Original Research Article

Some Nutritional Indices of Public and Private Secondary School Students in Igbanke, Edo State

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Abstract

The aim of this study is to determine the nutritional indices (Glucose, cholesterol, total protein and albumin) and body mass index of students attending public and private secondary schools in Igbanke. The study was conducted on 185 students comprising 95 students from public secondary schools (Igbanke mixed secondary and Igbanke grammar school) and 90 students from private secondary schools (Future hope secondary school and Wisdom comprehensive secondary school) in Igbanke. The research was designed to evaluate and compare the nutritional indices (Glucose, cholesterol, total protein and albumin) of students attending public and private secondary schools in Igbanke. The sample analysis was done at Diagnostic Laboratory, Department of Medical Laboratory Science, Ambrose Alli University, Ekpoma. This study was carried out within three (3) months. Our result shows that the mean values of body mass index (BMI) of students in public secondary school and private secondary school are 20.28 ± 4.21 kg/m^2 and 21.74 ± 4.14 kg/m^2 respectively. There is no significant difference ($p>0.05$) in the values of BMI of students in public secondary school when compared with private secondary school. The mean levels of glucose (Glu) of students in public secondary school and private secondary school are 84.38 ± 12.80 mg/dl and 79.48 ± 15.02 mg/dl respectively. There was a significant increase ($p<0.05$) in the level of Glu of students in public secondary school when compared with private secondary school. The mean levels of total protein (TP) of students in public secondary school and private secondary school are 6.78 ± 0.86 mg/dl and 6.98 ± 0.58 mg/dl respectively. There was a significant decrease ($p<0.05$) in the level of TP of students in public secondary school when compared with private secondary school. The mean levels of albumin (Alb) of students in public secondary school and private secondary school are 3.73 ± 0.61 mg/dl and 4.01 ± 0.48 mg/dl respectively. There was a significant decrease ($p<0.05$) in the level of Alb of students in public secondary school when compared with private secondary school. The mean levels of cholesterol (Chol) of students in public secondary school and private secondary school are 154.62 ± 30.94 mg/dl and 168.30 ± 14.88 mg/dl respectively. There was significant increase ($p<0.05$) in the levels of cholesterol of students in private secondary school when compared with public secondary school. In conclusion, a poor diet can cause deficiency diseases such as blindness, anemia, scurvy, health-threatening conditions like obesity and metabolic syndrome and such common chronic systemic diseases as cardiovascular disease, diabetes and osteoporosis. The findings from this study have shown that there are differences in the nutritional indices of students in public secondary school and private secondary school with public secondary school having lower protein level and private secondary school high cholesterol level.
Keywords: Nutritional indices, Glucose, Cholesterol, Total protein, Albumin, Body Mass Index, Students.

INTRODUCTION

Nutrition is one of the most important single factors for the health of the individual or the community, and is consequently a fundamental issue in modern public health (Tulchinsky and Varavikova, 2000). Optimal health is found in good nutrition. So that eating the right kinds and amount of food with good dietary habits throughout the entire life cycle means healthier bodies and minds, greater vitality and energy, greater resistance to diseases, efficiency and happiness (Polnay, 2002; Dietary Guidelines Advisory Committee, 2010).

Nutritional status is the balance between the intake and utilization of food nutrients by man in the

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process of growth and development (Adegun *et al.,* 2013) and it is an integral component of the overall health of an individual and provides an indicator of the well-being of children living in a particular region (Goon *et al.,* 2011).

Malnutrition which refers to an impairment of health either from a deficiency or excess or imbalance of nutrients is of public health significance among children all over the world specifically in developing countries (Amuta *et al.,* 2012, Sati and Dahiya, 2012). Globally, malnutrition among school age teenagers is becoming a major public health concern. More than 200 million school age children are stunted and underweight and if no action is taken and at this rate, about one billion school children will be growing up by 2020 with impaired physical and mental development (Ara *et al.,* 2011, UNICEF, 2011, Srivastava *et al.,* 2012, Mekonnen *et al.,* 2013). Despite the economic growth observed in developing countries, malnutrition and particularly under nutrition is still highly prevalent (Muller and Krawinkel, 2005).

Concurrently, a growing prevalence of obesity and its related chronic diseases is being observed in these countries (Prentice, 2006). In developing countries, this rising epidemic along with the persistence of under nutrition and infections typifies the 'Double Burden of Malnutrition' (DBM) (FAO, 2006), which is becoming of great concern for African countries (Thiam *et al.,* 2006). Indeed, the DBM is a real threat at the population, household and even individual level (Delisle, 2008) and it is now observed among school children (Fernald and Neufeld, 2007).

Nutritional intake as a pivotal element contributing to human health and well-being is of great importance and its role in childhood and adolescence is more prominent and of greater concern. Nutritional intake has a special direct effect on children's health due to their physical and mental growth as well as cognitive development. Furthermore, it has long-term effects on general health status through formation of life-long eating behaviors in children (Coulson *et al.,* 1998, Story *et al.,* 2002). Food intake patterns and overweight are associated with different immediate complications and major long-term consequences including cardiovascular diseases, diabetes, high blood pressure, stroke, cancer, dental caries, asthma, and some other psychological disorders like depression (McCabe and Ricciardelli, 2003, Shepherd *et al.,* 2006). Thus, quality of children's and adolescents' diet has become a major concern for researchers. Therefore, the present study aimed at determining and comparing the nutritional indices of students attending public and private secondary schools in Igbanke and its environs. The aim of this study is to determine the nutritional indices (Glucose, cholesterol, total protein and albumin) and body mass index of students attending public and private secondary schools in Igbanke.

MATERIALS AND METHODS
This study was carried out in Igbanke, Orhionmwon Local Government Area of Edo State. The town is located at latitude 6.21^{0}N and longitude 6.13^{0}E with estimated population size of 206,717 people (CSSR, 2008). The inhabitants are mainly civil servants and farmers.

Population of Study
The study was conducted on 185 students comprising 95 students from public secondary schools (Igbanke mixed secondary and Igbanke grammar school) and 90 students from private secondary schools (Future hope secondary school and Wisdom comprehensive secondary school) in Igbanke.

Research Design
The research was designed to evaluate and compare the nutritional indices (Glucose, cholesterol, total protein and albumin) of students attending public and private secondary schools in Igbanke. The sample analysis was done at Diagnostic Laboratory, Department of Medical Laboratory Science, Ambrose Alli University, Ekpoma. This study was carried out within three (3) months.

Inclusion Criteria and Exclusion Criteria
- Only apparently healthy secondary school students were recruited for this study.
- Secondary school students with visible ailment were excluded from this study.

Anthropometry Determination
- **Height Measurement -** Height measurements were taken using a meter steel tape. The participants were made to stand erect, bare footed in underwear but without head tie or cap, against a wall and their heights were read to the nearest 0.1cm.
- **Weight Measurement -** Weight was measured using a bathroom weighing scale (Hana, China) and was read to the nearest 0.1kg.
- **Body Mass Index (BMI) Determination -** BMI was determined mathematically by dividing the weight obtained in Kg by the square of height measure in metres.

Sample Collection
Two specimen bottles were used for each subject. Anticoagulant bottles containing fluoride oxalate for blood glucose and lithium heparin containers for cholesterol, Total protein and albumin. Blood samples (5ml) were collected by clean venepuncture from the ante-cubital fossa into already labeled bottles, without undue pressure to either the arm or the plunger of the syringe. The samples were mixed by gentle inversion and centrifuged at 3000 rpm for 5 min to obtain the plasma. The plasma supernatants were separated into sterile bottles and stored frozen until analysis was done at room temperature.

Sample Analysis

Method for determination of glucose: Enzymatic Endpoint method (GOD/PAP) (Barham and Trinder, 1972).

Procedure: Twenty microlitres of distilled water, standard and samples were dispensed into tubes labelled blank, standard and sample respectively. Two millilitre of glucose reagent was added into the respective test tubes, and the contents were mixed and incubated at 37^oC for ten minutes. The absorbance of standard and samples were measured against blank at a wavelength of 500nm using spectrophotometer.

Method for determination of total cholesterol: Enzymatic Endpoint method (CHOD-PAP) (Richmond, 1973).

Procedure: Ten microlitres of distilled water, standard and samples were dispensed into tubes labelled blank, standard and sample respectively. One millilitre of cholesterol reagent was added into the respective test tubes, and the contents were mixed and incubated at 37^oC for five minutes. The absorbance of standard and samples were measured against blank at a wavelength of 500nm using spectrophotometer.

Method for determination of total protein: Biuret method (Reinhold, 1953).

Procedure: Twenty microlitres of distilled water, standard and samples were dispensed into tubes labelled blank, standard and sample respectively. One millilitre of biuret reagent was added into the respective test tubes, and the contents were mixed and incubated at room for thirty minutes. The absorbance of standard and samples were measured against blank at a wavelength of 540nm using spectrophotometer.

Method for determination of albumin: BCG dye binding method (Spencer and Price, 1977).

Procedure: Ten microlitres of distilled water, standard and samples were dispensed into tubes labelled blank, standard and sample respectively. Three millilitre of albumin reagent was added into the respective test tubes, and the contents were mixed and incubated at room temperature for five minutes. The absorbance of standard and samples were measured against blank at a wavelength of 630nm using spectrophotometer.

Data Analysis

The data generated from this study was analysed using SPSS statistical package version 18 to determine the mean, standard deviation as well as the comparison between public and private schools using Student t-test. The level of significance will be set at $\alpha=0.05$, and a p-value less than 0.05 ($P<0.05$) was considered statistically significant.

RESULTS

Table 4.1 shows the body mass index and some nutritional indices of students in public secondary school and private secondary school in Igbanke, Edo State. Our result shows that the mean values of body mass index (BMI) of students in public secondary school and private secondary school are 20.28 ± 4.21kg/m^2 and 21.74 ± 4.14 kg/m^2 respectively. There is no significant difference ($p>0.05$) in the values of BMI of students in public secondary school when compared with private secondary school. The mean levels of glucose (Glu) of students in public secondary school and private secondary school are 84.38 ± 12.80mg/dl and 79.48 ± 15.02mg/dl respectively. There was a significant increase ($p<0.05$) in the level of Glu of students in public secondary school when compared with private secondary school. The mean levels of total protein (TP) of students in public secondary school and private secondary school are 6.78 ± 0.86mg/dl and 6.98 ± 0.58mg/dl respectively. There was a significant decrease ($p<0.05$) in the level of TP of students in public secondary school when compared with private secondary school. The mean levels of albumin (Alb) of students in public secondary school and private secondary school are 3.73 ± 0.61mg/dl and 4.01 ± 0.48mg/dl respectively. There was a significant decrease ($p<0.05$) in the level of Alb of students in public secondary school when compared with private secondary school. The mean levels of cholesterol (Chol) of students in public secondary school and private secondary school are 154.62 ± 30.94mg/dl and 168.30 ± 14.88mg/dl respectively. There was significant increase ($p<0.05$) in the levels of cholesterol of students in private secondary school when compared with public secondary school.

Table 4.2 shows the body mass index and some nutritional indices of female and male students in public secondary school in Igbanke, Edo State. Our result shows that the mean values of body mass index (BMI) of female and male students in public secondary school are 19.73 ± 3.52kg/m^2 and 20.80 ± 3.85kg/m^2 respectively. There is no significant difference ($p>0.05$) in the values of BMI of female students when compared with male students in public secondary school. The mean levels of glucose (Glu) of female and male students in public secondary school are 84.43 ± 13.27mg/dl and 84.32 ± 12.47mg/dl respectively. There is no significant difference ($p>0.05$) in the level of glucose of female students when compared with male students in public secondary school. The mean levels of total protein (TP) of female and male students in public secondary school are 6.72 ± 0.89mg/dl and 6.80 ± 0.83mg/dl respectively. There is no significant difference ($p>0.05$) in the level of TP of female students when compared with male students in public secondary school. The mean levels of albumin (Alb) of female and male students in public secondary school are 3.75 ± 0.64mg/dl and 3.71 ± 0.57mg/dl respectively. There is no significant difference ($p>0.05$) in the level

of Alb of female students when compared with male students in public secondary school. The mean levels of cholesterol (Chol) of female and male students in public secondary school are 160.45±28.78mg/dl and 149.04±32.19mg/dl respectively. There is no significant difference (p>0.05) in the level of Chol of female students when compared with male students in public secondary school.

Table 4.3 shows the body mass index and some nutritional indices of female and male students in private secondary school in Igbanke, Edo State. Our result shows that the mean values of body mass index (BMI) of female and male students in private secondary school are 20.99±4.21kg/m^2 and 21.94±4.14kg/m^2 respectively. There is no significant difference (p>0.05) in the values of BMI of female students when compared with male students in private secondary school. The mean levels of glucose (Glu) of female and male students in private secondary school are 79.68±15.42mg/dl and 79.24±14.75mg/dl respectively.

There is no significant difference (p>0.05) in the level of glucose of female students when compared with male students in private secondary school. The mean levels of total protein (TP) of female and male students in private secondary school are 6.93±0.59mg/dl and 7.05±0.59mg/dl respectively. There is no significant difference (p>0.05) in the level of TP of female students when compared with male students in private secondary school. The mean levels of albumin (Alb) of female and male students in private secondary school are 3.99±0.43mg/dl and 4.03±0.53mg/dl respectively. There is no significant difference (p>0.05) in the level of Alb of female students when compared with male students in private secondary school. The mean levels of cholesterol (Chol) of female and male students in private secondary school are 166.45±13.95mg/dl and 170.48±15.81mg/dl respectively. There is no significant difference (p>0.05) in the level of Chol of female students when compared with male students in private secondary school.

Table 4.1: BMI and some Nutritional Indices of Students in Public Secondary and Private Secondary School in Igbanke

Parameters	Public Sec School Mean±SD N=95	Private Sec School Mean±SD N=90	P-value	t-value
BMI (kg/m^2)	20.28±4.21	21.74±4.14	0.892	0.375
Glu (mg/dl)	84.38±12.80	79.48±15.02	2.367	0.019
TP (mg/dl)	6.78±0.86	6.98±0.58	1.989	0.048
Alb (mg/dl)	3.73±0.61	4.01±0.48	3.407	0.001
Chol (mg/dl)	154.62±30.94	168.30±14.88	3.742	0.000

KEYS: BMI=Body Mass Index, Glu=Glucose, TP=Total Protein, Alb=Albumin, Chol=Cholesterol.

Table 4.2: BMI and some Nutritional Indices of Students in Public Secondary School in Igbanke, Edo State Based on Gender

Parameters	Public Sec School Female Mean±SD N=47	Public Sec School Male Mean±SD N=48	P-value	t-value
BMI (kg/m^3)	19.73±3.52	20.80±3.85	1.421	0.151
Glu (mg/dl)	84.43±13.27	84.32±12.47	0.040	0.968
TP (mg/dl)	6.72±0.89	6.80±0.83	0.429	0.669
Alb (mg/dl)	3.75±0.64	3.71±0.57	0.365	0.717
Chol (mg/dl)	160.45±28.78	149.04±32.19	1.810	0.074

KEYS: BMI=Body Mass Index, Glu=Glucose, TP=Total Protein, Alb=Albumin, Chol=Cholesterol.

Table 4.3: BMI and some Nutritional Indices of Students in Private Secondary School in Igbanke, Edo State Based on Gender

Parameters	Private Sec School Female Mean±SD N=50	Private Sec School Male Mean±SD N=40	P-value	t-value
BMI (kg/m^2)	20.99±4.21	21.94±4.14	0.892	0.375
Glu (mg/dl)	79.68±15.42	79.24±14.75	0.136	0.892
TP (mg/dl)	6.93±0.59	7.05±0.59	0.929	0.356
Alb (mg/dl)	3.99±0.43	4.03±0.53	0.441	0.661
Chol (mg/dl)	166.45±13.95	170.48±15.81	1.264	0.210

KEYS: BMI=Body Mass Index, Glu=Glucose, TP=Total Protein, Alb=Albumin, Chol=Cholesterol.

DISCUSSION

Nutritional status is the balance between the intake and utilization of food nutrients by man in the process of growth and development (Adegun *et al.,* 2013) and it is an integral component of the overall health of an individual and provides an indicator of the well-being of children living in a particular region (Goon *et al.,* 2011). This present study aimed at assessing body mass index and some nutritional indices of apparently healthy students of public and private secondary schools in Igbanke, Edo State. There was a slight increase in the body mass index of students in private secondary school when compared with students from public school but the increase was not significant (p>0.05). This result partially agreed with the reports of Olanipekun *et al.,* (2012) and Amirat *et al.,* (2013) who reported a significant increase in the body mass index of students in private school when compared with their private school counterparts.

Also from this present study there were significant alterations in some of the nutritional indices assessed. There was significant increase (p<0.05) in plasma glucose level of students in public secondary school when compared with students in private secondary school. This agreed with the report of Amirat *et al.,* (2013) that the students in public schools eat more of carbohydrate than their fellow in private school and it can contribute to higher glucose level as observed in this study.

The plasma protein, albumin and cholesterol were significantly higher (p<0.05) in students attending private secondary school when compared with public secondary school. The variations observed in the present study may be due to socio-economic differences between children in public school and private school. Wickramasinghe *et al.,* (2004) reported that students attending private schools are with a good socioeconomic status and their nutritional status had always been better than the students attending public schools. This reason may be the contributing factor to significant higher value of total protein and albumin.

Also, the increase in body mass index and total cholesterol in private school as compared to public school has been attributed to the fact that being financially sound may allow the children to indulge in practice of purchasing calorie dense fast foods and a lifestyle involving less of physical activity and more in-door activities like playing games on computer and watching television (Ramesh, 2010, Thekdi *et al.,* 2011). Also Ashok *et al.,* (2014) concluded that higher economic class children, who go to private school, follow sedentary lifestyle and have higher risk of becoming overweight/obese which leads them toward non communicable diseases such as cardiovascular diseases.

In conclusion, a poor diet can cause deficiency diseases such as blindness, anemia, scurvy, health-threatening conditions like obesity and metabolic syndrome and such common chronic systemic diseases as cardiovascular disease, diabetes and osteoporosis. The findings from this study have shown that there are differences in the nutritional indices of students in public secondary school and private secondary school with public secondary school having lower protein level and private secondary school high cholesterol level. Although there were variations in the indices measured, the subjects used are not prone to any nutritional disease because all values are within normal reference range.

We therefore recommend that regular weight and height measurements should be taken in secondary school so that a regular check can be kept on the development of the secondary school students. Based on the nutritional need of secondary school students, intervention programmes such as one square meal per day should be developed in secondary school and implemented. There is a great need for further researches to provide the data regarding nutritional indices of different age group.

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