International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 03, March 2026)

High Impact Nutrition Intervention in Under 5 Children: A Narrative Review

Patricia T Osunu[1], Fortunatus D. Gbeinbo[1*], Ezekiel U. Nwose[2-3]

[1]*Department of Public Health, Bayelsa Medical University, Yenegoa, Bayelsa State, Nigeria.*
[2]*Department of Public and Community Health, Novena University, Ogume, Nigeria.*
[3]*School of Health and Medical Sciences, University of Southern Queensland, Toowoomba, Australia.*

Abstract-

***Background*-- High-impact nutrition interventions for children under five are paramount to reducing morbidity, mortality, and long-term developmental deficits associated with undernutrition and micronutrient deficiencies. This review aims to synthesize recent evidence on key interventions for children under five, including exclusive breastfeeding, complementary feeding, vitamin A supplementation, and zinc administration for diarrhea management.**

***Methods:* A narrative review methodology was utilized. Literature were searched in PubMed, Google Scholar, Our World in Data, and Mendeley Reference Library, and over sixty published works related to nutrition interventions and their impacts on children under five were reviewed. Quantitative data were analyzed descriptively.**

***Results:* Findings reported that high impact nutrition interventions including; exclusive breastfeeding, vitamin A supplementation, zinc supplementation etc., promotes optimal growth and neurodevelopment, reduce diarrheal and respiratory infections in under-five children. However, adherence to exclusive breastfeeding remain low in many low- and middle-income countries, particularly Nigeria, due to sociocultural norms, inadequate counseling, and limited maternity protection. Complementary feeding remains inadequate, with low dietary diversity influenced by maternal education and food insecurity. Vitamin A supplementation coverage is hindered by weak health systems. Zinc supplementation in treating and preventing diarrhea, significantly lowered its incidence and severity.**

***Conclusion:* Implementation quality and contextual factors influences the effectiveness of health interventions in Nigeria, where systemic challenges like supply chain weaknesses and funding limitations hinder program coverage. To achieve sustainable improvements, it is essential to strengthen community-based platforms, integrate nutrition services into healthcare, and address socio-behavioral determinants. The review emphasizes the importance of coordinated, multi-sectoral strategies to scale evidence-based nutrition interventions aimed at reducing under-five morbidity and mortality in resource-limited settings.**

I. Introduction

Nigeria has the second highest burden of stunted children in the world, with a national prevalence rate of 32 percent of children under five. An estimated 2 million children in Nigeria suffer from severe acute malnutrition (SAM), but only two out of every 10 children affected is currently reached with treatment. Seven percent of women of childbearing age also suffer from acute malnutrition (UNICEF, 2017). Child and maternal undernutrition, poor diets are the top two risk factors for death and disability worldwide, accounting for 11.5% and 9.6% of disability-adjusted life years lost, respectively (Gillespie *et al.,*2019).

Nutritional status is a major determinant of health and well-being of children. When children have a healthy, adequate diet, and are well cared for, they not only have a higher likelihood of survival but also greater chances to reach their full growth potential and prospects. Poor nutritional habits are amongst the key determinants of chronic illnesses (Popkin *et al,*2012). Children's nutritional outcomes are affected by a range of factors, at household, community, and country levels. Where they live, their family's income, and their gender play a role. (Szabo *et al.,* 2017). Their mother's level of education and the availability of information and access to locally produced food also influence how food is allocated within a family.

The global community has committed to addressing malnutrition, as evidenced by several declarations and goals, including a set of six global nutrition targets, endorsed by the World Health Assembly (WHA) in 2012 and the second Sustainable Development Goal (SDG 2) which aims to end hunger and all forms of malnutrition by 2030. To track progress towards these goals and targets, several nutrition-relevant monitoring and accountability frameworks and initiatives have emerged in recent years. (Gillespie *et al.,* 2019).

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 03, March 2026)

It is of interest that Nigeria tops the list in the world for number of citizens who are food insecure since 2015 (Fig 1). Another interesting track record is that undernourishment has been steadily growing in Nigeria since the past 16 years (Fig 2).

The logical implication is that under-5 children in households with food insecurity are by default malnourished or under-nourished.

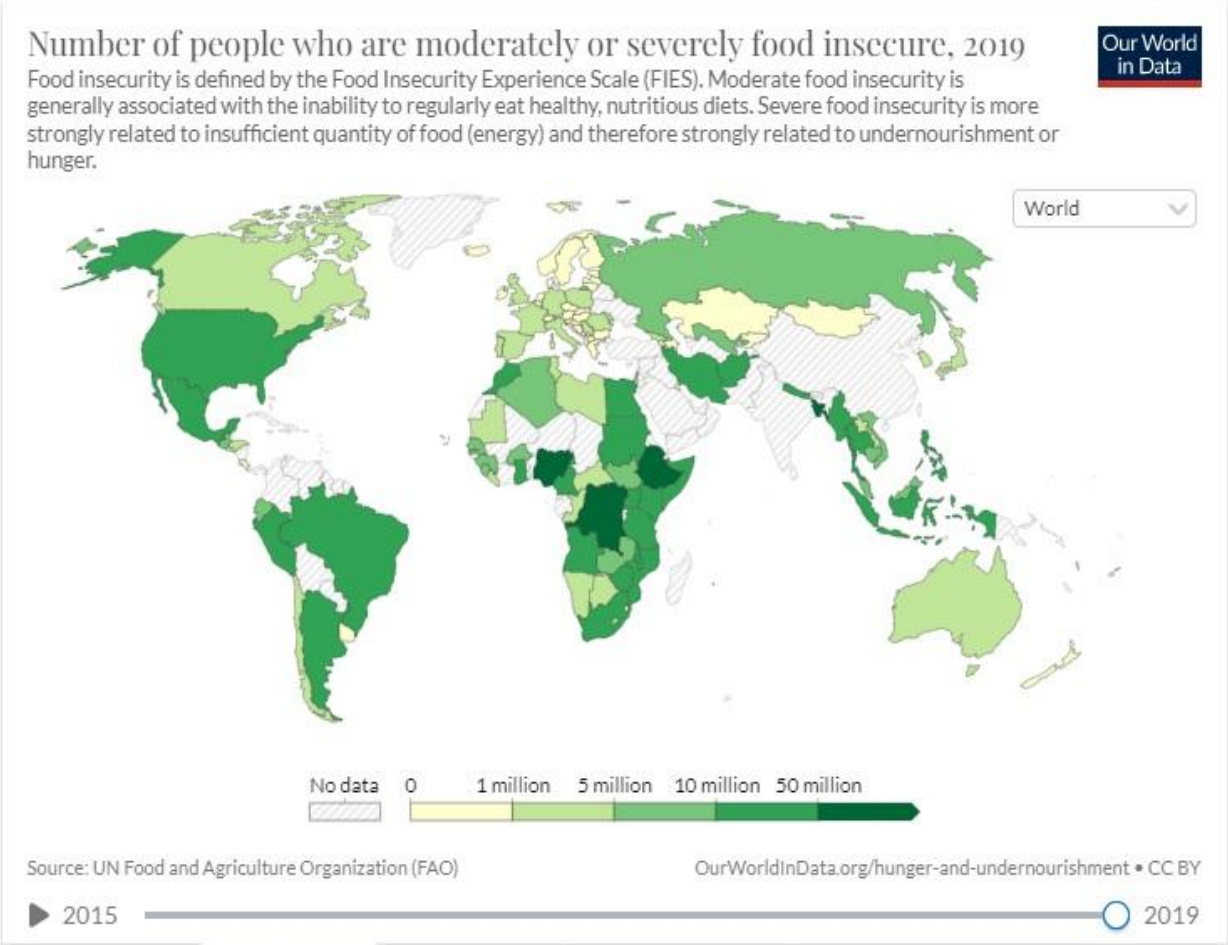

Fig 1: Our world of undernourishment (Roser, and Ritchie, 2019)

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 03, March 2026)

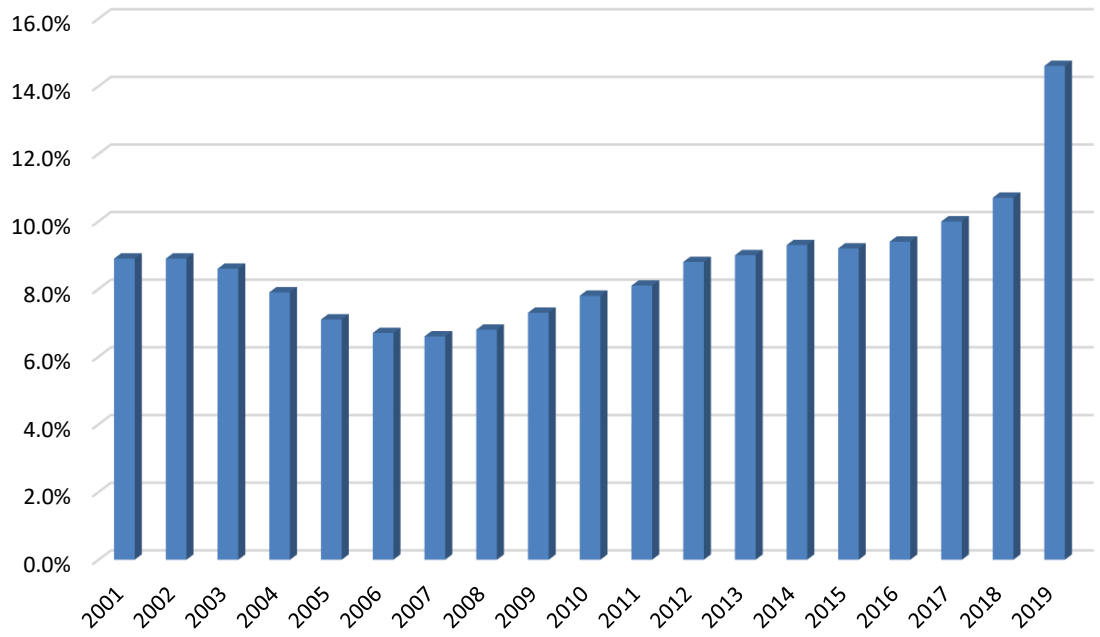

Fig 2: Growing trend of undernourishment in Nigeria since 2006 (Ezeh, *et al.*, 2021)

Research has shown that more than 33% of the deaths of children below 5 years old in Nigeria are attributable to malnutrition. Most of these deaths take place in the northern geopolitical zones (NGZs), which have a prevalence of stunting that is close to 50 percent among children younger than 5 years old (Ezeh, *et al.,* 2021). The Government of Nigeria has put several programs and policies in place to address the issue of child malnutrition. These include: The National Policy on Food and Nutrition (2016), the Food Security Bill (2015), the National Plan of Action on Food and Nutrition in Nigeria (2004), the National Strategic Plan of Action (the health sector response), the Micronutrient Control Programme, the Baby-friendly Hospital Initiative, and the school feeding Programme. The government has also enacted laws requiring the fortification of mass consumed foods with vitamin HHNA, iron and salt iodization (Szabo *et al.,* 2017).

II. Materials And Methods

A narrative review methodology was employed in this work. Search engines such as PubMed, Google Scholar, and Mendeley Reference Library were utilized to locate and assess over sixty published literary works from Nigeria, sub-Saharan Africa, and the rest of the world.

The published literature was searched using terms such as "nutrition intervention," "impacts of nutrition intervention on children under five," "under five children nutrition," "under five children nutritional status" and so on. Furthermore, relevant papers were looked up in the references, reviewed and relevant data was appropriately analyzed and summarized.

III. Results

Nutritional Status of Under-five children in Nigeria

Child malnutrition is one of the most dreadful challenges most poor people in the world are faced with. Underweight (low weight for age), stunting (low height for age) and wasting (low weight for height) are all manifestations of undernutrition. All these expose the child to health risks; in their severe forms, they constitute a threat to the child's survival. Globally, acute malnutrition is responsible for over 50% of mortality in children below the age of five years, implying that annually, about 3.5 million children die of malnutrition. In 2017, about 149 million children (22%) in the world were stunted (low height-for-age) and about 59 million (40%) of this were in Africa (Adeyonu *et al.,*2022).

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 03, March 2026)

In Sub-Saharan Africa, the incidence of child stunting was 34% and 29.2% in West Africa Sub-region in 2017 (Adeyonu *et al.,* 2022) while about 20% of children in developing countries are malnourished (Psaki *et al.,* 2012).

In Nigeria, prevalence of stunting changed marginally between 1990 and 2013 from 43% to 37%. During the same period, the burden of acute malnutrition increased – it was estimated at 9% in 1990 and is currently estimated at 18%. In the Northwest region, the prevalence of acute malnutrition remains as high as 27%. Finally, the level of severe acute malnutrition grew from 2% in 1990 to 9% in 2013 (NPC and ICF International, 2014). Severe acute malnutrition is a critical public health problem and a continuing challenge to clinicians (Rytter *et al,* 2015).

There are approximately 1.7 million children suffering from severe acute malnutrition in Nigeria. this number constitutes one tenth of all severely acutely malnourished children in the world (UNICEF, 2015). According to the UN Office for the Coordination of Humanitarian Affairs (2014), Nigeria has the second highest acute malnutrition burden in the world, with an estimated 3.78 million children suffering from wasting. The high malnutrition rate hence the need for high impact nutrition intervention.

Nutrition Intervention

Nutrition intervention can be defined as any type of intervention for children aged <5 years to improve their overall nutritional status. Different types of intervention include food fortification, supplementation, and behavioral and regulatory interventions which have an impact on nutrition outcomes (Pradhan *et al.,*2016). Nutrition intervention can also be referred to as purposefully planned actions intended to positively change a nutrition related behavior, risk factor, environmental condition, or aspect of health status for an individual, the individual's family, caregivers, target groups or the community at large (Szabo *et al.,* 2017). It consists of two components planning and implementation.

High-Impact Nutrition Interventions in Under 5 Children (HiNi)

1. Exclusive Breastfeeding in the First 6 months

Exclusive breastfeeding has many benefits for the infant and mother. Chief among these is protection against gastrointestinal infections which is observed not only in developing but also industrialized countries. Early initiation of breastfeeding, within 1 hour of birth, protects the newborn from acquiring infections and reduces newborn mortality.

The risk of mortality due to diarrhoea and other infections can increase in infants who are either partially breastfed or not breastfed at all. Breast milk is also an important source of energy and nutrients in children aged 6–23 months (Cesar *et al.,* 2016). It can provide half or more of a child's energy needs between the ages of 6 and 12 months, and one third of energy needs between 12 and 24 months. Breast milk is also a critical source of energy and nutrients during illness and reduces mortality among children who are malnourished.

Children and adolescents who were breastfed as babies are less likely to be overweight or obese and they perform better on intelligence tests and have higher school attendance (Nigel *et al.,* 2016). Breastfeeding is associated with higher income in adult life. Improving child development and reducing health costs results in economic gains for individual families as well as at the national level (Nigel *et al.,* 2016).

2. Complementary Feeding after 6 months

Around the age of 6 months, an infant is developmentally ready for other foods apart from breastmilk (Cesar *et al.,* 2016). If complementary foods are not introduced around the age of 6 months, or if they are given inappropriately, an infant's growth may falter.

Guiding principles for appropriate complementary feeding are:

a) Continue frequent, on-demand breastfeeding until 2 years of age or beyond
b) Practice responsive feeding (for example, feed infants directly and assist older children).
c) Feed slowly and patiently, encourage them to eat but do not force them, talk to the child and maintain eye contact
d) Practice good hygiene and proper food handling
e) Start at 6 months with small amounts of food and increase gradually as the child gets older
f) Gradually increase food consistency and variety
g) Increase the number of times that the child is fed: 2–3 meals per day for infants 6–8 months of age, 3–4 meals per day for infants 9–23 months of age, with 1–2 additional snacks as required
h) Use fortified complementary foods or vitamin-mineral supplements as needed, and during illness, increase fluid intake including more breastfeeding, and offer soft, favorite foods (Nigel *et al.,* 2016).

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 03, March 2026)

3. Vitamin A Supplementation

Vitamin A deficiency affects about 19 million pregnant women and 190 million preschool-age children, mostly from the World Health Organization (WHO) regions of Africa including Nigeria (WHO, 2011). The chart below shows the coverage of vitamin A coverage in Africa.

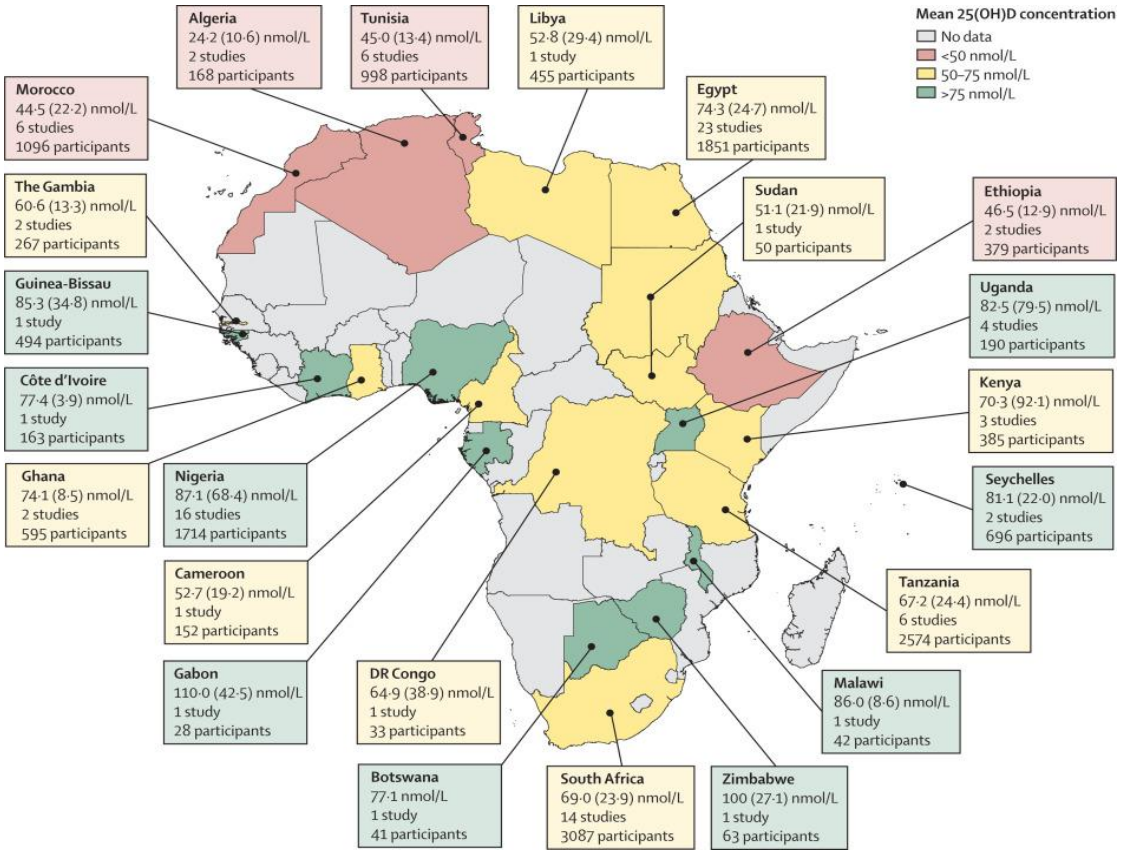

Figure 3: Vitamin A coverage in Africa (World Bank, 2018)

4. Zinc Supplementation for Diarrhea Management

Data from the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) shows that diarrhea is responsible for 15% of all deaths in children under 5 years of age and accounts for about 1.4 million annual infant deaths worldwide.

Research has also indicated that the prevalence of diarrhoea in Nigeria is about 11%, but unevenly more in the Northern zones (Awoniyi and Neupane, 2021).

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 03, March 2026)

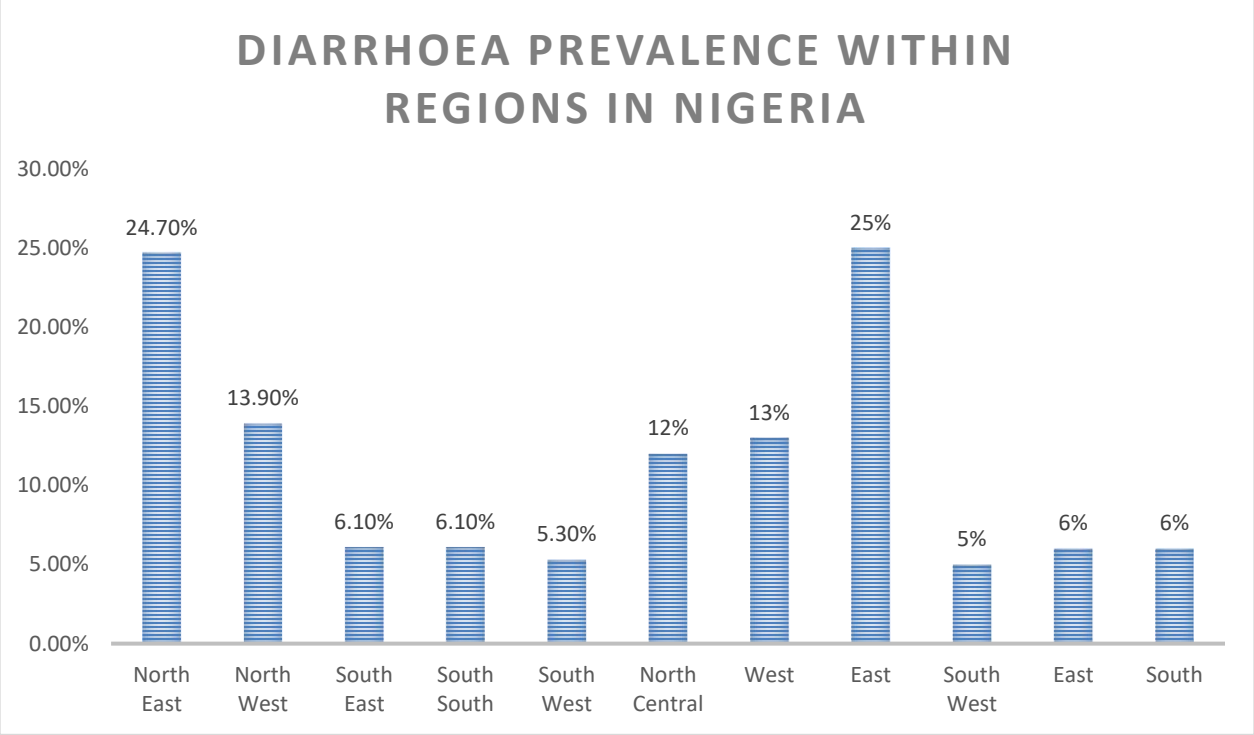

Figure 4: Prevalence of diarrhoea in Nigeria by zones (Awoniyi and Neupane, 2021)

Among the available treatments, WHO currently recommends early oral rehydration therapy and zinc. Zinc supplementation for treating diarrhea in children between 6 and 60 months of age. This recommendation is based on systematic reviews that have demonstrated the beneficial effect of zinc treatment in reducing the duration and severity of diarrhea episodes in children less than 5 years old.

Multiple Micronutrient Supplementation for children below 5 years

Micronutrient supplementation involves the provision of a single micronutrient (iodine, iron, folic acid, vitamin A, vitamin B12, vitamin D, zinc) or multiple micronutrients in the form of capsules, tablets, drops, or syrup. Multiple micronutrient supplements are defined as a single administration of three or more different micronutrients (Yadav *et al.,* 2012). Micronutrients (vitamins and minerals) are an essential component of the diet and are necessary for normal cellular and molecular function. While micronutrients are only needed in trace amounts, their deficiency can result in physical, developmental, and cognitive impairment, increased susceptibility to infections, higher morbidity and mortality, and decreased productivity later in life (Larson *et al.,*2018; Tam, & Keats *et al.,*2020).

Children under-five are particularly vulnerable, as rapid growth and development necessitates a higher demand for micronutrients (Rooze *et al.,*2016). Worldwide, an estimated 43% of children under-five have anemia, 29% of children under-five in Low- and middle-income countries in Africa are deficient in vitamin A, 30% of school-aged children have insufficient iodine intake, and 17% of the population are deficient in zinc, despite a considerable degree of uncertainty in these estimates (Ritchie, and Roser, 2019). The level of micronutrients deficiency across some African countries as reported by Ritchie, and Roser, (2019), highlighted that in Ethiopia, iodine deficiency is the most critical public health issue, affecting 86% of the population, indicating low iodized salt consumption. Iron deficiency (39%) and zinc deficiency (32%) are also concerns, while vitamin A deficiency (19%) is moderate. In Kenya, iron deficiency is prominent at 53%, with vitamin A deficiency at 14% and zinc deficiency at 39%; iodine deficiency is unreported. Nigeria shows high zinc deficiency (63%) and iodine deficiency (59%), with iron deficiency at 39% and vitamin A deficiency at 16%. In South Africa, vitamin A deficiency is most prevalent at 42%, with lower rates of zinc (39%), iron (25%), and iodine deficiency (15%), indicating better iodization efforts (Ritchie, and Roser, 2019).

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 03, March 2026)

These variations are indicative of differences in dietary habits, farming methods, socioeconomic conditions, and the success of national fortification initiatives. This underscore the necessity of tailored nutrition interventions for each country, including advanced food fortification, better dietary diversity, supplementation initiatives, and bolstered public health education, to tackle the specific micronutrient deficiencies identified in each nation.

IV. Discussion

High-impact nutrition interventions for children under five address the immediate causes of undernutrition, such as inadequate dietary intake and disease, as well as key micronutrient deficiencies that elevate morbidity and mortality risks. Comprehensive syntheses, including those from There is a wide range of evidence-based, interventions which include breastfeeding promotion, appropriate complementary feeding, vitamin A supplementation, zinc for diarrhea treatment, deworming when necessary, salt iodization, point-of-use multiple micronutrient powders (MNPs), and programs aimed at preventing and treating moderate to severe wasting (CMAM/OTP/RUTF). When implemented effectively at scale, these interventions have been shown to reduce mortality and enhance growth and developmental outcomes. However, the effects of these interventions can vary based on the local context, coverage, and implementation quality, and other factors, necessitating a localized interpretation of global data (Keats et al., 2021; WHO, 2023).

In Nigeria, challenges in supply chains and funding impact MAM programs, but integrating these with cash transfers and food security measures enhances effectiveness. Prevention of severe acute malnutrition (SAM) requires strategies like exclusive breastfeeding, adequate complementary feeding, and multi-sectoral programs. Community-Based Management of Acute Malnutrition (CMAM) improves access and survival rates; however, outcomes depend on program quality and resource availability. Coverage and equitable access are vital for achieving population-level impacts, with highlighted constraints related to supply chains and financing in Nigeria. Integrated delivery models that combine nutrition interventions with existing healthcare platforms are recommended for improved outcomes.

Impact of Exclusive Breastfeeding in the First 6 months in under five children

Breast milk, the natural first food and immunization for babies is a keystone of child health and survival.

It provides for all nutritional requirements during early infancy besides contributing significantly to lower morbidity and mortality from childhood infections such as pneumonia, diarrhea, otitis media and urinary tract infections (Penugonda et al., 2022). The WHO recommends optimum duration of exclusive breastfeeding (EBF-no other liquids or solids except vitamins, mineral supplements or medicines) for all new born infants worldwide till end of six months of age (Penugonda et al., 2022).

Exclusive breastfeeding (EBF) for six months is repeatedly associated with reduced diarrheal and respiratory morbidity and lower infant mortality, and it supports optimal growth and neurodevelopment (WHO, 2022). Systematic reviews and meta-analyses demonstrate consistent protective effects of EBF on infections and mortality in low- and middle-income countries (LMICs), and breastfeeding promotion interventions (peer support, maternity leave policies, facility support via Baby-Friendly steps) raise EBF prevalence when properly resourced (Keats et al., 2021; WHO ELENA). In India, Penugonda et al., (2022) revealed that exclusive breastfeeding (EBF) prevalence at six months was 47%. Out of 450 infants, 242 reported illnesses, predominantly respiratory (82.6%) and gastrointestinal (11.6%). Illness rates were lower in the EBF group (0.45) compared to the non-EBF group (0.6), with significant differences observed ($p = 0.015$). this indicate that EBF prevalence is low, and interventions are needed to promote early initiation and maintenance of EBF in the first six months. In Nigeria, Anoshirike et al., (2022) reported that 98% of children were breastfed, with 38.6% initiating breastfeeding early and only 10.5% exclusively breastfed for the first six months. Nutritional assessments showed 14.7% of children were wasted, 20.0% underweight, 12.0% stunted, and 3.3% overweight. A significant relationship ($P<0.05$) was noted in nutritional status (weight for age and weight for height) between exclusively and non-exclusively breastfed children, though height for age showed no significant differences ($P>0.05$). The low exclusive breastfeeding (EBF) rate, despite high initiation, indicates a gap between uptake and adherence due to factors like cultural beliefs promoting early introduction of water and solid foods, maternal employment challenges, inadequate counselling in health facilities, and family influence on feeding choices. To improve EBF adherence, stronger breastfeeding promotion initiatives such as community support groups, Baby-Friendly Hospital Initiatives, extended maternity protection, and targeted educational campaigns are essential.

Furthermore, Nigeria's 2018 DHS revealed a low national EBF prevalence (about 29% of infants aged 0 to 5 months), with notable subnational and sociodemographic differences (such as education, urban/rural, and region) (NDHS, 2018). Early supplemental feeding customs, maternal employment without supportive maternity leave, a lack of facility-based counseling, and social norms favoring the introduction of water or porridge are some of the obstacles identified by Nigerian studies (Adebayo et al., 2021; UNICEF Nigeria comments). A large portion of the coverage gap in comparison to worldwide targets can be explained by these supply- and demand-side obstacles (Adebayo et al., 2021; NDHS, 2018). Countries that combine EBF promotion with community peer support and facility maternal services have shown significant improvements. Nigeria's low EBF rates are a reflection of sociocultural norms, disparities (regional, education), and fragmented breastfeeding support (policy and health-system constraints), a pattern common to many large, diversified LMICs (Keats et al., 2021; Adebayo et al., 2021).

Impact of Complementary Feeding after 6 months in under five children

Appropriately timed, nutrient-dense complementary feeding (CF) after six months is essential for continued growth. Interventions that combine counselling for caregivers with provision/fortification of complementary foods (or micronutrient-rich food) improve dietary diversity and can improve linear growth when implemented at scale and combined with infection control and WASH interventions (Keats et al., 2021). Reviews show caregiver education increases feeding practices (meal frequency, diversity), and food supplementation/fortification yields larger impacts on anthropometry, though benefits are context-dependent.

In India, Varghese et al., (2023) reported that grains and pulses were the primary food groups consumed by children aged 6–23 months. Approximately two-thirds had unhealthy food, 20% had sweet beverages, and 61% consumed no vegetables or fruits in the previous 24 hours. Appropriate complementary feeding was observed in 51.3% of children, significantly associated with the educational status of mothers, maternal dietary diversity, and counsel received on complementary feeding. The link between maternal dietary diversity and child feeding indicates that mothers with varied diets likely possess better access to diverse foods and enhanced nutrition knowledge, positively influencing child feeding practices. Research shows that caregivers' eating habits directly impact children's diets, leading to potential limitations when family meals are monotonous.

Additionally, complementary feeding counselling is crucial for promoting healthier feeding practices, as evidenced by improved knowledge and behaviors through various health education initiatives. Community-based programs in Nigeria demonstrate that structured communication can significantly enhance dietary diversity and meal frequency in young children.

Nigerian studies consistently report suboptimal complementary feeding practices (low dietary diversity, early or late introduction, inadequate nutrient density), with maternal knowledge gaps and food insecurity as leading drivers (NDHS 2018; Gemede et al., 2025; Ariyo et al., 2021). Samuel and Ibidapo, (2020) in a study of 283 mother-child pairs, 33.6% achieved minimum meal frequency, 14.5% had minimum dietary diversity, and 9.2% met minimum acceptable diet standards based on WHO IYCF indicators. Overall, appropriate complementary feeding practices were low at 4.2%, associated with antenatal care, clinic attendance, and the mother's workplace ($p<0.05$). The Infant and Child Feeding Index (ICFI) identified low (11.7%), medium (24.7%), and high (63.6%) scores, linked to mother's education and household size ($p<0.05$). The findings highlight a high prevalence of inappropriate complementary feeding, underscoring the importance of monitoring and advocacy in this area. Similarly, Olatona,et al., (2017), in Lagos, reported that the prevalence of timely initiation of complementary feeding was low at 47.9%, with dietary diversity and minimum acceptable diet for children aged 6 to 9 months at 16%. Overall, appropriate complementary feeding practices were also low at 47.0%, which were linked to higher levels of mothers' education and occupation. This finding challenges the assumption that urban mothers, despite better healthcare access, would have superior complementary feeding outcomes. Urban factors like busy work schedules and processed food reliance can detract from optimal feeding. A strength of the study is identifying maternal education and occupation as crucial determinants of appropriate complementary feeding. Educated mothers tend to better understand feeding practices and hygiene while having greater resources. Though formal employment can present time constraints, benefits related to education and income appear to surpass these hurdles. Adequate nutrition is crucial for a child's physical and mental development; its compromise leads to malnutrition. Key feeding practices include early initiation of breastfeeding, exclusive breastfeeding, the timely introduction of complementary foods at six months, and continued breastfeeding up to two years or beyond.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 03, March 2026)

Complementary feeding practices significantly affect a child's growth, health, and development within the first two years. Poor complementary feeding can result in malnutrition, contributing to stunting and underweight. Ideal recommendations include introducing solid foods at six months, alongside breast milk, and not delaying allergenic foods or gluten introduction, as timing does not specifically mitigate risks for allergic diseases, coeliac disease, or type 1 diabetes mellitus.

Interventions that combine behaviour change communication (BCC) and provision of fortified complementary foods or MNPs show promise but face logistical and cost constraints. Education alone improves feeding behaviors; the largest, more consistent gains in growth come when improved feeding is paired with fortified foods or MNPs and disease control measures. Differences across studies reflect baseline food security, program intensity/duration, and whether complementary feeding programs addressed both quality and quantity of diets.

Impact of Vitamin A Supplementation in under five children

High-dose vitamin A supplementation for children 6–59 months has long been shown to reduce all-cause child mortality in settings with vitamin A deficiency, and to reduce risk of xerophthalmia/visual consequences (WHO recommendations). Meta-analyses estimate substantial mortality reductions in deficient populations (WHO, BMJ meta-analyses). Gains are most pronounced in areas where deficiency prevalence is high and coverage is good.

In a study on a vitamin A supplementation program for children in central Asia, significant improvements were noted post-intervention. Self-reported cases of diarrhea and intestinal infections decreased, while the number of children with normal vitamin A levels increased. Mean serum retinol levels rose from 30.01 ±0.5 µg/dL to 61.06 ±1.2 µg/dL ($p < 0.001$), and reported diarrhea cases decreased significantly (30 vs. 95; $p < 0.01$). The findings indicate improved health status and support implementing the program nationally, highlighting important policy implications (Beisbekova et al., 2024). Nigeria has historically had low and inequitable VAS coverage (45% in 2018 with wide subnational variation). Coverage declines are attributed to decentralized delivery systems, weak outreach, and missed opportunities (e.g., low use of MNCH weeks or poor integration). Recent programmatic efforts to integrate VAS with seasonal malaria chemoprevention (SMC) or routine contact points have shown feasibility and improved coverage in pilot settings (Malaria Consortium; Oresanya et al., 2022). In South-East Nigeria, a study reported that only 37.2% knew the recommended frequency for vitamin A supplementation despite having a good level of knowledge on vitamin A.

The study also highlighted that a significant majority (95.3%) recognized the benefits of vitamin A, with 61.3% aware that it can prevent blindness (Obinna et al., 2025). A study on Vitamin A deficiency among under-five Nigerian children with diarrhea, highlights significant insights into vitamin A deficiency (VAD) among children, revealing that 15.9% of children were classified as deficient, which was significantly associated with wasting and hospitalization of child, marking it a severe public health issue according to WHO standards. Children with VAD had a higher likelihood of hospitalization (odds ratio of 4.40), suggesting VAD contributes to compromised immune function. Notably, the only death recorded in the study was in a vitamin A deficient child, underscoring the link between VAD and mortality. The findings advocate for urgent preventive strategies like vitamin A supplementation and strengthened child health initiatives to mitigate the impacts of VAD on health outcomes (Abolurin, et al., 2018). Although, regional and socioeconomic inequities in Vitamin A Supplementation (VAS) exists in Nigeria, which may significantly contribute to the causes of childhood blindness, context-specific and effective strategies must be developed and implemented to mitigate these inequities (Aghaji and Aghaji, 2019). Where VAS is administered through well-structured campaigns or integrated with extensive platforms (e.g., SMC, vaccination days), coverage increases and child mortality can be diminished. Low coverage in Nigeria implies system fragmentation and equity gaps; enhancing integration into high-reach platforms is a realistic avenue.

Impact of Zinc Supplementation for Diarrhea Management in under five children

Oral zinc supplementation (10–20 mg daily for 10–14 days) for treatment of acute diarrhea in children under five reduces duration and severity of diarrheal episodes and lowers subsequent incidence (WHO, 2024). A randomized controlled trial study in Northern Africa resolved that daily zinc supplementation for 4 months can decreased both the incidence and severity of diarrhea in young children than 5 years old (Abd El-Ghaffar, et al., 2022). This shows that zinc enhances the immune system and helps maintain the integrity of mucosal barriers in the gastrointestinal tract. Also, minimizing the severity of diarrhea episodes implies that even when children do develop diarrhea, the presence of adequate zinc levels promotes recovery, shortens length, and minimizes the risk of consequences such as dehydration, weight loss, and hospitalization. This is consistent with global evidence, including WHO recommendations, which recognize zinc as a key therapeutic and preventive micronutrient in diarrhea management (Sadiq et al., 2023; WHO, 2023; Shah et al., 2021).

Zinc is essential for both innate and adaptive immune systems, with deficiencies causing abnormal immune cell development and impaired intracellular communication. It also maintains intestinal mucosal integrity, regulates junction proteins, and aids in epithelium repair, thereby preventing pathogen entry into the gut and minimizing fluid losses during infections (Rampedi et al., 2024). Zinc not only reduces the duration and severity of diarrhea but its deficiency is linked to gut dysbiosis, altered host-microbiota interactions, and increased gut permeability, contributing to gut disorders. Adequate zinc intake is crucial in preventing diarrheal deaths in low- and middle-income countries (LMICs) and emphasizes its importance in maintaining the gut barrier beyond its immune-modulatory functions (Rouhani et al., 2022). Ali et al., (2024) conducted a systematic review and meta-analysis of 38 randomized controlled trials validating the efficacy of zinc supplementation in treating both acute and chronic diarrheal episodes. Additionally, recent evidence suggests that zinc supplementation is the most effective in reducing the duration and severity of diarrheal diseases in population groups with the highest baseline zinc deficiency. Furthermore, zinc supplementation has greatly reduced diarrhea-associated morbidity and mortality in several community-based trials, underscoring its importance in LMICs' infant and young child programs. A meta-analysis on zinc supplementation and its role in preventing diarrhea reported a 16% reduction in all-cause mortality risk in children. Additionally, it was reported that consumption of 10 mg per day or more of zinc for less than 11 months decreased all-cause mortality by 44%. Diarrhea-specific mortality reduction was reported to be 15% after less than a year of zinc supplementation (Sinha et al., 2022). Intervention studies have reported a combination of both zinc and oral rehydration solution (ORS) within routine diarrheal management to be cost-effective and efficient in reducing child mortality burden (Somji et al., 2019).

Nigeria's national guidelines recommends zinc for pediatric diarrhea; however, routine use varies because of provider prescribing practices, caregiver awareness, and supply chain deficiencies. The necessity of ensuring zinc availability at the community level and combining it with ORS is highlighted by recent country studies and regional assessments. A descriptive retrospective study in the Niger Delta Sub-Region of Nigeria reported that 96.1% of those who received zinc supplementation experienced no repeat diarrhea episodes. Only 1.3% of the zinc group had increased episodes versus.

Furthermore, 2.6% of those receiving zinc had reduced diarrhea episodes, against 14% among those who did not (Asuquo et al., 2012). These findings underline the effectiveness of zinc supplementation in managing diarrhea in young children, supporting its use in Nigeria. Zinc's clinical efficacy is robust; programmatic gains depend on commodity availability and adherence to recommended dosing. Heterogeneity in observed population-level benefits arises because benefits are greater where baseline zinc deficiency or diarrheal burden is high, and where programs ensure full courses reach caregivers.

V. Conclusion

There is robust evidence that a specific set of high-impact nutrition interventions can significantly decrease under-five mortality and morbidity. These interventions include exclusive breastfeeding promotion, appropriate complementary feeding (with fortification as necessary), vitamin A supplementation in areas with deficiencies, zinc treatment for diarrhea, targeted deworming, salt iodization, micronutrient powders (MNPs), and community-based management of acute malnutrition (MAM & SAM) using community-based management of acute malnutrition (CMAM), outpatient therapeutic programmes (OTP), and ready-to-use therapeutic food (RUTF). In Nigeria, the overall impact is hindered by programmatic limitations such as coverage gaps, issues in supply chains, decentralized delivery systems, and specific socio-cultural practices. However, targeted integration of interventions and strengthening of health systems offer practical solutions to bridge this gap. It is crucial for policymakers to focus on integrated, context-specific delivery methods and sustainable funding to translate evidence into substantial population impact.

REFERENCES

[1] Abolurin, O. O., Adegbola, A. J., Oyelami, O. A., Adegoke, S. A., & Bolaji, O. O. (2018). Vitamin A deficiency among under-five Nigerian children with diarrhoea. *African health sciences*, *18*(3), 737-742.

[2] Abd El-Ghaffar, Y. S., Shouman, A. E., Hakim, S. A., El Gendy, Y. G. A., & Wahdan, M. M. M. (2022). Effect of zinc supplementation in children less than 5 years on diarrhea attacks: a randomized controlled trial. *Global Pediatric Health*, *9*, 2333794X221099266.

[3] Aghaji, A. E., Duke, R., & Aghaji, U. C. (2019). Inequitable coverage of vitamin A supplementation in Nigeria and implications for childhood blindness. *BMC public health*, *19*(1), 282.

[4] Ali, A. A., Naqvi, S. K., Hasnain, Z., Zubairi, M. B. A., Sharif, A., Salam, R. A., ... & Das, J. K. (2024). Zinc supplementation for acute and persistent watery diarrhoea in children: A systematic review and meta-analysis. *Journal of Global Health*, *14*, 04212.

[5] Anoshirike, C. O., Okere T. O., Ogbonna P. C., Ogbu, C. C., Asinobi, C. O., Ofoezie, E. (2022). Exclusive Breastfeeding Practice and Nutritional Status of Infants Attending University of Nigeria Teaching Hospital Enugu, Nigeria. *International Journal of Innovative Studies in Sciences and Engineering Technology (IJISSET),*3(2),17-22.

[6] Ariyo, O., Aderibigbe, O. R., Ojo, T. J., Sturm, B., & Hensel, O. (2021). Determinants of appropriate complementary feeding practices among women with children aged 6-23 months in Iseyin, Nigeria. *Scientific African*, *13*, e00848.

[7] Asuquo, E., Georgewill, U., Nta, I., Enyidah, N., Umofia, E., & Deekae, S. (2012). The effect of zinc supplementation on diarrheal diseases in children in the Niger Delta Sub-Region of Nigeria. *Open Journal of Preventive Medicine*, *2*(2), 137-140.

[8] Awaf, A., Elias, A., & Mahfouz, M. S. (2023). Complementary feeding practices among mothers having children less than two years old attending well-baby clinics in Jazan City, Saudi Arabia. *Pan African Medical Journal*, *45*(1).

[9] Beisbekova, A., Ospanova, F., Kainarbayeva, M., Ushanskaya, E., Bykybayeva, S., Berdygaliev, A., ... & Linkov, F. (2024). Effectiveness of vitamin A supplementation among children under 5 years old in Kazakhstan. Slovak Journal of Food Sciences/Potravinarstvo, 18.

[10] Obinna N. C., Onyinye C. H., Chiesonu N. D., Francis O. N., Josephat C. M. (2025). Vitamin A Supplementation Among Children Attending Enugu State University Teaching Hospital Enugu: The Caregiver Perspective. *Canadian Journal of Medicine,* 7(2025) 86-99.

[11] Olatona, F. A., Adenihun, J. O., Aderibigbe, S. A., & Adeniyi, O. F. (2017). Complementary feeding knowledge, practices, and dietary diversity among mothers of under-five children in an urban community in Lagos State, Nigeria. *International Journal of MCH and AIDS*, *6*(1), 46.

[12] Penugonda, A. J., Rajan, R. J., Lionel, A. P., Kompithra, R. Z., Jeyaseelan, L., & Mathew, L. G. (2022). Impact of exclusive breast feeding until six months of age on common illnesses: a prospective observational study. *Journal of Family Medicine and Primary Care*, *11*(4), 1482-1488.

[13] Rampedi, P. N., Ogunrombi, M. O., & Adeleke, O. A. (2024). Leading Paediatric Infectious Diseases, Current Trends, Gaps, and Future Prospects in Oral Pharmacotherapeutic Interventions. Pharmaceutics, 16(6), 712.

[14] Sadiq, F., Jan, M. S., Tariq, M., Ullah, I., Khan, A. A., & Suleman, M. (2023). Effect of zinc supplement on duration of acute watery diarrhea from 6 months to 5 year aged children. *The Professional Medical Journal*, *30*(10), 1328-1333.

[15] Samuel, F. O., & Ibidapo, E. G. (2020). Complementary feeding practices and associated factors among nursing mothers in Southwestern Nigeria. *International journal of maternal and child health and AIDS*, *9*(2), 223.

[16] Sinha, B., Dudeja, N., Chowdhury, R., Choudhary, T. S., Upadhyay, R. P., Rongsen-Chandola, T., ... & Bhandari, N. (2022). Enteral zinc supplementation in preterm or low birth weight infants: a systematic review and meta-analysis. *Pediatrics*, *150*(Supplement 1), e2022057092J.

[17] Somji, S. S., Dhingra, P., Dhingra, U., Dutta, A., Devi, P., Kumar, J., ... & Simon, J. L. (2019). Effect of dose reduction of supplemental zinc for childhood diarrhoea: study protocol for a double-masked, randomised controlled trial in India and Tanzania. *BMJ paediatrics open*, *3*(1), e000460.

[18] Varghese, A., Agarwal, M., & Singh, V. K. (2023). Complementary feeding practices in children aged 6–23 months in rural Lucknow: A cross-sectional study. Clinical Epidemiology and Global Health, 22, 101331.

[19] World Health Organization (2022). The World Health Organization's infant feeding recommendation, WHO. World Health Organization. [Last accessed on 2022 Jan 10]. Available from: https://www.who.int/news/item/15-01-2011-exclusive-breastfeeding-for-six-months-best-for-babies-everywhere

[20] World Health Organization (2023). Zinc supplementation in the management of diarrhea. Retrieved from; https://www.who.int/tools/elena/interventions/zinc-diarrhoea

*Corresponding author:

Fortunatus Gbeinbo. Department of Public Health, Bayelsa Medical University, Yenegoa, Bayelsa State, Nigeria