RELATIONSHIP BETWEEN BODY MASS INDEX AND ACADEMIC PERFORMANCE AMONG STUDENTS OF BASIC MEDICAL SCIENCES, BAYERO UNIVERSITY KANO, NIGERIA

Mukhtar Muhammad

Department of Anatomy,
Faculty of Basic Medical Sciences,
College of Health Sciences,
Bayero University Kano, Kano State, Nigeria.

Azizah Abdullahi Umar

Department of Anatomy,
Faculty of Basic Medical Sciences,
College of Health Sciences,
Bayero University Kano, Kano State, Nigeria.

Ibrahim Ahmad Atiku

Department of Anatomy,
Faculty of Basic Medical Sciences,
College of Medicine,
Federal University Dutse, Jigawa State, Nigeria

Abstract

Most at times health maintenance is not given a priority, not until a dysfunction intercedes. Many people are plagued with array of disorders arising from complex causes such as dysfunctional body mass profile like body mass index (BMI). Successes for all youths require good academic performance. This study was conducted to determine the relationship between BMI and academic performance among students of Basic Medical Sciences, Bayero University Kano, Nigeria. Data was collected from 160 males and 224 female students of the Faculty. Seca ZT-120 stadiometer with functional weighing scale. (Model RGZ 160, China) was used for the measurement of height and weight. Body mass index (BMI) was calculated by dividing the weight in kilogram with the square of height in meters. Quantitative variables were described using measures of central tendency and standard deviation. Chi-square test was used in assessing the significant associations between categorical groups, a p-value ≤ 0.05 was considered statistically significant. Correlation analyses were done to determine the relationship between the BMI and academic performance. The study has shown that majority of the participants have a normal BMI, and revealed a moderate trend with a weak and negative correlation (-0.123), between BMI and Academic Performance. However, BMI could be used among other factors to predict whether an individual will do well academically or not.

INTRODUCTION

It has been a wide saying by ancient philosophers that an individual's health is the most important asset in his or her life. The needs to maintain a healthy life need not to be emphasized. However, most Nigerians have not considered health maintenance a priority, not until a dysfunction intercedes. Many people tend to take their health for granted thereby going into difficult situation that are preventable. Globally, many people are plagued with array of diseases and disorders arising from complex causes. Among these numerous medical diseases which science and insurance companies have shown great interest and concern are dysfunctional body mass profile, especially overweight and obesity problems on one side and underweight problems on the other side. Underweight and overweight have been observed to contribute greatly to the likelihood of being susceptible to death at the early age than those of normal body weight (Grundy, 2004). Excessive fats are associated with various diseases that have caused serious concerns to many governments (Halslam & James, 2005). Diseases such as diabetes type 2, cancer, cardiovascular diseases, and non-alcoholic fatty liver diseases are attributed to the increased number of fat cells (Bray, 2004). Increased body fat alters the body's response to insulin, potentially leading to insulin resistance and creates a proinflammatory and a prothrombic state in the human body (Shoelson et al., 2006). This study was conducted to determine the relationship between body mass index and academic performance among students of Basic Medical Sciences, Bayero University Kano, Nigeria.

The fact that success for all youths is essential for the future of Nigeria is irrefutable. International testing showed that Nigeria is falling behind other countries in science, reading, and mathematics globally. Education reform in Nigeria since 1980s has been driven by the setting of academic standards for what students should know and be able to do. However, students cannot compete effectively with the global standard (Jukes, 2005). It is important that Nigeria needs to examine health factors that may be associated with academic success. There have been increasing numbers of overweight and obese youth who are experiencing physical and emotional consequences of the excess fat, and this may be related to school performance. With increasing pressure for children and adolescents to perform better in school, administrators and teachers have often responded by increasing classroom time. This often resulted in less time spent on physical activity and has been cited as one reason for the increasing prevalence of childhood obesity (Daniels, 2009). The associations between health status and Academic Performance were mostly examined in elementary, middle or high school children with limited studies among university students particularly in Nigerian context. More children are struggling with their weight. The Physicians Committee for Responsible Medicine (2010) attributed these changes for children to a sedentary lifestyle and improper diet. Even moderate under nutrition can have lasting effects on a child's cognitive development and school performance (Berg, 2004). By

identifying the relationship between body mass index (BMI) and academic performance in elementary school students, educators can determine the need for promoting student health and proper nutrition. Fewer studies have been made especially in the northern part of Nigeria on the said topic and the importance of academic performance and achievement of an individual cannot be overemphasized. Due to limited research done on Academic Performance (AP) and (Body Mass Index) BMI, it cannot be ascertain from the literature whether normal Body Mass Index or Physical Fitness enhances Academic Performance at university level in Nigeria. Indeed, most studies that assessed the associations between health and AP were undertaken in the US and Europe (Castelli *et al.*, 2007; Edward *et al.*, 2011). Nutritional status and fitness measures were associated with higher Academic Performance in a Midwest City School in the USA (Edward *et al.*, 2011). In a review by Castelli and his colleagues several studies have documented a positive relationship between physical fitness (PF) and Academic Performance or other cognitive performance measures, whereas other studies have observed small or negative relationships (Castelli *et al.*,2007). The study therefore, provides anthropometric data which indicates relationship between BMI and academic performance. It further indicates that a healthy status is most vital for normal activity as well as academic performance. Thus BMI and academic performance are related.

METHODOLOGY

The Study Area

This research was conducted in Kano metropolis. Kano state is located on latitude 12^o02^1N, longitude 08^o30^1E in the north-western region of Nigeria. Kano is the most populous state in Nigeria with a state population of over 9million, a metropolis of 137 km² area consisting of 6 local government areas with a population of over 12 million. The major inhabitants of Kano are of Hausa and Fulani ethnic groups with minority representing virtually all tribes in Nigeria and a minute fraction of foreigners.

Plate i. Map of Nigeria showing the location of Kano state (Ado, 2013).

Sampling Techniques and Data Collection

Simple random sampling technique was applied at each level of 200, 300 and 400 level students of the Faculty of Basic Medical Sciences, Bayero University Kano. In this descriptive cross-sectional study of the research, data was collected from three hundred and eighty-four (384) subjects with 160 males and 224 female students of the Faculty. Only healthy students who consented verbally were considered in this research.

Seca ZT-120 stadiometer with functional weighing scale. (Model RGZ 160, China) measuring to the nearest of 0.1kg for weight and 0.1cm for height was used for the measurement of height and weight.

Plate ii. Stadiometer (Model RGZ 160, China)

For the measurement of weight, participants were asked to remove any heavy object that may likely add up to their body weight before mounting the scale. They were asked to stand straight in a lateral position against the vertical part of the stadiometer. Measurement of height was done with a stadiometer, where subjects stand erect with shoulder, buttock and the heels in full contact with the vertical measuring board (Plate ii). The height was measured to the nearest 0.1cm and recorded. Body mass index (BMI) was calculated by dividing the weight in kilogram (kg) with the square of height in meters (m). Ethical approval was obtained from Department of Anatomy, Bayero University Kano.

Statistical Analysis

Data were collected, entered and filtered using Microsoft Excel and analyzed using SPSS version 23.0. Absolute numbers and simple percentages were used to describe categorical variables. Quantitative variables were described using measures of central tendency [mean and median] and measures of dispersion (standard deviation) were used. The Chi-square

test was used in assessing the significant associations between categorical groups, and a p-value of 0.05 or less was considered statistically significant. Correlation analyses were done to determine the relationship between the BMI and academic performance.

RESULTS AND DISCUSSION

Socio-demographic features revealed that females constitute 58 % of the study population while the remaining 42 % were males (Table 1). Anatomy students constitute 44 %, Physiology students constitute 34 % and Biochemistry students constitute 22% (Table 1). Two hundred level students constitute 41 %, 300 level constitute 30 %, and 400 level constitute 29 % (Table 1). Most of the participants, 82 %, were found to be single. Regarding physical activities, majority of the participants were found to be moderate (Table 1).

Table 1. Socio-demographic Characteristics

Variable		Frequency	Percentage (%)
Sex	Male	160	42
	Female	224	**58**
Department	Anatomy	167	**44**
	Physiology	133	34
	Biochemistry	84	22
Level	200	156	**41**
	300	118	30
	400	110	29
Marital status	Single	314	**82**
	Married	67	17
	Divorced	2	0.7
	Widowed	1	0.3
Physical activity	Sedentary	17	4
	Light	168	44
	Moderate	183	**48**
	Intensive	16	4

Majority of the participants, 76 %, do not have a family history of diabetes. Only 24 % of the participants have a family history of diabetes (Fig 1).
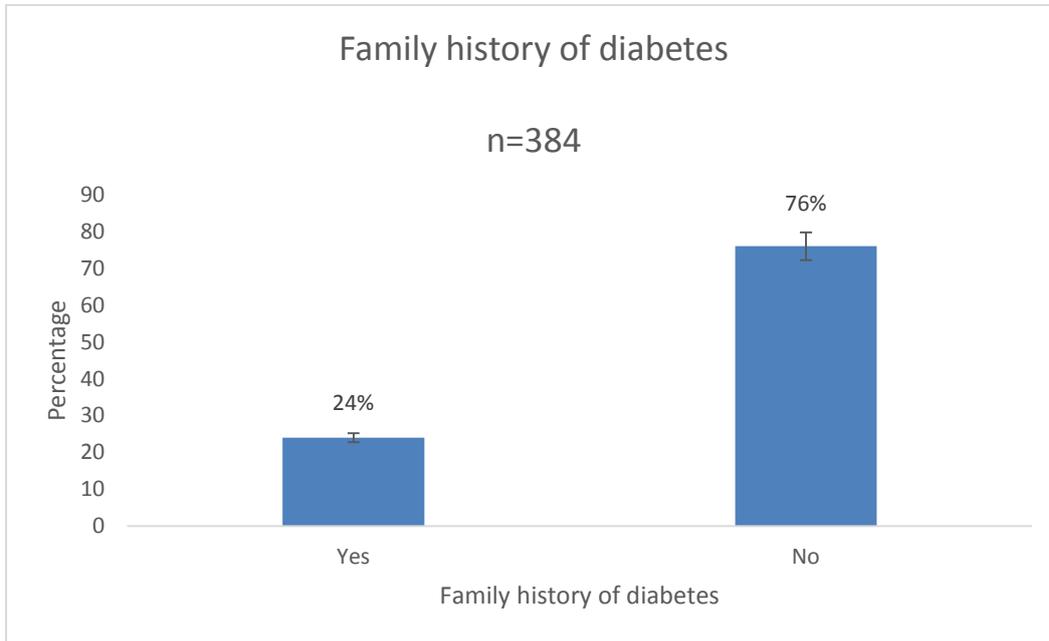
Fig 1 Family history of diabetes

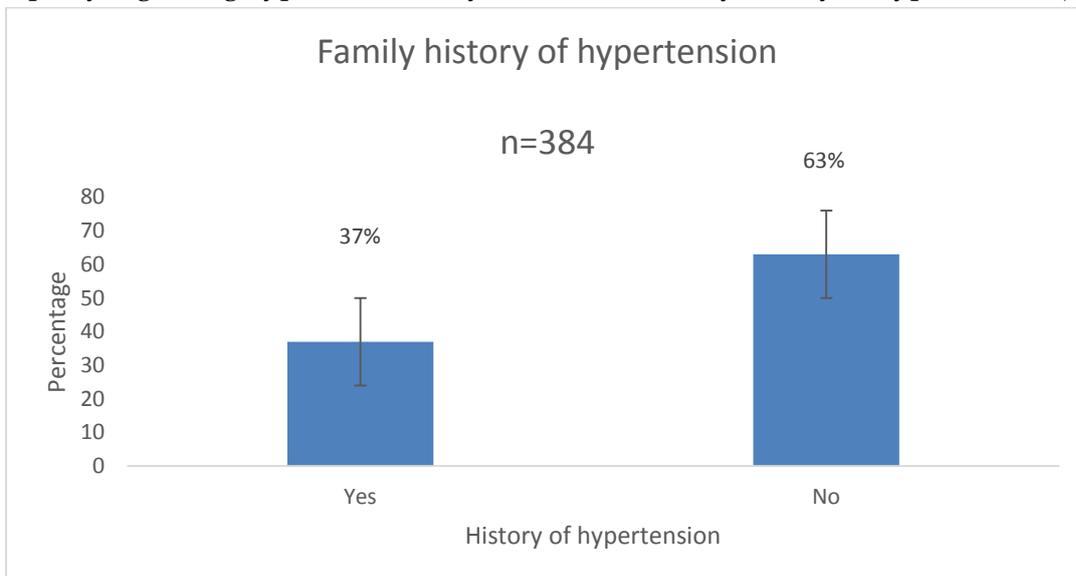Equally regarding hypertension only 37 % have a family history of hypertension (Fig 2)

Fig 2 Family history of hypertension

29 % of the participants fell within the group of students with a CGPA within 1.50 – 2.49 i.e. Pass Degree, the highest percentage, 47 % fell within the group of students with a CGPA within 2.5 – 3.49, Second Class Lower and 24 % fell within the group of students with CGPA between 3.5 – 4.49 Second Class Upper(Fig 3).
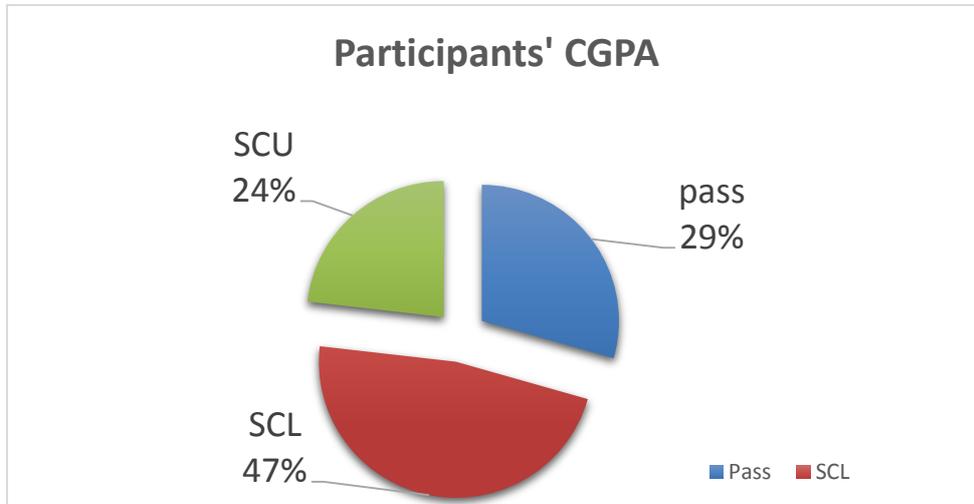
Fig.3 Pie chart showing participants' Cumulative Grade point average (CGPA)

Weight and Height Distribution

The minimum age taken were17 years, and the maximum were 33 years (Table 2). The minimum weight was 39 kg and the maximum were 105kg (Table 2). The minimum height recorded were 1.4 m, and the maximum were 1.6 m (Table 2).

Table.2. Distribution of participants according to their age, height and weight

Variables	N	Minimum	Maximum	Mean±SD
Age	384	17	33	22±3
Weight(kg)	384	39	105	54±9
Height (m)	384	1.4m	1.9	1.6±0.1

Only 27% of the participants fell within the underweight group having a BMI less than 18.5, 66% of the participants fell within the normal group having a BMI between 18.5 – 24.9, 4% of the participants fell within the overweight group having a BMI between 25 – 29.9, 3% of the participants fell within the obese group having a BMI 30 – 34.9, and none of the participants had a BMI greater than 35 (Fig. 4).
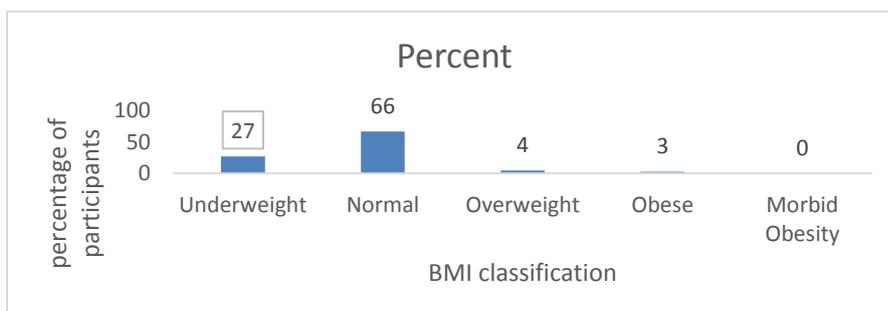

Fig. 4 BMI distribution of the participants.

Out of the participants with a Pass Degree, 23% were underweight, 73% were normal, 4% were overweight and 0.9% were obese. Participants within Second class lower grade had 23% being underweight, 67% being normal, 7% being overweight and 4% being obese. Participants within the Second class upper grade have 43% being underweight, 54% being normal, 1% being overweight and 2% being obese (Table 3).

Table 3. Fisher's test for CGPA and BMI

			CBMI					
			|underweight	Normal	Overweight	Obese	Morbid obesity	Total
CGPAGRP	Pass	N	26	82	4	1	0	113
		%	23%	73%	4%	.9%	0.0%	100.0%
	Second class lower	N	41	121	12	8	0	182
		%	23%	67%	7%	4%	0%	100.0%
	Second class upper	N	38	48	1	2	0	89
		%	43%	54%	1%	2%	0.0%	100.0%
Total		N	105	251	17	9	2	384
		% within CGPAGRP	27.3%	65.4%	4.4%	2.3%	0.6%	100.0%

Out of the participants in 200 level, 34 % were underweight, 62 % were normal, 3 % were overweight and 2 % were obese. Participants in 300 level, had 21 % underweight, 70 % normal, 5 % overweight and 4 % obese. Participants in 400 level had 25 % underweight, 66 % normal, 6 % overweight and 3 % obese (Table 4).

Table 4. Level of Study and BMI cross tabulation

Level			CBMI					Total
			underweight	normal	overweight	Obese	morbid obesity	
	200	N	53	96	4	3	0	155
		%	34%	62%	3%	2%	0.0%	100.0%
	300	N	25	82	6	5	0	118
		%	21%	70%	5%	4%	0.0%	100.0%
	400	N	27	73	7	3	0	110
		%	25%	66%	6%	3%	0.0%	100.0%
Total		N	105	251	17	11	0	384
		%	27%	65%	4%	4%	.0%	100.0%

Pearson correlation between CGPA and BMI of the general subjects presented significant correlation (P=0.016), but the relationship was found to be weak (-0.123) and negative (Table 5)

Table 5: Correlation between CGPA and BMI

Variable	Sex	N	r-value	p-value
CGPA -BMI	Males	160	-0.123	0.016
	Females	224	-0.119	0.018

DISCUSSION

Generally speaking BMI cannot determine body fat percent, but it places individuals in the BMI chart as to degree of weight, underweight, normal, overweight, obese and morbid obesity. This study shows that the Body Mass Index of an individual is related to his/her Academic Performance and determines Academic Performance to some extent. This contribute to a resolution of otherwise of a study by Franz *et al* (2014) which concluded that there is no basis to judge a student generally by body mass profile rather conducive learning environment (science and technology) and genetic (typology and mental) endowments would continue to influence academic performance in University Students. This difference is probably owing to the fact that the study was conducted on Physical Health Education students who are continuously involved in physical activities and are more likely to stay fit and within the normal range, hence, unlikely to be overweight or underweight, as such no significant association between Body Mass Index and Academic Performance was recorded in that study. The study is also in consistency with the findings of Emad *et al* (2014) conducted at the Faculty of Sports Sciences and Recreations at UiTM, which suggested that obesity may play an important role in lowering academic performance levels. The study also showed that the participants in the "normal" BMI category had the highest percentage in the Second class Upper (SCU) and Second Class Lower (SCL) CGPA Classification, this is probably because a significant portion of the population are within the normal BMI classification. Numerous studies showed healthy body weight, and moderate to high levels of physical fitness have been linked with many benefits, including improved academic performance. In this study even though there is a statistically significant relationship, a weak and negative correlation between Body Mass Index and academic Performance was observed. The weak form of the relationship is not well understood but could be the fact that BMI is not the only factor influencing academic performance. However, it can be deduced from this study that BMI may contribute to the prediction on whether an individual will do well academically. This is in coherence with the study by Sumrall *et al* (2014) which indicated a potential trend toward a correlation of physical fitness and academic achievement, a moderate correlation between physical fitness and academic achievement and between physical fitness and body mass, and a moderate to strong correlation between physical fitness and academic achievement and between body mass and academic

achievement for Caucasians. There are many potential causal connections between Body Mass and academic performance. One such causal connection is the fact that a Normal Body Mass Index owing to physical exercise has been shown in numerous studies to boost cognition (Hillman *et al.,* 2008). By boosting cognition, regular physical activity aids in academic performance. Also, physical activity has been linked with lowering body mass and better overall health. Another causal connection is that Healthier students generally are not sick as often, and therefore, do not miss class as often as their less healthy classmates, which further aids them in their academics. There are numerous other explanations for such trends that may be further explored. The results of this study suggest that one may predict whether an individual will do well academically based on their physical fitness and Body Mass Index, and vice versa.

CONCLUSION

This study has been able to determine the Body mass Index of the participants. The study has also shown that majority of the participants have a normal BMI. The study revealed a moderate trend with a weak correlation between Body Mass Index and Academic Performance. However, it could be used among other factors to possibly predict whether an individual will do well academically based on their Body Mass Index.

REFERENCES

Berg, F. M. (2004). *Underage & overweight America's childhood obesity crisis: What every family should know*. Long Island City, NY: Hatherleigh Press.

Castelli, D.M, Hillman, C.H, Buck, S.M, Erwin, H.E. (2007**).** *J Sport Exerc Psychol,* 29: 239-252.

Fox, C. K., Barr-Anderson, D., Neumark-Sztainer, D., & Wall, M. (2010). Physical activity and sports team participation: Associations with academic outcomes in middle school and high school students. *Journal Of School Health*, *80*(1), 31-37.doi:10.1111/j.1746-1561.2009.00454.

Daniels, S. R. (2009). Associations between physical activity, fitness, and academic achievemen. *The Journal of Pediatrics*, *155*(6), A1.doi: 10.1016/j.jpeds. 2009.10.022

Edward, J.U, Mauch L, Winkelman M. (2011), *Journal of School Health*, 81(2), 65-73

Emad, I.U, Davis, C. L, Johnson, C.L. (2014). Body mass index and academic performance : Summary of the discussion. *American Journal of Clinical Nutrition*, 70:173S-175S.

Franz Atare and Nkangude A. T (2014): Body Mass Index and Academic Performance of Undergraduate University Students. *Asian Journal Of Management Sciences & Education.***(3);** 105.U

Grundy, S. M. (2004). Obesity, metabolic syndrome, and cardio vascular disease. *Journal of Clinical Endocrinology and Metabolism, 89*(6), 2595-2600.

Halslam, D. W. & James, W. P. (2005). Obesity. *Lancet, 366*(9492), 1197-209. PMID16198769

Hillman, C.H., Erickson, K.I., & A.F. Kramer. (2008). *Nature Reviews: Neuroscience,9,* 58-65. "Be smart, exercise your heart: exercise effects on brain and cognition."

Jukes M. (2005) The long-term impact of preschool health and nutrition on education. *Food Nutrition Bull.*;26(2 Suppl 2):S193–201.

Shoelson, S. E., Lee, J, &Goldfine, A. B. (2006). Inflammation and Insulin Resistance.*Journal of Clinical Investigation, 116*(7), 1793-801. PMID 16823477.

Sorof J, Daniels S. (2004) Obesity and Hypertension in children: A problem of epidemic proportions Lane DA, Gill P. Ethnicity and tracking blood pressure in children. *Journal Of Human Hypertens.*;18:223e228.