

**ASSESSMENT OF NUTRITIONAL STATUS AND KNOWLEDGE OF  
STUDENTS FROM SELECTED SECONDARY SCHOOLS IN SOKOTO  
METROPOLIS, SOKOTO STATE, NIGERIA**

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## ABSTRACT

The significance of improving nutrition knowledge in order to have a positive influence on food choices and health should not be underestimated. This study assessed the nutritional status and knowledge of school children attending selected secondary schools in Sokoto metropolis. The study population was purposively drawn from secondary school students in Nigeria attending Federal Government College and State Government-owned schools. Four secondary schools were used for the study: Federal Government College (FGC), Sani Dingyadi Secondary School (SDUSS), Nagarta Secondary School (NSS) and Army Day Secondary School (ADSS). A sample of 240 school students, aged 10 to 25 years participated in the study. The measuring instruments included a questionnaire to determine the nutrition knowledge of the students. Anthropometric measurements included weight, height and mid-upper arm circumference, measured using standard methodologies. The mean age recorded for male and female students were  $18.0 \pm 1.90$  and  $15.7 \pm 1.20$  years, respectively. The result showed that 27.9% were underweight, 7.5% overweight and 64.6% had normal BMI status. Nutritional status was significantly related with sex ( $\chi^2 = 16.169$ ,  $p < 0.05$ ) but not with age ( $\chi^2 = 1.368$ ,  $p > 0.05$ ). The prevalence of underweight was higher among the males (33.9%) compared to the females (13.9%), while more females were overweight (15.3%) compared to the males (4.2%). Seventy one percent performed poorly in the nutrition knowledge assessment rating. The overall performance of the female students was significantly higher ( $\chi^2 = 46.386$ ;  $P < 0.05$ ) than their male counterparts. Furthermore, 5, 12 and 12% had excellent, very good and good nutrition knowledge, respectively, while 33% and 38% had fair and poor nutrition knowledge, respectively. The results further revealed that the students were deficient in knowledge and understanding of the facts about energy and nutritive values of foods. Therefore, adequate nutrition education is needed at the secondary school level; this will enable the students to make good food choices and positively influence their eating habits thereby ensuring better nutritional status.

**Key words:** malnutrition, knowledge, school, anthropometry, Sokoto

## INTRODUCTION

Malnutrition has an effect on children's wellbeing and their ability to learn and play normally. Indeed, healthy food choices improve a child's wellbeing and ability to learn and play normally [1]. Dietary habits in childhood impact growth, development and the prevalence of disease throughout the life cycle. Healthy eating habits should thus be established during childhood [2]. The quality of diet declines as children move from childhood to adolescence. Eating healthy is not a priority for adolescents. Poor eating patterns may thus add a risk for current and future health problems [3]. A large number of school-based nutrition programmes have been implemented globally, focusing mainly on obesity, the importance of activity and of vegetables and fruit in the diet [4]. However, little research on basic nutrition education focusing on adolescents has been published [5]. The significance of improving nutrition knowledge through nutrition education in order to have a positive influence on healthy food choices should not be underestimated [6, 7].

The aim of this study was to determine the nutrition knowledge and nutritional status of children attending a secondary school in Sokoto metropolis. This was done in order to gain information for planning a nutrition education programme, as poor knowledge of nutrition is seen as one of the reasons for poor food choices [8] and, consequently, as a contributing factor in the development of malnutrition [9].

## MATERIALS AND METHODS

This study was a descriptive survey involving secondary school students comprising male and females aged 10-25 years. The study was conducted in Sokoto Metropolis, Sokoto State, Nigeria. Sokoto Metropolis has 19 State Secondary Schools out of which nine (9) are boarding. Permission to carry out the study was obtained from the Ministry of Education, Sokoto State.

The study population was drawn from secondary school students attending Federal Government College and State Government-owned schools. A purposive sampling technique was used where the total number of schools used for the study as well as the total number of students from each school was purposively selected. The selected schools were: Federal Government College (FGC), Sani Dingyadi Secondary School (SDUSS), Nagarta Secondary School (NSS) and Army Day Secondary School (ADSS). A total number of 240 students, comprising 60 students from each school, participated in the study.

Data for the study were collected using a structured and validated questionnaire. The respondents were requested to select the appropriate options as it applied to them. Anthropometric measurements of weight and height of the children were carried out based on the standardized methods of WHO [10] and UNICEF [11]. The students were weighed on a bathroom scale wearing minimal clothing. Height was measured with a wooden height meter. Children were measured without shoes. Heads were erect and hands hanging at their sides in a natural manner. Readings were taken to the

nearest 0.1cm. Height-for-age, weight-for-age and weight-for-height of each student were compared with WHO Growth standards.

The nutrition knowledge of the school children was assessed by the use of multiple choice questions set by the researcher to ascertain their level of knowledge of nutrition. The test comprised 12 nutrition knowledge questions. The nutrition knowledge scores of the students were graded as follows: Excellent (71-100), Very good (61-70), Good (51-60), Fair (41-50) and poor (0-40).

Data collection and editing were done manually. Data processing and analysis were done using Microsoft Excel and Statistical Package for Social Sciences (SPSS) for Windows, version 18.0 (Statistical Package for Social Sciences, Chicago, IL, USA). Statistical methods used were means, standard deviations, analysis of variance (ANOVA), frequency and percentages and chi-square test. Statistical significance was set at  $P < 0.05$ .

## RESULTS

### Food consumption and eating habits

Two hundred and forty (240) secondary school students comprising 168 males (70%) and 72 females (30%) participated in the study. The ages of the students ranged from 12 to 23 years with a mean age of  $18.0 \pm 1.90$  years and  $15.7 \pm 1.20$  years for males and females, respectively. The result of food consumption and eating habits of the respondents showed that more than half of the students (56.3%) ate three times daily while 27.1% ate more than three times (Table 1). Meal skipping was high among the selected secondary school students as 68.8% reported that they skipped meals. Only 31.3% do not skip meals. The major reason for meal skipping was fasting/religious reasons (57.1%). This observation could be attributed to the period in which the study was carried out. The study was carried out in the month of August, which happened to coincide with the Islamic Ramadan fasting period. Further, 20.4% reported meal skipping as habitual, while dislike for the meal accounted for 15% of the reason for meal skipping. The major meal skipped by the students was breakfast (40.4%) followed by lunch (26.3%) and dinner (21.7%), respectively. Snacking was also observed to be high among the students as 82.1% of the students reported that they consumed snacks. The students gave reasons for snacking such as like (48.3%), hunger (26.3%), habit (13.8%) and to make up for skipped meals (11.6%), respectively. The major source of snacks for the students was home (33.3%), while 30.4% obtained their snacks from the school premises, 18.8% from outside school premises and 17.5% from food vendors.

### Anthropometric measures

The mean weight of the students ranged from 49.4kg for students of Nagata College Sokoto (NCS) to 53.6kg for SDUSS students with significant difference ( $P < 0.05$ ) in the observed values (Table 2). Mean weight of ADSS and FGCS were 55.1kg and 53.2kg, respectively. A global mean weight of 52.8kg was recorded for the study.

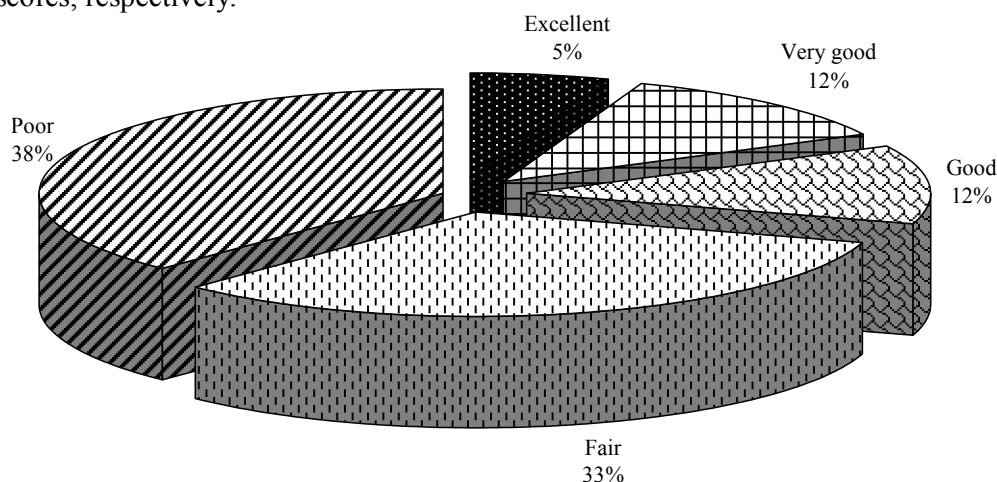
Students of SDUSS were significantly taller (164.6cm) than students of the other selected schools. Army Day Secondary School (ADSS), FGCS and NCS had mean height values of 159.2, 160.8 and 159.7cm respectively, although these differences were not statistically significant ( $P>0.05$ ). With respect to mid upper arm circumference (MUAC), ADSS recorded the highest mean value (21.7cm) which was not significantly different ( $P>0.05$ ) from those of FGCS (21.6cm) and SDUSS (20.8cm), respectively. Nagata College Sokoto (NCS) students had the least MUAC value of 18.9cm. Body mass index (BMI), which is an index of nutritional status, was significantly different among students of the selected secondary schools. The overall mean BMI value was  $20.3 \text{ kg m}^{-2}$ . Mean BMI value was highest in ADSS ( $21.7 \text{ kg m}^{-2}$ ) followed by FGCS ( $20.6 \text{ kg m}^{-2}$ ). NCS and SDUSS had mean BMI scores of  $19.3$  and  $19.8 \text{ kg m}^{-2}$ , respectively.

### Nutritional status

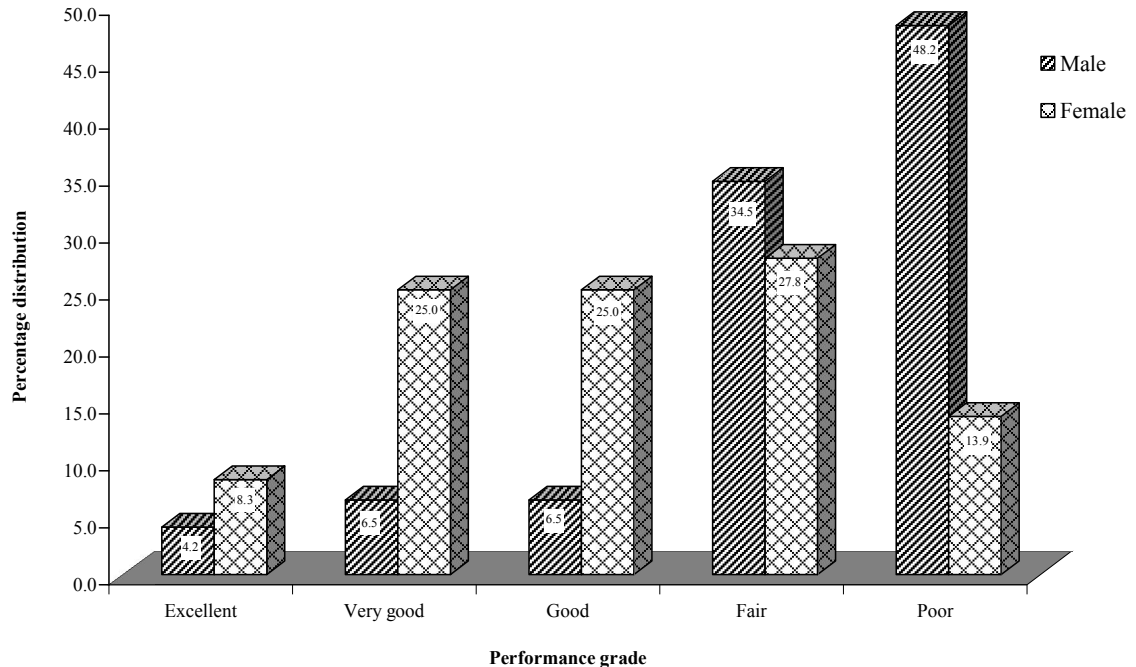
Results showed that 27.9% were underweight, 7.5% overweight and 64.6% had normal BMI status (Table 3). Nutritional status was significantly related with sex ( $\chi^2 = 16.169$ ,  $p<0.05$ ) but not with age ( $\chi^2 = 1.368$ ,  $p>0.05$ ). The prevalence of underweight was higher among the males (33.9%) compared to the females (13.9%), while more females were overweight (15.3%) compared to the males (4.2%).

### Nutrition knowledge

Twenty nine percent had good nutrition knowledge while 71% performed poorly (Fig. 1). The overall performance of the female students was significantly higher ( $\chi^2 = 46.386$ ;  $P<0.05$ ) than that of their male counterparts (Fig. 2). This was revealed by the higher percentage of female than male students who had excellent nutrition knowledge scores (8.3 vs. 4.2%), very good nutrition knowledge scores (25 vs. 6.5%) and good nutrition knowledge scores (25 vs. 6.5%). However, more males than females had fair (34.5 vs. 27.8%) and poor (48.2 vs. 13.9%) nutrition knowledge scores, respectively.



**Figure 1: Nutrition knowledge of secondary school students from selected schools in Sokoto Metropolis**



**Figure 2: Nutrition knowledge rating of male and female secondary school students from selected schools in Sokoto Metropolis ( $\chi^2 = 46.386$ ;  $df = 4$ ;  $P = 0.000$ )**

### Response to nutrition knowledge assessment questions

Multiple-choice questions were used in the assessment. Generally, there were significant differences ( $P < 0.05$ ) in the responses of the selected secondary school students to questions 1, 3, 5, 6, 10, 11 and 12 (Table 4). The students had better performance in their response to questions 1, 5 and 12 having total scores above 60%. However, the responses to question 2 (green leafy vegetables contain more of?) and question 11 (which food group provide the best source of energy?) is a cause for concern because the correct scores obtained were below 20% (17.5% for question 2 and 11.7% for question 11).

### DISCUSSION

This study revealed that 68.8% of the students skipped meals and the breakfast was the meal mostly skipped (40.4%). The skipping of breakfast has been associated with lower nutritional status and the risk of cardiovascular diseases [12]. It has also been reported that less adequate breakfast habits may contribute to the appearance and further development of obesity [13]. Therefore, the importance of regular eating patterns cannot be overemphasized in nutritional education.



Generally, 71% of the students performed poorly. Poor nutrition knowledge among school students in rural QwaQwa, South Africa has also been reported by Oldewage-Theron and Egal [6]. This showed that the students were deficient in knowledge and understanding of the facts about energy and nutritive values of foods. Kostanjevec *et al.* [14] reported a similar observation among school students in Slovenia. This however, validates the need for adequate nutrition education at the secondary school level, which will go a long way to enhance the ability of the students to make good food choices and will positively influence their eating habits thereby ensuring better nutritional status. Numerous studies have shown that well-planned nutrition education can significantly influence the quality of nutrition knowledge of children [15, 16, 17, 18]. Nutrition education, which may take various forms of formal and informal education, can also significantly change nutrition behaviour and dietary habits of school children [19, 20, 21].

Understanding different factors which influence nutrition behaviour of children is the first step to forming efficient measures which may change nutrition behaviour [22]. Education as well as nutrition knowledge, do not always have direct impact on nutrition behavior of individuals; however, they may significantly influence the attitudes, and other psychosocial factors which directly influence nutrition behaviour [23, 24]. Worsley [21] believes that nutrition education is necessary; however, it is not the only factor which can change nutrition behaviour of persons. Harnack *et al.* [25] stress that nutrition education is a key element to promoting lifelong healthy eating and should start at early stages of life. Nutrition education is an accessible effective tool in the promotion of health nutrition in education programmes with focus on healthy eating [26, 27].

School nutrition education should focus not only on the provision of nutrition information, but also on the development of skills and behaviours related to areas such as food preparation, food preservation and storage; social and cultural aspects of food and eating; enhanced self-esteem and positive body image and other consumer aspects [28].

## CONCLUSION

The poor nutrition education knowledge and nutritional status of the study population has revealed the need for adequate nutrition education intervention. Nutrition knowledge is needed for better dietary choices. Adolescents are becoming more autonomous and behavioural patterns acquired during this phase of life, such as dietary intake behaviour, may influence long-term behaviours. It is, therefore, recommended that a nutrition education programme be developed and implemented for this group of adolescents, as nutrition education can be an accessible and effective tool for improving food choices. Since most adolescents spend most of their time in school, school-based nutrition education, combined with physical activity programmes, can be employed to reinforce the message of healthy eating.

**Table 1: Food consumption and eating habits of the respondents**

|                                    | Frequency | Percent |
|------------------------------------|-----------|---------|
| <b>Frequency of eating per day</b> |           |         |
| Once                               | 8         | 3.3     |
| Twice                              | 32        | 13.3    |
| Thrice                             | 135       | 56.3    |
| More than 3 times                  | 65        | 27.1    |
| Total                              | 240       | 100.0   |
| <b>Meal skipping</b>               |           |         |
| Yes                                | 165       | 68.8    |
| No                                 | 75        | 31.3    |
| Total                              | 240       | 100.0   |
| <b>Reason for meal skipping</b>    |           |         |
| I don't like the food              | 36        | 15.0    |
| Fasting for religious reason       | 137       | 57.1    |
| No time to eat                     | 15        | 6.3     |
| Just a habit                       | 49        | 20.4    |
| To maintain my figure              | 3         | 1.3     |
| Total                              | 240       | 100.0   |
| <b>Meal skipped</b>                |           |         |
| Breakfast                          | 97        | 40.4    |
| Lunch                              | 63        | 26.3    |
| Dinner                             | 52        | 21.7    |
| Breakfast and Lunch                | 19        | 7.9     |
| Lunch and Dinner                   | 9         | 3.8     |
| Total                              | 240       | 100.0   |
| <b>Snacking</b>                    |           |         |
| Yes                                | 197       | 82.1    |
| No                                 | 43        | 17.9    |
| Total                              | 240       | 100.0   |
| <b>Reason for snacking</b>         |           |         |
| I like them                        | 116       | 48.3    |
| Hunger                             | 63        | 26.3    |
| Habit                              | 33        | 13.8    |
| To make up for skipped meal        | 28        | 11.6    |
| Total                              | 240       | 100.0   |
| <b>Source of snack</b>             |           |         |
| School premises                    | 73        | 30.4    |
| Home                               | 80        | 33.3    |
| Outside school premises            | 45        | 18.8    |
| Food vendors                       | 42        | 17.5    |
| Total                              | 240       | 100.0   |



**Table 2: Mean anthropometric values of selected secondary school students in Sokoto Metropolis**

| School       | Weight (kg)             | Height (cm)              | MUAC (cm)               | BMI (kg m <sup>-2</sup> ) |
|--------------|-------------------------|--------------------------|-------------------------|---------------------------|
| SDUSS        | 53.6 <sup>a</sup> ± 7.0 | 164.6 <sup>a</sup> ± 8.5 | 20.8 <sup>a</sup> ± 2.5 | 19.8 <sup>bc</sup> ± 2.2  |
| ADSS         | 55.1 <sup>a</sup> ± 9.8 | 159.2 <sup>b</sup> ± 7.8 | 21.7 <sup>a</sup> ± 2.1 | 21.7 <sup>a</sup> ± 3.6   |
| NCS          | 49.4 <sup>b</sup> ± 8.4 | 159.7 <sup>b</sup> ± 7.6 | 18.9 <sup>b</sup> ± 2.2 | 19.3 <sup>c</sup> ± 2.5   |
| FGCS         | 53.2 <sup>a</sup> ± 7.7 | 160.8 <sup>b</sup> ± 6.6 | 21.6 <sup>a</sup> ± 3.3 | 20.6 <sup>b</sup> ± 2.7   |
| <b>Total</b> | <b>52.8 ± 8.5</b>       | <b>161.1 ± 7.9</b>       | <b>20.7 ± 2.8</b>       | <b>20.3 ± 2.9</b>         |

<sup>a,b,c,d</sup> means in a column with different superscript letters are significantly different (P<0.05)

Values are mean ± standard deviation of 60 respondents

MUAC = mid upper arm circumference

BMI = body mass index

SDUSS = Sani Dingyadi Unity Secondary School

ADSS = Army Day Secondary School

NCS = Nagarta College Sokoto

FGCS = Federal Government College Sokoto

**Table 3: Nutritional status of the respondents by age and sex**

|                                     | <b>Underweight</b> | <b>Normal</b> | <b>Overweight</b> |
|-------------------------------------|--------------------|---------------|-------------------|
| <b>Sex</b>                          |                    |               |                   |
| Male                                | 57 (33.9)          | 104 (61.9)    | 7 (4.2)           |
| Female                              | 10 (13.89)         | 51 (70.83)    | 11 (15.28)        |
| Total                               | 67 (27.92)         | 155 (64.58)   | 18 (7.50)         |
| <b>Chi-square = 16.169, p=0.000</b> |                    |               |                   |
| <b>Age group (years)</b>            |                    |               |                   |
| 12-15                               | 18 (32.1)          | 33 (58.9)     | 5 (8.9)           |
| 16-19                               | 41 (27.3)          | 98 (65.3)     | 11 (7.3)          |
| 20-23                               | 8 (23.5)           | 24 (70.6)     | 2 (5.9)           |
| Total                               | 67 (27.92)         | 155 (64.58)   | 18 (7.50)         |
| <b>Chi-square = 1.368, p=0.850</b>  |                    |               |                   |

*Values in parenthesis are percentages*

**Table 4: Performance of the selected secondary school students in Sokoto Metropolis based on the Nutrition knowledge assessment**

| Nutrition knowledge questions                                                              | Answers | School    |           |           |           | Total      | $\chi^2$ | P-value |
|--------------------------------------------------------------------------------------------|---------|-----------|-----------|-----------|-----------|------------|----------|---------|
|                                                                                            |         | SDUSS     | ADSS      | NCS       | FGCS      |            |          |         |
| 1. Fruits are richest in?                                                                  | Wrong   | 34 (56.7) | 16 (26.7) | 16 (26.7) | 6 (10.0)  | 72 (30.0)  | 32.381   | 0.000** |
|                                                                                            | Correct | 26 (43.3) | 44 (73.3) | 44 (73.3) | 54 (90.0) | 168 (70.0) |          |         |
| 2. Green leafy vegetables contain more of?                                                 | Wrong   | 51 (85.0) | 51 (85.0) | 53 (88.3) | 43 (71.7) | 198 (82.5) | 6.811    | 0.078   |
|                                                                                            | Correct | 9 (15.0)  | 9 (15.0)  | 7 (11.7)  | 17 (28.3) | 42 (17.5)  |          |         |
| 3. Why is variety of food in well-balanced diet preferred to eating a single kind of food? | Wrong   | 56 (93.3) | 39 (65.0) | 45 (75.0) | 17 (28.3) | 157 (65.4) | 59.581   | 0.000** |
|                                                                                            | Correct | 4 (6.7)   | 21 (35.0) | 15 (25.0) | 43 (71.7) | 83 (34.6)  |          |         |
| 4. The food you eat have effect on your looks                                              | Wrong   | 12 (20.0) | 18 (30.0) | 19 (31.7) | 16 (26.7) | 65 (27.1)  | 2.429    | 0.489   |
|                                                                                            | Correct | 48 (80.0) | 42 (70.0) | 41 (68.3) | 44 (73.3) | 175 (72.9) |          |         |
| 5. Meat, fish, egg are rich in?                                                            | Wrong   | 36 (60.0) | 5 (8.3)   | 12 (20.0) | 2 (3.3)   | 55 (22.9)  | 67.247   | 0.000** |
|                                                                                            | Correct | 24 (40.0) | 55 (91.7) | 48 (80.0) | 58 (96.7) | 185 (77.1) |          |         |
| 6. What should be considered most while choosing food?                                     | Wrong   | 56 (93.3) | 16 (26.7) | 40 (66.7) | 12 (20.0) | 124 (51.7) | 86.229   | 0.000** |
|                                                                                            | Correct | 4 (6.7)   | 44 (73.3) | 20 (33.3) | 48 (80.0) | 116 (48.3) |          |         |
| 7. Eating too much of oily and fatty food can lead to which of these health problems?      | Wrong   | 38 (63.3) | 38 (63.3) | 47 (78.3) | 35 (58.3) | 158 (65.8) | 6.002    | 0.112   |
|                                                                                            | Correct | 22 (36.7) | 22 (36.7) | 13 (21.7) | 25 (41.7) | 82 (34.2)  |          |         |
| 8. Raw eggs are more nutritious than cooked eggs                                           | Wrong   | 47 (78.3) | 45 (75.0) | 47 (78.3) | 39 (65.0) | 178 (74.2) | 3.740    | 0.291   |
|                                                                                            | Correct | 13 (21.7) | 15 (25.0) | 13 (21.7) | 21 (35.0) | 62 (25.8)  |          |         |
| 9. Healthy eating should be combined                                                       | Wrong   | 38 (63.3) | 40 (66.7) | 39 (65.0) | 28 (46.7) | 145 (60.4) | 6.464    | 0.091   |

|                                                          |         |           |           |           |           |            |        |         |
|----------------------------------------------------------|---------|-----------|-----------|-----------|-----------|------------|--------|---------|
| with what for better health?                             | Correct | 22 (36.7) | 20 (33.3) | 21 (35.0) | 32 (53.3) | 95 (39.6)  |        |         |
| 10. Which of the following foods has high fiber content? | Wrong   | 48 (80.0) | 38 (63.3) | 43 (71.7) | 20 (33.3) | 149 (62.1) | 31.631 | 0.000** |
|                                                          | Correct | 12 (20.0) | 22 (36.7) | 17 (28.3) | 40 (66.7) | 91 (37.9)  |        |         |
| 11. Which food group provides the best source of energy? | Wrong   | 50 (83.3) | 57 (95.0) | 46 (76.7) | 59 (98.3) | 212 (88.3) | 17.790 | 0.000** |
|                                                          | Correct | 10 (16.7) | 3 (5.0)   | 14 (23.3) | 1 (1.7)   | 28 (11.7)  |        |         |
| 12. Which of these is NOT considered a nutrient?         | Wrong   | 40 (66.7) | 20 (33.3) | 20 (33.3) | 7 (11.7)  | 87 (36.3)  | 40.153 | 0.000** |
|                                                          | Correct | 20 (33.3) | 40 (66.7) | 40 (66.7) | 53 (88.3) | 153 (63.8) |        |         |

\*\* Performance of students in selected schools differ significantly ( $P < 0.01$ )  
Values in parenthesis are percentages

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