Abstract

The study assessed the effect of micronutrient (vitamin A) deficiency on preschool children in Edo South Senatorial District of Edo State (Oredo Local Government Area). Vitamin A is an essential fat-soluble vitamin required for normal visual function, epithelia cellular integrity, immune function, growth, development and reproduction. Intake of vitamin A in preschool children’s diet has a plethora of health benefits, on the other hand, its deficiency causes several clinical symptoms such as xeropthalmia, night blindness, keratomalacia, diarrhea, measles, respiratory diseases and vision complications. These health challenges are caused by inadequate intake of vitamin A foods, ill-health of mother and lack of exclusive breast feeding, poor feeding practices amongst others. These negative effects can reduce the working capacity of the bread winner, affect the academic performance of the preschool child as well as affect the economic development of the society. Therefore, vitamin A could be encouraged by breastfeeding, enriched weaning foods with vitamin A and advocating that mothers embrace immunization from prenatal to five years of the child. Education on exclusive breastfeeding should be encouraged, complementary food should be fortified with vitamin A, enforce routine immunization of vitamin A supplements should be given at 3-6 months to aged 1-6 years.

Keywords: Adequate Nutrition, Exclusive Breast Feeding, Micronutrients (Vitamin A), Children Ages 3 Months- 6 years, Immunization

Introduction

Good nutrition is the first line of defense against numerous childhood diseases which can leave a lifelong influence on a child. According to Seriki and Abiamuwe (2016), poor nutrition during early Childhood causes delayed physical growth and motor development, impaired cognitive development. This leads to lower intelligent quotient, maladjusted behaviours at school, decreased attention, deficient learning and lower educational achievement. Seriki and Abiamuwe (2016) opined that every year, more than 200 million children below five years old fail to reach their full cognitive and social potentials. During early childhood (from prenatal period to eight years of age), children undergo rapid growth that is highly influenced by their nutrition and environment. Many challenges faced by adults such as mental health issues, obesity, heart disease, poor literacy and numeracy can be traced back to early childhood. The impaired nutritional status during childhood, are consequences for the health and performance of children into their adult years (UNICEF, 2017) Adequate nutrition is especially important in periods of rapid growth and development. Vitamin A deficiency is a major public health nutrition challenge in developing world, Preschool children fall within these periods. Poor nutrition during pregnancy, infancy and adolescence can mean stunted physical and mental development with lifelong consequences. Preschool children can only achieve high academic performance and attain their potentials if their health status is sound enough to support their academic efforts. An essential part of health status that largely defines and determines general health and well-being is nutritional health. Natalie (2020) defined nutrition as the study of nutrients in food, how the body uses them, and the relationship between diet, health and disease. It is also a process by which the organism; ingest, digest, absorbs, transports, utilizes and excrete food substances. World Health Organization (2020) viewed nutrition as a critical part of health and development in relation to improved infant, child and maternal health, stronger immune system, safer pregnancy and child birth, lower risk of non-
communicable diseases (such as diabetes and cardiovascular disease), and longevity.

According to Marriam-Webster (2020), preschool age is between 2-5 years of age. They are different from toddlers because they are developing the basic life skills, independence and knowledge that they need when they enter their school years. Preschool is also known as nursery school, pre-primary school or play group. At this age, children are at risk of developing several nutritional disorders. Nutritional deficiencies such as vitamin A deficiency results in dry skin, dry eyes, night blindness, growth retardation, poor wound healing, acne and breakouts (Marriam-Webster, 2020). More than half of preschool children suffer micronutrient deficiencies. An estimated 75 million and 140 million preschool children have clinical and subclinical vitamin A deficiencies respectively. It has been estimated recently that about half of the world population are at risk of inadequate intake of supplements (Seriki & Abiamuwe, 2020). Good nutrition that contains adequate vitamin A foods is therefore necessary to produce good health and general wellbeing of Preschool children. Vitamin A deficiency can result from inadequate intake of fat malabsorption or liver disorder. The deficiency impairs immunity and hematopoiesis, rashes and typical ocular effect such as xerophthalmia, night blindness (WHO 2017). However, in Nigeria vitamin A deficiency has been documented as public health burden among the preschoolers, it’s prevalence ranges between 11%-28%. (Aghaji A.E etal 2017).

According to Aghaji AE etal 2017, in Nigeria, the under-five mortality rate (USMR) is currently 108/1000 live births, which is over four times the sustainable development goal target of 25/1000 live births. Hence vitamin A supplementation has been found as one of the most cost-effective strategy for improving child survival.

In Edo State, nutrition plays a key role in the control of linear growth through a variety of mechanism. For example, if a child is well breast fed, the chart of the growth will show a steady upward growth. Also, the weight of the child at birth will double at six months. Likewise, a well-fed preschool child will show a steady weight and growth. A child that is well fed with sufficient vitamin A will have good eye sight. (Edo State Strategic Plan Action for Nutrition, 2019-2023)

Vitamin A is an essential fat-soluble vitamin required for normal visual function, epithelia cellular integrity, immune function, growth, development and reproduction. Different forms of vitamin A, such as retinal, retinyl esters, and retinol acid serve different functions in the body (Solomon, Erdman, Macdonald & Zeisel, 2012). Two forms of vitamin A can be found in the diet: pre-formed vitamin A and pro-vitamin A carotenoids. Pre-formed vitamin A is found in animal products such as milk, fish, meat (particularly liver) egg, yolk, dairy products, fortified foods and supplements. Pro-vitamin A carotenoids primarily beta-carotene, alpha-carotene and beta-cryptoxanthin are found predominately in green leafy vegetables, yellow or orange fruits, vegetables and palm oil, mashed yam, egg yolk and palm oil, along with orange juice should be given to the preschool age child for effective growth with good eye sight.

World Health Organization (WHO) and Food Agricultural Organization (FAO) (2019) of the United Nations estimated that the mean daily requirement of vitamin A range between 180Ng and 200Ng retinol equivalents (RE)/day. Also, the liver is the primary storage site of vitamin A, with most stored in stellate cells at retinyl ester. Liver should be fed to the preschool child often. Just as adequate intake of vitamin A in preschool children diet has a plethora of health benefits so also on the other hand, its deficiency causes several clinical symptoms, including xerophthalmia, night blindness, Bitot spots, keratomialacia, corneal scars and permanent blindness. Another major consequence of vitamin A deficiency is increased risk of several health problems such as respiratory diseases, diarrhoea, measles and vision complications (World Health Organization, 2019). For example, infections and vitamin A deficiency often overlap and negatively exacerbate each other. Together, these form a cycle of increased vitamin A deficiency, morbidity and mortality. Therefore, investment on early childhood nutrition has far-reaching effects on the child and the society at large. Also, early in-take of vitamin A foods protects health, boost-economic productivity and saves the lives of preschoolers and beyond.

This paper is on effect of micronutrient deficiency (vitamin A) on preschool children.

The objectives of this study are: to ensure that preschool children receive adequate amount of Vitamin A foods through dietary diversification, supplementation, immunization and fortification. To
integrate Vitamin A deficiency prevention and control strategies in our communities. To reduce prevalence of Vitamin A deficiency in Edo State.

**Micronutrients (Vitamin A)**

World Health Organisation (2021) defined micronutrients as essential elements - required in small amount for the normal growth and development, they include vitamins and micro-minerals. Micro-minerals or trace elements include iron, cobalt, chromium, copper, iodine, manganese, selenium, zinc and molybdenum. While vitamins are organic substances which the body requires in small amount for its metabolic processes to promote growth, reproduction, maintenance of life and protection; they must be included in the diet. Vitamins are classified as fat soluble and water-soluble vitamins.

Vitamin A cannot dissolve in water except fats and oil. Vitamin A deficiencies represent a major threat to the health development of the populations in the world over, particularly children and pregnant women in low-income countries as posited by World Health Organization (2020). It was stated that low-income countries such as Nigeria bear the disproportionate burden of micro nutrient deficiencies due to inadequate diet. For example, vitamin A performs a range of functions such as good eye sight, high immunity, good skin and also prevent mental retardation (Mbah, 2016).

World Health Organization (2020), stated that inadequate intake of vitamin A foods are well known causes of growth retardation. In the first few years of life, children grow rapidly and hence need a variety of nutrients to help them grow. From birth to age one, a child’s body weight is increased by an average of three -fold. During the period of rapid growth, children rely on nutrition from breast milk as well as vitamin A foods to support their growth (UNICEF 2017). Research has it that the breast milk is near balanced diet for the new born. After infancy, young children experience significant growth spurts and need foods rich in vitamin A to support their physical development.

The goals of desirable nutrition in early childhood as stated by Marriam-Webster (2020), are to promote physical growth and development, visual and cognitive development, healthy immune system development and healthy body functions and organs systems, which include cardiovascular, digestive and neurological system. Seriki and Abiamuwe (2016) agreed that diets affect all parts of the body including the brain. They stated further that what the child eats have great influence on the child’s mood, behavior, thoughts and emotions. Optimal brain functioning is dependent upon adequate micronutrients which includes Vitamin A.

**Micronutrient (Vitamin A) Deficiency and Its Effect on Preschool children 02**

Edo State strategic plan of Action for Nutrition (2019-2023), reveals that malnutrition is a major threat to the survival, growth and development of children. The effects of lack of vitamin A in preschool children are; night blindness, rough skin, susceptibility to diseases such as measles, diarrhea, pneumonia, gastrointestinal disease and cognitive development problems. Also, inadequate intake of vitamin A foods in infancy and early childhood increases infant and child morbidity and mortality. It diminishes cognitive and physical development and may lead to poor performance in school and negatively impacts productivity later in life (United Nations International Children Education Fund) (UNICEF, 2017).

Healthy eating habits reduces diseases. Healthy nutritional status has often been a major parameter to determine quality of life. A deficiency in vitamin A has been associated with poor cognitive performance and behavioural problems including attention deficit problems. In the same view, Hannah and Max (2017) Stated that nutrition during the early years of children life have a profound effect on their health status, as well as their ability to learn, communicate, think analytically, socialize effectively and adapt to a new environment.

Hannah and Max (2017) defined micronutrient as lack of essential vitamin and minerals required in small amount by the body for proper growth and development. Most of the people affected hardly show the physical symptoms. Micro-nutrient deficiencies have devastating effect on the physical and mental well-being as well as the productivity of the population, thereby contributing to increased morbidity and mortality among children less than five years of age. Aghagi, et al (2017) reported that micronutrient deficiencies increase the risk of dental decay, anemia, fatigue, nervous irritability, goiter, hypofausia, abnormal clotting of the blood, low resistance to infection, night blindness, scurvy, rickets, heart disease, nervous and glandular disorder and retarded growth in children.
UNICEF (2017) stated that lack of micronutrients contributes significantly to the burden of diseases. Iron deficiency is associated with malaria, anemia, intestinal parasitic infections and chronic infections. Chronic iodine deficiency causes goiter in adults and children and also revealed that vitamin A deficiency increases the risk of severe illness and death from common childhood infections, particularly diarrhea and measles. UNICEF (2017) further opined that in communities where vitamin A deficiency exists, children are on the average 50 percent more likely to suffer from acute measles. It agreed that improvements in vitamin A status by administering vitamin A supplements to children from 6 months to 59 months with a period of six months led to 25% reduction in mortality among children aged one to five years.

Vitamin A deficiency as a micronutrient is a major global health problem. A large number of preschoolers are estimated to be deficient in key vitamins and minerals, particularly vitamin A, iodine and zinc. Most of these children live-in low-income communities and are typically deficient in more than one micronutrient. Deficiencies occur when there is inadequate intake and access to micro-nutrient-rich foods such as fruits, vegetables, animal products and fortified foods. This is because they are expensive to buy or are locally unavailable. Micronutrients deficiencies increase the general risk of infectious illness such as diarrhea, measles, malaria and pneumonia (WHO 2020). For a lactating mother, her micronutrient status determines the health and development of her breast fed infant, especially during the first six months of life. Vitamin A deficiency is of significant public health concern, particularly in Edo State. Globally 5.17 million preschool children have night blindness and 190 million have low serum retinol, these represent 0.9% and 33.3%, respectively of children in countries considered to be at risk of vitamin A deficiency (WHO, 2019).

A recent analysis of trends in vitamin A deficiency in preschoolers in low-and middle-income countries between 1991 and 2013 demonstrated a decrease in its overall prevalence from 39% to 29% in East and South East Asia, Oceania, Latin America and the Caribbean. The prevalence in South Asia and Sub-Saharan Africa remains high at 47% respectively (Stevens, Bennett, Hemoqc, Lu, De-Regil, Rogers & Ezzat, (2015). The deficiency has a direct effect on child mortality. It is estimated that 94,500 diarrhea and 11,200 measles related death per year are attributed to vitamin A deficiency, with most of these deaths occurring in Sub-Saharan African countries and South Asia. Together these represent 1.7% of all child deaths in low-and middle-income countries (Steven et al., 2015).

**Effects of Vitamin A Deficiency**

The effects of vitamin A deficiency in Edo State are multifaceted and they include poor infant and young child feeding practices, which contribute to high rates of illness and poor nutrition among children, lack of access to health care, water and sanitation, armed conflict, particularly in the remote areas, irregular rainfall, high unemployment and poverty. Diet-related non-communicable diseases are also on the high side due to globalization, urbanization, lifestyle transition, socio-cultural factors, and poor maternal nutrition, fetal and infant nutrition, food insecurity. Vitamin A deficiency infringes on child’s right to life, proper nutrition, health and quality education. (Chioma Obinna 2023)

UNICEF (2018) stated that poverty can affect inadequate intake of foods with Vitamin A, which will subsequently affect proper brain development. The effect of poverty can increase depression in parents, drug abuse and social isolation. Also, mothers act as role model for children in developing eating habits, dietary belief and attitudes towards food which influences their childhood development, and this could have short- or long-term implication on their lives such as poor immunity, growth and cognitive implication and skin problem. UNICEF (2017) added that mothers are the role model who influences the food choices of children. As such, healthy nutrition and eating habits are products of environment and influence. Since the child’s diet and environmental factors are like part of the causes of childhood vitamin A deficiency, it is therefore possible to check the trend among the preschool age and minimize its spread if total eradication is not possible.

Edo State Strategic Plan of Action for Nutrition (2019-2023), reported that vitamin A deficiency is caused by nutritional deficiency. Most people affected by it do not show the physical symptoms early which is related to malnutrition hence it is referred to as hidden hunger. UNICEF (2017) reported that a large percentage of preschool children who died in hospitals from diseases such as pneumonia, measles, malaria and others are so, because of poor vitamin A intake, which means that their immunity was low. WHO(2019), revealed that repeated vitamin A deficiency disease on a child
such as skin disease, and eye blindness among others will reduce the working capacity of the bread winner, increase poverty, affects food production, academic performance of the child. All these affect the economic development of the society. According to Aghaji et al (2017) other causes of vitamin A deficiency are linked to prenatal, genetic and environmental influences, educational background of parents, economic status of parents, consumption of junk foods, food prepared away from home, increased in ill health, family crisis, ill-health of mother and not practicing exclusive breast feeding.

**Symptoms of Vitamin A Deficiency**

The liver is the primary storage site of vitamin A, with most stored in stellate cells at retinyl ester (Noy, et al, 2013). Vitamin A deficiency causes several clinical symptoms, including xerophthalmia, night blindness, Bitot spots, keratomalacia, corneal scars and permanent blindness.

Xerophthalmia is an abnormal dryness of the conjunctiva and cornea of the eye, with inflammation and ridge formation, typically associated with vitamin A deficiency (Collins English Dictionary, 2020). Keratomalacia is an eye condition in which the cornea, the clear front part of the eye, gets cloudy and softens. It is also known as xerotic keratitis and corneal melting. Night blindness is due to corneal opacity (Collins, 2020). Bitots spots (XB) are glistering white plagues formed of desquannated thickened epithelium, usually triangular and firmly adjacent to the underlying conjunctiva.

Vitamin A deficiency affects the ability to survive common childhood infection and diseases such as diarrhea, measles and respiratory infections. Other symptoms of vitamin A deficiency are night blindness, dryness of the conjunctiva eye, foamy triangular spot that are pearly or yellow in colour, loss of vision or blindness due to simple irritation, burning sensation, redness, itch, blurring vision that improves with blindness, intense eye irritation from smoke or wind.

**Requirements of Vitamin A**

World Health Organization (WHO) and Food and Agricultural Organization (FAO) (2019), estimated that the mean daily requirement of vitamin A range between 375 Ng and 450 Ng retinol equivalents (RE)/day as shown below in infants and children aged 0-6 years.

<table>
<thead>
<tr>
<th>Group</th>
<th>(Ng RE/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants</td>
<td></td>
</tr>
<tr>
<td>0-6 months</td>
<td>375</td>
</tr>
<tr>
<td>7-12 months</td>
<td>400</td>
</tr>
<tr>
<td>1-3 years</td>
<td>400</td>
</tr>
<tr>
<td>4-6 years</td>
<td>450</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>800</td>
</tr>
<tr>
<td>Lactating women</td>
<td>850</td>
</tr>
</tbody>
</table>

IU: International Units, RE: retinol equivalents, a/RE retinol = 1Ng or 0.3 IU retinol =0.3 Ng retinol or 0.33 RE.

The absorption efficiency of pre-formed vitamin A as the form found in supplement is typically higher than 70% and may remain at the same level with further increases of ingested preformed vitamin A absorption and conversion of pro-vitamin A are more limited, owing to negative feedback mechanisms (Noy, et al 2013).

**Ways to Improve Vitamin A Intake on Preschooler**

From the data above there is evident that there is need to improve vitamin A status in Edo south senatorial district of Edo State by improving on the dietary diversification, increased access to vitamin-rich foods, vitamin A supplementation and improved access to health facilities in order to treat infectious diseases. Supplements are concentrated sources of
The use of Vitamin A supplementation began in 1962, when global survey commissioned by WHO revealed that xerophthalmia was widely spread in Asia, Africa and Latin America (WHO, 2019). In 1975, the International Vitamin A Consultative Group (IV ACG) was formed to address and understand this nutritional problem (Steven, Bennett, Hemoq, Lu, De-Regil, Rogers, & Ezzat, 2015). Reports in Indonesia revealed that 16% of all deaths in children aged 1-6 years were attributed to mild vitamin A deficiency. These observations made clear that vitamin A deficiency needed a straightforward solution, and became the basis of a series of randomized controlled trials in which children receive vitamin A supplement (Beaton, Marterll, Aronson, Edmonston, McCabe, Ross, & Harvey, 2019). Since 1992, vitamin A supplementation intervention has decreased child mortality rate by 23-34%. Hence a cost-effective strategy for improving child survival.

Reports have shown that, symptoms of vitamin A deficiency can be treated with eye drops. Women of reproductive age should not receive large doses of vitamin A which are contraindicated to pregnancy. If a woman has night blindness or Bitots spot, a daily dose of 10,000 IU of vitamin A orally for 2 weeks is recommended. Vitamin A fortification is necessary as diet change should include foods that are rich in vitamin A such as carrots, dark green leafy vegetables, deep yellow fruits, sweet potatoes, squash, lettuce, dried apricot, sweet red pepper, tuna fish, cod liver oil, whole milk, peas dried basil, tomatoes, spinach, palm oil and breast milk.

National Academies (2022) reiterated that the benefits of Vitamin A intake on preschool children are to:

1. Increase child survival
2. Supports a healthy immune system
3. Reduces new cases or incidence of diarrhea and measles
4. Protects eyes and eye sight and prevent anaemia
5. Promotes physical growth.

Ways to Prevent Vitamin A Deficiency
Aghaji et al (2017), opined that growing children need a high proportion of nutritious foods such as carrots, pawpaw, egg, fish, milk, fats, palm oil, potatoes, fruits and vegetable, nuts and also fortified foods with vitamin A and D in order to meet up with the metabolic processes they undergo at that stage in life. Vitamin A diet is associated with the health of the epithelial cells. The disease organisms which enter through the epithelial cells are those responsible for respiratory and eye infections. Preschoolers who are living on diet which is barely adequate, such infections will spread rapidly through the community.

Edo State Strategic Plan of Action for nutrition (2019) stated that nutrition education and promotion of good nutrition practices in school have significant effect in fostering healthy eating habits. School provides an ideal setting to promote good nutrition practices early in life since they reach a high proportion of children and adolescents. The nutritional challenges facing various institutional dietary needs are related to the quantity of food provided. There is need to ensure that adequate vitamin A foods are provided in diet, to meet the Recommended Dietary Allowance (RDA) of the child. Recommended Dietary Allowance is the estimated amount of a nutrient per day considered necessary for the maintenance of good health by the food and nutrition board of the national research council/ National academy of sciences (J.W. Marks 2021).

UNICEF (2016) stated that parents are influential in shaping early and physical activity and patterns in children. Although, parents primarily control the food available, but in the context of eating and the opportunities for eating right in preschool children, parent involvement seems critical for successful prevention of vitamin A deficiency at this age. For parents to actively engage in vitamin A and micronutrient deficiency disease prevention efforts with their young children, they must be aware that their children are becoming malnourished and must be concerned about potential consequences. In conjunction with the child’s right, information of Bureau of the Ministry of information and culture in Enugu revealed that fulfilling children’s right is a
Effect of Micronutrient (Vitamin A) Deficiency on Preschool Children in Edo State

prerequisite for realizing sustainable development goals (SDGs). (Obinna Chioma, 2022).

However, Chethana (2017), highlighted the under listed points as ways of preventing vitamin A deficiency:

1. Education on nutrition to encourage breastfeeding. Colostrum and breast milk contain vitamin A.
2. Weaning foods should be rich in vitamin A. For example, mango or papaya, egg, liver, dark green leafy vegetables maybe given at one year and older.
3. Encourage the planting of small gardens with advice as to which fruits and vegetable should be grown.
4. Over cooking and drying fruits in the sun both reduce vitamin A content of foods.
5. Vitamin A capsules 200,000 IU may be given every 3-6 months to children aged 1 to 6 years who are at high risk. The current Expanded Programme on Immunization (EPI) schedule in Nigeria for vitamin A immunization is: 100,000 IU 1st dose at 6 months, 200,000 IU 2nd dose at 9 months. It is given orally.
6. A program of measles immunization should be planned and carried out.
7. Food should be fortified with vitamin A. For example, fortifying a widely used food such as sugar, milk, wheat and others with vitamin A and D.

Therefore, schools, parents and other institutions in Edo South Senatorial District should support effective and current nutrition knowledge, care and nutritious food in order to prevent early childhood micronutrient deficiency diseases with special emphasis on vitamin A deficiency. There is need to work with school management committees and administrators, curriculum designers and media to address this issue. Also vitamin A supplement should be given to children from infants to the age of 5 years.

References


