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Nutritional Status of Obese Hypertensive Individuals Attending Irrua Specialist Teaching Hospital, Irrua, Edo State

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Adults and older people are more likely to have obesity-related hypertension which pose a double risk for cardiovascular diseases. Therefore, asessment of adults and older people's nutritional status has become an important issue due to a rise in ageing globally.
Objectives: The research determined the nutritional status of obese hypertensive individuals attending Irrua Specialist Teaching Hospital Irrua.
Methods: A descriptive cross sectional study design was used with a sample size of 440 obese hypertensive individuals. Questionnaires, personal interviews, clinical examination and anthropometric measurements wereused to collect data using purposive sampling technique. Data collected was analysed using Statistical Package for the Social Sciences (IBM SPSS) 22 Version.

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Results: A total of 440 respondents were used in the study and data were elicited from all of this number giving a 100% response rate. Out of the 440 (100%) respondents, 133 (30.2%) were males while 307 (69.8%) were females; 424 (96.4%) were 31 years and above. A total of 301 (68.4%) had high total cholesterol; uncontrolled hypertension and class 1 obesity were the highest among the study population represented by 36.1% and 53.2% respectively.
Conclusion: It can be concluded based on the key findings of this study that there is statistically significant association between nutritional status by Lipid Profile and obesity status by Body Mass Index (BMI) among the obese hypertensive individuals.
Recommendation: Obese hypertensive individuals should be encouraged from time to time to watch their lifestyle and check their nutritional status.

Keywords: Nutritional status; obese; hypertensive; individuals; hospital.

1. INTRODUCTION

Malnutrition is a highly prevalent condition in the hospital setting and is associated with many adverse outcomes [1]. Poor nutritional status increases the risk of infections, disease period and hospitalisation rates [2]. Patients in thehospital setting represent an important risk group for malnutrition [1]. According to Hassan et al. accurately defining obesity using anthropometric measures that best capture obesity-related risk is important for identifying high risk groups for intervention [3]. Current study showed that there were differences among males and females in the cutoffs of hip and waist circumferences, waist hip and waist-to-height ratios, abdominal and mid-upper arm circumferences, triceps skin-fold thickness, calf circumference, abdominal volume index, body roundness index, and body adiposity index [2].

Ezemagu et al. in a study provided a clear understanding of how appreciable increment in body mass index, waist girth, and waist-height ratio could lead to hypertension and variation in pulse pressure, systolic and diastolic blood pressure using correlation base analysis [4]. Precisely, it revealed that an appreciable increase in female waist and hip girth with the advancement in age could increase pulse pressure and lead to hypertension [4]. In a study carried out by Hong et al. it was found that even within normal body mass index range, high waist circumference and high percentage body fat is associated with hypertension [5].

Obesity and hypertension are considered to be two of the main risk factors for cardiovascular diseases. Alterations in the production of adipokines and pro-inflammatory substances by white adipose tissue play a variety of functions in atherogenesis in addition to adverse metabolic processes [6]. An increased BMI leads to a number of hormonal changes. Additionally, concomitant hormonal diseases can be present in obesity and have to be properly diagnosed – which in turn might be more difficult due to alterations caused by body fatness itself [7]. The distribution of adipose tissue also varies depending on sex, whereas men usually show android-type obesity, or visceral adiposity, women exhibit more commonly a deposition of fat involving the gynoid gluteo-femoral or subcutaneous type [8].

2. MATERIALS AND METHODS

Study Design: A descriptive cross sectional study design was used with a sample size of 440 obese hypertensive individuals. A purposive sampling technique was used in recruiting the study subjects. Questionnaires, personal interview and anthropometric measurements were used to collect data. The questionnaires was approved by the supervisor; they were pre-tested on 40 individuals in Irrua Specialist Teaching Hospital Irrua; the questionnaires was administered by the researcher after the respondents have signed the written informed consent form; it was ensured that the structured instrument/questionnaire was reliable and valid for the purpose of the research after validation by the research supervisor and two expert from the community. The Study was carried out by the researcher incorporating other scientists/ professionals on the need arises basis. The written informed consent forms were given (and after consenting) was followed by the collection of samples and other research procedures. Data collected was analyzed using Statistical Package for the Social Sciences (IBM SPSS) 22 Version and ENA Software Version 2011. Hypotheses were tested using Chi-square, t-test and Pearson Product Moment Correlation Coefficient at 95% confidence level.

Sample Techniques/ Size: A purposive sampling technique was used for this study. The

sample size was achieved within the period of six (6) months; it was based on individuals attending Irrua Specialist Teaching Hospital Irrua, Edo State who were screened and confirmed to be obese and hypertensive.

Sample size determination: [9]

$n= Z^2 pq/d^2$
Z= Level of significant = 1.96^2
p= Prevalence of indicators= 0.061(6.1%)
q= 1-p
d^2=Degree of Precision = 0.05^2
$n = 1.96^2 \times 0.061 (1-0.061)$
0.05^2
n=88.01
n= 88

- Minimum sample size

Sample size of 440

Study Area: The study area was Irrua Specialist Teaching Hospital located at KM87 Benin - Auchi expressway Edo State. Edo State is one of the 36 states of Nigeria, located in the south – south geopolitical zone of the country. It is bounded by the states of Kogi to the northeast and east, Anambra to the east, Delta to the southeast and south, and Ondo to the west and northwest; the Niger River flows along the state's eastern boundary. Benin City is the state capital and largest urban center. Edo state lies at elevations between 500 feet (150 m) in the south and more than 1,800 feet (550 m) in the north. Tropical rain forest covers most of the area. The state is inhabited largely by the Edo (Bini) people, who are linked to the historic kingdom of Benin [10].

Agriculture is the mainstay of the economy. Yams, cassava (manioc), oil palm produce, rice, and corn (maize) are the major subsistence crops, while rubber, timber, and palm oil and kernels are cash crops. Mineral resources include limestone and lignite. Industries produce pharmaceuticals, rubber, plywood, beer, sawn wood, and furniture. A network of trunk roads in the state and an airport at Benin City facilitate transportation. The Nigerian Institute of Oil Palm Research, the Rubber Research Institute of Nigeria, and the University of Benin (founded 1970) are located at Benin City, while a state university (founded 1981) is at Ekpoma. The state population figures were projected to be about 8,000,000 in 2022 [10].

Scope of Study: The research was limited to individuals attending Irrua Specialist Teaching Hospital Irrua, Edo State who are screened and confirmed to be obese and hypertensive. Irrua Specialist Teaching Hospital is a federal tertiary healthcare institution where people from different communities mostly within Edo State seek for healthcare services.

Study Population: The study population is the obese hypertensive individuals attending Irrua Specialist Teaching Hospital Irrua, Edo State. Population of the state is projected to be 8,000,000 as at 2022. The estimated obese hypertensive sub-population in the study area is 19%.

Inclusion Criteria: The study included all obese hypertensive individuals between the ages of 20 to 65 years attending Irrua Specialist Teaching Hospital Irrua, Edo State who gave both verbal and written consent to be part of the research.

Exclusion criteria: Obese and hypertensive who were below 20 years and above 65 years, critically ill and non-consenting individuals were excluded from the study.

Method and Instrument for Data Collection: Questionnaires, personal interviews, instruments for anthropometric, biochemical and clinical assessments were used to collect samples and data. Section "A" of the questionnaire captured the socio-demographic data of the individuals while section "B" the nutritional status of the obese hypertensive individuals attending the Irrua Specialist Teaching Hospital, Edo State. 8mls of blood was drawn from each of the participant for the nutritional biochemistry analysis (lipid profile, electrolytes, urea and creatinine, fasting/random glucose level).

Validity: It was ensured that the structured instrument/questionnaire was pre-tested and valid for the purpose of the research after validation by the research supervisors and two experts from the department of community and public health.

Reliability: The instrument/questionnaires were approved by the supervisors; they were pre-tested on 40 obese hypertensive individuals in Irrua community, Edo State; the questionnaires were administered by the researcher after the written informed consent form had been signed.

Limitation of Study: A follow-up study design could be much better to study the nutritional status of obese hypertensive individuals attending Irrua Specialist Teaching Hospital, Edo State.

Method for Data Analysis: Analysis of data was based on information obtained from the questionnaires, anthropometric measurement, biochemical information, clinical examination and personal interviews that was computed and presented in frequency distribution tables. Statistical Package for the Social Sciences (IBM SPSS) 22 Version and ENA Software Version 2011 was used for analyzing the data. Hypotheses were tested using Chi-square, t-test and Pearson Product Moment Correlation Coefficient at 95% confidence level.

3. RESULTS

3.1 Socio-demographic Characteristics of the Respondents

A total of 440 respondents/participants were used in the study and data were elicited from all of this number giving a 100% response rate. Out of the 440 (100%) participants, 133 (30.2%) were males while 307 (69.8%) were females. The age distribution shows that the highest proportion 424 (96.4%) were 31 years and above, 13 (3.0%) were within the age group 21-25 years, 3 (0.7%) were within the age bracket 26-30 years while none were recorded for age group 15 – 20 years. The mean age for the respondents was 33 years. Majority of the study participants 348 (79.1%) were married, followed by 40 (9.1%) who were widowed, 39 (8.9%) were single while 13 (3.0%) were divorced. Majority 409 (93.0%) of the respondents subscribed to Christianity, while 30 (6.8%) subscribed to Islam. Most of the respondents 254 (58.0%) had tertiary education, followed by 92 (20.9%) who had secondary education, 86 (19.5%) had primary education while 7 (1.6%) had no formal education. Few of the respondents 46 (10.5%) were into business as their occupation, followed by 43 (9.8%) who were civil servants and 13 (3.0%) who were farmers. Details of this result are presented in Table 1.

Table 1. Socio-demographic characteristics of respondents (N=440)

Variables	Frequency	Percent	Mean	Standard Deviation
Sex of respondents			1.70	0.460
Male	133	30.2%		
Female	307	69.8%		
Age of respondents			*33.37	2.503
15-20 years	0	0.0%		
21-25 years	13	3.0%		
26-30 years	3	0.7%		
31 years and above	424	96.4%		
Marital status			2.12	0.684
Single	39	8.9%		
Married	348	79.1%		
Divorced	13	3.0%		
Widowed	40	9.1%		
Religious affiliation			1.07	0.269
Christianity	409	93.0%		
Islam	30	6.8%		
Others	1	0.2%		
Educational status			2.35	0.846
No formal education	7	1.6%		
Primary level of education	86	19.5%		
Secondary level of education	92	20.9%		
Tertiary level of education	254	58.0%		
Occupation			3.24	1.815
Civil servants	34	9.8%		
Housewives	5	1.1%		
Farmers	13	3.0%		
Business Women/men	46	10.5%		
Applicants	4	0.9%		
Others	23	5.2%		

**Mean age*

3.2 Nutritional Status Data

On account to determine the Body Mass Index (BMI) of respondents, 234 (53.2%) were within 30-34.9 (class 1 obesity), 127 (28.9%) were within 35-39.9 (class 2 obesity) while 79 (18.0%) were within 40 and above (class 3 obesity). The waist circumference of the male response was 7 (1.6%), 26 (5.9%), and 92 (20.9%) for ≤ 94cm (Normal), 81-88.9cm (High), and ≥ 90cm (Very high) respectively while the waist circumference for the female respondents was 0 (0.0%), 10 (2.3%) and 305 (69.3%) for ≤ 80.9cm (Normal), 81-88.9cm (High), and ≥ 90cm (Very high) respectively. On account of the lipid profile, 139 (31.6%) had normal total cholesterol while 301 (68.4%) had high total cholesterol. The high-density lipoprotein was 23 (5.2%) low, 249 (56.6%) normal and 168 (38.2%) high. The low-density lipoprotein was 75 (17.3%) low, 225 normal, and 139 (8.9%) high (Table 2a).

The triglycerides for respondents was 251 (57.0%) normal and 189 (43.0%) high. With respect to the renal function test, the results of respondents showed 7 (1.6%), 399 (90.7%), and 24 (7.7%) for low, normal and high urea respectively. There was 10 (2.3%), 327 (74.3%) and 103 (23.4%) for low, normal and high serum creatinine respectively. There was 7 (1.6%), 350 (79.5%), and 83 (18.9%) for low, normal and high Sodium respectively while there was also 182 (41.4%), 238 (54.1%), and 20 (4.5%) for low, normal and high Potassium respectively (Table 2a). On account to measure the fasting blood glucose, there was 271 (61.6%) normal and 53 (12.0%) high while the random blood glucose was 63 (14.3%) normal and 53 (12.0%) high blood glucose. A total of 135 (30.7%) had normal (110/70-130/85) Blood Pressure (BP), 146 (33.2%) had mild (131/86-139/89) BP while 159 (36.1%) had severe (140/90 and above) BP (Table 2b).

On account to measure the fasting blood glucose, there was 271 (61.6%) normal and 53 (12.0%) high while the random blood glucose was 63 (14.3%) normal and 53 (12.0%) high blood glucose. More than half 251 (57.0%) of the respondents were active, followed by those 186 (42.3%) who were sedentary and a few 3 (0.7%) who were hyper-active in terms of activity level A total of 135 (30.7%) had normal/controlled (110/70-130/85) Blood Pressure (BP), 146 (33.2%) had mild (131/86-139/89) BP while 159 (36.1%) had severe (140/90 and above) BP (Table 2b).

3.3 Test of Hypotheses

There is no statistically significant association between nutritional status by Lipid Profile and obesity status by Body Mass Index (BMI) among obese hypertensive individuals in Edo State, Nigeria. The independent variable was nutritional status by Lipid Profile while the dependent variable was obesity status by Body Mass Index (BMI). The test statistic used in testing this hypothesis was the Chi-square at 95 CI (0.05 significance level). The study showed that total cholesterol was normal 139 (31.6%) among the class 1 obese individual and high among the class 2 obese individual. Similarly, there is an observable normal 'high and low density lipoprotein' 211 (48.0%) and 158 (%) among class 1 obese individuals as compared to other classes while the same high number of normal Triglyceride 234 (53.2%) was observed among class 1 obese individuals as compared to the high number 110 (25.0%) observed among class 2 obese individuals. Analysis using Chi-square test showed that the relationship between nutritional status by Lipid Profile and obesity status by Body Mass Index (BMI) ($P = 0.0001$; $df = 2$ and 4; at the different Chi-square statistically observed for each Lipid profile) was significant. Therefore, the null hypothesis was rejected and then concluded that there is statistically significant association between nutritional status by Lipid Profile and obesity status by Body Mass Index (BMI) among obese hypertensive individuals in Edo State, Nigeria (Table 3).

4. DISCUSSION

The result in this part of the study revealed that the nutritional status of the study participants reflected 53.2% class1 obesity, 28.9% class2 obesity and 18.0% class3 obesity. This is a reflection of the fact that BMI can be used to determine nutritional status. However, all the results depicted that all respondents were obese. This study is corroborated with that of Antonino et al. who asserted that obesity may be viewed as a multi factorial pathology and chronic low-grade inflammatory disease and the most widely used parameter for diagnosis of nutritional status is the determination of Body Mass Index (BMI) which can ascertain accumulation of body fat [11]. Even though it is demonstrated that BMI alone cannot define obesity, which consists not so much in weight gain as in excess fat mass, it is an independent risk factor for the development and progression of hypertension. This finding is also in tandem with the finding by Ezemagu et al.

who stated that nutritional status can be determined by BMI determination and if it reflects obesity, it can also be a pointer for hypertension [4].

The findings from this study also showed that there is a statistically significant association between nutritional status and the possibility of hypertension ($P < 0.05$). This further implies that those who are obese may be associated with hypertension especially if nutritional status is not monitored and this is why one can say obese hypertensive individuals to mean those who are obese and at the same time hypertensive. This assertion is synonymous with the assertion by Moath et al. that hypertension has been established as a common health condition among people and this can be focused on the impact of body mass index (BMI) and if hypertension is diagnosed among the obese, it can be said the individual in question is an obese hypertensive individual [12].

Table 2a. Nutritional status and clinical assessment data (N=440)

Variables	Frequency	Percent	Mean	Standard Deviation
Body Mass Index (BMI)			1.65	0.767
30-34.9 (Class 1 obesity)	234	53.2%		
35-39.9 (Class 2 obesity)	127	28.9%		
40 & above (Class 3 obesity)	79	18.0%		
Waist circumference in males			2.68	0.576
≤ 94cm (Normal)	7	1.6%		
95-101.9cm (High)	26	5.9%		
≥ 102cm (Very high)	92	20.9%		
Waist circumference in females			2.97	0.176
≤ 80.9cm (Normal)	0	0.0%		
81-88.9cm (High)	10	2.3%		
≥ 90cm (Very high)	305	69.3%		
Lipid profile				
Total cholesterol (≤ 200 mg/dl)			1.68	0.465
Normal	139	31.6%		
High	301	68.4%		
High density lipoprotein (35-60 mg/dl)			2.33	0.571
Low	23	5.2%		
Normal	249	56.6%		
High	168	38.2%		
Low density lipoprotein (100-159 mg/dl)			1.92	0.507
Low	76	17.3%		
Normal	225	73.0%		
High	139	8.9%		
Triglycerides (≤ 150 mg/dl)			1.43	0.496
Normal	251	57.0%		
High	189	43.0%		
Renal function test				
Urea (10-55 mg/dl)			2.06	0.299
Low	7	1.6%		
Normal	399	90.7%		
High	34	7.7%		
Serum creatinine (0.7-1.4mg/dl)			2.21	0.461
Low	10	2.3%		
Normal	327	74.3%		
High	103	23.4%		
Sodium (135-145 mmol/L)			2.17	0.418
Low	7	1.6%		
Normal	350	79.5%		
High	83	18.9%		
Potassium (3.5-5.3mmol/L)			1.63	0.569
Low	182	41.4%		
Normal	238	54.1%		
High	20	4.5%		

Table 2b. Nutritional status and clinical assessment data (N=440)

Variables	Frequency	Percent	Mean	Standard Deviation
Blood glucose				
Fasting (65-110 mg/dl)			2.16	0.370
Low	0	0.0%		
Normal	271	61.6%		
High	53	12.0%		
Random (120 mg/dl)			1.46	0.500
Normal	63	14.3%		
High	53	12.0%		
Blood Pressure			2.05	0.817
110/70-130/85 (Normal)	135	30.7%		
131/86-139/89 (Mild)	146	33.2%		
140/90 and above (Severe)	159	36.1%		
Food pattern			3.73	1.072
Breakfast and lunch	13	3.0%		
Lunch and dinner	50	11.4%		
Breakfast and dinner	83	18.9%		
Breakfast, lunch, dinner	208	47.3%		
Breakfast, lunch, dinner and extra	69	15.7%		
Lunch	17	3.9%		
Activity level			1.58	0.507
Sedentary	186	42.3%		
Active	251	57.0%		
Hyper-active	3	0.7%		
Blood Pressure				
110/70 - 130/85((Normal/Controlled)	135	30.7%	2.05	0.817
131/86-139/89 (Mild)	146	33.2%		
140/90 and above (Severe)	159	36.1%		

Table 3. Chi-square association between nutritional status by Lipid Profile and obesity status by Body Mass Index (BMI) among obese hypertensive individuals (N=411)

		Body Mass Index (BMI)			Chi-square (X^2)	P-value
Nutritional status by Lipid Profile	**Test variables**	Class 1 obesity (30 – 34.9)	Class 2 obesity (35 – 39.9)	Class 3 obesity (40 & above)		
	Total Cholesterol				178.876	0.0001*
	Normal	139 (31.6%)	0 (0.0%)	0 (0.0%)		
	High	95 (21.6%)	127 (28.9%)	79 (18.0%)		
	High Density Lipoprotein				329.798	0.0001*
	Low	23 (5.2%)	0 (0.0%)	0 (0.0%)		
	Normal	211 (48.0%)	38 (8.6%)	0 (0.0%)		
	High	0 (0.0%)	89 (20.2%)	79 (18.0%)		
	Low Density Lipoprotein				273.200	0.0001*
	Low	76 (%)	0 (0.0%)	0 (0.0%)		
	Normal	158 (%)	127 (%)	36 (%)		
	High	0 (0.0%)	0 (0.0%)	39 (%)		
	Triglycerides				379.909	0.0001*
	Normal	234 (53.2%)	17 (3.9%)	0 (0.0%)		
	High	0 (0.0%)	110 (25.0%)	79 (18.0%)		

**Statistical significance based on P-value < 0.05;*
df = 2; Critical value = 5.991 (for Total cholesterol and Triglyceride respectively)
df = 4; Critical value = 9.488 (for High and Low Density Lipoprotein respectively)

5. CONCLUSION

It can be concluded based on the key findings of this study that there is statistically significant association between nutritional status by Lipid Profile and obesity status by Body Mass Index (BMI) among obese hypertensive individuals; there is statistically significant association between obesity status by Body Mass Index (BMI) and hypertension among obese hypertensive individuals in Edo State, Nigeria ($p<0.05$).

6. RECOMMENDATION

Obese hypertensive individuals should be encouraged from time to time to watch their lifestyle and check their nutritional status.

Nutrition and health education by governmental and nongovernmental organization, health organizations/agencies, provision of basic necessities of life such as food, clothing and shelter especially to the poor populace, formulation and implementation of policies promoting healthy lifestyle should be a priority.

Improvement in the factors affecting the nutritional status of obese hypertensive individuals would be more effective if the economic situation of the community is simultaneously improved.

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Ethical Consideration: Ethical Consideration: The study was conducted according the National Code of Health Research Ethics in Nigeria (the CODE) and the Declaration of Helsinki. Every other institutional guideline was followed [13]. The health research ethics committee of the Irrua Specialist teaching hospital (ISTH REC) reviewed and approved the protocol before the field visit (REG. NO: NHREC/29/03/201). Appropriate culture-sensitive and specific written informed consent was sought and obtained from the parents of the children prior to participants' recruitment. The researcher ensured privacy in handling the participants and confidentiality in handling the data. All examinations were done in a safe, comfortable and private environment and the questionnaire was anonymous; the collected data was stored in a pass-worded computer only available to the principal investigator on a need to know basis. The data is available for inspection by regulatory authorities and for quality assurance for ten years.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Milicevic T, Radic J, Radman M, Dogas T, Zivkovic PM, Kovacic V. Nutritional status of patients with arterial hypertension in acute hospital setting. J Hypertens. 2018;36;Suppl 1:137.
   DOI: 10.1097/01.hjh.0000539357.98989.f4
2. Başıbüyük GÖ, Ayremlou P, Saeidlou SN, Ay F, Dalkıran A, Simzari Wida, et al. A comparison of the different anthropometric indices for assessing malnutrition among older people in Turkey: a large population-based screening. J Health Popul Nutr. 2021;40(1):13.
   DOI: 10.1186/s41043-021-00228-z, PMID 33785057.
3. Hassan S, Oladele C, Galusha D, Adams OP, Maharaj RG, Nazario CM, et al. Anthropometric measures of obesity and associated cardiovascular disease risk in the Eastern Caribbean Health Outcomes Research Network (ECHORN) Cohort Study. BMC Public Health. 2021;21(1):399.
   DOI: 10.1186/s12889-021-10399-3, PMID 33632164.

4. Kenneth EU, Chinedu UG, Christian AO, Ezeonu PO, Obaje SG. Analysing trio-anthropometric predictors of hypertension: Determining the susceptibility of blood pressure to sexual dimorphism in Body stature. Int. J Hypertens. 2021;2021(6):1-6.
DOI: 10.1155/2021/5129302
5. Seok Lee HS, Park Y-M, Han Kyungdo, Yang JH, Lee Seungwon, Lee SS, et al. Obesity-related hypertension: findings from the Korea National Health and Nutrition Examination survey 2008-2010. PLoS One. 2020;15(4):e0230616.
DOI: 10.1371/journal.pone.0230616, PMID 32315310.
6. Zoltán J, Ágnes H, Adél N, Ildiko S, György P, Péter F. Alterations in anthropometric, physiological and biochemical parameters during a complex exercise and dietary treatment program for obese patients with controlled hypertension. J Hypertens. 2021;39:333-40.
7. Pasquali R, Casanueva F, Haluzik M, van Hulsteijn L, Ledoux S, Monteiro MP, et al. European Society of Endocrinology Clinical Practice guideline. European Society of Endocrinology Clinical Practice Guideline: Endocrine work-up in obesity. Eur J Endocrinol. 2020;182(1):G1-G32.
DOI: 10.1530/EJE-19-0893
PMID 31855556
8. Castelnuovo G, de Cuevillas B, Alfredo Martinez SN-C J. Body fat mass assessment and obesity classification: A review of the available methods for adiposity estimation. Prog Nutr. 2021; 23(1):2021014.
9. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? Indian J Psychol Med. 2013 Apr;35(2):121-6.
DOI: 10.4103/0253-7176.116232
PMID 24049221
PMCID PMC3775042.
10. Gaur A, Mckenna A, State E. Nigeria. Encyclopedia Britannica.
https://www.britannica.com/place/Edo-state-Nigeria.
[Accessed Feb 24, 2023].
11. De Lorenzo A, Gratteri S, Gualtieri P, Cammarano A, Bertucci P, Di Renzo L. Why primary obesity is a disease? J Transl Med. 2019;17(1):169.
DOI: 10.1186/s12967-019-1919-y, PMID 31118060.
12. Ejheisheh MA, Correa-Rodríguez M, Fernández-Aparicio Á, Ahmad Batran M, Schmidt-RioValle JM-JJ. Obesity-related parameters are associated with blood pressure in palestinian children. Biol. Res Nurs. 2020;23(2):151-9.
13. Federal Ministry Of Health. National code of Health Research ethics. ISBN: 978-978 080-708-5; 2007.
Available:http://www.nhrec.net/nhrec/NCHRE_July%2007.pdf

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