



The Nutritional Status and Diets of Preschool Children (2-5 Years) In Nigeria: A Scoping Review

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Abstract: Optimal nutrition in formative years supports age-appropriate growth and development and promotes lifelong health. This work aimed at examining the diets and nutritional status of preschoolers in Nigeria through published nutritional studies in order to provide more information that can be leveraged for age-appropriate interventions. The review included 34 studies retrieved from Scopus, PubMed, the Web of Science, AJOL, Google Scholar, and ScienceDirect on preschoolers' nutritional status and diet. The articles chosen used mixed techniques and quantitative approaches and were published between 2009 and 2025. The predominant criteria for article selection during screening were the study ideas, the phenomenon of interest, design, evaluation, and research type. The PRISMA-ScR Standards and SPIDER framework were used to screen the articles that met the selection criteria. These study findings revealed a high prevalence of both undernutrition and the increasing emergence of overweight and obesity. Zinc and iron deficiency anaemia were also widespread, and micronutrient powder supplementation provided only minor improvements. Furthermore, malaria, anaemia, diarrhoea, and gut parasitic infections continued to be significant health burdens that negatively affected the nutritional status of preschoolers. In studies also reviewed, the diets of undernourished preschoolers were characterised by high intakes of starch-based staples and low intakes of legumes, animal foods, fruits, and vegetables. In contrast, those of overweight or obese preschoolers were characterised by high intake of highly sweetened foods and drinks. Therefore, there is a need for more studies, particularly interventional studies focusing mainly on preschoolers, in order to close the nutrient gaps associated with their age.

Keywords: Preschoolers, nutritional status, undernutrition, micronutrients, diet quality.

1. INTRODUCTION

Early developmental stages of life remains important stages of physical, social and emotional growth and development, requiring adequate intake of food and nutrients [1]. Good nutrition is essential for children's healthy development; however, child malnutrition is a global public health issue that leads to high rates of mortality and morbidity [2]. Globally, an estimated 149 million (22%) children under the age of five are stunted, 45 million (6.7%) are wasted, and 39 million (5.7%) are overweight [3, 4]. In 2020, an estimated 5 million children under five years of age died, with nearly half (45%) of these deaths attributable to malnutrition-related factors [5], with other consequences being a delay in physical growth, a lower intelligence quotient, more significant behavioural problems, a deficiency in social skills, and susceptibility to contracting diseases [6]. Micronutrient deficiencies are common contributors to poor growth, intellectual impairments, prenatal complications and increased risk of morbidity and mortality in children, with iron, iodine, folate, vitamin A, and zinc deficiencies being the most widespread within Africa and Asia as the most affected regions, mainly affecting women and children [7]. Since 2014 until date, the global acute malnutrition (GAM) prevalence in children 6-59 months in Nigeria has remained at an alarming rate of 5-9.9% [8]. The national acute malnutrition (weight-for-height Z score and/or edema) prevalence in Nigeria remains as high as 7.0 percent, with moderate acute malnutrition (MAM) of 5.5% and severe acute malnutrition (SAM) of 1.5%, including 24 (0.1%) edema cases [8]. The high burden of malnutrition in African nations is associated with a high

intake of cereal-based foods, hookworm and schistosomiasis infestations, increased conflict, malaria, HIV and TB [9, 10].

Malnutrition of all forms among preschool-preschool children is on the rise in Nigeria and many other countries of the world as a result of inadequate food intake or poor-quality food, as well as other factors such as disease and poor childcare practices. Preschool age is a critical period in the lives of young children, due to nutritional transition from both breastfeeding and complementary feeding to the consumption of family meals. However, typically, what may be considered as family meals in Nigeria depends on availability and location, with most of what is consumed as family meals is mainly prepared from starch-based cereals, roots and tubers [11] and eaten with or without stew, sauce, or soup. In most Sub-Saharan African countries, at this age, most preschoolers have been weaned from breastfeeding, which reduces the quality of their overall nutrient intake in addition, their diets are predominantly based on starchy foods with little or no animal products and few seasonal fruits and vegetables. Most of these plant-based diets tend to be high in antinutrients, low in several micronutrients, which may also be in forms that may not be easily absorbed in the body. Thus, the outcome of the continuous consumption of these poor-quality diet is the significantly high prevalence of malnutrition reported among this age group, affecting human performance, health and survival [12].

A review of the prevalence and determinants of undernutrition among under-five children in Nigeria by [13] identified younger preschoolers (2-3 years) as the most affected, an indication of high risk of malnutrition beyond the first 1000 days of life also requiring urgent attention. However, most nutritional studies amongst children under 5 years of age has been tailored towards infants and young children 0-23 months; as such most interventions have also been tailored towards exclusive breastfeeding and safe, adequate and age-appropriate complementary feeding, leading to high levels of malnutrition in preschoolers. This work therefore aims to identify quantitative studies on the nutritional status of preschoolers in Nigeria and their diets in order to identify knowledge gaps and possible areas of interventions that will be age-appropriate for their nutritional needs.

2. METHODOLOGY

2.1 Search Strategy

This review is guided by the Preferred Reporting Item for Systematic Review and Meta-Analyses for Scoping Reviews (PRISMA-ScR) in order to identify gaps in knowledge among preschoolers in Nigeria. Keywords for search, as shown in Table 1 in this review, cover three aspects of nutrition for preschoolers in Nigeria: food intake and nutritional practices, anthropometry and micronutrients. The study population (preschoolers) was defined using another group of keywords added to each search strategy, and several keywords were used for setting and country setting (Nigeria). The search was combined with each group of keywords using "AND" and "OR" within a group of keywords. The article search was carried out in Scopus, PubMed, Web of Science, AJOL and Science Direct and also looked for in gray literature and other web-based sources such as Google Scholar from Jan 1, 2009, to March 30, 2025. Only quantitative study design was accepted (observational, analytical, interventions and clinical trials) for this review.

2.2 Literature Search

A search to obtain relevant studies on preschooler nutritional status and nutritional practices in Nigeria was conducted between February 10, 2025 and March 30, 2025, using the keywords in Table 1 from Scopus, PubMed, Web of Science, AJOL, Science Direct and other web-based sources such as Google Scholar.

2.3 Inclusion Criteria

Quantitative studies conducted in Nigeria among boys and girls 2-5 yrs of age on diet, nutritional practices, anthropometry and micronutrient status from January 2009 to March 2025 and published in English

2.4 Exclusion Criteria

Qualitative studies and reviews conducted in Nigeria among preschool children 2-5 yrs of age, Quantitative studies not covering diet and nutritional practices, anthropometry and micronutrient status, studies not carried out in Nigeria, not published in English and studies carried out before January 2009 and after March 30, 2025.

Table 1: Keywords used for the search

Nutrition Topic	Outcome	AND	Population/Participant	AND	Setting	AND	Country Setting
Diet and nutritional practices	food OR diet OR nutrition OR food frequency questionnaire OR 24-hour dietary recall OR diet diversity OR diet diversity score OR protein OR carbohydrate OR fats OR consumption OR intake, food dairy OR sugar OR energy OR calorie OR calories		preschooler OR preschoolers OR preschool child OR young child OR young children OR under-five OR under five children OR nursery attending children OR kindergartener OR toddler OR early childhood OR early learner OR boy OR boys or girl OR girls OR 2-5 years OR 3-5 years		community OR ECD centre OR nursery OR kindergarten OR playschool OR creche OR preschool OR pre-primary school		Nigeria
Anthropometry	anthropometry OR weight OR BMI OR overweight OR obesity OR body size OR body mass OR stunting OR stunted OR wasting OR wasted OR underweight weight for height OR weight for age OR height for age OR Z score OR MUAC		preschooler OR preschoolers OR preschool child OR young child OR young children OR under-five OR under five children OR nursery attending children OR kindergartener OR toddler OR early childhood OR early learner OR boy OR boys or girl OR girls OR 2-5 years OR 3-5 years		community OR ECD centre OR nursery OR kindergarten OR playschool OR creche OR preschool OR pre-primary school		Nigeria
Micronutrients	micronutrient OR iron OR zinc OR calcium OR vitamin A OR folate OR vitamin B6 OR vitamin C OR vitamin D OR anaemia OR diarrhoea OR intestinal parasites		preschooler OR preschoolers OR preschool child OR young child OR young children OR under-five OR under five children OR nursery attending children OR kindergartener OR toddler OR early childhood OR early learner OR boy OR boys or girl OR girls OR 2-5 years OR 3-5 years		community OR ECD centre OR nursery OR kindergarten OR playschool OR creche OR preschool OR pre-primary school		Nigeria

2.5 Literature Selection, Data Extraction, and Synthesis

This review was conducted in an explorative way without excluding papers due to methodology, sample size, or result; studies excluded were the ones with no specific data on outcomes of the studies on preschoolers (children 2 - 5 years) or where the outcomes were not based on age categorization hence leaving no room from age-specific data extraction. However, for intervention studies, age was open to children under five years as long as the intervention included children of preschool age.

Each search strategy was carried out in Scopus, PubMed, Web of Science, AJOL, Google Scholar and Science Direct and duplicates removed. Potentially relevant titles and abstracts were then screened: the full-text were obtained and reviewed to finalize the selection. The main reason for exclusion of articles as well as title and abstract screening, were documented. Data extraction was done using a standardized form that collected the following information from each selected article. The author's name for a single author or names for double authors, first author name for 3 or more authors, year of publication, the main objective of the study, study design/length of study, period of study, sample size, country setting (urban or semi-urban or

rural), percentage of a participant who were girls or females, main result, study findings and a final column for recommendation based on findings of the review of each paper. Articles were ordered in the data extraction table by topic and year of publication.

3. RESULTS AND DISCUSSION

3.1 Literature Selection

A total of 1171 potentially relevant articles were identified: 385 on diet and nutritional practices, 532 on anthropometry, and 254 on micronutrients. After deleting duplicates, 950 articles were obtained and screened using their titles and abstracts, resulting in 361 full-text articles for review. The reason for title and abstract screening was to remove studies not related to nutrition. After careful reading the 361 articles, 34 were selected. The reason for exclusion here was because articles did not have relevant preschooler data as it was important to ensure that the articles finally selected were relevant to the subject of study, met age categorization and also met the study setting (location). One relevant article was also obtained from gray literature; no additional publications were identified from the references of the selected articles. Finally, thirty-four (34) articles were analysed in this review, as shown in Figure 1.

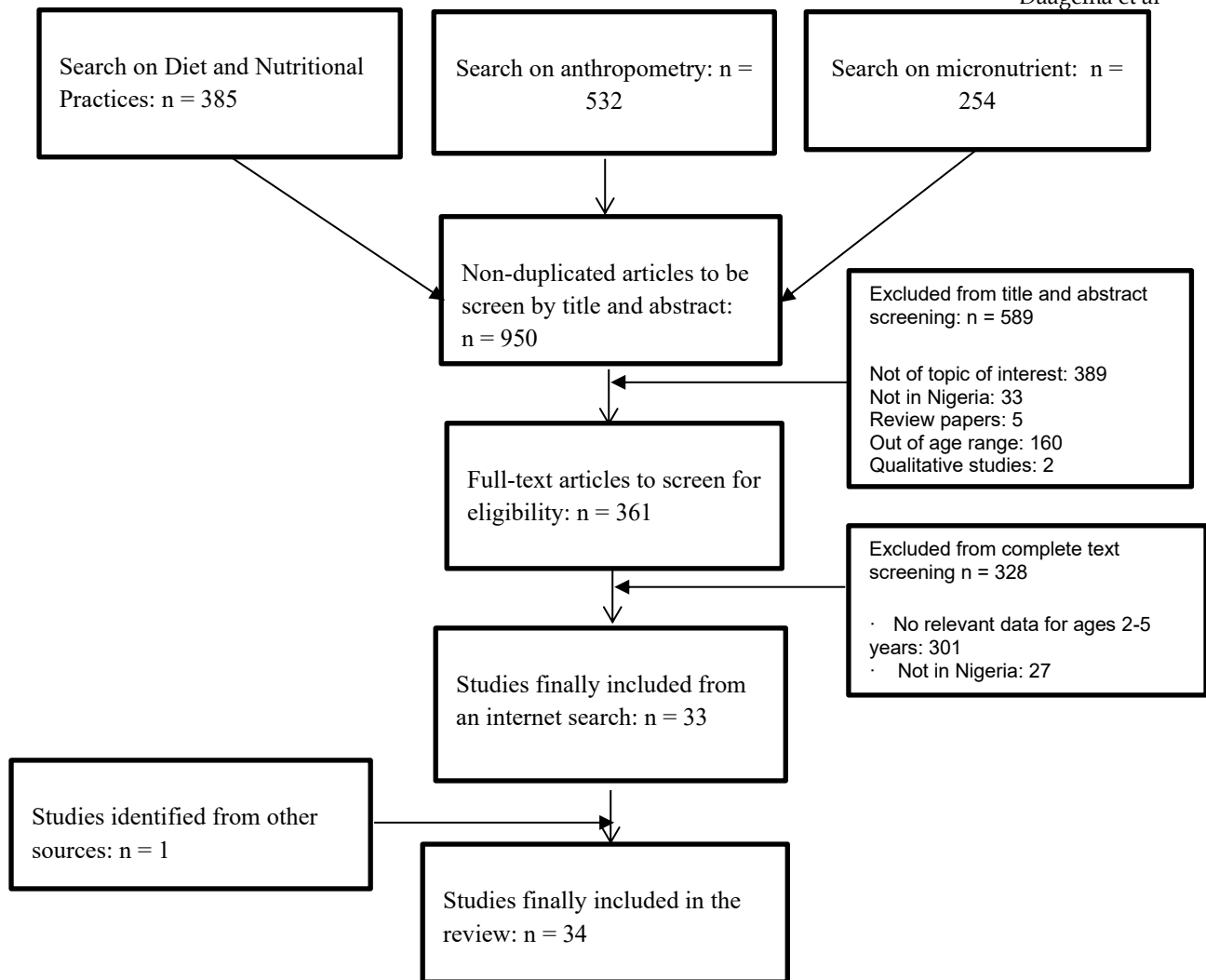


Figure 1: Flow chart of the literature selection to identify nutritional studies conducted among preschoolers aged 2-5 years in Nigeria between 2009 and 2025

3.2 Study Characteristics Based on Data Presented in Tables 2, 3 and 4

Among the 34 articles selected for this review and presented in Tables 2, 3 and 4. Twelve (12) were on nutritional status only, 16 were on nutrition status and practices and 6 were intervention studies. Also, from the 34 selected articles, 23 were descriptive cross-sectional surveys only, 5 descriptive cross-sectional surveys with laboratory analysis, 4 randomized controlled trials, 1 longitudinal study and 1 quasi-experimental study. The selected articles covered 7 studies from urban settings, 7 from semi-urban, 19 from rural, 3 from urban + rural, 1 from semi-urban + rural, and 2 from urban + semi-urban + rural settings in Nigeria, while 2 included Nigeria and Kenya. By geopolitical regions of Nigeria, 3 studies were conducted in the North-Western regions, 3 from the North-East, 2 from the North-Central, 8 from the South-West, 13 from the South-East and 5 from the South-South. Gender-stratified data shows, 13 of the

studies had more males than female participants, 12 had more females than males, 3 had equal males and females and 6 had no report on sex data for their works. The ages of participants in this review were as follows: two of the studies reported the ages of preschoolers as 2-4 yrs, 5 studies reported as 3-5 years, 17 studies reported as 2-5 yrs while another also reported the age of the children as 36-59 months. However, for intervention studies that included children under five years of age, 2 of the studies reported the ages of the children as 6-59 months, while the ages of 5-59 months and 1-3 years were reported by two studies each. The main topics of interest addressed by articles in this review were: assessment of nutritional status to determine the prevalence of malnutrition or as a baseline study, which was covered by 7 articles, 8 of the articles covered the relationship between diet quality and nutritional status of preschoolers, 6 of the articles where on nutritional factors influencing malnutrition.

Other topics in this review were on nutritional status and cassava consumption, feeding patterns of preschool children, efficacy of biofortified cassava on the vitamin A status of preschoolers, use of micronutrient powder and therapeutic food, effect of a micronutrient fortified drink on micronutrient status, growth and cognitive development, nutritional status, pack cell volume and parasitic infection, as well as on nutritional status and effect of armed conflict and caregivers nutrition education intervention on nutritional status of preschool children.

3.3 Prevalence of Malnutrition

The review showed twenty-three studies used anthropometric data to predict malnutrition. In eighteen of these studies, the Z-score was used as an indicator, six used both the Z-score and mid upper arm circumference (MUAC) for age, and three used both the Z score and body mass index (BMI) for age. The nutritional status preschool children from this review indicated, stunting ranged from 7.69 to 61%, with variations in the rural, semi-urban, and urban settings. Stunting is more common in the northern part of the country and among rural preschoolers born into polygamous homes, living in a large household, having a mother with no formal education, and eating a low-protein diet.

Underweight prevalence ranged from 2.4 to 39.72%, while wasting prevalence ranged from 2 - 18.9%. Five studies measured overweight and obesity, with a range of 10-15% for overweight and 8.6% - 17.1% for obesity, which were both higher among preschoolers living in urban settings in the southern part of the country.

Two studies reported high rates of anaemia (29.0–94.8%), which was defined by using the international red cell parameter cut-offs from the World Health Organization (WHO). Four authors reported low iron intake, with a mean daily intake of 9.1mg which is 43% lower than the expected daily reference intake (DRI) for preschool children. Four authors also reported low zinc intake, ranging from 3.1 to 9.9 mg and also less than 59% of their expected DRI. Other mineral deficiencies reported includes calcium (2 authors), iodine (1 author), and selenium (1 author). Four authors reported the prevalence of vitamin A deficiency(VAD) with one of the authors reporting 9% VAD and low serum retinol concentration of 1.06 mol/L. In another study vitamin A intake for preschoolers was reported as 85% less their expected DRI. Other vitamins mentioned in this review by authors includes vitamin B complex (two authors), vitamin C and vitamin D (one author each).

3.4 Food Intakes and Nutritional Practices

Twelve studies provided information on the types of foods consumed by preschoolers and four provided information on their diet patterns. From these studies, foods consumed was mostly of plant origin, and most

diets were prepared from starch-based cereals, roots and tubers such as rice, yam, cassava and sorghum. Consumption of legumes, meat, fish, milk, fruits, and vegetables was low. For example, fruits and vegetables were consumed only occasionally and when in season. None of the authors reported on the consumption of edible insects. Two of the 12 authors also reported fast food, fatty foods, highly sweetened foods and drinks consumption among preschoolers who were overweight or obese. According to the data from the study on diet pattern of preschoolers, 78.2% of preschoolers ate three times a day, while 10.5% skipped at least one meal, with breakfast being the most skipped meal at 96.4%. Reasons for skipping included illness, sleeping, a monotonous diet, and a dislike of the food. In addition, diet diversification among preschoolers was poor, with a range of 3.2–4.0. Carbohydrate was the most consumed food nutrient, while protein intake was between 2.5 g/kg-23.5g/kg, and higher among the urban preschoolers as indicated by comparative studies among urban and rural preschoolers.

3.5 Parasitosis Infections

Three studies reported on malaria in preschoolers with an infection prevalence in the range of 9%-75.0%. Other parasitic infections reported were intestinal worm infestation with a prevalence of 22-44% and diarrhoea. This review showed these infections contributed significantly to malnutrition among preschoolers, especially those from rural settings.

3.6 Viral Infection

Human immunodeficiency virus (HIV) infection was reported by an author as a major contributor to preschooler malnutrition and it was carried out in an urban setting in a tertiary hospital in the North-West part of the country.

3.7 Factors Associated with Nutritional Status Among Preschoolers

Most studies were descriptive and factors associated with undernutrition included poor diet quality, poor diet diversity, poor domestic food processing and food preparation, living in communities with high consumption of cassava as a staple, living in a rural area or urban poor setting, living in low economic status households with food insecurity, exposure to armed conflict especially in the northern part of the country, caregivers low educational status, born into and living in a polygamous home/large family setting, being a younger preschooler (2-3 years), been a male preschooler, preschoolers with frequent illness especially malaria, diarrhoea, intestinal worm and upper respiratory tract infection without appropriate medical intervention and follow up nutritional care. Meanwhile, factors associated with overweight and obesity included being a female preschooler, being a first child, spending more time watching television and

playing video games, taking trips to and from school in private cars and high consumption of fast foods, fatty foods and highly sweetened foods and drinks.

3.8 Interventions to Modify Nutritional Status in Preschoolers

From the six intervention studies examined, five aimed at preventing micronutrient malnutrition, while one aimed at both macronutrients and micronutrients. Micronutrients of most concern were vitamin A and iron. At the same time, preventive interventions included the consumption of provitamin-A cassava, leveraging existing platforms for the distribution of micronutrient powder, providing nutrition education to caregivers for lifestyle changes, use of micronutrient powder and ready-to-use therapeutic foods to prevent acute malnutrition among ill and recovering children and the use of micronutrient enhanced drink to improve preschooler micronutrient status, growth and cognitive

development. These interventions were majorly focused on micronutrient fortifications, biofortification, therapeutic food supplementation and nutrition education. While five of the interventions had positive outcomes, one had a negative outcome where the use of micronutrient powder or ready-to-use therapeutic food to complementary food or family meals did not prevent malnutrition among convalescent preschool children during their study period and was attributed to reinfections of the same diseases or other ones, leaving the child in the malnutrition infection cycle. It was also observed from this review that, interventional studies published before 2020 aimed at using micronutrient powder, while those published in 2020 and beyond aimed at diet modification, lifestyle change and the consumption of biofortified crops.

This scoping review includes summary tables of studies on preschoolers' nutritional status, food intake and diet which is shown in Tables 2, 3 and 4.

Table 2: Studies on nutritional status only

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Aliyu, 2012 [14]	To obtain a baseline assessment of nutritional indices of preschool children in a typical rural Northern community of Nigeria	Descriptive cross-sectional survey	-	294	Rural	North-West/ (Kaduna)	2-5	50	Observed weight and height range were 7.0-21.0kg and 70.0-116.0 cm. Females had slightly higher weight and height. 44.9% were stunted, 15.6 underweight, and 3.7 were wasted using the Z scores indicator.	Malnutrition among preschoolers is high requiring urgent interventions.
Agbedyi <i>et al.</i> , 2015 [15]	Nutritional status of day care attendees in Port Harcourt metropolis	Descriptive cross-sectional survey/9 months	Nov. 201 - July 2012	1541	Urban	South-South/ (Rivers)	0-35M	50.3	Preschoolers in this study with age ranged of 24-35m were 631. using the Z score indicator, 12 of the preschoolers were underweight, 45 were stunted, 63 were wasted, and 193 were overweight	There is also need for interventions that aids in the prevention of over-weight and obesity in early childhood such as including exercise regimens in daycare activities.
Amadi, 2015 [16]	To determine the nutritional status of preschool-age children in Enugu	Descriptive cross-sectional/3 months (comparative studies)	-	409	Urban	South-East/ (Enugu)	2-5	53	The mean weight-for-age was 17.7 ± 3.7 kg, height-for-age was 105.3 ± 10.0 cm, weight-for-height was 101.4 ± 11.8 percent and MUAC was 16.5 ± 1.4 cm. Underweight, wasting, and stunting was 17.1 percent, 10.1 percent, and 21.1 percent respectively, was highest among preschoolers from high-density residential	There is need for more cost-effective nutrition intervention targeted at households with low household income.

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Balogun and Yakubu, 2015 [17]	To identify determinants of preschooler malnutrition in a rural Nigerian community	Descriptive cross- sectional survey	-	374	Rural	North- West/ (Kaduna)	0- 59M	46.5	areas with low-social classes. While preschoolers from the low- and medium-density residential areas and high- social classes were heavier, taller, and had bigger arm sizes. Only 217 of the participants were 2-5 years. Median anthropometric Z-score range of children (24- 59M) assessed were: weight for age -1.23 to - 1.27 weight for height 0.34 to 0.33 height for age -2.52 to - 2.52 BMI for age 0.56 to 0.51 MUAC for age -0.79 to - 0.53 The weight for height indicator also reviewed that 9 of the children 2-5 years were overweight, and 11 were severely malnourished. Children with diarrhoea four weeks before the studies were more likely to be wasted. Children whose	Recent illness (diarrhoea) and father's educational status were strong determinants of preschooler malnutrition in these study as such could be targeted for appropriate nutrition specific interventions such as water and sanitation hygiene.

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
									fathers attended post-secondary school were likelier to eat meat, fish, and eggs.	
Olusegun <i>et al.</i> , 2017 [18]	To assess the nutritional status of the preschool children	Descriptive cross-sectional	-	209	Semi-urban	South-South (Edo)	3-5	49	Estimated prevalence of malnutrition using the Z-score indicator was height-for-age 17.9%; weight-for-age 22.1% and weight-for-height 15.9%. 45.2% was estimated using the mid-arm circumference-for-age indicator.	Malnutrition among preschoolers is high requiring urgent interventions
Babalola <i>et al.</i> , 2020 [19]	To assess the Prevalence of malnutrition among the preschool children aged 2-5 years (24-60 months) in Ejigbo local government, Osun State	Descriptive Cross-Sectional	-	300	Semi-urban	South-West (Osun)	2-5	61.3	MUAC assessment showed that only 14.9% were malnourished while using Z scores indicator and disaggregated by sex reviewed that 91% of males and 13% of females had less than -2Z scores	Malnutrition among preschoolers is high requiring urgent interventions
Yusuf <i>et al.</i> , 2020 [20]	To assess the nutritional status of young children newly diagnosed with HIV infection at Usmanu Danfodiyo	Prospective cross-sectional studies/5yrs	Jan 1, 2015-Dec 31, 2019	67	Urban	North-West (Sokoto)	0-5	35.8	Only 39 children were aged between 2 and 5 years old out of which 13 were undernourished while 26 had normal nutritional status using the Z score indicator. Out of the 13	There is a need for more nutritional intervention among infected children to ensure their survival, growth and development

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
	University Teaching Hospital(UDUTH), Sokoto, Nigeria								malnourished preschool children, 11 were stunted, while 2 were stunted and underweight. Malnutrition was predominant among preschoolers from lower economic status, decreased with increase in the ages of the children but increased with an increase as the stages of the infection increased. Overnutrition was found in 27.7% of the preschool children (overweight,10.0%, and obesity,17.7%). Females (31.1%) had a higher prevalence of overnutrition than males (23.3%). Overweight and obesity were more among firstborn children, children who spent more time watching television and playing video games as well as went to school in private cars and frequently ate fast foods	
Pius <i>et al.</i> , 2022 [21]	To describe the magnitude of the problems and identify the risk factors of overnutrition among preschool children in Rivers State, Nigeria	Descriptive Cross-Sectional survey	-	310	Rural	South-South (Rivers)	2-5	57.1		The prevalence of overnutrition among preschool children requires urgent attention. Lifestyle factors are significant in the etiology of becoming overweight and obese. Thus, intervention to prevent obesity must include adopting healthy lifestyles in early childhood.
Ekumankama, 2022 [22]	To determine the mean body dimensions of	Descriptive cross-sectional survey(comparative)	-	928	Urban and Rural	South-East (Abia)	2-5	-	Preschoolers in private urban schools were had higher upper-arm	Although the study didn't categories malnutrition based on

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
	urban and rural preschool children in private and public schools in Umahia and Aba zones of Abia state.								circumference of 22.92cm, 23.75cm, 23.96cm and 24.93cm and were also taller with mean heights of 100.85cm, 104.66cm, 109.61cm, and 115.00cm for ages 2, 3, 4 and 5yrs than their rural public schools urban counteracts with upper-arm circumference of 17.00cm,18.00cm,17.21cm and 17.93cm and mean heights of 99cm, 93.66cm, 99.83cm, and 103.73cm. Similar pattern were also observed for other body measurement such as head and waist circumference and	standards of MUAC for age and heights for age. The result of this study showed disparity in nutritional status of preschoolers based on location indicating the need for location specific interventions.
Okafor <i>et al.</i> , 2023 [23]	prevalence of stunting among preschool-aged children in Awka South LGA Anambra State, Nigeria	Descriptive cross-sectional survey	-	449	Urban	South-East (Anambra)	0-5yrs	46.5	Preschool children aged 24-60 months were 386 (208 males and 178 females). No male or female preschooler was severely stunted; however, moderate stunting was reported among 78 males, with the highest occurring among those between the ages of 2 and 3, and 39 females, with the highest	Stunting is a chronic form of malnutrition and intervention to prevent it must start from the first 1000days and continue during preschool age.

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Makinde <i>et al.</i> , 2023 [24]	To access the nutritional health outcomes of children aged 36–59 months exposed to armed conflicts	Descriptive cross-sectional survey	-	4299	Urban and Rural	North-East (Yobe, Adamawa and Borno)	36-59m	49.21	occurring among those under 2 years. The incidence of moderate stunting reduced with age, as older preschoolers had a lower prevalence of stunting reported among them. Using the Z score indicator, about a third of the children were malnourished, with 35% stunted, 3% wasted and 20% underweight. More than half had severe (2%), moderate (32%), or mild (26%) anaemia. Exposure to armed conflicts indicated that, each child had an average exposure of 3.75 conflicts per month since the child's birth increasing their risk for stunting and underweight but not wasting.	Early childhood exposure to armed conflict is associated with chronic malnutrition during preschool age in Nigeria. Strategies that aim to end childhood malnutrition should also target children exposed to armed conflicts with appropriate interventions such as nutrition in emergency interventions.
Melah <i>et al.</i> , 2025[25]	To assess the health risk associated with protein-energy malnutrition among under five children attending	Descriptive cross-sectional survey	-	350	Rural	South-East (Imo)	0-5	-	Preschool children aged 24-60 months were 250. Using the Z-score indicator, 72% of the children had stunted growth, 60% were wasted, 83% were underweight	The prevalence of malnutrition among the preschoolers is high and requires both nutrition specific and sensitive interventions such as

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
	a health facility in Okpala Local Government Area of Imo state.								and 45% were stunting and underweight. Diet of the children showed that 77% of the children had moderate intake of proteins foods why 25% had low intake indicating inadequate intake. The study identified 33 preschoolers with severe acute malnutrition and reported associated health risk prevalence among them were malaria(75%), skin infections(40%), diarrhoea(35%) and helminths(20%)	nutrition and WASH education in order to improving the nutritional status of the preschoolers.

Table 3: Studies on nutritional status and pattern/quality of food intake

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Ojiako <i>et al.</i> , 2009 [26]	To evaluate the nutritional status of preschool children and identified influencing factors	Descriptive Cross-Sectional	-	511	Rural	North-West (Kaduna and Kano)	2-5	-	The weight-for-age Z-score report of the preschoolers showed that 39.72% were underweight, 57.12% were normal and 3.16% were Overweight. Height-for-age Z-score showed 61.45% were Stunted, 37.15% normal and 1.40% were Tall. Weight-for-height Z-score showed 17.07% were Wasted/thin, 70.94% were normal and 11.99% were Overweight. Significant factors influencing nutritional status were poor intake of meat and soybeans, polygamy, maternal level of education, and household income	Interventions that will aid to improve maternal education and household consumption of legumes such as soyabeans are targeted interventions that will aid in preventing preschooler undernutrition in Nigeria. In addition, there is also need for the prevention of emerging overweight and obesity nutritional status among preschoolers.
Okoroigwe and Okeke, 2009 [27]	To assess the nutritional status and food quality of preschool children aged 2 - 5 years in Aguata	Descriptive Cross-Sectional survey	-	208	Semi-urban	South-East (Anambra)	2-5	51.9	Using the Z score indicator, Weight for height was 86.06% for standard, 7.69% was wasted, and 6.25% was above normal. Height for age was 80.77% for	Improved food processing and fortification are necessary to reduce malnutrition

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
	L.G.A of Anambra State, Nigeria.								normal, 7.69% stunted and 11.54% above normal. Weight for age was 93.75 %for normal, underweight 2.40%, and 3.85% for above normal. The children's daily energy intake ranged between 51.2% and 62.9% of their daily energy requirement. Their daily protein, iron, calcium, and B-complex vitamin intakes were generally poor, while vitamin A's was above requirement values. However, most of their foods were from plants with poorly bioavailable nutrients.	among this age group.
Stephenson <i>et al.</i> , 2010 [12]	To test the hypothesis that Nigerian and Kenyan children consume cassava as their staple food are at greater risk for inadequate dietary protein intake than those children who	Descriptive cross-sectional and laboratory	2001-2003	656	Rural, Medium, and Urban	South-East (Abia, Anambra, Ebonyi, Enugu and Imo)	2-5	51	For Nigerian preschoolers only. Mean weight-for-height Z-score 0.0 ± 1.2 , Mean height-for-age Z-score -1.5 ± 1.8 , Mean weight-for-age Z-score -0.8 ± 1.3 , Mean weight (kg) 13.1 ± 2.6 , Stunting: height-for-age < -2 Z score affected 236 children (36%). Dietary	Inadequate protein intake was found in the diets of Nigerian preschool children consuming cassava as a staple food. Inadequate dietary protein intake is

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
	consume less cassava								energy obtained from cassava by the preschoolers was > 25% in 35% of the children while mean dietary diversity score was 4.0. Most consumed food items were maize, rice, yam, and sorghum, while the least consumed foods were sweet potatoes, legumes, meat, fish, fruits, and vegetables, leading to a mean total protein intake (g/kg) of 2.5 ± 1.2 , zinc intake (mg) of 3.1 ± 1.8 and iron intake (mg) of 9.1 ± 5.8	associated with stunting in this population. Interventions to increase protein intake in this vulnerable population should be the focus of future work.
Gegios <i>et al.</i> , 2010 [28]	To assess children consuming cassava as a staple food risk for inadequate zinc, iron, and vitamin-A Intake	Descriptive cross-Sectional and Laboratory analysis	2001-2003	793	Rural, Medium, and Urban	South-East States: (Abia, Anambra, Ebonyi, Enugu and Imo)	2-5	51	Mean weight-for-height Z-score 0.0 ± 1.2 , Mean height-for-age z-score -1.5 ± 1.8 , Mean Weight-for-age z-score -0.8 ± 1.3 and Mean Energy intake (kcal/kg) 84 ± 10 . % of total dietary energy from Cassava Intake >50% by 80 preschoolers (10%), vitamin-A intake < DRI 656 (83%), zinc intake < DRI 460 (59%), iron intake < DRI 340 (43%)	High cassava consumers are at high risk for inadequate vitamin A, zinc, and iron intake. Efforts to ameliorate this risk can be done through supplementation programs and the increase in

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Agbon <i>et al.</i> , 2010 [29]	To assess Preschool children's nutrient consumption using the weighed food intake method.	Descriptive Cross-Sectional survey and Laboratory methods	-	116	Rural	South-West (Ogun)	2-5	47.4	and household dietary diversity score (0–12) 4.0±1.4. Other foods of high consumption were maize, rice, and banana, while fruits, vegetables, and animal proteins were poorly consumed. The preschoolers' mean intake of protein/day was 17.0g and energy/day was 1068kcal. For both macronutrients their intake was lower than the Food and Agricultural Organization of the United Nations (FAO)/World Health Organization (WHO)–recommended intake. Calcium/day intake of 474 mg was lower than the Food and Nutrition Board recommended intake. Zinc /day intake of 9.9 mg marginally met basal dietary requirements for zinc as recommended by WHO in a low-bioavailability diet. The most consumed	consumption coverage of micronutrient-fortified cassava and other crops. This result reviews that, the diet quality of preschool children is inadequate for their age nutritional requirements. Therefore, there is a need to improve on the quality of diets/foods consumed by this age group in order to reduce the risk of malnutrition and associated complications such growth failure and developing diet-related chronic

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Agbon <i>et al.</i> , 2011 [30]	This study was carried out to determine the packed cell volume, nutritional status and parasitic infection among preschool children living in rural villages in Ogun state.	Descriptive cross-Sectional survey and Laboratory methods	-	116	Rural	South-West (Ogun)	2-5	47.4	foods were maize, cassava, and yam. Using the Z score indicator, 44.1% of the preschool children had different degrees of stunting with 7.8% been severely stunted. 16.4% of the children were wasted. 94.8% were anaemic, 75.9% complained of recurrent fever episodes. More than half (60.3%) were observed with the malaria parasite, and 44% were observed with an intestinal parasite. RDA of the nutrient intake of the children showed no significant difference ($P<0.05$) between the mean height and weight of urban (1.1m and 16.0kg) and rural (1.1m and 15.9kg) children. Using the Z-score indicator, height-for-age, reviewed 5% of urban and 11% of rural children were stunted while weight-for-height	diseases in adulthood. This result is an indication of the double burden of malnutrition among preschoolers in Nigeria and also evident to disease such as malaria parasites and intestinal parasitic infections as contributors to preschoolers' malnutrition. This result is an indication of the double burden of malnutrition among both urban and rural preschoolers in Nigeria and the need to expand interventions coverage especially to the rural areas in order to improve
Lemchi and Okpara, 2015 [31]	This study aimed to compare the nutritional status of preschool children (3-5 years) in urban and rural areas of Owerri North, Imo State, Nigeria.	Descriptive Cross-Sectional Survey(comparative studies)	-	200	Urban and Rural	South-East (Imo)	3-5	50		

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Mezie-Okoye and Alex-Hart, 2015 [32]	To determine the prevalence and factors associated with overweight and obesity among preschool children in Port Harcourt	Descriptive Cross-Sectional survey / 3-month	Sept.-Nov. 2010	220	Urban	South-South (Rivers)	2-5	45.9	reviewed 2% of urban and 17% of rural children were wasted. The mean Protein intake was below RDA among the rural children (18.4mg) but within the RDA among the urban children (23.5mg). Energy, Vitamin A, and iron intakes were below RDA in both locations, while Carbohydrate and Vitamin C intakes were above the RDA for both locations. Foods with the highest intake were rice, beans, biscuits, and fish, while those of low intake were fruits, vegetables, meats, milk, and milk products Using the BMI-for-age indicator showed 19 (8.6%) were obese, 33 (15.0%) Overweight, 145 (65.9%) had normal weight and 23 (10.5%) were underweight. There was no statistically significant gender difference in the	the nutritional status of this age group. Although there are several identified risk factors for overweight and obesity. Therefore, there is an urgent need to improve on the quality of diets/foods

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Oguizu and Nnadede, 2016 [33]	To assess the nutritional status and feeding pattern of children aged 2-5 years in Isiala Ngwa North LGA, Abia State.	Descriptive Cross-Sectional	-	150	Semi-Urban and Rural	South-East (Abia)	2-5	48	prevalence of obesity and overweight, at $p = 0.72$. High consumption of sugar-sweetened foods and drinks and a preference for fatty foods were associated with BMI >85th percentile. Using the Z score indicator, 10% of the preschool children were wasted, 36% stunted, and about 20.3% were underweight. Malnutrition was more prevalent among females than in males. Their frequently most foods were Garri, rice, bread, beans with crayfish as a food ingredient; milk consumption was occasional and majorly among those in the urban setting. The least consumed foods were legumes, meat, fish, fruits (eaten only if in season) and vegetables.	consumed by this age group in order to reduce the risk of malnutrition and associated complications such the developing diet-related chronic diseases in adulthood. The result of this survey indicates the need for interventions aimed at improving the quality of food/diets consumed by children 2-5yrs in Nigeria.

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Ukegbu and Ogu, 2017 [34]	To assess the dietary diversity score of rural under-five children and the relationship with nutritional status and sociodemographic characteristics of their mothers/caregivers	descriptive cross-sectional	-	226	Rural	South-East (Imo)	2-5	48.2	Using the Z scores indicator, 2.6%, 8%, and 6.7% were underweight, stunted, and wasted, respectively with Stunting been higher among the children from low socioeconomic status. Using the 1-12 diet diversity score (DDS) indicator only 1.3% scored high. Cereals, roots and tubers, small fishes, and beverages were the most consumed foods, while dairy products, eggs, meat, legumes, and fruits were the least consumed.	There is a need for continuous nutrition education to enable households increase their consumption of locally available nutrient-dense foods as family meals and also, it is important to design cost-effective nutrition specific and sensitive interventions for preschool children living in resource limited settings aimed at improving the nutritional status of rural households.
Kpurkpur <i>et al.</i> , 2017 [11]	To assess the nutritional status and diet diversity of preschool	Descriptive cross-sectional Survey/6 months	2016	1207	Semi-Urban	North-Central (Benue)	3-5	51.2	The study revealed that the younger children (3 years old) were more severely malnourished than the other age. Using	The findings of this study reviewed that, the high prevalence of

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
	children in Benue State Nigeria								the Z score indicator, 19.1%, 17.9% and 18.9% were stunted, underweight, and wasted, respectively. The dietary diversity score showed that 45.7% of the children had low diversity (ate <4 food groups/day), with cereal, roots and tubers as the most consumed food group. In contrast, fruits, vegetables, and proteins foods such as meat and eggs were rarely consumed.	malnutrition among this age group, could be attributed to the poor quality of their family diets consumed by them thus recommending food for food fortification to improve family meal quality.
Okerie <i>et al.</i> , 2018 [35]	Assessment of body mass index for age status and children eating behaviour among preschool children (2-4yrs) in Igbo-Etiti local government area of Enugu state, Nigeria	Descriptive cross-sectional survey	-	163	Semi-Urban	South-East (Enugu)	2-4	49	62 of the preschoolers had normal BMI for age, 26 were at the risk of becoming overweight, 25 were overweight, and 45 were obese, while 3 were mildly wasted and 2 were severely wasted. At p less than 0.05, there was a significant difference between food responsiveness and BMI for the preschool children's age. The preschoolers' response to food was not regular,	The prevalence of obesity among this age group is on the rise and also requires interventions for prevention which should involve both the caregivers and their children to aid better understanding of the relationship between food

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Adepoju and Ayodele, 2019 [36]	To assess the dietary diversity, nutrient adequacy, and nutritional status of preschool children in Ibadan.	Descriptive cross-sectional	-	552	Semi-Urban	South-West (Oyo)	3-5	47	and they preferred pleasure eating and were selective in food choices. Thus, they preferred highly sweetened foods and snacks, which could be attributed to a high number of them being overweight and obese. Malnutrition among preschoolers was more prevalent among males (22.0%) than females (18.4%). Stunting was the most prevalent form of malnutrition (26.8%). Dietary diversity score of preschoolers was low (3.2 ± 1.9). The most consumed food group were cereals, roots, and tubers (83.9%), while the fruit was the least consumed (6.5%). The nutrient adequacy ratio for carbohydrates was the highest (1.2 ± 0.2) and least in fibre (0.2 ± 0.2).	choices, eating behaviour, nutritional status and health outcomes. There is a need for continuous nutrition education to enable households increase their consumption of locally available nutrient-dense foods in order to improve their diet diversity and also, it is important to design cost-effective nutrition specific and sensitive interventions for preschool children living in resource limited settings

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Onifade <i>et al.</i> , 2019 [37]	To assess the nutritional status of preschool children and their eating patterns	Descriptive cross-sectional survey	-	220	Semi-Urban	South-West (Ogun)	2-5	50.5	Pattern of food intake by the preschool children reviewed that, 78.2% ate more than 3 times a day and 10.5% skipped meals. The most skipped meal was breakfast by 96.4% of the children while 80% ate between meals. Using the Z-score indicator, Stunting, underweight, and wasting among the children was 8.1%, 7.7%, and 1.9%, respectively, with stunting the most common malnutrition indicator in the study area. Using the Z-score indicator, 10.8% were wasted and 20% stunted irrespective of the sex of the children at p greater than 0.5. Using the observation method, 10.8 % of children had discoloured scanty hair,	aimed at improving their nutritional status Continues nutrition education is required in order to ensure preschoolers do not miss meals, especially breakfast, which is considered the most important meal of the day in order to reduce the prevalence of malnutrition among this age group. Malnutrition among preschoolers is high and require urgent interventions such as nutrition education and the
Osadebe and Attah, 2022 [38]	To assess the nutritional status of nursery school children	Descriptive cross-sectional survey	-	102	Semi-Urban	South-South (Cross River)	2-5	54.9		

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Okorie <i>et al.</i> , 2024 [39]	To evaluate the association between Preschooler anthropometry status and eating behaviours	Descriptive cross-sectional survey	-	256	Rural	South-East (Abia)	2-4	45.3	11.8% had flat buttocks, and 4.9 pedal edema. The children's eating patterns showed that 45.5% ate what was available, mainly carbohydrate staples, although 80% ate thrice a day. Meal skipping was noticed among some, which was attributed majorly to not having enough to eat in their homes and the issue of food choice. Using the Z-score indicator, 26.6% of the children were wasted, 20.7 were stunted and 16.4 were underweight with only 21.1% of the male and 16.0% of the female preschoolers having good eating behaviours. There was significant difference in the eating behaviours between the male and female preschoolers as the males showed better food enjoyment and responsiveness at (p<0.05). The study also	establishment of home gardens to complement the household food supply in order to meet the nutritional needs of preschoolers for growth and development as well as active life. The prevalence of malnutrition among the preschool children is high and requires urgent attention. Additionally, interventions targeted at reducing food fussiness a major eating habit which contributes in poor intake of varied nutrient dense foods

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
									reported there was a significant association between food fussiness of preschoolers and their weight for age indicator	could be helpful in preventing early childhood malnutrition particularly wasting and the development of healthier eating habits later in life

Table 4: Intervention studies only

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Korenromp <i>et al.</i> , 2016 [40]	Determine the feasibility of distributing micronutrient powder for home fortification during bi-annual Maternal and newborn child health week (MNCHW) events to improve young children's nutrition.	Longitudinal cohort (mother and child pair)/6 months	Dec. 2013- June2014	895	Rural	North-Central (Benue)	6-59m	-	Micronutrient powder distribution using MNCHW as a delivery channel was feasible and adequately used by caregivers for their benefiting children, although it had a lower population coverage than the targeted. Health workers' knowledge of MNP delivery and use was improved.	The study did not indicate biochemical parameters among the children prior to and post-distribution (use) of the MNP however it showed existing platform could be leveraged for nutritional and or other interventions.

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Van der Kam., 2016 [41]	To investigate if the incidence of malnutrition among ill children <5 years old could be reduced by providing a fortified food product or micronutrients during their 2-wk convalescence period.	Randomized Controlled Trial/8 months (community and clinic)	Feb. – Sept 2012	2213	Rural	North-West (Sokoto)	6-59m	50	The 2-weeks supplementation with RUTF or MNP to ill children as part of routine primary medical care did not reduce the incidence of malnutrition. The MNP group showed a lower number of events for diarrhoea but had a higher number of malaria events compared with the RUTF and control groups. There were fewer deaths in the RUTF group than in the control and MNP groups.	An integrated approach combining prevention and treatment of diseases and treatment of moderate malnutrition, rather than prevention of malnutrition by nutritional supplementation alone, might be more effective in reducing the incidence of acute malnutrition in ill children.
Afolamin et al., 2021 [42]	To determine the efficacy of biofortified cassava to improve vitamin A status of Nigerian preschool children	Randomized controlled trial /4 months		176	Rural	South-West (Osun)	3-5	43.1	At baseline, mean serum retinol concentration was 1.06 µmol/L, and 9% (<i>n</i> = 16) of the children were vitamin A deficient. During intervention Children consumed provitamin A and white edible cassava which were processed into <i>Eba</i> , <i>Garri</i> and <i>moin-moin</i> equivalent to 221 and 74 µg/d retinol equivalents from intervention foods in the yellow and white cassava groups, respectively. The treatment	Daily consumption of β-carotene from biofortified cassava can improve the serum retinol concentration of Nigerian preschool children hence, there is need for more nutrition education and other interventions that will aid in household adoption and use of provitamin-A cassava and other biofortified

[illegible]

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
Nwaba <i>et al.</i> , 2022 [44]	To test the effectiveness of caregiver education in improving anaemia knowledge and dietary prevention strategies and promoting sustainable lifestyle changes to reduce the	Pre- and post-quasi-experimental educational intervention survey	-	41	Rural (Clinic based)	South-East (Imo)	5-60 months	63	3.0/% at the end line at $p = 0.04$ among all the participants, irrespective of their participating group. Pre- and post-intervention faecal examination for gut microbiome showed that Enterobacteriaceae decreased over time without difference in the participating groups. In contrast, Bifidobacteriaaceae and pathogenic E. coli were unaffected, indicating the product had no adverse effect on gut health. Ninety-five percent of participants had moderate diet diversity, but there was no correlation between diet diversity and socioeconomic status ($P = 0.32$). Barriers to healthier diets were associated with socioeconomic status. Pre-education scores were not associated with caregivers' education levels; however, post-education scores were significantly higher in university-educated than technical-trained	The result of this work indicates that, nutrition education is essential for all socioeconomic groups in the society evident by the increased caregivers' knowledge on anaemia across all educational levels after the nutrition education program and this can potentially lead to the reduction in the

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
	prevalence of childhood. Iron-deficiency anaemia (IDA)								caregivers. Caregiver-reported self-efficacy increased after the education program.	prevalence of paediatric iron deficiency anaemia.
Senbanjo <i>et al.</i> , 2022 [45]	To investigate the effect of a multi-nutrient fortified dairy-based drink on micronutrient status, growth, and cognitive development in malnourished Nigerian toddlers.	Three-arm, open randomized intervention trial/6 months	-	184	Rural	South-West (Lagos)	1-3yrs	-	At endline, there were no significant improvements in iodine, zinc, vitamin B12, and folate status in any of the three groups (each receiving a daily dose of 200mls, 400mls, and 600mls of the multi-nutrient dairy-based drink). In contrast, there was improvement in the vitamin A and selenium status of the 600mls group and also in the vitamin D status among the 400mls and 600mls groups when compared to the baseline. There were no differences found between the groups for weight-for-age Z-score (WAZ), weight-for-height Z -score (WHZ), height for age Z-score (HAZ) and BMI-for-age z-score (BAZ). However anthropometric differences between groups were	A longer study duration might be necessary to study the effects of a nutritional intervention on linear growth and cognition. However, based on the result of this study daily consumption of 600ml of the fortified dairy-based drink was the most effective in improving the micronutrient status of the children.

First Author /Year	Main Objective	Study Design/Length of Study	Study Period	No. of Participants	Country Setting	Country Zone/State	Age (Yrs.)	Sex (%F)	Result	Remarks
									indicated by their absolute weight, height, and head circumference; Cognition results did not differ within groups, as all the groups showed a decline in the percentage of competent children for receptive language.	

This review gives an insight into current nutritional studies of preschoolers living in Nigeria. Most studies were exclusively for this age group and were descriptive, primarily cross-sectional surveys. Undernutrition (wasting, stunting and underweight), diet diversification, nutrient quality of food intake, vitamin A, and iron deficiency were the topics covered the most. In contrast, zinc deficiency, Parasitosis, overweight, and obesity had only a few studies.

Studies assessing anthropometry showed, undernutrition is still highly prevalent in this country among preschoolers, especially in the northern part of the country, in the rural as well as urban settings, but more in the rural than urban and more among those exposed to armed conflicts. Stunting, wasting, and underweight reported here are similar to those reported by [8] among children under five as 37%, 7%, and 22%, as well as by [46] as 33.3%, 11.6 %, and 25.3%, respectively. Both [8] and [46] reported 2% and 1.5% overweight, respectively. The trend of anthropometry assessment in this review is similar to the findings of [8] and [46] were both surveys reported stunting, wasting, and being underweight were more prevalent in the Northern part of the country, in contrast, overweight and obesity was more prevalent in the Southern part of the country. Both surveys also reviewed that, stunting and underweight were highest among preschoolers in the North-West part of the country and wasting was more prevalent in the North-East part of the country. The findings of this review is also consistent with the those of [47, 48] that undernutrition in Nigeria is concentrated in rural areas and among landless, pastoralist, small farm holder and hired agricultural workers and also higher in the Northern part of the country due to high food insecurity worsen by adverse climate change, low socioeconomic status as to large family size and widespread polygamy, poor access and utilization of water and sanitation hygiene (WASH) and public health services, poor infant and young child feeding and care practices, social and economic disempowerment of women, poor flow of information and low rate of adherence to behavioural change messages [49]. The overweight prevalence reported in this review is between 10-15% and is higher than the findings of [46], which was 1.5%, and [8], which was 2% for children under 5 years in the both surveys; however, the highest prevalence was reported in the Southern part of the country. Obesity reported in this review was also higher than 0.6% reported by [46] for children under five. The prevalence of overweight and obesity among young children in Nigeria is on the rise, leading to a double burden of malnutrition among them hence the need for urgent interventions aimed at its prevention.

Vitamin A, iron and zinc remain some of the micronutrients of public health significance among children under 5 years. However, findings from these review shows, the high consumption of starchy staples, low intake of fruits, vegetables and varied diets leads to low diet diversity which is an associated risk factor for micronutrient malnutrition thus, putting preschoolers at a high risk of micronutrient deficiencies. The trend across the country is similar to that of [8] indicating children in the Northern zones (North-

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Central, North-East, and North-West) consumed fewer foods rich in vitamin A and iron than those in the Southern zones (South-East, South-South, and South-West). These trends also agree with the findings of [42] who reported only modest serum retinol improvement from their provitamin-A Cassava feeding studies, which was attributed to low VAD prevalence in the Southern part of the country as more impact of the intervention could have been observed if it were among preschoolers in the Northern part of the country where VAD prevalence is high. Anaemia findings from [46] also reviewed that, iron deficiency anaemia (IDA) was 62% among children 6-59 months and highest in the Northern part of the country.

Although there have been interventions to improve micronutrient intake in Nigeria, [46] also reported that the use of micronutrient powder was as low as only 7% for children 6-59m while vitamin A supplementation among the same population was only 25% for 6 months preceding the survey. The survey also reported that household use of biofortified crops showed that, only 3% consumed yellow cassava, 5% orange flesh sweet potatoes (OFSP) and 13% consumed orange maize, with the highest consumption of these biofortified products in the North-East of the country.

Zinc intake per day was reported to be in the range of 3.1 mg – 9.9 mg in this review which meets the expected daily intake of 2-11 mg per day for apparently healthy preschool children; however, for preschool children with diarrhoea, it is expected to increase to 20 mg/day which should be met by oral intake of zinc tablet for 10-14 days in order to boost the immune system and have a shorter recovery time from the illness which is the current method of zinc supplementation in Nigeria among children less than five years of age. However, other studies, such as [50], in the 2001-2003, Nigeria food consumption studies reported a 20% zinc deficiency; [51] reported 32%, and [52] also reporting a 26% deficiency from their study. Consumption of foods high in phytate, such as cereals, which are one of the staples in Nigeria, has been associated with not just zinc but iron deficiency as well; hence, the need for adequate processing of cereals prior to consumption in order to reduce antinutrient load, improve nutrient bioavailability and fortification.

Micronutrient studies from this work have shown that, articles reviewed were majorly focused on iron, zinc and vitamin A which is an indication that, studies on other micronutrient deficiencies, such as those of vitamin B Complex, vitamin C, Calcium, iodine and Magnesium, have been insufficiently explored and or reported in Nigeria among this age group, constituting a significant gap in research data.

High rates of parasitic infection were another important concern for preschoolers in this review. The infections of interest were malaria, intestinal worms and diarrhoea. While having an episode of illness increases a preschooler's chance of developing malnutrition, repeated episodes will lead the preschooler to enter the malnutrition infection cycle and also increase his/her chance of mortality where appropriate interventions are not provided and timely hence, the

negative outcome of the intervention of [41] where the supplementation of micronutrient powder or ready to use therapeutic foods did not prevent convalescent children from becoming malnourished due to reinfection or newer infections. Parasitism could also become a co-morbidity during malnutrition requiring treatment. While [8] reported a decrease in the prevalence of malaria among children under five years from 42% in 2010 to 23% in 2018 and attributed it to a higher number (61%) of households using at least one insecticide-treated bed net, the [46] survey reported in 2022 a malaria prevalence of 24% which is an indication malaria disease is still highly prevalent among young children in the country. The 2022 survey also reported, 74% of anaemia cases during their survey period had mild to severe malaria, which could have been a significant risk factor for anaemia; the same survey also reported helminths infection prevalence of 11% among children under five years of age and also reported it as an associated risk factor for anaemia. Diarrhoea infection occurs when children are exposed to diarrhoea-causing pathogens and is frequently related to the consumption of contaminated water to unhygienic practices in food preparation and disposal of excreta. Frequent passage of loose stool during diarrhoea leads to dehydration and dyselektrolytemia, thereby increasing the risk of mortality among children. Nigeria's diarrhoea prevalence is reported to be 18.8%, one of the worst prevalence in Sub-Saharan Africa, and annually accounts for 16% of deaths among children under five years[53]. The same authors also reported that home management of diarrhoea was suboptimal, with the rare use of zinc tablets as recommended. While there have been several interventions aimed at reducing childhood infections, illness, and improving child health and survival, such as vaccination, routine deworming and promotion of good health-seeking behaviours among caregivers, intervention coverage has shown to be more effective in the urban than in rural areas and the Southern part of the country than the Northern part of the country.

Nigeria is reported as the third country with most significant burden of human immunodeficiency virus (HIV) infections globally, while worldwide, more than 3 million children are infected with HIV infection [54]. Undernutrition in children who are HIV positive accounts for 35% of preventable deaths among them [55], where poor nutrition is an identified challenges of child/children and adults living with HIV because it accelerates the progression of HIV into full acquired immunodeficiency syndrome (AIDS). A close and dual-way relationship has been established between HIV and malnutrition where at the same time, HIV compromises nutritional status; on the one hand, poor nutrition weakens body immunity, leaving these children vulnerable to opportunistic infection [56]; hence, mortality from severe acute malnutrition is more than three times higher in HIV-positive children than their HIV-negative peers due to higher risk of comorbidities such as tuberculosis, respiratory tract infections, gastroenteritis, candidiasis and other complications like persistent <https://doi.org/10.53982/ajeas.2025.0301.09-j>

diarrhoea and poor oral intake [57]. The finding of this review on malnutrition among infected preschoolers is consistent with those of [56-58] whose works also reported high levels of malnutrition with stunting, and marasmus been significant types of malnutrition identified among these children who are receiving highly active antiretroviral therapy (HAART) in different parts of the country. The effect of HIV on nutrition begins early in the course of the disease, even before it becomes evident that the child is infected, increasing higher energy requirement, which is likely to increase by 10% to maintain body weight, physical activity, and growth in asymptomatic children and for this reason, energy intake needs to be increased by 50 – 100% over standard requirements in children experiencing weight loss in HIV, there is also higher need of other nutrients as well especially vitamins and minerals to build and maintain the immune system of these children thereby keeping them healthy with reduced risk for opportunistic infections. However, this is not meet in child/children living with HIV (CLHIV) due to be an orphan, poor infant and young child feeding, household food insecurity and low socioeconomic status[58].

While there have been both nutrition-specific and sensitive intervention efforts in Nigeria at different levels by the government, non-governmental organizations and international agencies, such as routine distribution of micronutrients, deworming drugs, vaccination and free distribution of insecticide-treated nets, compulsory and voluntary food fortification, community management of acute malnutrition, promotion of nutrition-sensitive agriculture, promotion of improved infant and young child feeding, major challenges hindering the success of this interventions among several other challenges are funding which in turn limits coverage, high level of poverty leaving most families food insecure and the high burden of disease.

3.9 Review Summary, Implication of the Results and Future Perspectives

The main lesson from this review is the need for more research or studies into preschool age nutrition and health in Nigeria. Most studies identified during this review tagged as preschoolers were studies for children under 5 years (0-59 months) or 0-5 yrs and did not provide disaggregated data by age; hence, the need for studies or research specifically among preschoolers (2-5 yrs) as most of the intervention tailored towards under five are central to the benefit of infant and young children 0-23 months of age and were tailored towards improved exclusive breastfeeding and high quality, age-appropriate and safe complementary foods and feeding. However, preschoolers are a disadvantaged population because, at preschool age, they have joined their families in eating family meals, which are prepared from available cereals, roots and tubers that are low in proteins and micronutrients; diet diversity has also been found to be low among preschoolers from most of the studies which reviewed poor consumption of fruits and vegetables, and since most preschoolers are no longer breastfed these increase their risk of malnutrition. Undernutrition is also

generally more prevalent in children between 2 and 3 years of age (younger preschoolers) because, at this age, children start to feed themselves and receive less care from their mothers or caregivers who, in some cases, are nursing another pregnancy or in other cases, may also have just started attending preschool. While the review shows that acute malnutrition is all over the country among preschoolers, chronic malnutrition is more in the Northern part of the country than in the southern part; malnutrition (undernutrition of all forms) was reported more in the rural areas than urban. In contrast, overweight and obesity was more prevalent in urban areas. Hence, the need for location-specific intervention. With a high level of armed conflicts in the country, there is also need to increase coverage of nutrition in emergencies interventions. This review also shows that there is still a high consumption of local varieties of staples in spite of the availability of improved varieties with higher nutritional benefits such as provitamin-A cassava thus, creating the need for research that will aid in understanding household barriers hindering the adoption of the improved varieties. Also, more research is needed on family meal nutrient modification through food-to-food fortification, which can significantly complement micronutrient supplementation and closes both energy and protein gaps. Studies are also needed on the acceptance and use of biofortified varieties in Nigerian traditional meals and snacks; more studies are also needed on other micronutrients, such as iodine, calcium, magnesium, and potassium, in addition to those of vitamin A, iron, and zinc. In addition, it is also important that future studies should indicate the relevant school status of preschoolers.

With the country as well as the continent experiencing a nutrition transition with greater access to unhealthy foods and a more sedentary lifestyle, the development of overweight and obesity and other non-communicable diseases are on the rise, leading to a double burden of malnutrition, which has also been reported in this review thus the need for early interventions targeted towards improved nutrition and physical activity for prevention of overweight and obesity in early life. Additionally, there is need for targeted nutritional intervention aimed at improving protein, fruits and vegetable intake for this age group.

4. CONCLUSION

This review identifies critical gaps that will aid better understanding of preschool age nutrition and health in Nigeria. It highlights the need for targeted research and interventions to address the unique nutritional challenges faced by this age group in the country as current published research predominantly focuses generally on children under five. The findings of this review show geographical disparities in malnutrition prevalence's with higher chronic malnutrition in the north and overweight in the urban areas emphasizing the need for context specific interventions and increased nutrition education particularly those targeted at the consumption of diverse and nutrient rich diets. To effectively address the malnutrition burden among this age

group, future studies should prioritize disaggregation of data for preschool children and interventions such as the potentials of food-to-food fortification, exploring barriers to the adoption of nutrient rich improved crop varieties and the acceptance of biofortified foods within local culinary traditions. Future research on their micronutrient status should also broaden its scope beyond vitamin A, iron and zinc. In addition, with Nigeria now burdened with nutrition transition and the rise of obesity in early childhood giving rise to double burden of malnutrition, interventions targeted at both the prevention of under and overnutrition through improved diets and lifestyle are essential for the immediate and long-term health of this vulnerable population. By addressing these knowledge gaps with evidence-based interventions, the nutritional status and health of preschoolers in Nigeria will be improved.

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