EFFECT OF NUTRITIONAL STATUS OF JUNIOR SECONDARY SCHOOL STUDENTS ON THEIR EDUCATIONAL ACHIEVEMENT

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ABSTRACT:
This project investigated the effect of nutritional status of junior secondary school students on their educational achievement. The study combined the descriptive survey and quasi experimental approaches, the Federal Polytechnic secondary school was chosen because it has students from all geopolitical zones of the country. The researcher personnel measured weight of students using beam balance and their heights using a graduated wall. These were used to measure BMI. The academic achievement of the students was determined using the last end of term scores which were obtained from their school. The mean score which describe the overall performance of 86 students was calculated as 49.3. The calculated BMI index of each student reveals that 67% of the students fall below the normal BMI index which in turn explains why the general performance of the students is below average. The mean of the average performance of the three groups of students categorised by the BMI index as underweight, normal weight and overweight were compared using ANOVA test with Excel Package. The outcome of the test shows that each group can still perform above average independent of their nutritional status. Confirming this was the correlation analysis which shows that there was no relationship between the BMI indexes and the average performance of the students. This explains why some Nigerians students still excel academically despite their poor nutritional status. But this does not override the importance of nutritional food intake, as it is an integral part of academic excellence.

INTRODUCTION
Nutrition is the sum total of the processes involved in the taking in and the utilization of food substances by which growth, repair and maintenance of the body are accomplished. It involves ingestion, digestion, absorption and assimilation. Nutrients are stored by the body in various forms and drawn upon when the food intake is not sufficient. (Brookover, 2013).
Nutrients contain foods that build the body tissues, produce energy and vitamin to keep healthy. The nutrients also help to develop and maintain the immune system needed to fight infection and maintenance of vitality. Therefore, in order for school children to grow properly, they must eat a well-balanced diet. A well-balanced diet incorporates all of the food groups represented in the food guide pyramid. The most important meal for school children is breakfast. Just as a car cannot start without fuel, a child cannot properly learn without a nutritious breakfast. Starting the day with a nutritious, well-balanced meal allows them to concentrate and learn to their full potential.
Malnutrition is defined as insufficient, excessive or imbalance consumption of nutrients. (Nordqvist, 2013). According to World Health Organisation (WHO), malnutrition is the grarest
single threat to global public health; and by far the largest contributor to child mortality globally. Currently, malnutrition is present in 45 percent of all cases (WHO). Studies reveal that Children who are severely malnourished typically experience slow behavioural development, and can lead to mental retardation. Even when treated, under nutrition may have long-term effects in children, it can cause weakness in mental function and can cause digestive problems. This problem may persist in some cases for the rest of the children’s lives. (Nordqvist, 2013).

Studies have revealed that children who were severely malnourished as young children were less well liked and were unhappier than classmate controls. Affected children also behaved immaturesly more often and were clumsier. Children with a history of malnutrition were either more active or more lethargic than their classmates and were more often withdrawn, solitary, or unsociable. Previously severely malnourished children had poorer relationships with classmates and teachers, exhibited a greater degree of attention deficit, and received poorer grades in school. (Galler, et al. 1983; Galler 1984; Richardson, Birch, and Ragbeer 1995).

According to the Society for Neuroscience (2003), recent studies reveal that diets with high levels of saturated fats actually impair learning and memory. Unfortunately, foods with saturated fats are often the most affordable and widely available in schools.

One of the theories that explain the link between saturated fats and brain power is the effects of glucose and sugars in the higher-fat foods. Essentially, glucose comes from carbohydrates, and while glucose is vital for energy, foods that are too high in glucose actually cause a body’s energy levels to drop. As glucose is ingested, the body releases insulin in order to process the newly acquired foods. Normally, after a healthy meal, glucose levels should rise slightly, and a body should feel energized after taking in nutrition. (Chen, 2008).

In the Nigerian schools, studies also revealed that nutritional status is an important indicator of school students’ health and wellbeing. According to Akinyele (2009) there is high level of malnutrition among children in rural Nigeria; the figures differ with geopolitical zones, with 56 percent reported in a rural area of South West and 84.3 percent in three rural communities in the Northern part of Nigeria. Nationally, the overall prevalence of stunting, wasting and underweight were 42.0 percent, 9 percent and 25 percent respectively.

Studies by Abidoye et al (2006) revealed that among the malnourished children in the primary schools, a total of 89 repeated class and 44 children had poor academic performance and that there is a significant relationship between the academic performance and nutritional status of the children. Further research also shows that malnutrition was negatively and significantly related with the academic performance (Essien et al, 2012).

Anthropometric approaches are, for the most part, relatively non-invasive methods that assess the size or body composition of an individual. For adults, body weight and height are used to evaluate overall nutritional status and to classify individuals as at healthy or non-healthy weights. In the United States of America and other industrialized countries, the emphasis for unhealthy weight is over-weight and obesity. The standards for these have changed over time. The most recent classification is to use body mass index (BMI, in kg/m$^2$) (Kuczmarski and Flegal, 2000).

BMI (Body Mass Index) is a statistical measurement that is indicative of fat in the body in correlation with the height and weight of the person. The BMI of a person signifies if he is underweight, normal, overweight, or obese. According to the MedLinePlus website, a healthy BMI is between 18.5 and 24.9. If your BMI is between 25 and 29.9, you are considered overweight, and if your BMI is over 30 then you fall into the obese category. Having a BMI below 18.5 places you into the underweight range.
A standardized estimate of an individual’s relative body fat calculated from his or her height and weight. The formula for calculating BMI is weight in kilograms (kg) divided by height in meters (m) squared. Regardless of age or population, is normal at 18.5 to 25.0 kg/m$^2$, overweight at 25.0 to 29.9 kg/m$^2$, and obese at over 30.0 kg/m$^2$ (USDA & USDHHS, 2000). In general BMI greater than 30 is assumed to be due to excessive adiposity.

In children, growth charts have been developed to allow researchers and clinicians to assess weight-and height-for-age, as well as weight-for-height. For children, low height-for-age is considered stunting, while low weight-for-height indicates wasting.

To interpret anthropometric data, they must be compared with reference data. The choice of the appropriate reference has been discussed by Johnston and Ouyang (1991). Because well-nourished children in all populations follow similar patterns of growth, reference data need not come from the same population as the children of interest. It is of greater importance that reference data be based on well-defined, large samples, collected in populations that are healthy and adequately nourished. Reference growth charts (Kuczmarski et al., 2002) have been compiled from cross-sectional data collected from population surveys of U.S. children. These have been adopted as international standards by the World Health Organization.

**PURPOSE OF THE STUDY**
The purpose of the study is to investigate the effect of nutritional status of junior secondary school students on their educational achievement

**RESEARCH QUESTION**
The study is designed to find answers to the following research questions that:

1. What is the trends and pattern of nourishment among JSS students in Bauchi?
2. Is there any significant relationship between educational achievements of JSS students of Federal Polytechnic Staff School using end of term results and body mass index (BMI) of the students?
3. Is there any significance different between the scores of the underweight, normal and overweight students?

**METHODOLOGY**
This study combined the descriptive survey and quasi experiment approaches. The descriptive design was used to assess the trend and pattern of nourishment among students of Federal Polytechnic Bauchi Secondary School. While the quasi experimental design compared differences in the students nutritional status as indicated by BMI with the students’ level of academic achievement, measured using immediate past end of term scores.

JSS1 and JSS2 students of Federal Polytechnic Bauchi Secondary School were used for the study. These numbered 86 students. JSS3 students were exempted because they were writing their JSCE exams.

There are mainly two approaches to measuring incidences of nutrition among vulnerable groups: calorie nutrition intake approach used by Sukhatme (1982) and Gopalan (1995); and the anthropometric approach used by Osmani (1992) and Pal (1999).
In this study the anthropometric approach was used because it is regarded as more reliable than the calorie intake approach (Vipin, 2009). The anthropometric approach entailed measuring the weight and height of each student. The procedures followed are discussed.

The measurement of weight was carried out on all 86 students using balanced beam. Students were asked to remove their outer garment (Jacket, coat etc.) and shoes, and to stand in turns, in the centre of the platform. This is to ensure that each student’s weight is distributed evenly on both feet. Standing off-centre may affect measurement. The weights are moved until the beam balances and the value of the weight is recorded to the resolution of the scale (the nearest 0.1 kg).

**HEIGHT MEASUREMENT PROCEDURES**
The measurement of height was also carried out on the students. The heights are measured using a wall calibrated in centimetre and with hard floor surface.

Students are asked to remove their shoes and heavy outer garments. Each of them was asked to stand with his/her back to the calibrated wall. It was ensured the back of the head, back, buttocks, calves and heels were touching the upright wall. Feet were put together and the student is asked to look straight.

**METHOD OF DATA ANALYSIS**
The BMI status of the students is summarized in a grouped frequency distribution table and also in a line graph to determine the inherent trend of the BMI status. The essence of this is to determine the pattern of the BMI of the students in the JSS classes.

Hypotheses were tested using correlation and analysis of variance (ANOVA) at the 0.05 level of significance

**Research Question 1**
What is the trends and pattern of nourishment among JSS students in Federal Polytechnic Bauchi secondary school?

<table>
<thead>
<tr>
<th>BMI Status</th>
<th>Number of Students</th>
<th>Percentages of BMI Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under weight</td>
<td>58</td>
<td>67.4</td>
</tr>
<tr>
<td>12.0 – 18.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>25</td>
<td>29.1</td>
</tr>
<tr>
<td>18.5 – 24.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over weight</td>
<td>3</td>
<td>3.5</td>
</tr>
<tr>
<td>25.0 – 29.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>30.0 and above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>86</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1 indicate that 58 (67.4%) of the students under study were underweight, 25 (29.1%) had normal weight while 3 (3.5%) were overweight.

**Table 2: Frequency Distribution Table summarizing BMI Status of the 86 Students**
Table 2 is the frequency distribution table that summarizes the Body mass index (BMI) of the 86 students. Line graph is employed to depict the inherent trend of the BMI of the 86 students and is presented on figure 1

Fig 1: Line Graph of Students’ BMI Status

Figure 1 shows the trend of the BMI status of the 86 students which indicates most of the students BMI status fall below the normal range of (18.5 – 25.0) BMI value, and that the distribution of the BMI status tends to be partially normal.

Research Question 2
Is there any significant relationship between educational achievements of JSS students of Federal Polytechnic Staff School using end of term results and body mass indices (BMI) of the students? Using Microsoft excel Package, the BMI status of the students was correlated with end of term students average score. The mean score is given as 49.3 while the degree of relationship produced is -0.15. This indicates that the degree of relationship between the BMI status and students average score is very low. We therefore conclude that there is no significant relationship between the BMI status and students’ average score.

Research Question 3
Hypothesis 1: There no significance different between the scores of the underweight, normal and overweight students.

Table 3: Summary of the Groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Count</th>
<th>Sum</th>
<th>Average</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Weight</td>
<td>58</td>
<td>2857</td>
<td>49.25862</td>
<td>196.3355</td>
</tr>
<tr>
<td>Normal</td>
<td>25</td>
<td>1269</td>
<td>50.76</td>
<td>204.7733</td>
</tr>
<tr>
<td>Over Weight</td>
<td>3</td>
<td>110</td>
<td>36.6667</td>
<td>129.3333</td>
</tr>
</tbody>
</table>

Table 4: ANOVA Table
<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>P-Value</th>
<th>F criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>532.0247</td>
<td>2</td>
<td>266.0124</td>
<td>1.349215</td>
<td>0.265074</td>
<td>3.106507</td>
</tr>
<tr>
<td>Within Groups</td>
<td>16364.35</td>
<td>83</td>
<td>197.1608</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16896.37</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the tables 4, we do not reject the null hypothesis at the 0.05 level of significant. Therefore, the null hypothesis accepted at 0.05.

**SUMMARY OF FINDINGS**

The study revealed the followings:

1. That approximately 71% of the students have below the normal value which indicates that majority of the students is not adequately fed.
2. That the average score of the overall performance of the students is 49.3
3. That there was no relationship between BMI status and the academic performance of the students under study.
4. The ANOVA analysis further revealed that there is no significant different between the mean average performance of the three groups of students: underweight, normal and overweight.

**DISCUSSION**

Table 1 indicated that 58 (67.4%) of the students under study were underweight, 25 (29.1%) had normal weight while 3 (3.5%) were overweight. This means that by approximation, 71% of the students fall under the normal BMI value. It is therefore conclude that majority of the students are nutritionally deficient, which can in turn have adverse effect on their wellbeing and academic performance. Siribaddana (2010), observes that for a growing child, nutrition would play a major part in his or her development and it will be a mistake to not know what manifestations would occur due to a nutrient deficiency.

Table 2 depicts the trend of the BMI status of the students, which also confirms that, with respect to BMI standard value, the majority of the students are nutritionally deficient.

Table 3 indicates that the average scores in end of term exam of the underweight and overweight students are 49.3 and 36.7 respectively. While that of the students who possess normal BMI value is 50.8. This relates to Colby-Morley (1981), who stated that it is no surprise that what we eat directly influences the brain. It also correspond to the research conducted by Lahey & Rosen (2010), that nutrition affects learning and behaviour and suggested that diet can influence cognition and behaviour in many ways, which include the condition of not enough nutrition or the condition of the lack of certain nutrients.

Table 4 reveals that there is no significant different in the mean average performance of the three groups of students: underweight, normal and overweight. This goes to explain that each of the group, underweight, normal and overweight, can operates independently with very little or no influence of their nutritional status on academic performance.
It could then be said that the majority of the students can still perform better, which can be confirmed by the result of this study. Table one (1) indicates that 58 (67.4%) of the students are underweight and these same students have their average score as 49.3, which is close to average performance.

The study also revealed that there was no relationship between BMI status and the academic performance of the students under study but, this result does not correspond with Kretsch et al (2001) which discovered a direct correlation between poor nutrition and lowered school performance among school-aged children.

CONCLUSION
The study revealed that 71 percent of the students are malnourished. Parents must play the vital role of ensuring that their children take good and nutritional food. They must make sure that all the classes of food are included in children’s meal. Balance diet foods improve good health and also enhance the cognitive ability of the students as it was established in the study. Sometime in the absence of not too good nutritional food intake, students tend to perform better as in the case of this study. This situation is rare and where such are obtained, the societal influence and the in-depth perception about education that “I must be educated come what may” could be at work with such students together with unflinching support from their parents. But the true is that in any ideal societal system good nourishment is key to educational achievement.

RECOMMENDATION
As good nutrition affects the growth and development, health maintenance, disease prevention etc and which also part of integral parts to educational achievement, parents should be enlightened on the six classes of food and how they can be included in their children’s meals for body nourishment. Government should give special attention to the nutritional status of school children through monitoring and provision nutritional meals for school students. They should also mandate all schools that assessment of nutritional status of school students should be part of the school activities. Also the school management, health management board and all other stakeholders should collaborate to create public awareness on the need of proper nutrition to school students. If these can be achieved and sustained, it will definitely have a positive impact on the educational achievement of school students at every level of learning.

REFERENCE

Adam, Brookover. (2013). Definition of Nutrition. Retrieved from
www.healthguidance.org/definition of nutrition.


Richardson SA, Birch HG, Ragbeer C, 1975. “The Behavior of Children at Home who were severely Malnourished in the first 2 years of life.”
