Journal of Natural Sciences Research www.iiste.org
ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online)
Vol.4, No.6, 2014

Health Forecast in Contemporary Society- A Case Study of Dorben Polytechnic Students, FCT Abuja

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Abstract
A good indicator of how much fat you carry is the Body Mass Index (BMI). Although it is not a perfect measure, it gives a fairly accurate assessment of how much of your body is composed of fat. BMI is a measure which takes into account a person's weight and height to gauge total body fat in adults. Thus, this study explored the relationship between body mass index (BMI) and Blood Pressure with waist circumference and serum fasting lipid levels of apparently healthy students attending Dorben Polytechnic, so as to make predictions on health. Samples were obtained from the representative students of the institution after oral consent. On the basis of BMI, all participants were divided into three groups via, underweight (BMI was less than 18.50 kg/m^2), normal weight (BMI was between 18.50- 24.90 kg/m^2) and overweight (BMI between 25.00 - 29.90 kg/m^2). The mean of serum lipid levels, waist circumference as well as blood pressure were within the normal range in all the three BMI categories. The BMI in underweight and overweight categories correlated well with risk factor of cardiovascular disease as compared to BMI in the normal category. The mean BMI of 18.39Kg/M^2 and 27.15Kg/M^2 recorded in the underweight and overweight category respectively have lipid profiles that are predictive of future metabolic disorder, if left unabated in geometric fashion, and in the long run. Health problems can be extrapolated following the trend, and by extension health forecast.
Key words: health forecast, Anthropometric parameters, Lipid profile

1. Introduction

The determination of one's state of health has been based on medical history. It comprises of the past and the present health-medical history. There is need to predict with near accuracy of the future health status of individuals, families and groups. This calls for a paradigm shift from medical history to Health Forecast.

Health is the level of functionality or metabolic efficiency of living organism. In human, it is the general condition of a person's mind and body, usually meaning to be free from illness, injury or pain as in good health. Accordingly WHO defines health in its broader sense in 1946 as a state of complete physical, mental and social well-being and not merely of the absence of disease or infirmity (World Health Organization 1946; Grad, 2002 and World Health Organization 2006).

Although this definition has been subject to controversy, in particular as lacking operational value and because of the problem created by use of the word "complete," it remains the most enduring (Callahan 1973) and (Jadad and O'Grady 2008). Other definitions have been proposed, among which a recent definition that correlates health and personal satisfaction (Bellieni and Buonocore 2009). Classification systems such as the WHO Family of International Classifications, including the International Classification of Functioning, Disability and Health (ICF) and the International Classification of Diseases (ICD), are commonly used to define and measure the components of health.

The associations between overweight and many diseases have been established. Body-fat distribution could possibly identify subjects with the highest risk of disturbed lipid and hypertension. Disturbed lipid profile has always been associated with cardiovascular diseases. Anthropometric parameters are commonly used as research tools to assess the non communicable disease risk factors in the populations as they are inexpensive and easy to monitor at the community level (Jaap *et al.,* 2001). Its measurements can easily reflect any changes in the lipid concentration in the human body.

The health and well being are adversely affected to an extent by the excessive fat accumulation and this is associated with obesity. Obesity is a worldwide health challenge, rapidly increasing, because feeding has changed to a marker of lifestyle rather than nutrition. With changing food habits and sedentary lifestyles, the prevalence of obesity has increased markedly in Western countries faster than the developing ones (Gortmarker *et al.* 1987). Obesity may increase the risk of many diseases such as diabetes, atherosclerosis, hypertension, hyperlipidemia, gall bladder diseases and cardiovascular diseases (Troiano *et al.,* 1995). Intra-abdominal fat has been identified as being the most clinically relevant type of fat in humans. Increased level of Low Density Lipoprotein (LDL), high Total Cholesterol (TC), and low levels of High Density Lipoprotein (HDL) are frequently observed in combination with hypertriglyceridemia (Lemos-Santos *et al.,* 2004).

1.1 Justification of the study

There is a growing burden of obesity and hypertension in developing countries, this is partly due to increased westernization; however, there is limited studies done on the contribution of body mass index (BMI), waist circumference, blood pressure (BP) and lipid profile. Hypertension in Nigeria today is the commonest risk factor for stroke, heart failure, ischemic heart disease and chronic kidney disease (Ogah, 2006). In Nigerian population, it is estimated that high Blood Pressure is the cause of 7.1 million deaths, and there are more than 300 million obese people worldwide as stated by the World Health Organization (WHO). Obesity increases the risk of high BP, coronary heart disease, ischemic stroke, type 2 diabetes mellitus, and certain cancers (Tesfaye *et al* 2002) In particular, it has been established that BMI is a significant predictor of cardiovascular disease and type 2 diabetes mellitus (Janssen *et al*., 2002). Furthermore, it was found that BMI is positively and independently associated with morbidity and mortality from hypertension (Pi-Sunyer 1993). The correlation between BMI and lipid profile has long been studied internationally (Denke *et al*., 1993; Dongsheng *et al*., 2008 ; Pihl and Jürimäe 2001, and Maki *et al*., 1997) and it is explained that BMI increases due to an increase in adiposity characterized by decreased high-density lipoprotein cholesterol (HDL-c) and increased triglycerides (Trujillo *et al*., 2005)

In the present study, an attempt has been made to investigate the correlation of BMI and waist circumference with Blood Pressure and lipid profiles in context of Nigerian School age, with Dorben Polytechnic Abuja FCT as a case study.

1.2 Significance of the study

More often than not people only concentrate on what they weigh. Perhaps, more important than weight is the percentage of fat in the body. The Nigerian Economy is still dwindling day by day paradoxically many are getting extra weight as seen in congestions in commercial vehicles and public sitting places hence regular complaint of been tight. I blamed these on mal-nutrition. Obesity is simple an excess of body fat and is an increasing problem in developed and developing countries including Nigeria (Ifeoma, 2013). By extension, Obesity has quadrupled, to nearly one billion in developing countries, worldwide. Many individuals who are affected by obesity are not even aware of it. Hence this work will be an eye-opener to the Nigeria populace.

1.3 Aim of the study

To investigate the relationship between anthropometric measurements and lipid profiles among Polytechnic students of Dorben Polytechnic.

2. Materials and Method

Human Subjects

A total of 80 randomly volunteered students (males and females) from Dorben Polytechnic Abuja, aged 18 – 28 years from different parts of Nigeria, were considered as samples. The study participants underwent a clinical assessment from the institution clinic after obtaining an informed oral consent. Ethical approval was obtained from the Ethical committee of the institution. In the present study we considered apparently healthy students as samples, because it is purely a correlation – study among BMI, Blood Pressure, waist circumference and the lipid profiles of students.

2.1 Method

They participants were measured for body mass index and four lipid profiles, viz. serum total cholesterol, triglycerides, HDL-C and LDL-C. Measurements of the weight to the nearest 0.1 kg by a weighing machine and height to the nearest of 0.1 cm by an anthropometer rod were done. In addition waist circumference was taken by tape.

BMI was calculated as weight (in kgs) divided by height (in meters) squared as indicated by the World Health Organization (WHO, 1998).

Venous blood samples were taken from all the subjects in the morning after fasting overnight (16hours). Total cholesterol and triglyceride concentrations were determined with a semi-automated enzymatic Analyzer (RA 50, Semi-auto Chemistry Analyzer,Bayer's India Ltd, India). HDL- Cholesterol serum level was measured by using phosphotungstate precipitation method. Standard Statistical calculations were also made. The results were expressed as mean and deviation calculated to the nearest two place of decimal.

Statistical analysis

Data were expressed as mean ±Standard deviation. The results were analyzed using 0ne way ANOVA. Post hoc test was also conducted to determine level of significance between the treated and control groups using Tukey-Kramer Multiple Comparisons Test. Statistical significance was considered at $P< 0.01$ and $P< 0.001$.

3.0 Results

The mean BMI (Height / weight), blood pressure (Systolic and Diastolic), waist circumference, and lipid profile levels were measured for all the participants.

The results are presented as mean and standard deviation, according to the BMI ranges. It is grouped into three BMI classifications via: BMI<less than 18.5Kg/M^2, BMI (18.5 – 24.9) Kg/M^2 and overweight (25.0 – 29.9

Kg/M^2).
The mean±standard deviation of the three categories in the 80 participants were; BMI (18.38±0.08Kg/M^2, 21.52±1.55Kg/M^2 and 27.15±1.5Kg/M^2), Blood Pressure (120±8.16/77.5±5.00mmHg, 109.44±8.72/69.44±8.73 mmHg and 111.67±8.33/71.67±5.00mmHg), Waist circumference (31.25±2.22, 32.73±2.66and 34.43±3.51 (inches), TOTAL- Cholesterol (4.70 ±0.85, 3.56 ±0.99, 3.57 ±1.32mmol/l), TAG (1.24±0.63, 0.65 ±0.50 and 0.71± 0.30, mmol/l), HDL-C (1.10±0.36, 1.30±0.39, 0.76±0.36 mmol/l). There was no significance difference in all the parameters measured (P>0.05) except the BMI. The underweight category is significantly difference from the normal (P< 0.01) and overweight category is most significantly difference from normal (P<0.001).

Table 1: Underweight Participants according to body mass index (Classification based on World Health Organization, 1998).

	BMI<(less than 18.5Kg/m^2	BP systolic (mmHg)	BP diastolic (mmHg)	WC (inches)	T-CHOL (mmol/l)	TAG (mmol/l)	HDL-C (mmol/l)
Mean	18.38**	120	77.5	31.25	4.70	1.24	1.10
Standard deviation	0.08	8.16	5.00	2.22	0.85	0.63	0.36

Value expressed as Mean±Standard Deviation of n=14: ** p<0.01 BMI= body mass index: BP = Blood Pressure; WC = Waist Circumference TOTAL-CHOL= Total Cholesterol: TAG= Triacylglyceride; HDL-C = High Density lipoprotein cholesterol.

Table 2: Normal weight Participants according to body mass index (Classification based on World Health Organization, 1998).

	BMI (18.5 – 24.9) Kg/m2	BP systolic (mmHg)	BP diastolic (mmHg)	WC(inches)	T-CHOL mmol/l	TAG Mmol/l	HDL-C mmol/l
Mean	21.52	109.44	69.44	32.73	3.56	0.65	1.30
Standard deviation	1.55	8.72	8.73	2.66	0.99	0.5	0.39

Value expressed as Mean±Standard Deviation of n=14: ** p<0.01 BMI= body mass index: BP = Blood Pressure; WC = Waist Circumference T-CHOL= Total Cholesterol: TAG= Triacylglyceride; HDL-C = High Density lipoprotein cholesterol.

Table 3: Overweight Participants according to body mass index (Classification based on World Health Organization, 1998).

	overweight (25.0 – 29.9 Kg/m2),	Blood Pressure systolic (mmHg)	Blood Pressure diastolic (mmHg)	W C (inches)	T-CHOL mmol/l	Tag mmol/l	HDL-C mmol/l
Mean	27.15***	111.67	71.67	34.43	3.57	0.71	0.76
Standard deviation	1.50	9.83	5.00	3.51	1.32	0.30	0.36

Value expressed as Mean±Standard Deviation of n=50, *** p<0.01BMI= body mass index: BP = Blood Pressure W C = waist circumference; T-CHOL= Total Cholesterol: TAG= Triacylglyceride; HDL-C = High Density lipoprotein cholesterol.

4.0 DISCUSSION

The anthropometric parameters, body mass index (BMI) and waist circumference (WC) have the advantages in daily clinical practice of being simple to measure and reproducible. (Cercato *et al*., 2004 and Haun 2009). The BMI is commonly used to classify individuals as underweight (less than 18.5Kg/m^2), normal weight (18.5 – 24.9 Kg/m^2), overweight (25.0 – 29.9 Kg/m^2), Obesity class I (30.0– 34.9 Kg/m^2), class II (35.0 – 39.9 Kg/m^2) and class III (more than 40 Kg/m^2) (World Health Organization,1998). Body mass index, waist circumference are useful anthropometric predictors for cardiovascular risk (Rexrode *et al.,* 1996). The size of a person's waist or waist circumference may indicate abdominal obesity; excess abdominal fat is a risk factor for developing heart disease and other obesity related diseases. Grundy *et al.,* 2005 classifies the risk of obesity-related diseases as high if men have a waist circumference greater than 102cm (40 in) and women have a waist circumference greater than 88cm (35 in). The highest mean waist circumference in the study participant stood at 34.43 inches, in the overweight group (Table 3). This shows that the higher the BMI, the more the waist circumference, vice verse. It has been established that BMI is a significant predictor of cardiovascular disease and type 2 diabetes mellitus (Janssen *et al*., 2002) and waist circumference measures adiposity, hence both correlated well. Although mean waist circumference in all BMI categories are within normal. Blood cholesterol, Obesity and high Blood pressure have been identified as risk factors in developing hypertension (Jones *et al*. 1992). In the present study,

BMI, in overweight participant, correlated well in inverse manner with cardiovascular index, such as HDL-Cholesterol (Table 3), thus the higher the BMI, the lower the HDL-C., as seen in the tables (Table 1, 2 and 3). It is a well known fact that lower values of HDL-C and higher cholesterol are pointer to cardiovascular disease and hence hypertension. Although both the Systolic and diastolic pressure in all the participants are within the normal range, the information is predictive of future development of cardiovascular disease, if it increases in linear manner unchecked. The measured parameters being within normal in all the BMI categories may be due to low socioeconomic status of the participant groups as revealed during the interview, the majority of the students indicated sponsoring themselves from unskilled work. This may rule out the contribution of overfeeding and sedentary lifestyle in the parameter measured and explained why the measured parameters are within normal.
The higher BMI in the overweight participants correlates well with the HDL-C which is lower compared to the normal weight group (table 3 and 2). The BMI share inverse correlation with HDL serum level (Table 2 and 3). It is also reflected in the waist circumference as the mean waist circumference tilted towards higher side (Table 3). Among important predictors for metabolic disturbances include overweight, obesity, dyslipidemia hypertension cardiovascular diseases, hyperinsulinaemia etc. (Sandhu *et al.,* 2008) and (Pihl and Jürimäe 2001). This is evidence from the tables assuming the trend increases in linear manner. The association of abnormal lipid profiles with cardiovascular diseases is connected with lifestyle (Serter *et al.*, 2004 and Twisk *et al.*, 1998), age (Maki *et al.*, 1997), intra-abdominal adiposity (Mannabe *et al.*, 1999 and Mari *et al.*, 1999), obesity (Despres *et al.,* 1988; Denke *et al.,* 1993; Dongsheng *et al*., 2000 and Pihl and Jurimae, 2001) and BMI (Bertolli *et al.,* 2003). The mean Blood pressure and mean lipid profile in the underweight category is higher than that in normal category, this if left unchanged can progress to lipid dysfunction.

4.1 Conclusion

Defining the relationship between body weight and metabolic disease is critical towards a better understanding of the underlying pathophysiological processes leading to excessive fat-related metabolic disease. Body mass index only provides a rough estimate of desirable weight. However, Physicians recognize that many other factors besides height affect weight. Weight alone may not be an indicator of fat, as in the case of a bodybuilder who may have a high BMI because of a high percentage of muscle tissue, which weighs more than fat. Likewise, a person with a sedentary lifestyle may be within a desirable weight range but have excess fat tissue. Generally higher BMI, leads to greater risk for developing serious medical conditions. Although BMI does not take into account whether the weight is carried as muscle or fat, just the number, it is advisable that healthy weight should be maintained through healthy life style/healthy living.
There is, therefore, a need to encourage health forecast in the populace as means of primary intervention. There is also a need for increased public health education to increase the awareness of contributions of BMI to hypertension and the sequela.

ACKNOWLEDGEMENT
We wish to thank the Proprietors of Dorben Polytechnic Abuja in the persons of Dr. and Dr. Mrs. Ekwere, B. for their advice and encouragement.
We wish to acknowledge the following people: Mr. Victor, Abianga the Registrar of Dorben Polytechnic, for creating enabling environment during this work, Mrs. Oluchi, Paul M. for reading through the work and making necessary input.
Also our profound gratitude goes to the following Staff of medical Unit of the Dorben polytechnic: Mr. Obulu, Joseph O. (CNO), Mrs. Omanibe, Patience, Mr. Paul Abdul, Mr. Ashaba Mathew and Miss.Onyenze Nmasichi Faith. We thank you all.

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