamin D3 supplementation in raising serum 25-hydroxyvitamin D status: A systematic review and meta-analysis. American Journal of Clinical Nutrition. 2012;95(6): 1357-1364.
9. Monica D, Rosanna A, Gian FG, Alessandro C, Francesco S. Vegetarian, vegan diets and multiple health outcomes: A systematic review with meta- analysis of observational studies. Critical Reviews in Food Science and Nutrition. 2016;58(7): 1–9.
10. MaeveH, Maria H, Anne-Maria M, Mark F, Brijesh T. Future protein supply and demand: Strategies and factors influencing a sustainable equilibrium. Journal of Pubmed Central. 2017;6(7):58–69.
11. Cavazos A, Gonzalez de Mejia E. Identification of bioactive peptides from cereal storage proteins and their potential role in prevention of chronic diseases. Comprehensive Reviews in Food Science and Food Safety. 2013;12:364–380.
12. Rodriguez NR, DiMarco NM, Langley S. Position of the American Dietetic Association, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and athletic performance. Journal of American Dietetic Association. 2009; 109:509-527.
13. Khan N, Afaq F, Mukhtar H. Cancer chemoprevention through dietary antioxidants: Progress and promise. Antioxidant and Redox Signaling. 2008; 10:475-510.
14. Ekeinde A. Slum demolition plan ups tension in Nigeria oil hub. Reuters Africa. 2010;2. Retrieved 28 April, 2018
15. The Tide Newspaper. Medical Tourism: The Rivers Initiative. Port Harcourt: Rivers State Newspaper Corporation, February; 2014. Retrieved 28 April, 2018.
16. Demographia. Demographia World Urban Areas. (11th ed.), February; 2014. Retrieved 28 April, 2018.
17. World Population Prospects. - United Nations population estimates and projections.Department of economic and social affairs of the United Nations secretariat; 2014.
18. Ihejirika WC. Muslim minorities and media access in a predominantly Christian city: The case of Port Harcourt, Nigeria. In Winston Mano. Journal of African Media Studies and Intellect. 2009;469–491.
19. Bazzano LA, Li TY, Joshipura KJ, Hu FB. Intake of fruit, vegetables, and fruit juices and risk of diabetes in women. Diabetes Care. 2008;31:1311-1317.
20. Altorf-van der C, Kuil W, Engberink MF, Vedder MM. Sources of dietaryprotein in relation to blood pressure in a general Dutch population. PLoSOne. 2012;7: e30582.
21. Ruby M. Vegetarianism. A blossoming field of study. Appetite. 2012;58(1):141-150.
22. Kumar S, Syed A, Mohammed J, Shanawaz C, Mamum AD. Nutrition in lipidprofile in general population and vegetarian individuals living in Rural Bangladesh. Journal Obesity and Weight loss Therapy. 2012;55:123-138.
23. Marsh K, Zeuschner C, Saunders A. Health implications of a vegetarian diet. American Journal Lifestyle Medication. 2011;1(10):1177.
24. Belasco W. Food*:* The key concepts*.* Oxford University Press; 2008.
25. Leitzmann C. Vegetarian nutrition: Past, present, future. American Journal Clinical Nutrition. 2014;100:496–502.
26. Nivedita S, Singh SP, Raizada A. A comparative study on parameters of lipid metabolism and fasting blood sugar in normal vegetarians and non–vegetarians. Journal of Advanced Research in Biological Sciences. 2012;4(4):306–311.
27. Sluijs I, Joline WJB, Vander DL, Spijkermen AMW, Grobbee DE, Schouw YTV. Dietary inake of total, animal, and vegetable protein and risk of type 2 diabetes in the European prospective investigation (EPIC)-NL study. Diabetes Care. 2010;33(1):43-48.
28. Garcia AL, Koebnick C, Dagnellie PC, Leitzmann C, Hoffmann I. Long term strict raw food diet is associated with favourable plasma beta- carotene and low plasma lycopene concentrations in Germans. British Journal of Nutrition. 2008;99:1293-1300.

29. Xiao CW. Health effects of soy protein and isoflavones in humans. The Journal of Nutrition. 2008;138(6):1244-1249. Available:https://doi.org/10.1093/jn/138.6.1244S
30. Halkjær J, Olsen A, Overvad K, Jakobsen MU, Boeing H, Buijsse B, Palli D, Tognon G, Du H, Vander ADL, Forouhi NG, Wareham NJ, Feskens EJ, Sorensen TI, Tjonnel A. Intake of total, animal and plantprotein and subsequent changes in weight or waist circumference in European men and women: The Diogenes project. International Journal of Obesity (London). 2011;35:1104-1113.
31. Fraser GE. Vegetarian diets. What do we know of their effect on common chronic disease? American Journal of Clinical Nutrition. 2009;89:16075–16125.
32. Anderson JW. Beneficial effects of soy protein consumption for renalfunction. Asia Pacific Journal of Clinical Nutrition. 2008; 17(1):324-328.
33. Dagnelie PC, Mariotti F. Vegetarian diets: Definitions and pitfalls in interpreting literature on health effects of vegetarianism. Vegetarian and Plant-Bsed Diets in Health and Disease Prevention. 2017;3-10. Available:https:doi.org/10.1016/B978-0-12-803968-7.00001-0
34. Gili RV, Leeson S, Montes-Chani EM, Xutuc D, Contreras-Guillen IA, Guerrero-Flores GN, Martins MCT, Pacheco FJ, Pacheco SOS. Healthy lifestyle practices among Argentinan vegetarians and non-vegetarians. Nutrients. 2019;11:154. DOI: 10.3390/nu11010154
35. Olapade AA, Aworh OC, Oluwole OB. Quality attributes of biscuit from Acha (*Digitaria exilis*) flour supplemented with cowpea (*Vigna unguiculata*) Flour. African Journal of Food Science and Technology. 2011;2(9):198–203.
36. ADA. Position of the American Dietetic Association and Dieticians of Canada: Vegetarian diets. Journal of the American Dietetic Association. 2009;103(6):748-765.
37. Check J, Schutt RK. Research methods in education. Thousand oaks, CA: Sage. 2012;160.
38. Nieman, DC. Nutrition and the immune system. Tratto da vegetarian Nutrition and Health Letter. pubblicatodalla Loma Linda University (Traduzione in italiano). 2000; 3(1).
39. Yokoyama Y, Nishimura K, Barnard ND. Vegetarian diets and blood pressure: A meta-analysis. JAMA Internal Medicine. 2014;174:577-587.
40. Mann N, Pirotta Y, O'Connell S, Li D, Kelly F. Fatty acid composition of habitual omnivore and vegetarian diets. 2006;637-646.
41. Lobo V, Patil A, Phatak A, Chandra N. Free radicals, antioxidants and functional foods: Impact on human health. Pharmacognosy Reviews. 2010;4(8):118-126. DOI: 10.4103/0973-7847.70902

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/59091