



Micronutrients deficiencies (poor levels of antioxidants Vitamin A and Vitamin C) and Academic Performance of Selected Young Girls in Sokoto, Nigeria

Aminu Umar Imam¹ and Yusuf Sarkingobir²

¹Sokoto State University, Nigeria

²Shehu Shagari University of Education, Nigeria

superoxidedismutase594@gmail.com

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ABSTRACT

It is widely stressed that girl-child education is good; and girls could only learn properly if they are fed well. Levels of micronutrients such as antioxidants vitamins A and C could lead to poor brain or nervous system functions. The objective of this work was to evaluate the relationship between Micronutrients deficiencies (poor levels of antioxidants Vitamin A and Vitamin C) and academic performance of selected young girls in Sokoto, Nigeria. This work determined blood levels of vitamin A and C in 250 young girls in Sokoto using standard methods and materials of analytical grade. A semi experimental study involving 40 selected study participants was done. An exploration of academic performance of subjects that are with enough vitamin C and A and their counterparts was done using assessment. This study shows that, the girls with normal levels of antioxidants vitamins A and C scored a mean mark (55.0+ 13.015) more than those with poor levels (35.63+12.63) ($p < 0.05$). This signifies that nutritional concerted interventions are needed. Nutritional education, soil fertilization, bio fortification, and relations could be used for improving public diet in the state.

Kata kunci: Nigeria, vitamin A, vitamin C, antioxidants, youngsters, brain



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INTRODUCTION

Micronutrients include minerals and vitamins required or needed in small amounts by the body through the diet to perform functionally in life processes (Khader, 2021). Poor intake of micronutrients whatsoever has strong impact on social, economic, educational, and political factors. Due to factors such as poverty (that is widespread in Africa), low awareness, deficient soils, poor interventions, etc, there is still the problem of micronutrients deficiencies in our regions (Khader, 2021). Micronutrients deficiencies are hidden hungers, due to inadequate food supply, and mostly latent symptoms. The problems affect over 840 million individuals of developing nations origin (Khader, 2021).

Meanwhile, some people especially in Africa are affected by multi micronutrients deficiencies; having poor levels of two or more micronutrients (Shukla et al., 2014). Micronutrients role in the body cannot be overemphasized. They are vital for healthy development, disease prevention, as well as overall wellbeing (Haritha, 2022). Children and young people need micronutrients more, because failure to provide them cause devastating consequences (Haritha, 2022; Kihara et al., 2020).

Young girls are at the state of important opportunities, while at one hand are facing risks if not properly fed. Many of the girls consume few fruits, vegetables, and other important food groups due to factors such as poverty (Özdemir, 2016). This could result possibly to poor antioxidant levels (such as vitamin A and C). Antioxidants are important for reducing the risk of diseases (Ene-Obong et al., 2003). Parable, vitamin A is essential for normal vision, immune function, cell group, and development. Vitamin C is functioning in blood and cells, immune system, and synthesis of serotonin, adrenaline,

and collagen as well (Styrer, 1988). Vitamin C has a role in copper-containing hydroxylases and alpha-ketoglutarate linked iron-containing hydroxylases-dopamine Bata-hydroxylase is used as a copper-containing hydroxylase that is utilized in the synthesis of catecholamines (epinephrine and norepinephrine) in the central nervous system. The role of vitamin A and C is to protect the body against free radicals to avoid damage to nucleic acids, lipids, proteins, membranes, and plasma lipoproteins (Huskisson et al., 2007). Thus, role of the two vitamins (A and C) in antioxidation connect them with brain or central nervous system functioning; therefore, the need to monitor them in girls for health and effective learning is enormous. This monitoring is significant in a state battling up to improve girl-child education among it's citizens. The objective of this work was to evaluate the relationship between Micronutrients deficiencies (poor levels of antioxidants Vitamin A and Vitamin C) and academic performance of selected young girls in Sokoto, Nigeria.

RESEARCH METHOD

Study Participants, 250 Participants for this study are young girls from Sokoto State, Nigeria (in school students, age 15-18). Blood samples collection, blood samples were collected from participants through venipuncture, transferred into clean tubes, centrifuged. Serum was obtained after centrifuging, at 3000rpm for 5 minutes. Sera was transferred into labelled plastics tubes (1ml capacity) and stored at -20°C, analyzed for vitamin A and C.

Assay Method, the vitamin A was determined according to methods reported in Underwood & Olson (1993). Vitamin C was determined based in the method provided by Lowry et al. (1949). Semi experimental design, the design involves recruiting of participants, teaching, as well as assessment.

Students assessment, the participants were instructed (in the area of biology for a good four weeks), later they were assessed by the teachers (researchers) using 50 multiple choice objectives attracting 100 marks. The grading included prepared grades (fail, less than 40 marks; and 40-above, as pass marks). The means were statistically analyzed using Chi-square test.

RESULT AND DISCUSSION

Table 1. Prevalence of micronutrients deficiencies in girls in Sokoto State Nigeria

Participants	Frequency
Participants with multimicronutrients deficiency (vitamin A and Vitamin C)	37
Vitamin A Deficiency	17
Vitamin C deficiency	37

Table 2. Levels of antioxidants vitamins A and C in selected girls in Sokoto, Nigeria

Status	N=250	
	Frequency	Percentage
Level of vitamin A (ug/dl)		
Deficient (<10)	17	6.8
Low (<20)	16	6.4
Correct (<20-29)	217	87.8
Vitamin C (mg/dL)		
Low (<0.7)	37	14.8
Correct (0.7-1.4)	215	85.2

Table 3. Relationship between levels of vitamins A and C and academic performance of selected girls in Sokoto, Nigeria

Participants/subjects	Mean score	Standard deviation	Chi-square	Remarks
N=20 Normal level of vitamin A and Vitamin C	55.0	13.015	29.103	Significant
N=20 Poor level of vitamin A and C	35.63	11.633.	285.852	Significant

The results of two selected antioxidants micronutrients (vitamin A & vitamin C) were revealed in Tables 1, 2 and 3. Table 2 shows the status of two selected antioxidants vitamins (A and C) among girls in Sokoto, Nigeria. The level of vitamin A shows that out of the 250 participants that participated in this study, few (6.8%) were deficient (having level of < 10ug/dl), few (6.4%) were having low (<20ug/dl). Table 1 also shows that, blood vitamin C level among the 250 participants was low in 14.8 % (37 girl participants), and normal in 85.2% (213 participants).

Table 3 shows the relationship between multi -micronutrients deficiency (vitamin A and C) and academic performance of selected young girls in Sokoto, Nigeria. The normal girls scored a mean mark of 55.00 ± 13.05 ($p < 0.005$), while girls with poor levels of vitamin A and C scored mean mark of 35.63 ± 11.633 .

Micronutrients are globally important. Many regions and nations are battling with micronutrients deficiencies. Nigeria is among the nations with micronutrients concern, especially in Sokoto where there are several reports of malnutrition (Abduljalil et al., 2023) despite the fact that nutrition is vital for human body. Albeit, nutritional requirements vary according to certain factors such as age, sex, and health status, micronutrients are essential aspect of nutrition for healthy level as a result of their roles in health, growth, and development (Özdemir, 2016). Vitamin A deficiency lead to 1 million premature deaths in children every year, and also as well as poor immunity (Styrer, 1988). Low levels of vitamin C (hypovitaminosis C) have effects such as fatal scurvy, fatigue, mood changes, lethargy, and the likes (Rowe & Carr, 2020). This study revealed blood low-level (deficiency) of antioxidants Vitamin A and C in few young girls in Sokoto, Nigeria. The condition is a serious issue in the girls affected due to their needs for micronutrients for growth, functioning, and development (Styrer, 1988). The affected girls condition could be due to poor nutrition. Due to low socioeconomic status, many people could not afford balanced (adequate) diet, rather many are living on silent hunger, left with no option than to wallow in food insecurity or at least consumed monotonous diet (Bilbis et al., 2003). The practice of monotonous and low quality or inadequate diet is a trend in many households in Sokoto (Bilbis et al., 2003; Rowe & Carr, 2020). People consuming Fe food materials grown from Sokoto or other related areas may be at risk of developing micronutrients deficiencies and consequent effects; because the soils are poorly-rich in the Sub-Saharan parts of the state and poor food processing might not be done properly (Khanam et al., 2022). People taking only grains may develop low vitamin C level (Rowe & Carr, 2020). Particularly, vitamin A and Vitamin C deficiencies were reported. Parable, Bilbis et al. (2003) had reported in the studies of preschool children that about 9.8 percent had severe deficiency; which is higher than the finding of this work. And this work's result was similar to a report of a study by Ene-Obong et al. (2003) among adolescents in Enugu, that shows major percentage of the participants consume enough vitamin C.

In this study, comparing the academic performance of girls with normal vitamin A and vitamin C levels and that of those who have poor multi micronutrients levels show that, the normal girls scored a mean mark higher than the girls with deficiency of vitamin A and C simultaneously. This shows multi micronutrients deficiencies effects. And that could not be dissociated the outcome from the role of the two important antioxidant vitamins (A and C) in functioning of the human biological system. Parable, vitamin C supports absorption of iron (a very important micronutrient associated with brain and body

functions) and hemoglobin functioning (Khanam et al., 2022). Studies have elaborated the role of vitamin C and diseases, as well as nervous system (brain functions) (Rowe & Carr, 2020). Poor vitamin A level may elicit impairment in iron stores and increased infection; that in turn affecting learning (including an academic performance) as well (Bilbis et al., 2010; Fishman et al., 2000). Huskisson et al., (2007) discerned that, micronutrients (including vitamins A and C) exert effects by affecting oxidative stress, energy metabolism, neurotransmitters synthesis (vitamin C is directly needed for synthesis of dopamine, epinephrine, norepinephrine) and other efforts. Therefore, proper dietary intake is essential for health and good learning outcomes.

Many of the deficiencies including that of vitamin A and vitamin C in youngsters are preventable through nutrition education, healthy and diverse foods consumption, fortification, supplementation, fertilization, etc (Jennifer, 2020). Though, word and regional interventions have made significant contributions, a lot are yet to be done (Jennifer, 2020). Failure to address the stemming micronutrients deficiencies means a lot. It means an impediment to growing minds, lowering of national intelligence quotient and other resultant effects (Jennifer, 2020).

CONCLUSION

Micronutrients are examples of nutrients needed by the body for proper functioning and health. However, when there is shortage of intake of micronutrients such as vitamin C and A, there is going to be consequences. Some of the consequences of vitamin A and C multi-micronutrients deficiency in youngsters as indicated by this work is the effect on academic or learning outcome.

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