



Correlation and Regression Analysis of Age and Body Mass Index (BMI) Among Nsidung Fisher Folks, Calabar South, Cross River State, Nigeria: The Counselor Sensitization Strategy

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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

The research focuses on the relationship between age, blood pressure and body mass index among fisher folks at Nsidung, Calabar south, cross River state Nigeria. The study evaluated one hundred and twenty fisher folks separated into six groups based on age. Appropriate equipment and tools were used to measure the systolic and diastolic blood pressures and pulse rates. The body mass index was determined using weight over square of height (kg/m^2). The data generated was analyzed using Pearson's' correlation coefficient and linear regression analysis. The results showed that the age of the Nsidung fisher folks correlates strongly, positively and significantly with their body mass index and systolic blood pressure and correlated negatively, weakly and non-significantly with diastolic blood pressure, mean body weights, height and pulse rate. The results also revealed that a body mass index is linearly dependent on the age of the fisher folks. The results of correlation analysis reveals that age correlated ($r=0.719$; $p<0.001$) and ($r=0.883$; $p<0.001$) significantly,

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positively and strongly with Body mass index (BMI) and systolic blood pressure respectively. The study revealed the line of best fit equation $Y = 1.2329X + 23.937$ with a significant regression coefficient R^2 of 0.5182. The counselor's intervention strategy will focus on the creation of awareness on the need for a regular and routine blood pressure check - up by all fisher folks at Nsidung. There is need to create awareness on the potential risk factors that predisposes the Nsidung fisher folks to increased blood pressure and pulse rates. The need for urgent guidance and counseling program for the Nsidung fisher folks on the dangers of drug abuse, smoking and poor dieting which is highly prevalent among them. The need for government safety nets intervention program for the aged among the Nsidung fisher folks to forestall increasing cardiac associated problem which is highly prevalence among the aged.

Keywords: Relationship; age; blood pressure; body mass index; hypertension; predisposing factors; fishermen.

1. INTRODUCTION

The goals of genetic counselors are to provide families with complete and appropriate information to aid people in making informed decisions that is in the best interest of their families and help them take best alternatives available that can prevent loss of lives and possible adjustments to any situation [1]. Genetic counselling as a tool in public health has three main goals which include (i) prevention through genetic counselling (ii) treatment security and management of person detected during screening programs and patients seen in diagnostic and counseling centers (iii) research and development of public policies and for further scientific progress. This strategy of the counselor promises a great deal of breaking through in both predictive and diagnostic benefits to public health especially for the less informed members of the society [2].

Also, some common diseases such as coronary heart diseases, diabetes mellitus, cancer and susceptibility to infections tend to cluster in families. Such families' aggregation disorders are rarely caused by a single gene, rather it results from cumulative interaction of several genes with environmental factors [3]. These disorders are known as polygenic inheritance. Scott, further stated that molecular genetics has establish physical genetic maps of many organisms including the human genome and most of the genes involved in polygenic diseases of both adults and birth defects of children have been characterized and mutant alleles that predisposes organisms to such diseases have been identified and published.

A lot of people have cut short their lives due to negligence on their part to carry routine check-up of their health status. This is been worrisome

especially self-dependent, self-employed and low income earners in most third world countries such as Nigeria. The Nsidung beach is one of such area in Calabar south, Cross River State, where the bulk of the residence are fishermen. They are self-employed and low income earners who engage in artisanal fishing in the Great Qua and Calabar Rivers for their livelihood. They goes into the high sea even at midnight for fishing as the waters are belief to be calm and quiet in the night favouring heavy catch of fishes that come to surface water at night to feed. These activities of the Nsidung fisher folks predisposes them to a wide variety of heart related disease due to increased blood pressure and pulse rates arising from uncertainties and increased alcoholism [4].

The identification and subsequent treatment of early life predisposing factors made it possible to prevent, control and eliminate heart related diseases in organism thereby saving life and reducing human mortality and have remained invaluable in public health assessment worldwide. Diseases are a lack of a healthy state of life, a disorder or illness caused by infections, genes defects and life style rather than by accident. Medically disease is defined as any deviation from or interruptions of the normal structure or function of any body part, organ or system that is manifested by a characteristic set of symptoms and signs and whose etiology, pathology and prognosis may be known or unknown. Disease is said to have caused over three hundreds million illnesses and over five million deaths against accident and other causes of death. For being the number one killer, conquering heart related diseases is given premium in the scale of preference of the quest to conquer nature in human search for reliable knowledge which is the core concern of scientific investigations [5].

Diseases may be caused by several factors originating from external or exogenous sources such as microbial – related or infectious diseases, or internal dysfunctions such as autoimmune diseases. Other non-infectious diseases include cancer, most heart diseases, genetic diseases such as sickle cell anemia, albinism, down syndrome. The study focuses on the relationship between age, blood pressure and body mass index with the incidence of heart related ailments like hypertension, obesity and coronary diseases in fisher folks who barely take out time to go for health status check-up.

2. MATERIALS AND METHODS

2.1 Research Area

The study on the correlation of body mass index with incidence of hypertension and diabetes among fisher-folks was carried out at Nsidung, Calabar South LGA, of Cross River State. The fisher-folks are artisanal fishermen who ply their trade at the Calabar and Great Qua rivers.

2.2 Study population

The study population consisted of 120 fisher folks carrying out their fishing activities at Nsidung beach of the Great Qua and Calabar rivers. The fisher folks were divided into six age brackets as follows;

- (i) 21 – 30 yrs
- (ii) 31 – 40 yrs
- (iii) 41 – 50 yrs
- (iv) 51 - 60 yrs
- (v) 61 – 70 yrs
- (vi) > 71 yrs

Twenty (20) respondents were randomly selected from each age brackets and used for the study. The respondents' ages were ascertained through brief structure questionnaire. Only male fisher folks were used for the study. The researchers receive consents from all the fisher folks who were very happy measuring their blood pressure and body mass index parameters free of charges and most of them for the first time in their life time.

2.3 Blood Pressure

Blood Pressure is a measure of the force of blood flowing against the walls of the arteries. The blood pressure readings have two numbers which is indicated as 120/80 mmHg

(Systolic/Diastolic or SYS/DIA). A single measurement of blood pressure does not provide an accurate indication of the true blood pressure. Hence the need to repeat measurements at specific time interval is ideal as done in the present study.

2.4 Measurement of Systolic Blood Pressure

The systole is the highest pressure in the cycle which is called the systolic blood pressure. This blood pressure is necessary to enable the evaluation of blood pressure status by healthcare professionals. The OMRON M2 Automatic Upper Arm Blood Pressure Monitor (Intellisense) for all health care was used in the determination of systole in mmHg. It is a clinically validated – intellisense technology which ensures accurate and comfortable measurement of content. Vietnam: Model (code): M2 (HEM-1721-E) with irregular heartbeat detection inbuilt meter. It ranges from 20 – 300 mmHg, with increasing risk of heart diseases as value increases. This measurement was repeated thrice at three days interval and the means taken for the different age brackets used in the study.

2.5 Measurement of Diastolic Blood Pressure

The diastole is the lowest pressure in the cycle which is called the diastolic blood pressure. This blood pressure is necessary to enable the evaluation of blood pressure status by healthcare professionals. The OMRON M2 Automatic Upper Arm Blood Pressure Monitor (Intellisense) for all health care was used in the determination of diastole in mmHg. It is a clinically validated – intellisense technology which ensures accurate and comfortable measurement of content. Vietnam: Model (code): M2 (HEM-1721-E) with irregular heartbeat detection inbuilt meter. It ranges from 1 - 150 mmHg, with increasing risk of heart diseases as value decreases. This measurement was repeated thrice at three days interval and the means taken for the different age brackets used in the study.

2.6 Measurement of Pulse Rate

This is the measurement of heart beats per minute. The OMRON M2 Automatic Upper Arm Blood Pressure Monitor (Intellisense) for all health care was used in the determination of diastole in mmHg. It is a clinically validated – intellisense technology which ensures accurate and comfortable measurement of content.

Vietnam: Model (code): M2 (HEM-1721-E) with irregular heartbeat detection inbuilt meter. it displays 40 to 180 beats/min. This measurement was repeated thrice at three days interval and the means taken for the different age brackets used in the study.

meters using a meter rule. Each respondent was made to stand beside the meter rule and the height was read perpendicular to the respondent head from the meter rule which was recorded in meters and the average for each age bracket extrapolated and tabulated (Table 2).

2.7 Measurement of Weight (kg)

The weights of ten (10) fisher folk’s respondents in the different age brackets were measured in kilograms using a manual weighing balance. Each respondent was made to climb the balance and the weight as displayed in the balance meter was recorded in kilogram and the average for each age bracket extrapolated and tabulated (Table 2).

2.9 Determination of Body Mass Index (BMI)

Body mass index (BMI) is a simple index of weight – for – height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m²). The mean weights and the heights measured from each of the respondents age brackets were used in the determination of the body mass index for each group. The BMI was tabulated in Table 2.

2.8 Measurement of Height (m)

The heights of ten (10) fisher folk’s respondents in the different age brackets were measured in

$$BMI = \text{weight (kg)} / \text{Height} \times \text{Height (m}^2\text{)}$$

Table 1. Indications and Classification of BMI (kg/m2)

S/N	Classification	Principal –cut-off point	Additional cut-off points
1	Underweight	< 18.50	<18.50
	Severe thinness	<16.00	<16.00
	Moderate thinness	16.00 – 16.99	16.00 - 16.99
	Mild thinness	17.00 – 18.49	17.00 – 18.49
2	Normal Range	18.50 – 24.99	18.50 – 22.99
			23.00 – 24.99
3	Overweight	>25.00	>25.00
4	Pre-obese	25.00 – 29.99	25.00 – 27.49
			27.50 – 29.99
5	Obese	>30.00	>30.00
6	Obese Class I	30.00 – 34.99	30.00 – 32.49
			32.50 – 34.99
7	Obese Class II	35.00 – 39.99	35.00 – 37.49
			37.50 – 39.99
8	Obese Class III	>40.00	>40.00

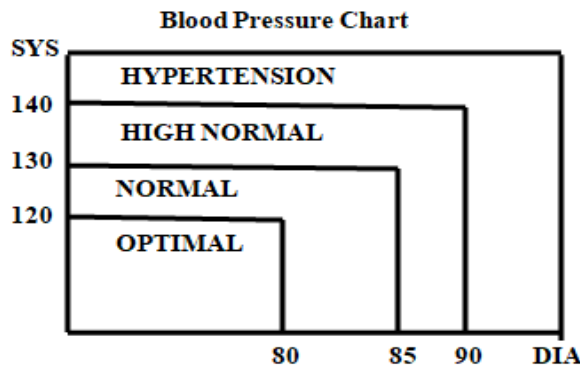


Fig. 1. Blood pressure chart

2.10 Statistical Analysis

The data generated from the measurement of systoles, diastoles, pulse rates, weights, heights and calculation of body mass indices for all the age brackets. The Minitab V 17 statistical software was used to analyze for the correlation coefficients, regression analysis, multiple components chart and radar distribution of the identified parameters. The blood pressure chart was used to interpret blood pressure results for the different age brackets while the indicator Table 3 was used interpret the body mass index.

3. RESULTS

The results of blood pressure indices including the systolic, diastolic and pulse rate and body mass index and its parameters measured and obtained from the respondents fisher folks are according to their age brackets are presented in Table 2. The results reveals that the youngest age bracket evaluated was 21 – 30 years while fisher folks between 71 years and above was the highest age bracket. The highest mean systolic blood pressure of 139 mmHg was obtained from the > 70 yrs age bracket and the least mean systolic blood pressure of 112 mmHg was obtained from the 21 – 30 yrs category. The highest mean diastolic blood pressure of 99 mmHg was obtained from the 61 - 70 yrs age bracket and the least mean diastolic blood pressure of 64 mmHg was obtained from the > 70 years category. The smallest mean Pulse rate of 59 heartbeats per minutes was obtained from the >70 yrs age bracket while mean of 79 heartbeats per minute was obtained from the 41 – 50 yrs category.

Results of body mass index as presented in Table 2 showed that only the youngest age bracket of 21 -30 yrs have a mean BMI of 23.39 kg/m² that falls within the normal range of health status (Table 2 and Fig. 1). The 31 – 40 yrs and the 61- 70 age brackets showed mean BMI of 25.67 kg/m² and 27.42 indicating pre-obese conditions respectively. The 41 – 50, 51 – 60 and above 70 yrs categories showed BMI of 30.51 kg/m², 31.56 kg/m² and 30.46 kg/m² respectively revealing an obese Class 1 hypertension (Table 2 and Fig. 1).

The results of correlation coefficient analysis of Age brackets, blood pressure indices and Body mass index parameters are presented in Table 3. The results indicated that age correlated ($r=0.719$; $P<0.001$) strongly, positively and significantly with body mass index of the fisher folks. The age of the fisher folks was also found be correlate ($r=0.883$; $P<0.001$) strongly, positively and significantly with systolic blood pressure. The age of the fisher folks showed negative, weak and non-significant correlation ($r= - 0.282$; $P>0.001$), ($r= -0.758$; $P>0.001$) and ($r= - 0.231$; $P>0.001$) with body weights, heights and pulse rate respectively (Table 3).

The results of regression of age against body mass index or the dependency of body mass index on age of Nsidung fisher folks is presented in the regression curve in Fig. 2. The results reveals a line of best fit equation to be $Y = 1.2329X + 23.937$ and a regression coefficient or determination coefficient $R^2=0.5182$. The results indicate a linear relationship between age and body mass index of the fisher folks (Fig. 2).

Table 2. Results of Blood pressure measurements and body mass index determination for fisher – folks at Nsidung

S/N	Age bracket of respondents (yrs)	Systole (mmHg)	Diastole (mmHg)	Pulse rate	Weight (kg)	Height (m)	Body Mass Index (BMI) kg/m ²	Remarks
1	21 – 30	112	82	73	62	1.63	23.39	Normal
2	31 – 40	120	81	69	76	1.72	25.67	Pre-obese
3	41 – 50	119	82	79	83	1.65	30.51	Obese class I
4	51 – 60	123	89	71	89	1.68	31.56	Obese Class I
5	61 – 70	139	99	60	65	1.54	27.42	Pre-obese
6	71 and above	136	64	59	53	1.32	30.46	Obese class I

Table 3. Correlation Coefficient of Body Mass Indices of the Fisher Folks

	Age	Weight	Height	BMI	Systole	Diastole	Pulse Rate
Age	0.00						
Weight	-0.282	0.00					
Height	-0.758	0.785**	0.00				
BMI	0.719**	0.364	-0.291	0.00			
Systole	0.883**	-0.337	-0.607	0.428	0.00		
Diastole	-0.135	0.435	0.541*	-0.106	0.192	0.00	
Pulse Rate	-0.231	0.631*	0.787**	-0.231	-0.912	0.112	0.00

*Significant at 5% and ** Highly significant at 1% level of probability.

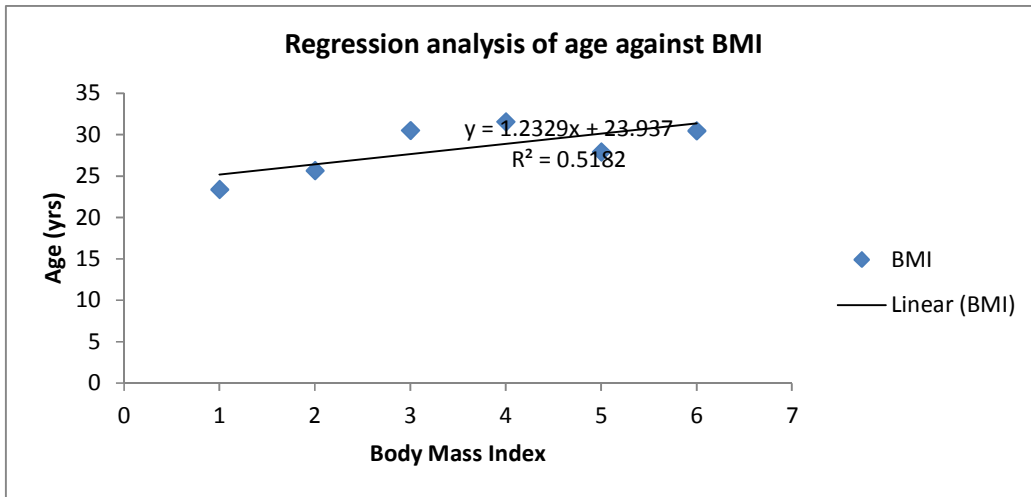


Fig. 2. Regression curve showing regression line of best fit and equation

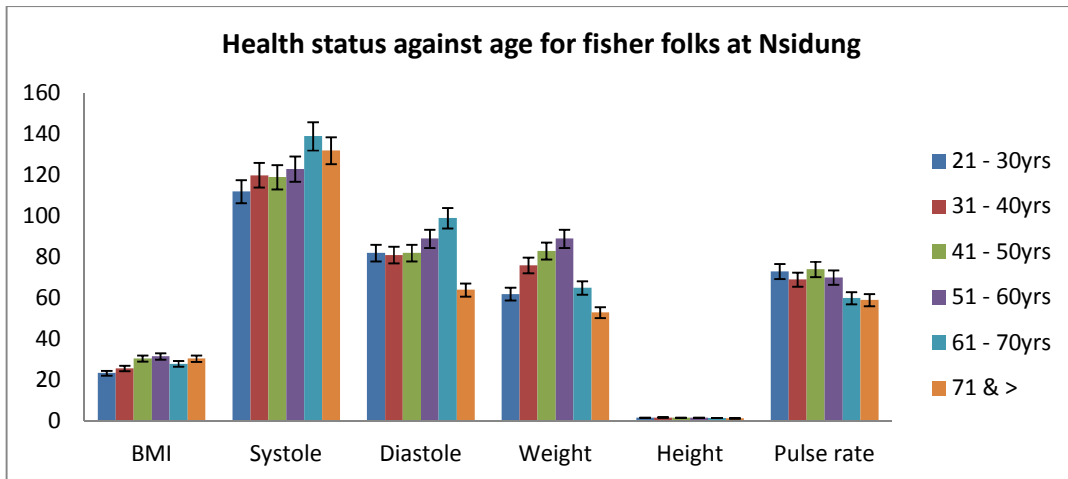


Fig. 3. Component bar chart of blood pressure indices against age

The results of mean statistical significant differences among the body mass indicators and blood pressure parameters are presented in Fig. 3. The results reveal that there were no statistical significant ($P > 0.05$) differences in the mean

heights of all age brackets. However, all other BMI indicators and blood pressure parameters varied ($P < 0.05$) significantly among the different age brackets of the fisher folks. The systolic and diastolic blood pressure parameters are

significantly high in to 21 – 30 years category of fisher folks. The diastolic blood pressure, Mean body weights and mean pulse rates are significantly least in the > 71 years category (Fig. 3).

4. DISCUSSION

Guidance and genetic counseling and interventions will help tremendously in reducing exposures and risk factors of obesity associated with wide variety of common diseases of public health importance including hypertension, diabetes and obesity. The early detection and identification of predisposing factors and subsequent treatment of early symptoms is possible to prevent, control and eliminate obesity associated diseases in humans thereby saving life and reducing human mortality and have remained invaluable in public health assessment worldwide.

The results of correlation analyses had shown that there is a strong, positive and significant relationship between age and body mass index and systolic blood pressure. From Table 1 increasing body mass index reveals is an indication of increasing obesity and class I and II. Fig. 1 also shows that increasing systolic blood pressure is synonymous with increasing risk of hypertension. The present study (Table 2) showed that the a higher proportion > 80% of the Nsidung fisher folks are pre-obese and obese class I with only less than 20% having normal health status and conditions. This is seen in the youngest age brackets among the fisher folks indicating that increasing risk of hypertension and obesity is age dependent as also revealed from the regression analysis. This finding corroborates with the reports of [6,7 8].

The results of regression analyses also revealed that line of best fit and linear equation ($Y=1.2329X + 23.938$) was obtained from the study where Y is the dependent variable (Body Mass Index) and X is the independent variable (Age). The rate of change in BMI as the fisher folks age increases in 1.2329 BMI meaning that for every additional age attained by the fisher folks, their average body mass index increases by 1.2329, a situation which is triggered by numerous predisposing factors. This condition and relationship is only applicable to the study population and the variables selected for the study as it may be contrary in other study

population. The opinion is in line with the position of [6,9,10].

4.1 Obesity

Obesity is a health condition presented in the form of excessive fat in human. It occurs when calories intake exceeds calories expended over an extended period of time. In some cases it is hereditary. Obesity is also the presence of large amount of fat in the subcutaneous tissues of the body. Mean values of body fat in the total body weight for normal young men is about 12% and for young women about 26% (Peterson, 2000). A man whose body fat amounts to over 20% of his total body weight may be considered obese and for women a Figure of over 40% is an indication of obesity.

Etiologically, obesity in this regards is multidimensional due to the following reasons; When calorie intake exceeds calorie expenditure (i.e over consumption or under expenditure of energy or frequently a combination of both). Over indulgence in sugary foods like cakes and chocolates and starchy foods like bread and biscuits as well as excessive or high intake of fatty foods [11,12].

4.2 Risk Factors of Obesity

The risk factors of obesity include; Age and sex – women are more prone to obesity than men Cultural factors as considering obesity as a mark of social prestige or a beauty marker. Bad eating habits involving the continuous nibbling of food and abuse of alcohols and smoking. This is very high among the respondents. Physical activity and exercise – obesity is common with those people who live sedentary lifestyle than active individuals and genetic factors – obesity is known to run in some families for which hereditary genes are responsible [11,12].

4.3 Health and Social Implications

Obesity has many health and social implications. Obesity predisposes individuals to diabetes, cancer, cardiovascular diseases, dental cares, etc. it may also lead to barrenness in females and hypertension in pregnant women. Life expectancy decreases by up to 25 % in some cases. The social implication includes wearing of unfashionable clothes, shyness and job preferences as also reported by [11,12].

4.4 Prevention and Treatment

These entails calorie restriction, regular exercise, use of drugs e.g. appetite de-stimulatory drugs, and medical supervision (Ewles and Smimet, 2005). Healthy diet with ample fibre, low in refined sugar, high in complex carbohydrates and moderate proteins are preventive measures. Others include regular exercise, weight reduction and refraining from habits like smoking and alcohol abuse which intake is very high and prevalent among the fisher folks at Nsidung. Note that refined sugar is a risk factor, not a direct primer of diabetes mellitus [6,12].

5. CONCLUSION

The study had shown that the age of the Nsidung fisher folks correlates strongly, positively and significantly with their body mass index and systolic blood pressure and correlated negatively, weakly and non-significantly with diastolic blood pressure, mean body weights, height and pulse rate. The study also revealed that a body mass index is linearly dependent on the age of the fisher folks. Hence, due to the increasing health risk associated with increasing body mass index with age, there is need to counsel the aged among the Nsidung fisher folks to seek for alternative means of livelihood as their chance of been hypertensive is very high.

5.1 Counselor Intervention Strategy

1. Creation of awareness on the need for a regular and routine blood pressure check - up by all fisher folks at Nsidung.
2. Create awareness on the potential risk factors that predisposes the Nsidung fisher folks to increased blood pressure and pulse rates.
3. The need for urgent guidance and counseling of the Nsidung fisher folks on the dangers of drug abuse, smoking and poor dieting which is highly prevalent among them.
4. There is need for government safety nets intervention program for the aged among the Nsidung fisher folks to forestall increasing cardiac associated problem which is highly prevalence among the aged.
5. Non-Governmental Organizations should also assist in reaching out to the fisher folks to reduce the problem of heart

diseases prevalent among the aged therein.

6. Donor agencies can provide fish processing facilities for the aged to reduce their artisanal fishing activities which predisposes them to high blood pressure.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Banta JE. Community Health today and tomorrow, New York. National league of nursing. 2009;215.
2. Scott J. Molecular genetics of common diseases. In British Med. Journal. Basic molecular and cell biology: London: The BMJ Publication. 2003;71.
3. Bulletin of Yale University. Epidemiology of Public health. 2003 – 2004;30- 31.
4. Porter IH. Genetic aspects of preventive medicine' in Last, J (1980) Maxcy-Rosenau Public health and preventive medicine, New York: Appleton – Century Croft. 2008;1409.
5. Davies A. Let's eat right to keep fit. 1st edition New York. Harcourt Brace Jovanovich Inc. 2007;41.
6. Umutong I. Exploring for knowledge. Uyo. Minder International Publisher. 2007;231.
7. Ubi GM. Genetic Screening and Counseling: Implications for Public health as Tools for Interventions in Obesity and Diabetes. Interventions in Diabetes and Obesity. 2018;6(2): 123–132.
8. Mancia G. Blood Pressure Determination and Diary. European Heart Journal. 2013;34(28):2159- 2219.
9. Egwu IN. Primary health care in Nigeria. Lagos, Elmore printing and publishing Co. Ltd. 2006;3.
10. Halan JJ, Pocket GE. Public health administration and practice. St Louis. Times Mirror/Mosby. 2004;3-7.

11. Ewles L, Simmeth I. Promoting health: A practical guide to health education. New York. John Wiley and Sons. 2005;5.
12. Peterson A. The new genetics and the politics of public health. Critical Public Health. 2000;8(1):59-65.

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