

## **RELATIONSHIP BETWEEN DIETARY INTAKE, NUTRITION STATUS AND ACADEMIC PERFORMANCE OF PUPILS**

**Ms Rhoda Musungu**

Postgraduate Student, Department of Nutritional Sciences  
Masinde Muliro University of Science and Technology, **KENYA**  
**Email:** rhodamusungu@gmail.com

**Prof. Asenath Sigot**

Professor, Department of Nutritional Sciences  
Masinde Muliro University of Science and Technology, **KENYA**  
**Email:** asigot@mmust.ac.ke  
**KENYA**

**Dr. Jane Naliaka Situma**

Lecturer, Department of Nutritional Sciences  
Masinde Muliro University of Science and Technology, **KENYA**  
**Email:** jsituma@mmust.ac.ke

### **ABSTRACT**

This paper focuses on the review of literature. It looks at the following areas; the dietary intake of pupils, the nutrition status of pupils and finally it evaluates the relationship that exists between dietary intake, nutrition status and school performance of the pupils. The reviewed literature suggests that children's dietary intake and nutrition status have an effect on their overall school performance. However, there exist gaps to be filled with regard to the dietary intake, nutrition status and school performance. This review looked at these in order to determine the relationship that exists between dietary intake, nutrition status and school performance of pupils 8-14 years.. From the review, there exists a relationship between dietary intake, nutrition status and academic performance of pupils aged 8-14 years.

### **Dietary intake of pupils, 8-14 years of age**

School age is the active growing phase of childhood and is a dynamic period of physical growth and mental development (Cartwright et al., 2003; Ogunbile, 2012). A child's eating patterns and dietary intake might influence their growth especially in SAC (Grosver & Smolin, 2009; KNBS, 2010). Thus the dietary intake of a child must supply the nutrients that are needed for their growth and development, and also for body maintenance and energy for physical activities. Inadequate dietary intake causes nutritional problems due to many reasons. When they affect a generation of SAC, they can lower their learning capacities, thus compromising their future, perpetuating an unending cycle of poverty and malnutrition with severe consequences to both individuals and nations (FAO, 2011).

Inadequate dietary intake is secondary to insufficient or inappropriate food supplies. In some areas, cultural and religious food customs may affect dietary intake (UNICEF, 2016). A study done in Kajjado, Kenya reported that cultural beliefs, taboos and attitudes negatively affected the dietary practices of SAC. Boys considered nutrition as a female domain and instead preferred masculine activities to nutrition related activities. Attitudes towards consumption of certain foods were influenced by the school set up; rural or urban. Girls on the other hand, did not consume animal products like eggs and meats as they assumed it will be difficult for them to get married (Mbithe, Kimiywe and Waudu, 2012). It is important to note that SAC tend to eat differently as they did as children due to such factors and also the need for independence and acceptance by their peers, mobility and time spent in school and the pre-occupation with

their self-image. To enhance cognition as well as the physical development of pupils, a good amount and quality of food is required (Barooh, 2012).

According to the FAO Family Nutrition Guide, the frequency of eating for older children including SAC should be 3 meals and 3 snacks daily (FAO, 2004a). WHO/FAO dietary guidelines (2010), states that there are important components that ensure adequate dietary intake for optimal nutrition among SAC. These include proteins, especially from animal sources, carbohydrates and fats. In addition to that, micronutrient rich foods should also be included in their diets, with adequate consumption of fruits and vegetables encouraged. Foods rich in iron, folate and vitamin B12 should be in plenty to avoid the occurrence of anemia as it negatively impacts the work capacity, intellectual performance and cognitive development. Sufficient iodine and zinc are also important to optimize mental development and prevent goiter. Vitamin A also plays a critical role in the diets of SAC eye health and immune function.

Another important aspect of dietary intake is dietary diversity. According to a study done by Mukherjee et al., (2017), the dietary intake of school aged children in developing countries is lacking in diversity. Fruits and vegetables have a key role in nutritional balance. They are the main food sources of fiber, vitamins, minerals and other biological components for the growth of the organism (Best *et al.*, 2010). A study by Bukhari (2013), showed that SAC consuming fruits and vegetables more than three times in the week are most likely to have better results, yet the diets of SAC in developing countries are inadequate in fruits and vegetables. Zaborskis et al., (2012), in a study among Lithuanian SAC found that the children had low intakes of fruits and vegetables with girls having a higher consumption at 27.1% than boys at 21.1%. Only a quarter of school children had a daily consumption of vegetables and fruits in Bahrain (Gharib and Rashid, 2011).

A study done in Ghana by Doku et al., (2013), also reported that fruits and vegetables were rarely eaten by the SAC. These findings are of great concern. In developing countries, plant based diets from cereals, tubers and roots are mainly consumed by SAC with limited consumption of animal based foods (Rauber, Hoffman and Vitolo, 2014). Gewa et al., (2014) found that milk was completely missing from the diets of SAC in rural populations in Kenya. From the above findings, it is true to note that dietary diversity reflects the nutrient quality of one's diet as stated by FAO (2011).

A study done in Lebanon by El-Kassas and Ziade (2017), found that half of the participants in their study on SAC had inadequate dietary intakes of proteins, fruits, and vegetables and 92% had inadequate milk and dairy intakes recommended for their age specific needs. Intake of animal based foods have been reported to promote increased intake of micronutrients and had a positive effect on cognitive development, body composition and growth as was demonstrated in Kenya by Omwami, Neumann and Bwibo (2011). Erickson (2006), also noted that animal sourced foods: meat, fish, milk and cheese, are key components required to keep the brain functioning correctly. These findings seem to concur with a study done by Zahe *et al.*, (2017), in Nigeria on the diet, nutrition status and school performance of SAC, that reported the proportion of school children performing well in mathematics, consumed more than three days of milk and dairy products in the week. For this reason, it is important that SAC diets be diverse in their food sources from both animal sources and plant based diets.

Meal patterns and food choices are also key in the dietary intake of SAC. Breakfast is the most important meal of the day and should provide most energy needed by the SAC for their learning and school activities. Despite this knowledge, various studies have reported that most SAC

miss out on breakfast with its contribution to the energy intake being 10% of the recommended daily allowance (Mwaniki and Makokha, 2013, Abrahams *et al.*, 2011 and Doku *et al.*, 2013). This was found to occur mostly in the rural populations (Sophie and Peninah, 2014). With regards to food choices, it is important to note that nutrition knowledge among SAC is key for them to establish proper foods required for their growth and development, especially when they eat away from home. A study done by Kiragu *et al.*, (2015), among primary school children in Nairobi found that the pupils had moderate nutrition knowledge and majority of them did not care about what they ate and had a bad attitude towards their diets.

Another important issue of concern is the increased consumption of processed foods among SAC. Foods high in sugar, salt and saturated fat are preferred by these children and school canteens stock these foods thus encouraging their consumption (Gharib and Rashid, 2011). This shift is intensified by the rapid replacement of traditional diets with western diets. This has encouraged the consumption of energy dense foods. These foods are mainly eaten away from home and they make a large contribution to the overall diet of the SAC (Nago *et al.*, 2010; Pangani *et al.*, 2016). Linking the diet quality in children to outcomes such as improved school performance may motivate children to eat healthy diets. In developed countries, studies have demonstrated the positive effects of adequate dietary intake on school performance.

### **Nutrition status of pupils, 8-14 years**

Adequate nutrition is key in the improvement of the quality of life and is a prerequisite to good health for a strong and productive society. Malnutrition is an underlying or associated cause in at least half of all childhood deaths. Under nutrition alone is responsible for more than one-third of child deaths globally and accounts for 11% of the global disease burden. It is also more prevalent in low and middle income countries (UNICEF, 2011). In Africa, malnutrition remains a major challenge with the burden on a worrying trend as stunting is at 40%, wasting 4% and underweight 25% in under-five children population (Millennium Development Report, 2015). Under nutrition among SAC is a public health problem in developing countries with the most commonly reported problems among SAC being underweight and micronutrient deficiencies of iron, zinc, iodine and vitamin A. It is also a major contributor to the global burden of disease (WHO, 2016). Under nutrition among SAC in Africa has been linked to dietary intake, hygienic practices, morbidity and family socio-economic status (Herrador *et al.*, 2014). Various studies seem to concur with the effects of malnutrition on SAC. It affects their health and capacity to perform in school as it results to poor school attendance, intelligence quotient, school achievement and morbidity (Omwami, Neumann & Bwibo, 2011). It also impairs the immune system making the child more vulnerable to infections and less interested in the environment they live in compared to their well-nourished peers and is an underlying factor for low school enrollment (WHO, 2016).

Kenya has a stunting rate of 26%, wasting 4% and underweight 11% while Bungoma County reported stunting at 24%, wasting at 2% and underweight at 9% (KDHS, 2014). Despite statistics on the nutrition status of under five children being reported in many national and regional surveys, the nutrition status of SAC, 8-14 years is hardly reported. This age forms a huge part of the population and statistics on their nutrition status will go a long way in understanding how the malnourished children under five years, progress at school age. Also this group of children are the future of our nation and their nutrition status will not only determine the economic situation of the county, but also the children born in future. Many studies have looked into the nutrition status of under five children.

Assessment of SAC nutrition status is essential for making development towards their overall health and well-being (Bhargava, Aggarwal, Kandpal and Semwal, 2015). Nutrition status can be assessed using several methods: anthropometry, clinical signs, and biochemical methods. A combination of these methods provides better findings of the nutrition status of the populations. In developed countries, many studies have been done on the nutrition status of the SAC. However, relatively few studies have been done in developing countries on the nutrition status of SAC. In a systematic review done by Best *et al.*, (2010) on the nutrition status of SAC, the available data indicated that malnutrition was a public health concern in developing countries and countries in transition. Underweight and thinness were most prominent in the populations from South East Asia and Africa with the prevalence of overweight being 15%. More recent studies indicate that the situation is still wanting as they are now faced with the dual burden of over nutrition and under nutrition.

It is well documented that suffering from under nutrition or over nutrition during the school years can inhibit a child's physical and mental development. Stunting (low height-for-age) is associated with long-term consequences, such as impaired intellectual achievement and school performance and also leads to reduction in adult body size and, subsequently, reduced work capacity and obstetric complications (Frongillo, 1999). Thinness (low body mass index [BMI]-for-age) in school aged children can result in delayed maturation, deficiencies in muscular strength and work capacity, and reduced bone density later in life. The overweight or obese school child also faces increased risks of high blood pressure, metabolic syndrome, non-insulin-dependent (type 2) diabetes, and psychological disorders (WHO, 2012).

According to studies done in Nigeria, malnutrition is prevalent. Amuta and Houmsou, (2009) in a study on nutrition status among primary school children found that males had a higher rate of under nutrition at 57.44% compared to their female counterparts at 44.65%. A similar study by Opoola *et al.*, (2016), reported that underweight was more prevalent in males than females whereas overweight was more prevalent in females than males. In Bangladesh, Haque *et al.*, (2014), reported that 93.3% of the SAC were malnourished with 10% of them being severely malnourished while in Nepal, Prakash *et al.*, (2017) found out the prevalence of underweight, wasting and stunting to be 7.4%, 52.59% and 28.88% respectively. In Lebanon, El-Kassas and Ziade (2017), reported that 13.8% of the SAC population were stunted with 9.2% being overweight and obese. In Tanzania a study by Mosha and Fungo (2010), showed that the prevalence of overweight and obesity combined among children aged 6–9 years in Dodoma and Kinondoni was 9.8% and 14.9%, respectively with a more recent study by Pangani *et al.*, (2016), reporting that 15.9% of SAC were overweight and 6.7% obese.

A study done on nutrition status among primary school children 4-11 years in Kenya found that, 24.5% were stunted, 14.9% underweight and 9.7% wasted (Mwaniki and Makokha, 2013). Findings from this study concurred with those done much earlier by Chesire *et al.*, (2008), that reported under nutrition among the SAC population with stunting being the most prevalent at 30.2%, wasting at 4.5% and underweight at 14.9%. An earlier study by Tai (2009), reported stunting at 35%, wasting at 14.8%, underweight at 26%, overweight at 7.1% and obesity at 6.3%. Another study by Wachira (2014), identified the prevalence of overweight, obesity, and thinness among children aged 5 to 18 years to have been 11.4%, 2.8%, and 13.0%, respectively. Kamau *et al.*, (2015) found that overweight and obesity was more prevalent in private schools at 16.7% and 6.9% respectively, compared to public schools, 5.7% and 1.6% respectively. This concurred with a study done previously that reported overweight and obesity to be more prevalent in private compared to public schools. These studies were conducted in urban areas and also with varied age brackets of pupils.

In rural populations, a study done by Kikete (2011), in Bumula district on the nutrition status of primary school children, 6-14 years, reported stunting at 13.24%, underweight at 17.64% and wasting at 7.35%. A more recent study in Kisii reported stunting at 3.9%, wasting at 6.5% and underweight 1.9% which is way below the WHO threshold of Kisii Central sub-county, 15% (Opini, 2017). Looking at the above studies, it is important to note that relatively few studies have looked into the nutrition status of SAC as compared to that of under five children, especially among rural populations in Kenya. This period is important in terms of growth and development of these children as it offers a window of opportunity for children to exhibit catch-up growth therefore, better health outcomes.

### **Dietary Intake, Nutrition Status and School Performance of Pupils, 8-14 years**

Performance in school is affected by a number of factors, including the quality of the school, the characteristics of the student's family such as socioeconomic status (SES) and parents' educational level, and the characteristics of the child. Under nourished SAC tend to have decreased school attendance, attention and academic performance and they experience more health problems compared to their well-nourished peers. The consequences of malnutrition at school age are severe and have effects way into adulthood. Poor dietary intake and nutrition status among SAC is the most common cause of low school enrollment, absenteeism, early dropout rates and unsatisfactory performance (Li *et al.*, 2008; Bener, 2013). According to Gharib and Rasheed (2011), malnourished children are more likely to begin school later than their well-nourished counterparts as they seem less mature. They have difficulty in concentrating and develop behavior problems more often than not, thus they do not perform well in school. They are also susceptible to illness and are more likely to be absent from school. In addition to that, they experience more grade repetition and higher dropout rates.

The human brain needs sufficient energy; specifically glucose, and a variety of micronutrients to perform cognitive functions. A long term deficiency of any or numerous macronutrients or micronutrients causes malnutrition and consequential cognitive impairment, the extent of which depends on the duration and degree of the malnourishment and the timing of its occurrence in development. Improvements in the nutritional quality of pupils' diets are associated with academically beneficial gains, but have not been repeatedly and causally correlated to increased academic achievement. Concrete links between food consumption either at large or in specific foods and academic performance have not been established, likely because of the complex nature of the variables, the abundant confounders, and the longitudinal design necessary to understand the enduring effects. In general, however, it is clear that consistently eating sufficient quantity and variety of nutrient-dense foods will improve children's diet quality, and consequentially reduce the potential for the cognitive impairments associated with malnutrition.

Malnourished children in Iran were reported to be 11.6 times at risk of low intelligence than normal children. Their intelligent quotient (IQ) scores were identified to be reduced by 7.3 points (Ghazi *et al.*, 2012). A study done in Ethiopia showed that food insecure children were absent from school twice a week more than their food secure counterparts (Belachew *et al.*, 2011). In addition to that, studies have linked breakfast consumption to improved school performance (Kikete, 2011; Bukhari, 2013). A study by Opoola *et al.*, (2016), in Nigeria observed that overweight children performed much better compared to their underweight counterparts. Zahe *et al.*, (2017), in a study on diet, nutrition status and school performance in Abidjan reported that the most successful SAC had good nutrition status and dietary intake of fruits, vegetables and dairy products.

In Kenya, a more recent study done by Githinji (2016), in the urban population of Nairobi County concluded that food adequacy and good nutrition status positively influences the school performance of SAC. The contribution of diet to pupils' academic performance has rarely been reported and the focus of much of the relevant research has been on the association between indicators of malnutrition and cognition. Insufficient daily consumptions of foods has been found to affect health status, and poor health and nutritional status may hinder a child's ability to learn. Moreover, nutritional deficiencies in childhood and adolescence can affect later behavioral development and the acquisition of social skills (Florence, Abridge and Veugelers, 2008). Many studies have looked in to the nutrition status and dietary intake of SAC. However, they have not captured the element of school performance in relation to the SAC dietary intake and nutrition status. While there may be a consensus that dietary intake and nutrition status are essential to learning, there is little empirical research that examines the exact relationship between SAC overall diet, their nutrition status and their school performance.

### **Conclusion**

Dietary intake of school going children is very crucial. This is because it influences the school going children's health and nutrition status which eventually influences the pupil's class attendance and concentration in class. Though there might be no direct relationship between dietary intake and academic performance of pupil but good nutrition is important for good academic performance

### **Recommendation**

Parents, school leadership have a duty to promote and support proper dietary intake among the school going pupils. This will go a long way in establishing proper dietary patterns and intake among school aged children. This may translate into a well-nourished and healthy pupils with better academic outcomes.