

MICRONUTRIENT DEFICIENCY AMONG NIGERIAN POPULATION: THE HIDDEN HUNGER

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Abstract: Ensuring healthy lives and promoting well-being at all ages is essential to sustainable development. However, the COVID-19 pandemic, insecurity, climate change and resultant economic downturns have exacerbated the food crises situation and consequently led to increase in the number at risk of hidden hunger. This has become a public health concern. Micronutrient deficiency also known as hidden hunger is a spectrum of undernutrition that occurs when intake or absorption of vitamins and minerals is too low to sustain good health and development as well as normal physical and cognitive functions. It develops gradually over a long period of time. The impact of this deficiency often goes unnoticed until irreversible damages have already occurred in the body and these damages include but not limited to diseases like osteoporosis, osteomalacia, thyroid deficiency, blindness, colorectal cancer, anaemia and cardiovascular diseases. In addition, hidden hunger compromises socio-economic development, learning ability and productivity of an individual and of a people in general. Hence, there is a need to study this public health menace for better understanding in order to mitigate its effects on the health and wellbeing of the populace.

Key Words: Micronutrient, Deficiency, Hidden hunger

INTRODUCTION

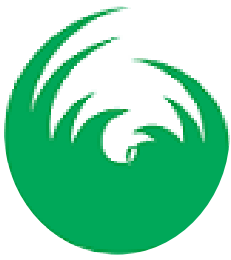
Food is essential as it provides vital nutrients for survival and helps the body function optimally (Black, *et al.* 2013). It is comprised of macronutrients which includes proteins, carbohydrates and fats that not only offer calories to fuel the body and give it energy but play specific roles in maintaining health. It also supplies micronutrients (vitamins and minerals) and phytochemicals which are essential elements needed in the body in small quantities to serve a variety of critical functions to ensure that the body operates optimally. These micro-minerals or trace elements include iron,

cobalt, chromium, copper, iodine, manganese, selenium, zinc, and molybdenum (Thompson and Amoroso, 2010). According to McCarthy (2018), proper nutrition at home and school results in a healthy body. However, some parents or caregivers may not understand what constitutes good nutrition and may depend on fast foods or convenience foods for meals and snacks which may lead to malnutrition. Uche and Familusi (2018) explained that hidden hunger occurs when people do not get all the vitamins and minerals their body need over time, despite consuming sufficient calories. This form of under nutrition occurs when intake or absorption of these micronutrients is too low to sustain good health and

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development in children and normal physical and mental function in adults (Awosanya, 2018).

In the view of Global Health (2013), historically, famine has been one of humanity's greatest threats—it claimed nearly 20–40 million lives in China from 1958-1961, killed up to 4 million in 1943 in India, and continues to plague the Sahel region in Africa. However, adoption of mechanization, agrochemicals, and high-yielding crops during the past 50 years has greatly improved agricultural yield (Food and Agricultural Organization, 2013) and has helped reduce the global burden of famine. Notwithstanding, today, millions of people in Nigeria are said to be suffering from hidden hunger (Agbota, 2019). The school feeding programme put in place by the Federal Government of Nigeria has not been able to address this challenge as it largely takes care of macronutrients. This may be due to ignorance on the part of implementers of the programme.

Apparently, micronutrient deficiencies are caused by poor diet, inadequate micronutrient supply during certain stages in life, such as pregnancy and lactation (Gautam, 2016). Agbota (2019) stated that in Nigeria and the rest of Sub Saharan Africa, micronutrient deficiencies are common among the people due to over farmed, depleted and nutrient lacking soils, low nitrogen in most African soil, high soil acidity, infestation of crops by pests and diseases and the effect of climate change. In addition, many people in developing countries lack the means to grow or buy micronutrient-rich foods (Kliegman, *et al.*, 2016), instead they rely on nutrient-poor staples. Their lack of dietary diversity is exacerbated by poor access to healthcare and a high burden of disease (Bhandari and

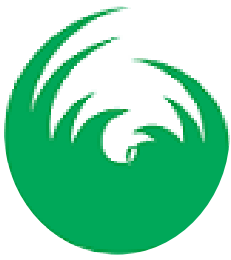
Banjara, 2015). Global Hunger Index, GHI (2014 ch.3, paragraph 1) posited that:

Hidden hunger afflicts more than 2 billion individuals, or one in three people, globally. This shortage in essential vitamins and minerals can have long-term, irreversible health effects which are particularly acute on child health and survival especially within the first 1,000 days of a child's life, from conception to the age of two, resulting in serious physical and cognitive consequences.

More so, it poses socioeconomic consequences that can erode a person's well-being and development which has a negative impact on countries' economies (Thompson and Amoroso, 2010). Although supplements and fortified food are helping to tackle this problem, they are costly and sometimes impractical. Therefore, a multipronged approach is required in solving this problem in order to reduce its consequences on the populace. Hence, this paper aims to critically explore micronutrient deficiency among the Nigerian population and explain why it is a hidden hunger.

The following objectives will help to realize the goal of this paper

- Discuss the concept of micronutrient deficiency
- Describe the epidemiology of micronutrient deficiency
- Highlight the causes of micronutrient deficiency
- Discuss the consequences of micronutrient deficiency throughout lifecycle
- Proffer solutions to micronutrient deficiency



Concept of Micronutrient Deficiency

Micronutrients also known as vitamins and minerals are essential components of a high quality diet required in small quantities and have a profound impact on health throughout the lifecycle (Bailey, *et al.*, 2015). Awosanya (2018) stated that they are essential building blocks for healthy brains, bones and bodies. Examples include; vitamins: A, D, E, K, minerals: iron, iodine, zinc, folate (folic acid) among others.

However, Ibeanu, *et al.* (2020) asserted that micronutrients deficiencies are referred to as “Hidden Hunger” because it doesn’t cause the physical hunger and the effects develop gradually over time; their devastating impact are not seen until irreversible damage has been done (Awosanya, 2018). According to Uche and Familusi (2018), hidden hunger is the inadequate access to micronutrients that are necessary for a healthy and functional body. In other words, a child may go to sleep each night with a full belly, but his or her body is still hungry for good nutrition.

There are several types of micronutrients deficiencies, some of which are of public health importance and they include; vitamin A, iron, iodine, folate and zinc deficiencies (Kliegman, *et al.*, 2016). Having discussed the concept of micronutrient deficiency, there is need to discuss its epidemiology so as to appreciate the magnitude of the problem.

Epidemiology of Micronutrient Deficiency

- More than 2 billion people worldwide suffer from hidden hunger, more than double the 805 million people who do

not have enough calories to eat (Food and Agriculture Organization of the United Nations Statistics Division, FAOSTAT, 2014).

- Mohammad (2018) asserted that Vitamin A Deficiency affects 40-60% of under-five children in developing countries, compromising their immune systems, resulting in a million deaths a year. Also, globally 5 million children under the age of five are affected with serious eye disorder.
- The report of Kuku-Shittu, *et al.* (2016) on micronutrient deficiency indices in Nigeria showed that 28 percent of under-five children suffer from iron deficiency anemia (IDA), 29.5 percent from vitamin A deficiency (VAD), and 29.6 percent from iodine deficiency.
- Nearly 18 million babies are born with brain damage due to iodine deficiency each year while severe anemia contributes to the death of 50,000 women in childbirth each year. In addition, iron deficiency saps the energy of 40 percent of women in the developing world (Micronutrient Initiative, 2014).
- Micronutrient deficiencies cause an estimated 1.1 million of the 3.1 million child deaths that occur each year as a result of undernutrition (Black *et al.*, 2013).
- The most commonly recognized micronutrient deficiencies across all ages, in order of prevalence, are caused by a lack of iodine, iron, and zinc (Hoddinott, *et al.*, 2012).
- Less common, but significant from a public health standpoint, is vitamin A deficiency, with an estimated 190 million preschool children and 19 million pregnant women affected (WHO, 2009).

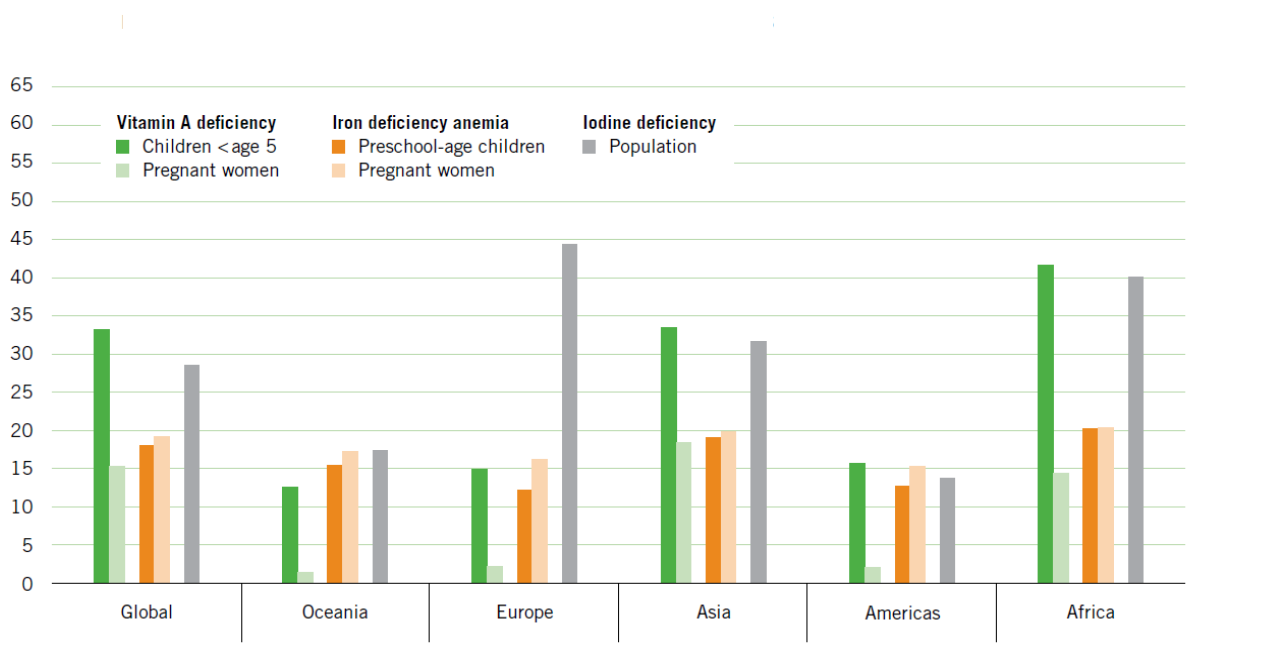
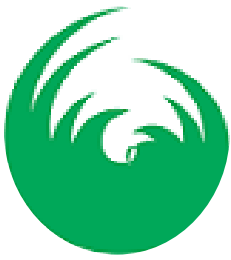


Figure 1: Percentage of population with selected micronutrient deficiencies by Black *et al.* (2013)

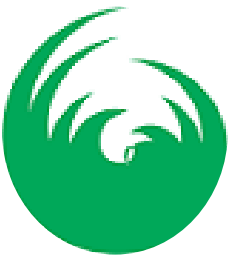
The above chart indicates that micronutrient deficiency affects significant number of the population; therefore, it is important to highlight its causes.

Causes of Hidden Hunger/ Micronutrient Deficiency

According to Pinstруп-Anderson cited in Gautam (2016), developing countries are embracing highly processed, energy-dense, micronutrient-poor foods and drinks instead of maintaining their traditional diets that are based on minimal processing. He further stated that with this nutrition transition, many developing countries face a phenomenon known as the “triple burden” of malnutrition- undernourishment, micronutrient

deficiencies, and obesity. Even an obese child can suffer from hidden hunger.

Gousia *et al.*, (2018) described poor diet as a common source of hidden hunger. In their view, diets based mostly on staple crops, such as maize, wheat, rice, and cassava, which provide a large share of energy but relatively low amounts of essential vitamins and minerals, frequently result in hidden hunger. Furthermore, they opined that what people eat depends on many factors, including relative prices and preferences shaped by culture; peer pressure; and geographical, environmental, and seasonal factors. Victims of hidden hunger may not understand the importance of adequate nutrition, dietary diversity nor



may they be able to afford or access a wide range of nutritious foods such as animal-source foods (meat, eggs, fish, and dairy), fruits, or vegetables, especially in developing countries (Biesalski, 2013). Bouis, *et al.* (2021) stated that in non-emergency situations, poverty is a major factor that limits access to adequate nutritious foods. This is because when food prices rise, consumers rely on staple foods while reducing their intake of non-staple foods that tend to be richer in micronutrients (Gousia *et al.*, 2018).

The Global Hunger Index, GHI (2014) noted that another source of micronutrient deficiencies is impaired absorption or use of nutrients by cells and tissues in the body. Such micronutrient losses may be caused by parasitic infestations which may alter the nutrient pools by affecting food intake, metabolism and the micronutrient uptake in the gut resulting in deficiency (Mrimi, *et al.*, 2022). With such losses established, and the attendant increased demand for such nutrients by the body tissues, the symptoms of deficiency are exacerbated. Infections and parasites can spread easily in unhealthy environments with poor water, sanitation, and hygiene conditions; coupled with unsafe food handling and feeding practices, these factors can further exacerbate nutrient losses (GHI, 2014).

Dietary constituents also affect absorption and bioavailability of micronutrients (Hall, *et al.*, 2016). Fat-soluble vitamins such as vitamin A are best absorbed when consumed with dietary fat, while consumption of some compounds such as tannins or phytates can inhibit iron absorption (Seidu, *et al.*, 2018). The presence of fiber and fiber components in a diet can significantly affect the absorption of iron (Saini, *et al.*, 2016). Similarly, alcohol

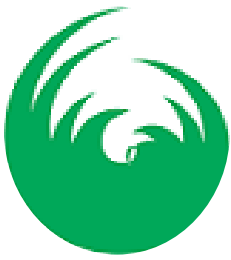
consumption also interferes with the absorption of micronutrients (Gousia *et al.*, 2018).

Furthermore, increased demand for growth during childhood and pregnancy puts these populations at high risk for micronutrient deficiency (GHI, 2014). Pregnancy and breast-feeding are periods when good nutrition is exceptionally important. If a pregnant woman fails to adopt good nutritional behavior, which may be due to poverty, non-compliance to routine vitamin supplementation amongst others, it puts the foetus at risk of several abnormalities which has a consequence for the growth and development of the young child.

Consequences of Hidden-Hunger throughout Lifecycle

Although, pregnant women, children, and adolescents are often cited as populations affected the most by hidden hunger, this public health menace impairs the health of people throughout the life cycle resulting to both short and long term effect on growth and development. These effects according to Ibeanu *et al.* (2020) include-

Stunted growth: this occurs as a result of deficiency or defects in metabolism of iodine, iron, zinc, vitamin D amongst others. This is as a result of the roles of these micronutrients in growth and development of the musculoskeletal, hematological and nervous systems (Kliegman, *et al.*, 2016). Millward (2017) stated that in the event of deficiencies of any or all of these micronutrients, which may be prenatal, during breastfeeding or early childhood, growth is severely impaired, with other health and social implications such as poor pregnancy outcomes, obstructed labour, vesico-vaginal fistula, stigmatization, disability, etc.



Impaired cognitive and brain development: several micronutrients such as iodine, iron, vitamin A, chromium, and copper, amongst others have been implicated in cognitive and brain development. Zhukovskaya, *et al.* (2019) opined that chronic iron deficiency leads to impaired learning ability and this occurs even in the absence of concurrent anemia. Zhukovskaya *et al.* (2019) further stated that in children with iron deficiency, cognitive impairments lead to a delay in intellectual development, difficulties in learning and chronic fatigue. Iron is a vital element in hemoglobin synthesis- the red pigment that carries oxygen in the blood. In iron deficiency state, the capacity of blood to transport oxygen to body tissues is reduced, leading to hypoxia. This affects the metabolism of all body tissues including the nervous tissues, thus the aforementioned neurologic effect. Furthermore, iodine is vital for the synthesis of thyroid hormones required for brain development which occurs during fetal and early postnatal life (Hatzel, 2000). In geographic areas where deficiency of iodine is severe, decompensation of the thyroid gland known as hypothyroidism results (Huang and LaFranchi in Klieman, *et al.*, 2016 Ch. 567). Globally, approximately 2 billion people, including 241 million school children, still have insufficient dietary iodine intakes (Andersson, *et al.*, 2012). Thus, despite great progress in the global effort to reduce iodine deficiency, it remains the leading cause of preventable intellectual disability worldwide (Kliegman *et al.*, 2016).

Weakened immunity: micronutrients play important roles in all the stages of the body's defense mechanisms- both the innate and specific immunity. According to Gombart, *et al.* (2020), micronutrients functions include-

maintenance of epithelia surfaces which is vital for innate immunity (vitamins A, C, D, iron and Zinc); regulation of intestinal immune function (folic acid, vitamins B6 and B12); defense against free radical damage of cell membranes (Vitamins A, C and E); act as co-factors in metabolic functions of immune cells (iron, copper, zinc and folic acid). Deficiency of these micronutrients will weaken the body's immunity making it susceptible to many infections and malignancies (Maggini, *et al.*, 2018).

Anemia: several micronutrients are important in hemoglobin synthesis- the major one being iron. Others include folate, vitamin A, B12, D, zinc and selenium. While iron deficiency is thought to be a major cause of anemia, other aforementioned micronutrients, have been implicated in childhood anemia (Jin, *et al.*, 2013). Anemia has a negative impact on an individual's mental and social functioning; reducing productivity and ultimately the economy of a nation (Thompson and Amoroso, 2010). Also, the demands of gestation can exacerbate anaemia in pregnancy with health consequences to the fetus (Gernand, 2016).

Death and increase susceptibility to infection and chronic diseases in children: Early life nutritional exposures, combined with changes in lifestyle in adult life, result in increased risk of chronic diseases and infections (Maggini *et al.* 2018). According to a study done by Christian and Stewart (2010), micronutrient status in fetal and early life may alter metabolism, vasculature, and organ growth and function, leading to increased risk of cardio-metabolic disorders, adiposity, altered kidney



function, and, ultimately, to type 2 diabetes and cardiovascular diseases.

Increased risk of low birth weight, birth defects, and stillbirths: micronutrients play important roles in fetal growth and development (Alpert, 2017) and so adequate intake of these nutrients is essential during pregnancy. Deficiencies of some micronutrients have been characterized by known clinical manifestations such as anemia in pregnancy which leads to low birth weight, perinatal asphyxia, neonatal anemia, heart failure, still births and increased neonatal morbidities (Helmy, 2018); neural tube defects due to folate deficiency (Kliegman *et*

al, 2016); whereas iodine deficiency result in congenital anomalies, decreased intelligence, and cretinism as well as maternal and foetal goiter (Toloza, *et al.*, 2020).

Also, hidden hunger contributes to low productivity and poor economic development in individuals, groups and nation at large. According to Cakmak cited in Agbota (2019), Nigeria is currently losing a whopping \$1.5 billion in Gross Domestic Product (GDP) to vitamin and mineral deficiencies.

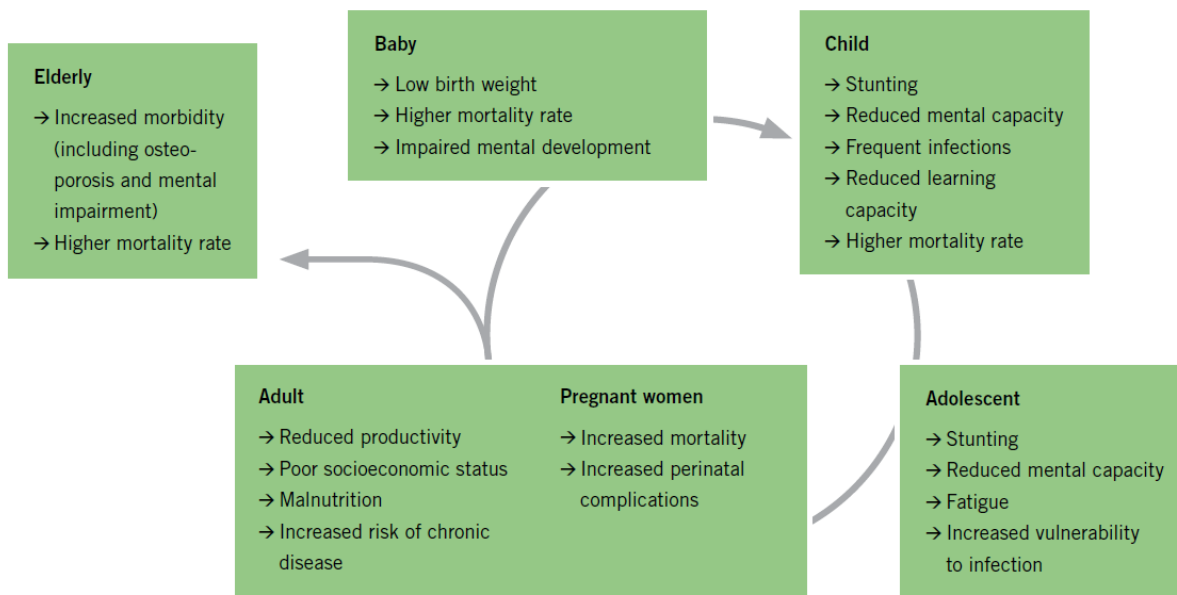


Figure 2: Hidden hunger across life cycle according to Bouis *et al.* (2011)

From the discussion so far, it is obvious that hidden hunger has a lot of negative health implications and



serious effort ought to be made to not only provide solutions but also reduce its incidence to the barest minimum.

Solutions to Hidden Hunger

Several interventions have been established to reduce and possibly eradicate micronutrient deficiencies. These interventions include;

- Fortifying Commercial Foods: Commercial food fortification, which adds trace amounts of micronutrients to staple foods or condiments during processing, helps consumers get the recommended levels of micronutrients (GHI, 2014). A scalable, sustainable, and cost-effective public health strategy, fortification has been particularly successful for iodized salt: 71 percent of the world's population has access to iodized salt and the number of iodine-deficient countries has decreased from 54 to 32 since 2003 (Andersson, *et al.*, 2012). Other common examples of fortification include adding B vitamins, iron, and/or zinc to wheat flour and adding vitamin A to cooking oil and sugar.
- Vitamin A supplementation especially in children
- Iron and folate supplementation for pregnant women
- Nutrition counseling and education during antenatal and well-child clinic visits
- Well structured school feeding programme
- Zinc supplementation
- Breastfeeding promotion and support
- Appropriate complementary feeding counseling and promotion
- Dietary diversification: this ensures a healthy diet that contains a balanced and adequate combination of macronutrients (carbohydrates, fats, and protein); essential micronutrients; and other food-based substances such as dietary fiber. A variety of cereals, legumes, fruits, vegetables, and animal-source foods provides adequate nutrition for most people, although certain populations, such as pregnant women, may need supplements (FAO, 2013). Effective ways to promote dietary diversity involve food-based strategies, such as home gardening and educating people on better infant and young child feeding practices, food preparation, and storage/preservation methods to prevent nutrient losses.
- Biofortification: this is a relatively new intervention that involves breeding food crops, using conventional or transgenic methods, to increase their micronutrient content. Biofortified crops that have been released so far include vitamin A sweet potato, vitamin A maize, vitamin A cassava, iron beans, iron pearl millet, zinc rice, and zinc wheat (Saltzman *et al.*, 2017).
- Empowerment and autonomy of women and improvement of their social, economic and political status: the girl child and women should have equal access to quality education, and vocational training. This is because higher



income and social status are linked to better health. According to McNeill (2010), high income earners can afford better life choices such as quality healthcare services, good nutrition, good housing amongst others.

- Proper implementation of the school feeding programme policy and addition of fruits and vegetables to school meals will ensure that these school children have at least a balanced diet which is necessary for optimum growth and development.
- Provision of soft loans to farmers to encourage agricultural activities and increased production. This will lead to decrease in high cost of food.

Relevance to Nursing

- Health education: knowledge gained from this paper will equip the nurse with relevant information to educate clients attending antenatal and well-child clinics as well as other members of the community on the importance of adequate nutrition with emphasis on micronutrients and on the various local food sources of these nutrients.
- Micronutrients supplementation: given the benefits of micronutrients to physical growth and cognitive development, the nurse will play an active role in ensuring that vulnerable groups such as pregnant and lactating mothers, children and the elderly receive micronutrient supplementation needed to ensure optimal body functions.

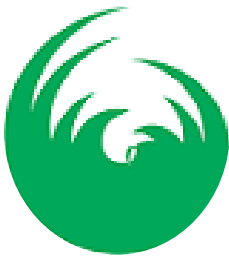
- Diagnosis of micronutrient deficiency: having been armed with the requisite knowledge, the nurse can recognize the early signs of micronutrient deficiency and take appropriate steps in its management.
- Advocacy: using her knowledge and skills, the nurse liaises with key stakeholders in the community to bring about conversations that will lead to concrete ways of preventing micronutrient deficiencies

Conclusion

Poverty drives people to consume single staple crops to satisfy their basic hunger but these cannot provide the essential vitamins and minerals needed for a healthy body. This problem has been exacerbated today due to spike in food prices amongst others. Micronutrient deficiencies (MNDs) have huge impact on health of vulnerable population like women and children. It directly affects children's physical and cognitive growth and increases susceptibility to infection and diseases. A range of interventions are needed to stem the tide of hidden hunger. This will require a multi-sectoral approach at the national and international levels. Hence, there is need for relevant ministries, including agriculture, health, education, and NAFDAC to form a united front to improve food and nutrition security.

Recommendations

- There is need to scale up interventions that has been found to be effective and efficient in the reduction of these deficiencies, such as



breastfeeding promotion and support, appropriate complementary feeding counseling and promotion, vitamin A and zinc supplementation, biofortification of crops.

- House-to-house supplementation of these micronutrients can be done, because some children are not covered by the centre-based interventions e.g. giving of vitamin A capsules to children in their homes to complement Vitamin A supplementation for children 6–59 months in immunization centers.
- Engaging more youths in agriculture.
- Develop nutrition education aids to increase the nutrition knowledge and the consumption of micronutrients-rich food sources among adolescents.
- Behavior-change communication that aims to improve women's, infants', and young children's utilization of health services, clean water, good sanitation, and hygiene to protect them from diseases that interfere with nutrient absorption.
- Empowering women by increasing access to education.
- Government and NGOs should provide social protection that gives poor people access to nutritious food and shields them from price spikes.
- Increased media campaign on the importance of home gardening.

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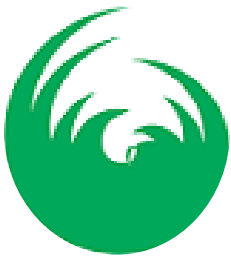
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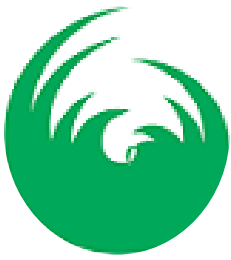
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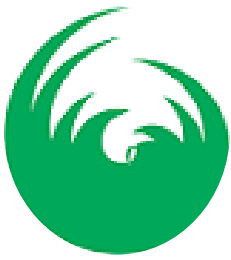
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