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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Prevalence of Malnutrition and its Effects on the Academic Performance of Students in Some Selected Secondary Schools in Sokoto Metropolis

E. Essien¹, M.J. Haruna² and P.K. Emebu³

¹Department of Community Medicine, Nutrition and Dietetic Unit,
Usmanu Danfodiyo University Teaching Hospital, P.M.B. 5252, Sokoto, Nigeria

²Shehu Shagari College of Education, Sokoto, Nigeria

³Department of Biochemistry, Usmanu Danfodiyo University, Sokoto, Nigeria

Abstract: This study investigated the prevalence of malnutrition and its effect on the academic performance of students in some selected secondary schools in Sokoto metropolis of Sokoto State, Nigeria. The study population was drawn from secondary school students attending Federal Government College and State Government-owned schools. Well tested and validated questionnaires were used to elicit information from the students. Purposive sampling technique was used for the selection of respondents. 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 of two hundred and forty (240) secondary school students comprising 168 males (70%) and 72 females (30%) participated in the study. The result revealed a high prevalence of malnutrition of 35.4% among the selected secondary school students, using BMI as index. Prevalence of malnutrition was significantly higher in SDUSS (43.3%) followed by NCS (35%), ADSS (33.3%) and FGCS (30%). The study recorded a total mean performance score of 44.3% for all the selected schools. There was significant difference ($p < 0.05$) in the mean performance score of the secondary school students. Students of FGCS recorded the highest mean score of 60.3% which was significantly higher ($p < 0.05$) than that of the other selected schools. SDUSS had the lowest mean performance score of 29.6%. Malnutrition was negatively and significantly related with the academic performance ($r = -0.154$, $p < 0.01$). It was further observed that SDUSS with the highest prevalence of malnutrition has the poorest performance, while FGC with the least prevalence of malnutrition had the best academic performance. Hence, activities to reduce the prevalence of malnutrition should be encouraged.

Key words: Malnutrition, nutritional status, academic performance, anthropometry, secondary school

INTRODUCTION

Nutrition is an important factor affecting growth, health and all round development of individuals, mostly children. According to UNICEF in 2005 (WBI, GAIN, IMD, 2006), malnutrition caused approximately 50% of child death worldwide, making the UN's Millennium development goal to eradicate extreme poverty and hunger by 2015 particularly ambitious (Jukes *et al.*, 2000).

The studies of the effect of malnutrition on cognitive ability indicate that chronic undernutrition is associated with lower achievement levels in school children (Grantham-McGregor and Ani, 2001). Good health and nutrition are needed to achieve one's full educational potential because nutrition affects intellectual development and learning ability (UN/ACC/SCN, 1990; Ernesto, 1990). Multiple studies report significant findings between the nutritional status and cognitive test scores or school performance. Studies have consistently shown that, children with more adequate

diets score higher on tests of factual knowledge than those with less adequate nutrition (Levinger, 1996; WHO, 1996; Pollitt, 1990). Studies have found that severe stunting in the first two years of life is strongly associated with lower test scores in school-age children. Also, nutritional anaemia, particularly deficiencies of iron, iodine and vitamin A are major problems for school-age children in low income countries. It has been shown that such deficiencies can negatively impact on growth, increase susceptibility to infection and also impair the mental development and learning ability of school children (Pollitt, 1990).

The education of millions of children throughout the world is being held back by malnutrition (UN/ACC/SCN, 1990). Malnutrition in early childhood can affect school aptitudes, time of school enrolment, concentration and attentiveness (Levinger, 1996). Children with a history of severe malnutrition perform less well on tests of IQ and specific factual knowledge than children in matched comparison groups (Pollitt, 1990). Malnutrition also

impairs the ability to concentrate, learn and attend school regularly (UN/ACC/SCN, 1990). A child who is malnourished and subsequently suffering from poor health cannot adequately take advantage of instructional and learning materials (Levinger, 1996). All of these consequences of malnutrition compromise children's attendance and performance at school. In developing countries like Nigeria, using Sokoto State as a case study, where child malnutrition is common, understanding the impact of nutrition on schooling is of even greater importance and urgency. Therefore, a study of this nature especially among secondary school students in Sokoto Metropolis is imperative.

MATERIALS AND METHODS

This study was a descriptive survey involving secondary school students comprising male and females within the ages of 10-25 years. The study was conducted in Sokoto Metropolis. 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 of 60 students from each school, were used for the study.

Data for the study was collected using questionnaire. The respondents were requested to select the appropriate options as it applied to them. Anthropometric measurements was based on the standardized method of WHO (1983) and UNICEF (1989).

The academic performance of the school children was determined thorough assessment of their performance in a test administered by the researcher. The students were taught nutrition education after which a test was conducted to ascertain the students understanding and performance. The test comprised 12 nutrition knowledge questions. The performance 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 obtained from the study was subjected to statistical analysis using descriptive statistics, chi-square and correlation respectively. Statistical significance was set at $p < 0.05$. Statistical Package for Social Sciences (SPSS) for windows version 15 was used for statistical analysis.

Table 1: Basic information of the respondents

	Frequency	Percent
Sex		
Male	168	70.0
Female	72	30.0
Total	240	100.0
Age group		
12-15	56	23.3
16-19	150	62.5
20-23	34	14.2
Total	240	100.0
Father's occupation		
Farming	36	15.0
Business	70	29.2
Teaching	17	7.1
Civil servant	117	48.8
Total	240	100.0
Mother's occupation		
Housewife	124	51.7
Self employed	45	18.8
Civil servant	41	17.1
Business	30	12.5
Total	240	100.0
Household size		
1-3	38	15.8
4-6	77	32.1
7-9	68	28.3
10 and above	57	23.8
Total	240	100.0

RESULTS AND DISCUSSION

The result in Table 1 shows the basic information of the secondary school students studied. A total of 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 majority of them (62.5%) within the ages of 16-19 years, while 23.3% and 14.2% were within the ages of 12-15 and 20-23 years respectively.

Result of the father's occupation showed that almost half (48.8%) were civil servants, 29.2% were businessmen, 15% were farmers and 7.1% were teachers. Also, more than half (51.7%) of the mothers were housewives, 18.5% were self-employed, 17.1% were civil servants and 12.5% were involved in one form of business or the other.

Nutritional status of the respondents by school: Table 2 summarizes the nutritional status of the selected secondary school students in Sokoto metropolis. The result showed that a total of 22.9% of the students were underweight (BMI below 18.5 kg m^{-2}). This was highest in SDUSS (40%) followed by NCS (35%), FGCS (21.7%) and ADSS (15%) respectively. Also, 7.5% were overweight (BMI, $24.5\text{-}30.0 \text{ kg m}^{-2}$), majority of which were students of ADSS (18.3%) followed by FGCS (8.3%) and SDUSS (3.3%) respectively. None of the students from NCS was overweight.

Table 2: Nutritional status of the respondents by school

School	Underweight	Normal	Overweight
SDUSS	24 (40.0)	34 (56.7)	2 (3.3)
ADSS	9 (15.0)	40 (66.7)	11 (18.3)
NCS	21 (35.0)	39 (65.0)	0 (0.0)
FGCS	13 (21.7)	42 (70.0)	5 (8.3)
Total	67 (27.9)	155 (64.6)	18 (7.5)

$\chi^2 = 24.872$, $df = 6$ p -value = 0.000 ($p < 0.001$). Values in parenthesis are percentages. SDUSS = Sani Dingyadi Unity Secondary School; ADSS = Army Day Secondary School; NCS = Nagarta College Sokoto; FGCS = Federal Government College Sokoto

Table 3: Mean performance score of respondents

School	Score (%)
SDUSS	29.6 ^a ±12.5
ADSS	46.6 ^b ±12.8
NCS	40.5 ^c ±15.1
FGCS	60.3 ^d ±11.0
Total	44.3±17.0

^{a,b,c,d}Means in a column with different superscript letters are significantly different ($p < 0.05$). Values are mean±standard deviation of 60 respondents

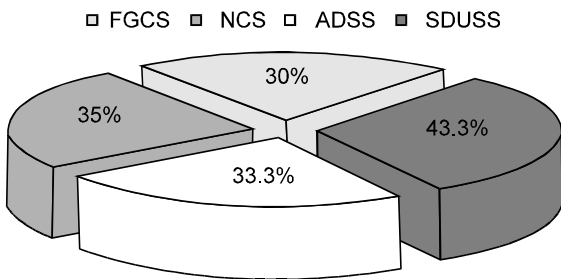


Fig. 1: Prevalence of malnutrition* in selected schools in Sokoto Metropolis. *Malnutrition was determined as underweight and overweight. Total prevalence recorded was 35.4%

Furthermore, more than half of the students (64.6%) had normal nutritional status (BMI, 18.5-24.5 kg m²). The school with the highest number of students having normal nutritional status was FGCS (70%). It was also observed that FGCS had the least prevalence of malnutrition (Fig. 1) compared to the other selected secondary schools. Also, SDUSS which had the least number of students with normal nutritional status had the highest prevalence of malnutrition (Fig. 1) and the poorest performance in the knowledge assessment (Table 3) compared to the other schools. This emphasizes the link between nutrition and academic performance.

The chi-square test showed significant difference ($p < 0.05$) in the nutritional status of the selected secondary school students studied ($\chi^2 = 24.872$, $df = 6$). Figure 1 shows the general summary of the prevalence of malnutrition. SDUSS recorded the highest prevalence of malnutrition (43.3%).

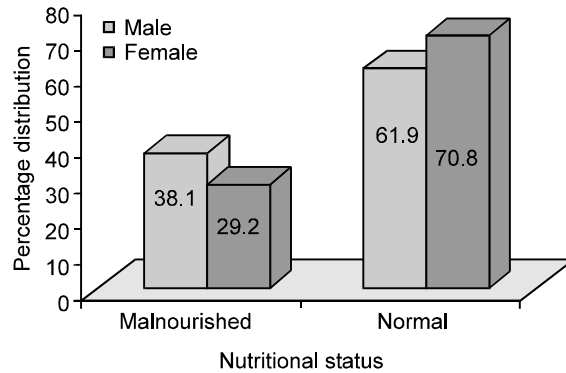


Fig. 2: Prevalence of malnutrition among male and female students in selected schools in Sokoto Metropolis ($\chi^2 = 1.757$; $df = 1$; $p > 0.05$)

Prevalence of malnutrition among NCS students was 35%, while that of ADSS was 33.3%. FGCS had the least prevalence of malnutrition of 30%. A total prevalence of 35.4% malnutrition was recorded among the selected secondary school students in Sokoto metropolis. A Cross sectional study carried out to assess the nutritional status of medical students at Ain Shams University, revealed that 58.7% of the students were malnourished with about half of the students being overweight and obese (Bakr *et al.*, 2002). Also, the prevalence of malnutrition recorded in this study was higher than the reported range among adolescents in Africa (4-30%) (Allen and Gillespie, 2001; Kurz and Johnson-Welch, 1994). Within Africa, prevalence of undernutrition among adolescents has been reported in Senegal (29.8%), Benin (23%) and Sudan (25%) (Kurz and Johnson-Welch, 1994; Benefice *et al.*, 2003; Inoussa, 1994). Studies in Maputo, Mozambique (Prista *et al.*, 2003) and in Kenya (Leenstra, 2005) determined that 16% of their adolescent samples were undernourished.

Figure 2 shows the prevalence of malnutrition among the male and female students from the selected secondary schools studied. The result revealed a higher prevalence of malnutrition among the male (38.1%) compared to the female (29.2%) students. Majority of the female students (70.8%) had normal nutritional status compared to the male (61.9%). This showed that the nutritional needs of the female students are given more attention compared to the male students. It was further observed that the females performed better than the males in the knowledge assessment carried out. However, malnutrition was not significantly ($p > 0.05$) associated with sex. In the Mozambican study (Prista *et al.*, 2003) a higher prevalence of undernutrition was found among boys than girls (23% vs 9%).

Mean performance score of the respondents: Table 3 summarizes the mean performance score and

Table 4: Performance of secondary school students from selected schools in Sokoto Metropolis based on assessment of their nutrition knowledge

Score grade	SDUSS	ADSS	NCS	FGCS
Excellent	0.0 (0.0)	2.0 (3.3)	2.0 (3.3)	9.0 (15.0)
Very good	2.0 (3.3)	6.0 (10.0)	3.0 (5.0)	18.0 (30.0)
Good	0.0 (0.0)	7.0 (11.7)	3.0 (5.0)	19.0 (31.7)
Fair	12.0 (20.0)	29.0 (48.3)	26.0 (43.3)	11.0 (18.3)
Poor	46.0 (76.7)	16.0 (26.7)	26.0 (43.3)	3.0 (5.0)

$\chi^2 = 122.384$, $df = 12$, $P\text{-value} = 0.000$ ($p < 0.001$). Values in parenthesis are percentages

Table 5: Pearson correlation matrix showing the relationship between malnutrition and performance score grade

	School	Sex	Age group	Father's occupation	Mother's occupation	Mal-nutrition	Score grades
School	1	0.407**	-0.468**	0.119	0.261**	0.090	-0.531**
Sex		1	-0.426**	0.058	0.256**	0.086	-0.389**
Age group			1	0.016	-0.130*	0.075	0.307**
Father's occupation				1	0.134*	-0.036	-0.132*
Mother's occupation					1	-0.035	-0.201**
Malnutrition						1	-0.154*
Score grades							1

**Correlation is significant at the 1% level ($p < 0.01$). *Correlation is significant at the 5% level ($p < 0.05$)

anthropometric values of the selected secondary school students in Sokoto metropolis. The study recorded a total mean performance score of 44.3% among all the selected schools.

Students of FGCS recorded the highest mean score of 60.3% which was significantly higher ($p < 0.05$) than that of the other selected schools. SDUSS had the lowest mean performance score of 29.6%.

Academic performance of respondents: Table 4 revealed the academic performance (nutrition knowledge scores) of the students from selected secondary school in Sokoto metropolis. The chi-square analysis showed that the academic performance of the selected secondary school students differed significantly ($\chi^2 = 122.384$, $p < 0.05$).

The highest number of students who performed excellently (scores 71-100%) was recorded in FGCS (15%) followed by 3.3% in ADSS and NCS respectively. None of the students in SDUSS had excellent grade. Also, FGCS recorded the highest percentage (30%) of students who had 'very good grades' (scores 61-70%), followed by ADSS (10%), NCS (5%) and SDUSS (3.3%) respectively. Majority of the students who had good grades (scores 51-60%) were from FGCS (31.7%) followed by ADSS (11.7%) and NCS (5%). None of the SDUSS students were in this category.

Assessment of the performance of all the students who scored above 50 in order of increasing performance shows FGCS (76.7%) > ADSS (25%) > NCS (13.3%) > SDUSS (3.3%). This presents SDUSS at the bottom of the 'ladder' and FGCS at the top.

Furthermore, SDUSS had the highest number of students with fair (20%) and poor (76.7%) performance while FGCS recorded the least (18.3 and 5%) respectively. The result so far further strengthens the link between malnutrition and academic performance.

Relationship between malnutrition and performance score grade:

The Pearson correlation coefficient matrix which shows the relationship between malnutrition and academic performance is shown in Table 5. The result showed negative significant relationship ($r = -0.154$, $p < 0.01$) between malnutrition and academic performance. The negative significant relationship indicates that increase in malnutrition will significantly and negatively influence the performance grade of the students. This link is further strengthened by the observed poor academic performance of students from SDUSS who had the highest prevalence of malnutrition, while FGCS with the least prevalence of malnutrition had the highest performance score grades.

Good nutrition therefore plays a key significant role in determining the academic performance of the secondary school students. The United Nations reported that education of millions of children throughout the world is being held back by malnutrition (UN/ACC/SCN, 1990). Malnutrition in early childhood can affect school aptitudes, time of school enrolment, concentration and attentiveness. Children with a history of severe malnutrition perform less well on tests of IQ and specific factual knowledge than children in matched comparison groups (Levinger, 1996; Pollitt, 1990). Malnutrition also impairs the ability to concentrate, learn and attend school regularly (UN/ACC/SCN, 1990). A child who is malnourished and subsequently suffering from poor health cannot adequately take advantage of instructional and learning materials (Levinger, 1996). All of these consequences of malnutrition compromise children's attendance and performance at school.

Other variables which were significantly related with academic performance were school ($r = -0.531$, $p < 0.01$), sex ($r = -0.389$, $p < 0.01$), age ($r = -0.307$, $p < 0.01$), father's occupation ($r = -0.132$, $p < 0.05$) and mother's occupation ($r = -0.201$, $p < 0.01$) respectively. Household size correlated significantly with malnutrition (-0.129 , $p < 0.05$).

Conclusion: The findings of this study have revealed a high prevalence of malnutrition (35.4%) among selected secondary school students in Sokoto metropolis, using BMI as index. Malnutrition was negatively and significantly related with academic performance. This link was further strengthened by the observed poor academic performance of students from SDUSS who had the highest prevalence of malnutrition, while FGCS with the least prevalence of malnutrition had the highest performance score grades. From the results of this study, it is clear that nutrition plays a significant role in the academic performance of school students. This study has shown that malnutrition is associated with lower academic performance in school children. It is therefore recommended that government as part of effort to reduce the incidence and prevalence of malnutrition should give priority to the provision of good quality meals for school students. Screening for common health problems and assessment of nutritional status should be an essential part of school services. Furthermore, activities to reduce the prevalence of malnutrition such as school-based interventions, educating parents, parents-to-be and other family and community members on the importance of good nutrition should be encouraged.

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