

## Research



# Factors associated with the nutritional status of children (6-30 months old) in home-based and centre-based child care centres in Embakasi East, Nairobi, Kenya

Josephine Atieno Odhiambo, Anselimo Makokha,  Peninah Kinya Masibo

**Corresponding author:** Josephine Atieno Odhiambo, Department of Research, Amref International University, Nairobi, Kenya. josephineodhiambo79@gmail.com

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**Factors associated with the nutritional status of children (6-30 months old) in home-based and centre-based child care centres in Embakasi East, Nairobi, Kenya**

Josephine Atieno Odhiambo<sup>1,&</sup>, Anselimo Makokha<sup>2</sup>, Peninah Kinya Masibo<sup>3,4</sup>

<sup>1</sup>Department of Research, Amref International University, Nairobi, Kenya, <sup>2</sup>Jomo Kenyatta University of Agriculture and Technology, Nairobi,

Kenya, <sup>3</sup>Global Programs for Research and Training, Affiliate of the University of California, San Francisco, California, United States, <sup>4</sup>Amref International University, Nairobi, Kenya

## &Corresponding author

Josephine Atieno Odhiambo, Department of Research, Amref International University, Nairobi, Kenya

## Abstract

**Introduction:** early childhood nutrition plays a fundamental role in children's development, growth, and health. However, poor caregiver knowledge of childcare practices and hygiene contributes to malnutrition and increased mortality and morbidity risks. This study therefore investigated sociodemographic, dietary patterns, feeding, nutrition, and hygiene practices in home- and centre-based childcare for children 6 to 30 months in an informal settlement in Nairobi, Kenya. **Methods:** a descriptive cross-sectional mixed-methods study assessed childcare practices and nutrition among children (6-30 months) in 26 Embakasi East centres. Dietary patterns were determined using a structured 24-hour recall questionnaire, capturing foods provided and feeding frequency, defined by how many times children were fed at the childcare centre. Data were analyzed using proportions, Chi-square tests ( $p \leq 0.05$ ), and ENA/Epi Info for z-score calculations. **Results:** most parents (97%) and caregivers/centre owners (78%) were aged 28-47 years. More than 50.7% of parents and 42% of centre owners/caregivers had secondary education. There was almost equal sex distribution (49.2% female, 50.8% male). Children (54.8%) were aged 24-30 months, while 45.2% were 6-23 months. Carbohydrate-rich foods were predominant (36%): animal protein consumption was low: only 39% of centers offered eggs, 35% milk, 13% fish, and 10% sardines (Omena). Most parents (63.8%) packed food for their children. The overall prevalence of wasting was 11.4%, stunting was 39.4% and underweight was 23.4%. Low

prevalence of stunting, wasting, and underweight amongst children who practiced handwashing respectively; (6.1% severe, 1.8% moderate;  $p < 0.000$ ), (6.1% severe, 1.5% moderate;  $p < 0.004$ ), and (8.9% severe, 8.3% moderate;  $p < 0.03$ ), compared to centres that did not practice handwashing: 21.2% severely, 10.2% moderate stunted, and 8.9% severe underweight. **Conclusion:** the study finds poor dietary patterns, inadequate feeding practices below WHO's recommended three meals, and compromised nutrition status, with children mainly consuming carbohydrate-rich foods in this study. Centres using potties and proper waste disposal recorded slightly lower malnutrition. Strengthening diets, feeding practices, and hygiene can improve the nutritional outcomes of children.

## Introduction

Early childhood nutrition plays a fundamental role in children's development, growth, and health. Nutrition supports brain development, physical growth, and immunity, while inadequate dietary patterns and feeding practices increase vulnerability to poor nutritional status. Optimal early childhood practices include appropriate meal frequency, dietary diversity, and responsive feeding, which align with global recommendations such as World Health Organization (WHO) feeding frequency guidance and United Nations International Children's Emergency Fund (UNICEF) maternal and child nutrition frameworks. The childcare settings shape children's nutritional outcome: home-based childcare services provide small-scale, flexible care within a private home facility, while center-based childcare and Early Care and Education programs offer structured routines and feeding support in a separate rented house, not part of the household. Informal childcare centers, however, often lack resources, consistent feeding standards, and hygiene practices, influencing children's diet quality. Nutrition outcomes are further affected by WASH conditions, as safe water, sanitation, and hygiene are essential for preventing illness and supporting

healthy growth (Centers for Disease Control and Prevention) [1]. Hygiene in childcare centers affects child health, as these environments facilitate pathogen transmission. Globally, 2.3 billion people lack handwashing facilities at home, and 462 million children lack handwashing access at early childhood centres [1]. Globally, 40% of nearly 350 million children aged 6-30 months lack access to quality home-based or center-based childcare services, often spending their days in unhygienic environments with poor nutrition [2]. In developing countries, childcare needs are growing due to women's work demands and domestic responsibilities, leading to a rise in home-based childcare in informal settlements and rented center-based childcare facilities [3]. Childcare centers form part of early care and education programs, making them critical in implementing dietary patterns, feeding, and hygiene practices guidelines [3]. In the U.S., 60% of children aged 0-3 years receive non-parental care, with 41% in center-based childcare, 26% in home care by relatives, and 5% in home-based childcare by non-relatives [4].

Globally, informal childcare centers encounter challenges like a lack of formal recognition and regulation, which often results from inadequate funding, poor infrastructure, and insufficient training for caregivers. In many low-income countries, enrollment rates for children aged 0-3 years in formal childcare services are below 20%, highlighting a significant gap in quality childcare provision [5]. This gap forces many working parents, especially those in the informal economy, to rely on informal childcare arrangements that may not meet essential standards for nurturing care. Addressing these challenges requires targeted interventions, such as supportive assessments and skills-building programs for childcare providers, to enhance the quality of care in these informal settlements [6]. Home-based and centre-based childcare centres are widely used in urban informal settlements as alternatives to parental caregiving for children under the age of three, with a utilization of 46% of employed and

23% of unemployed parents in the Korogocho slum of Nairobi [6].

Based on a mapping exercise done in 2017, there were 2700 informal home-based and centre-based childcare centres in Nairobi's informal settlements [7]. Some of these centres were observed to have poor hygienic conditions. Others were overcrowded, while others had no feeding programs [8].

In Kenya and many other African countries, women face huge challenges due to competing responsibilities on their time. Childhood malnutrition in Mukuru and Viwandani areas of Embakasi slums is associated with limited knowledge of child feeding practices and a knowledge gap on caregiving in childcare centres [9]. They are often responsible for all activities about childbearing and care, domestic chores like preparing meals, collecting cooking fuel and water, and other non-domestic livelihood activities. This results in a heavy workload [10]. The informal childcare centres help relieve mothers of childcare activities so that they can engage in livelihood activities [11]. Poor diet quality and caregiver training limitations affect child health in home-based and center-based childcare settings [12].

In Kenya, 9.9 million people rely on contaminated surface water, and only 25% have handwashing facilities [12]. Hygiene practices in early childhood centers in Kericho county, Kenya, are inadequate, highlighting a need for better Water, Sanitation, and Hygiene (WASH) implementation [13]. The lack of WASH facilities contributes to preventable diseases, including diarrhea, which is a major cause of death among children in informal settlements, linked to poor hygiene and sanitation [14-17]. In Bangladesh, unsanitary environments are associated with child morbidity, showing how caregiver management and cultural beliefs affect hygiene practices [18-20].

Childcare centers often provide little or no nutrition support, with poor diet patterns and

poor feeding practices reported, such as giving children alcohol or medications to induce sleep [21]. A study done in the informal settlement of Nairobi found 31.9% of children under five stunted, with older children at higher risk: 12-23 months: 46.3% stunted, 24-35 months: 38.3% stunted, and 36-47 months: 28.4% stunted [21]. Many centres lack structured feeding programs, relying on parent-packed meals that are often carbohydrate-heavy with minimal protein and vegetables [22]. Nutritional deficiencies in early childhood led to chronic diseases in adulthood, highlighting the importance of intervention [23,24]. This clearly shows that childcare feeding practices impact malnutrition rates [25,26] under five years in informal childcare centres.

Low dietary diversity and financial constraints reduce food quality [27,28]. Poor childcare practices have been reported, including giving alcohol or sedatives to children [29,30]. Proper caregiving practices, including feeding, hygiene, and play, influence child growth [31].

According to UNICEF's nutrition framework, care practices are crucial in child growth and development. The first 30 months of life are critical for growth and development. WHO recommends exclusive breastfeeding for six months, followed by nutrient-rich complementary feeding. However, less than 25% of infants meet dietary diversity standards, contributing to stunting and wasting [32]. United Nations International Children's Emergency Fund (UNICEF) Maternal and Child Nutrition Framework identifies poor diet, sanitation, and caregiver training as key determinants of malnutrition [25].

There is limited research on the dietary practices, hygiene conditions, and childcare quality in Kenya's informal home-based and center-based childcare settings. Despite the increasing reliance on childcare services, major gaps exist in feeding programs, caregiver knowledge on nutrition, and the long-term effects of poor childcare practices on the nutritional status of children. The study

provides findings on factors associated with the nutritional status of children (6-30 months old) in home-based and centre-based child care centers in Embakasi East, Nairobi, Kenya.

## Methods

**Research design, study area, and period:** a cross-sectional analytical mixed-methods research design, integrating both quantitative and qualitative approaches, was employed. Data collection was conducted in Embakasi East Sub-County, Kenya. Five wards, Pipeline, Imara Daima, Matopeni, Mukuru kwa Njenga, and Mukuru kwa Reuben were purposively selected based on the presence of active childcare centres affiliated with the Uthabiti Network of Women in Childcare, the primary group with whom the study engaged directly. Qualitative interviews and quantitative data collection were carried out within these wards, which were selected to ensure inclusion of centres meeting the study's eligibility criteria and representing the operational distribution of childcare services in the sub-county.

Qualitative participants were purposively sampled: childcare owners/caregivers, the sub-county nutrition coordinator, and the area assistant chief, due to their direct roles and experiential relevance to childcare systems in Embakasi East sub-county, from August 2023 to March 2024. Dietary patterns were determined using a structured questionnaire administered to childcare centre owners/caregivers, capturing a 24-hour dietary recall of the meals and types of foods provided to children under their care. Feeding frequency was assessed based on how many times children were fed at the childcare centre during the recall period. These data were used to characterize dietary patterns according to food types consumed and feeding frequency at the centre level. Key informant interviews were conducted with purposively selected participants, including childcare centre owners/caregivers, the sub-county nutrition coordinator, and the area assistant chief, based on their direct roles and

experiential knowledge of childcare services and nutrition systems in Embakasi East Sub-County.

**Sample size determination:** the sample size was determined by using Mugenda and Mugenda's formula for calculating the sample size was applied in determining the sample size of children:

$$Nf = n / (1 + n) / N$$

Where: Nf=the minimum sample size (when the population is less than 10,000); n= the minimum sample size (when the population is more than 10,000); N= the estimate of the population size. Therefore, if the minimum sample size is 312 when the population is less than 10,000, on a precision of 5% and a confidence level of 95%, the sample size for this study was attained as follows: Nf= less than 10,000 =  $312 / (1 + 312) / 312 = 313$ . This gave a minimum sample size of 313 children. However, a total of 325 children met the criteria and were included in the study (13 home-based and 13 centre-based childcare centres).

**Sampling strategy:** the study population consisted of 325 children aged 6-30 months who met the inclusion criteria and were present at the childcare centres; hence, they were all included in the study, 69 available parents, and 26 caregivers from 13 home-based and 13 center-based childcare centers within the Uthabiti Network. The study population comprised 13 home-based childcare centres with 128 children and 13 centre-based childcare centres with 197 children aged 6-30 months. The Uthabiti network was purposively selected, as it represents the primary umbrella body for women operating childcare services in Embakasi East, providing direct access to the target childcare centres. Selection criteria included children aged 6-30 months with documented birth records, parents, and caregivers directly responsible for childcare. Parents and caregivers were included if they provided informed consent and met the demographic and age requirements. Excluded were untraceable parents, caregivers, and sick children who did not attend the childcare centres.

**Study variables:** the study aimed to determine the dietary patterns, feeding and hygiene practices, in influencing the nutritional status of children between 6-30 (6-23 and 24-30) months in home-based and centre-based childcare centres. The dependent variable was children's nutritional status (stunting (low height/length-for-age); underweight (low weight-for-age); and wasting (low weight-for-height/length)), while the independent variables included childcare practices: hygiene, dietary patterns, feeding practices, parents' and childcare caregiver's age, education, marital status, occupation, and children's age and sex.

**Data collection:** data was collected using interviewer-administered questionnaires, key informant interviews, observation checklists, and anthropometric measurement tools like weighing. The lead investigator trained four data collectors on study tools, ethics, and administering questions to prevent bias. Participants were given an information form about the study, and those who agreed signed a consent form before the interview.

**Data analysis:** the collected data was cleaned for errors, coded, and entered into SPSS version 27. The ENA/Epi Info software was used to analyze anthropometric data and to calculate z-scores based on child growth reference standards: on sex, age, and anthropometric measurements to obtain indices on weight-for-height scores (wasting), height for age scores (stunting), and weight-for-age scores (underweight). Frequencies and percentages were analyzed for socio-demographic characteristics, dietary patterns/feeding practices, while Chi-square identified factors associated with child nutritional status, with significance defined as p-values  $\leq 0.05$  at a 95% confidence interval. Key informants were recorded, transcribed non-verbally into texts, and analyzed thematically.

**Ethical consideration:** the study was approved by the Amref International University Ethical and Scientific Review Committee (ESRC) (Ref

P1398/2023). The research permit was obtained from the National Commission for Science, Technology Innovation (NACOSTI). The child caregivers/owners and parents were informed that participation was voluntary and provided written informed consent. Questionnaires were assigned unique codes to ensure anonymity and confidentiality, with no names recorded.

## Results

A total of 325 (Table 1), children aged 6-30 months, 69 parents available, and 26 childcare caregivers/owners from Embakasi East sub-county were enrolled in the study. The majority of children, 72.6%, attended center-based childcare centers, while 27.3% attended home-based childcare centers. Half of the children (50.8%) were females. The majority (60.3%) were aged 24 and 30 months, while 39.7% were 6 to 23 months. Most parents (97%) and caregivers/centre owners (78%) were aged 28-47 years. About half (50.7%) of parents and 42% of centre owners/caregivers at centres had secondary education (Table 2). The overall prevalence of wasting was 11.4% (7.7% severely and 3.7% moderately wasted), stunting was 39.4% (27.4% were severely and 12% moderately stunted), and underweight was 23.4% (12.3% severe and 11.1% moderately underweight). The majority of parents (63.8%) reported packing food for their children to take to the childcare centre, while 36.2% did not (Table 3). As one caregiver stated, *“yes. They either pack food or ask the caregivers to provide it at an extra cost,”* and another noted, *“yes. At least they pack food for their children, and in cases that the daycare does not have a full feeding program, they organize with the caregivers to provide food at an extra cost.”* Across the childcare centres, most children (94.5%) were fed twice daily, with carbohydrate-rich foods being the most commonly provided (36% (Figure 1).

The study findings in (Table 3) show that 24.9% of children who ate food packed from home had severe stunting, and 11.1% were moderately stunted, compared to those children who did not

eat food packed from home, only having 0.9% being moderately stunted and 2.5% being severely stunted. Qualitative data provided reasons why some children were not able to feed from food prepared from home, including the need for the children to eat fresh food rather than leftovers. *“I usually prepare fresh food for those children, whose parents have paid and need their children to consume fresh food, hence they do not eat food packed from home”* said the centre caregiver. From my experience as a caregiver, I realize most parents pack starchy foods, which are mainly leftover foods or black tea, so I mainly advise those who can to pay for their children to eat freshly cooked food at the centre.

In the centres where handwashing was practiced by 141 children (43.4%), children had significantly lower rates of stunting at 8% (6.1% severely and 1.8% moderately stunted), wasting at 7.6% (6.1% severely and 1.5% of children moderately wasted), and underweight at 6.2% (2.8% severe and 3.4% moderately underweight), with respective p-values of <0.000, <0.004, and <0.03 (Table 4). Contrary, the centres where 184 children (56.6%) did not practice handwashing showed higher prevalence of underweight at 17.2% (8.9% for severe underweight, 8.3% for moderate underweight) and stunting at 31.4% 21.2% severe stunting rates, and 10.2% moderate stunting prevalence amongst children in those centres that did not practice handwashing. Children using potties (165) in the child care centres had significantly fewer cases of stunting at 14.2% (9.8% severe stunting and 4.3% moderately stunted children) and wasting rates at 5.2% (4.3% severe and 1.8% moderate wasting) compared to 160 children in the centres that did not use potties having prevalence of stunting at 25.2% and wasting at 6.2%; these were statistically significant with a  $p < 0.0005$  for stunting amongst centres use of potties, showing a statistical significance between childcare hygiene practices and child nutrition status. Most children (96%) were fed rice.

Animal protein consumption was low. Only 39% of centers offered eggs, 35% milk, 23% beef, 13% fish, and 10% sardines (Omena) (Table 5). The qualitative data provided insights into the feeding practices in these centres. Qualitative data gave insights into the reasons and quality of foods that 63.8% of parents packed from home. As one participant noted, *"Most of the children carry food from home, and some childcare centres provide food either on parents' request or they have a full feeding program."* Another participant mentioned, *"Mixed feeding where parents begin weaning their children when they are still below six months, non-nutritive foodstuffs (junk foods)."* The sub county nutritionist noted that *"Malnutrition, anemia, scurvy, rickets, hypocalcemia, and diarrhea are common cases they handle most of the time; at least daily"*.

Children aged 24-30 months showed higher levels of growth faltering than younger children. Severe stunting was more common in this age group than among children aged 6-23 months, and a similar pattern was observed for severe underweight. Qualitative data reinforced these patterns, with caregivers noting that older children often arrived at the centres having eaten little at home. One caregiver stated, *"Older children come in with very minimal food from home,"* while another noted, *"Parents tend to give older children irregular meals before they come to the centre."* The study shows that severe stunting and severe underweight were lower among female children, at 11.4% and 4.9% respectively, compared to male children, who recorded higher levels of severe stunting at 16% and severe underweight at 7.4% (Table 6). Children enrolled in centre-based childcare centres had higher levels of severe stunting and severe underweight, at 14.5% and 6.8% respectively, compared to those in home-based childcare centres, where severe stunting and severe underweight were 12.9% and 5.5% (Table 7).

## Discussion

The study identified meaningful correlations between children's (6-30 months) nutritional status (stunting, wasting, and underweight) with factors such as feeding practices, hygiene practices, and dietary patterns. Children in centres with inadequate handwashing and limited use of potties exhibited markedly poorer nutritional outcomes, while reliance on packed meals from home to childcare centres, low dietary diversity, and minimal animal-protein intake further contributed to growth faltering. Older children and males were disproportionately affected. Overall, the findings highlight critical practices on diet, hygiene, and feeding practices as determinants shaping child nutrition in childcare centres in Embakasi East.

The mixed-methods design provided both quantitative robustness and qualitative depth, allowing a comprehensive assessment of nutritional status and its determinants across home-based and centre-based childcare centres. Use of standardized anthropometric measures strengthened data validity. As a cross-sectional study, causality cannot be inferred, and findings from a single sub-county may not be generalizable to other contexts.

This study contributes to the growing evidence on childcare practices and child nutrition by integrating both quantitative and qualitative methods, an approach consistent with similar studies conducted in urban informal settlements. The mixed-methods design allowed for deeper insight into feeding practices, dietary patterns, and hygiene practices, mirroring strengths from previous research that combined household surveys with caregiver feedback. However, unlike longitudinal studies that track children over time, the cross-sectional nature of this study limits the ability to determine cause-and-effect relationships. Additionally, while our findings align with studies from other Kenyan informal settlements, the focus on a single sub-county presents a narrower geographic scope compared

to multi-site studies, which may limit broader applicability. Despite these limitations, the study provides context-specific evidence that complements existing literature and enhances understanding of the factors influencing child nutritional status in childcare centres.

The research objectives were to determine factors associated with the nutritional status of children (6-30 months old) in home-based and centre-based child care centres in Embakasi East, Nairobi, Kenya. Most respondents (parents, caregivers/centre owners) were young, married parents with secondary education, similar to studies conducted in the same contexts. A study by Macharia *et al.* [8] highlighted that despite awareness of proper hygiene practices, many childcare centers struggle with implementing effective sanitation measures due to resource constraints and a lack of caregiver training, which may explain why some centers still experience high levels of stunting and underweight cases despite efforts to improve hygiene. The results underscore the necessity of implementing hygiene interventions in childcare centres to guarantee the provision of safely managed water and enhanced sanitation facilities. A separate investigation conducted in a non-formal settlement in Nairobi similarly documented a lack of variety in the diet and the consumption of foods with low nutritional value among young children [8]. The prevalence of severe underweight and severe stunting was higher among children aged 24-30 months compared to those aged 6-23 months. The current study findings align with a previous study conducted in an informal community in Nairobi, which also observed elevated rates of undernutrition, particularly among older children [8].

A study by Kericho *et al.* [13] found that hygiene practices in early childhood education centers significantly influenced children's overall well-being, with centers that followed proper handwashing and sanitation protocols reporting lower rates of malnutrition and infections. The study found that primary dietary practices by

children in childcare centres are: consumption of more packed food from home, comprising carbohydrate-rich foods like cereal, porridge, rice, and tubers, and limited consumption of protein-rich foods by children. This is similar to the study, which found that starchy foods and legumes were often consumed by children in childcare centres, but the intake of vegetables, fruits, and animal-source foods was minimal [17].

The study's findings indicate that children consuming meals packed from home exhibit higher rates of undernutrition, particularly stunting, with a statistically significant association observed between dietary practices and child nutritional outcomes. These results suggest that home-packed meals may lack adequate nutritional balance, potentially due to limited dietary diversity, irregular feeding patterns, or economic constraints influencing household food choices. This pattern is consistent with evidence from other studies showing that meals prepared on-site in childcare centres tend to be more nutritionally adequate than those brought from home. Together, these findings highlight the need to strengthen caregiver nutrition knowledge and support centre-based feeding systems to ensure young children receive balanced and nutrient-rich meals [21]. The lack of significant differences between the dietary patterns of children consuming packed food and those eating meals prepared at childcare centers may suggest inadequate meal diversification and preparation in these centers, limitations inherent in the cross-sectional study design, or challenges faced by centers in providing a variety of meals.

These findings underscore the importance of implementing standardized feeding programs in childcare centers, emphasizing strong parental engagement to enhance knowledge on diet diversification. Such initiatives are crucial for improving the quality of meals provided to children. The majority of the foods provided consisted mostly of cereal and grain food groups, with a small number of animal-source foods. Nutrition in informal paid childcare provision is

poor where it has been studied; it offers poor diets, and little support is provided to even children below 3 years [21]. According to a study conducted in Kenya, cereals, roots, and tubers were found to be the primary diets supplied to children, with limited consumption of animal-source foods [25]. The limited intake of animal-sourced foods that are high in nutrients is consistent with previous research and can be attributed to the prevalence of nutrition status of children in informal urban settlements.

High prevalence of stunting, wasting, and underweight (39.4%, 11.4%, and 23.4%) was found in this study population, respectively. The study findings indicate statistically significant differences in severe underweight and severe stunting prevalence across various age categories and gender of children. These results align with previous research conducted in Nairobi's informal settlements, which reported high rates of undernutrition among children under five years nearly 50% of children in these areas were stunted, highlighting the severity of malnutrition in informal settlements [25]. The study findings on hygiene revealed that centers where handwashing was practiced, children had significantly lower rates of stunting, contrary, centers that children did not practice handwashing showed higher prevalence of underweight (8.9% for severe underweight, 8.3% for moderate underweight), 21.2% severe stunting rates, and 10.2% moderate stunting prevalence amongst children in those centres that did not practice handwashing. These findings align with Yue *et al.* [32], who emphasized that poor hygiene practices in childcare settings contribute to increased health risks among children and that improving WASH interventions can positively impact child health outcomes.

A study in the Dagoretti informal settlement in Nairobi, Kenya, reported that caregivers of children aged 0-2 years were primarily young adults with limited formal education and engaged in informal employment [33]. A study comparing the nutrition practices of home-based and center-based childcare centres found no significant

differences in the demographic profiles of children attending these childcare centres [34]. The implications of limited parental education, particularly among young caregivers, have been linked to poorer child nutrition outcomes due to reduced knowledge of dietary needs, feeding practices, and health-seeking behaviors of children in childcare centres [35]. The higher prevalence of underweight and stunting observed in center-based childcare settings may be attributed to inadequate nutritional practices within these centers. Factors such as the absence of standardized feeding programs and limited access to nutrient-dense foods could contribute to these disparities. This is consistent with other study findings, which noted that center-based childcare centres often lack comprehensive nutrition programs, potentially leading to suboptimal dietary intake among children [36].

The frequency of feeding children was less than 3 meals a day, which is below the required minimum frequency of at least 3 meals a day. The consumption of nutrient-dense foods such as vegetables, fruits, and milk was insufficient. The lack of feeding programs in home-based and center-based centres corresponds to the results in low-income households in Nairobi. Contrary to the findings, the provision of on-site meals did not lead to a considerable diversification of diets [37].

Children were provided with a limited variety of food in their diet, primarily consisting of cereals, with very few nutrient-rich items included. The frequency of feeding was reported to be sufficient, while the quality of the diets was low. Elevated rates of malnutrition were detected, consistent with local research. Home-based centres exhibited the most responsibilities, highlighting the necessity for focused enhancements in the provision of baby and young child feeding and hygiene assistance for caregivers who are not affiliated with formal centres. The age-related rise in malnutrition may be attributed to inadequate feeding practices on energy-dense food and heightened disease susceptibility.

The study shows that many young children in childcare centres are not receiving adequate nutrition for healthy growth. Feeding practices, hygiene conditions, and the childcare environment strongly affect their nutritional status. Children relying on packed food, those in centres with poor hygiene, and older boys were more likely to be undernourished. Overall, the findings highlight the need for better feeding practices, dietary patterns, and improved hygiene in childcare centres.

Key questions remain regarding how seasonal food availability, household food security, and childcare centre capacity influence child nutrition over time. Future research should include longitudinal studies to track growth patterns and feeding practices, and explore interventions that improve dietary diversity and hygiene in childcare centres. Broader studies across multiple counties are also needed to determine whether these findings reflect national trends.

## Conclusion

The study found that poor hygiene practices and poor dietary patterns, and feeding practices were associated with child nutritional outcomes in childcare centres. Many centres that used potties and correct waste disposal measures recorded slightly lower malnutrition prevalence. Similarly, a study shows that most children were fed on carbohydrate-rich foods with little protein or fruits. Many children were fed less than three times a day, contrary to the WHO-recommended feeding frequency of at least 3 meals a day with snacks in between for children. The study also reveals that most children were of the same age distribution. Addressing poor hygiene, poor dietary patterns, and poor feeding practices in childcare centres will be critical in improving child nutritional outcomes. These insights have significant implications for policy formulation, particularly in strengthening existing nutrition policies such as the Maternal, Infant, and Young Child Nutrition (MIYCN) policy, to fit into the childcare settings in areas of capacity building for the caregivers on matters of nutrition education.

## What is known about this topic

- High demand for childcare services in informal settlements as more women are engaging in economic activities;
- Challenges in nutrition and hygiene practices by childcare providers are linked to child nutritional status.

## What this study adds

- The study identified sociodemographic characteristics that influence childcare practices and the nutritional status of children in both home-based and centre-based childcare centres daughters;
- The study establishes meaningful correlations between children's nutritional status (stunting, wasting, underweight) and factors such as dietary preferences, handwashing, and water treatment practices;
- This study provides concrete, evidence-based information to policymakers and stakeholders on what needs to be done to enhance nutrition and hygiene in informal childcare centres.

## Competing interests

The authors declare no competing interests.

## Authors' contributions

Josephine Atieno Odhiambo: conceptualized the study, designed, conducted field research, methodology, analyzed data, and authored the manuscript; Anselimo Makokha and Peninah Kinya Masibo provided academic guidance, assisted in data interpretation, supervised the research design and methodology, and reviewed the manuscript. All the authors read and approved the final version of this manuscript.

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## Tables

**Table 1:** sample size (n=26) of home-based and centre-based childcare centres in Embakasi East, Nairobi, with children 6 to 30 months, between August 2023 to March 2024

**Table 2:** sociodemographic characteristics of parents (n=69), children (n=325), and centre owners/caregivers (n=26) in Embakasi East, Nairobi, between August 2023 to March 2024

**Table 3:** association between nutrition status and childcare dietary patterns and practices, between August 2023 to March 2024

**Table 4:** association between nutrition status of children and childcare hygiene practices, the study was conducted between August 2023 to March 2024

**Table 5:** food commonly consumed by children in childcare centres, study done between August 2023 to March 2024

**Table 6:** association between nutrition status and age and sex characteristics of children, study done between August 2023 to March 2024

**Table 7:** prevalence of child nutrition status, study done between August 2023 to March 2024

**Figure 1:** food groups commonly given to children in childcare centres, study done between August 2023 to March 2024

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**Table 1:** sample size (n=26) of home-based and centre-based childcare centres in Embakasi East, Nairobi, with children 6 to 30 months, between August 2023 to March 2024

Home-based and centre-based child care centres under the Uthabiti network in Embakasi East with children <30 months				
No	Name of centres	Type of centres	Total children <30 months	Centre location
1	Jey Wicks Daycare	Home-based	7	Nairobi - Embakasi East
2	Little Angels Daycare	Centre-based	20	Nairobi - Embakasi East
3	Caro`s Daycare	Homebased-based	14	Nairobi - Embakasi East
4	Full Gospel Daycare	Centre-based	11	Nairobi - Embakasi East
5	Ebenezer Learning Centre	Centre-based	11	Nairobi - Embakasi East
6	JG Daycare	Centre-based	12	Nairobi - Embakasi East
7	Kipawa Daycare	Centre-based	9	Nairobi - Embakasi East
8	Makochini Daycare	Home-based	5	Nairobi - Embakasi East
9	Life of Hope Daycare	Home-based	5	Nairobi - Embakasi East
10	Dynamite Daycare	Home-based	9	Nairobi - Embakasi East
11	Jan Bruce Community	Centre-based	7	Nairobi - Embakasi East
12	Hope Child Care	Centre-based	33	Nairobi - Embakasi East
13	Ess Excellent Daycare	Centre-based	23	Nairobi - Embakasi East
14	Washiru Daycare	Home-based	11	Nairobi - Embakasi East
15	Shinners Daycare	Home-based	2	Nairobi - Embakasi East
16	Mama Mwangi Daycare	Home-based	8	Nairobi - Embakasi East
17	Superstars Academy	Centre-based	6	Nairobi - Embakasi East
18	The New Hope Daycare	Home-based	5	Nairobi - Embakasi East
19	Upendo Centre	Centre based	9	Nairobi - Embakasi East
20	Nashville Academy	Centre-based	14	Nairobi - Embakasi East
21	Pendo Daycare	Home-based	26	Nairobi - Embakasi East
22	Tsavo Ten Centre	Centre-based	22	Nairobi - Embakasi East
23	Mama Bahati Daycare	Home-based	14	Nairobi - Embakasi East
24	Mount Olive Daycare	Centre-based	20	Nairobi - Embakasi East
25	Neema Daycare	Home-based	7	Nairobi - Embakasi East
26	Jacaranda Embrace Daycare	Homebased	15	Nairobi - Embakasi East
		Total	325	

**Table 2:** sociodemographic characteristics of parents (n=69), children (n=325), and centre owners/caregivers (n=26) in Embakasi East, Nairobi, between August 2023 to March 2024

	Frequency	Percent (%)
<b>Age in years: centre owners/caregivers</b>		
18-27	2	8
28-37	9	34.6
38-47	9	34.6
48-Above	6	23.1
<b>Age(years): parents</b>		
18 - 27	27	39.1
28 - 37	29	42
38 - 47	11	15.9
48 and above	2	2.9
18 - 27	27	39.1
<b>Education level of centre owners/caregivers</b>		
Primary	7	26.9
Secondary	11	42.3
Tertiary	7	26.9
University	1	3.8
Totals	26	100
<b>Education: parents</b>		
University	4	4.3
Tertiary	27	28.9
Secondary	46	50.7
Primary	11	15.9
<b>Marital status</b>		
Married	46	66.7
Divorced	18	26.1
Widowed	5	7.2
<b>Occupation</b>		
Business	25	36.2
casual laborer	17	24.6
Driver	1	1.5
Mechanic	1	1.5
Salaried	15	21.7
Unemployed/housewife	10	14.5
<b>Household size</b>		
1 - 2 people	9	13
3 - 4 people	42	60.9
5 - 6 people	15	21.7
7 and above	3	4.4
<b>Parents income</b>		
&#8804;5000	24	34.9
5001 - 10,000	27	39.1
10,001 - 20,000	10	14.5
>20,000	8	11.6
Total	69	100
<b>Child demographics</b>		
<b>Age in months</b>		<b>Centre based</b>
		<b>Frequency (%)</b>
<b>Homebased</b>		<b>Frequency (%)</b>
6 - 23	73 (56.6)	56 (43.4)
24 - 30	124 (63.3)	72 (36.7)
<b>Gender/sex</b>		<b>Frequency</b>
		<b>%</b>
Female	113	71
Male	123	75
Total	236	72.6

**Table 3:** association between nutrition status and childcare dietary patterns and practices, between August 2023 to March 2024

<b>Wasting (WHZ score)</b>							
Variables	Categories	MAM ( $\leq -2$ SD $\geq -3$ SD) N (%)	Normal ( $> -2$ to $+1.99$ ) N (%)	Obesity ( $> +3$ ) N (%)	Overweight ( $> +2$ to $+3$ ) N (%)	SAM ( $< -3$ ) N (%)	Chi-q $x^2$ test
Consumption of packaged food from home at the childcare	No	0 (0)	39 (12)	2 (0.6)	1 (0.3)	5 (1.5)	$x^2(4, N=325) = 6.412, p < 0.170$
	Yes	12 (3.7)	208 (64.0)	8 (2.5)	30 (9.2)	20 (6.2)	
Child feeding frequency at the childcare centres- daily	Feeding three times a day	5 (1.5)	23 (7.1)	0 (0)	7 (2.2)	25 (7.7)	$x^2(4, N=325) = 131.060, p < 0.000$
	Feeding two times a day at the centre	7 (2.2)	224 (68.9)	10 (3.1)	24 (7.4)	0 (0)	
<b>Stunting (HAZ)</b>							
Variables	Categories	Moderately stunted ( $\leq -2$ SD $\geq -3$ ) N (%)	Normal ( $> -2$ to $+1.99$ ) N (%)	Severely stunted $< -3$ N (%)	Chi-q $x^2$ test		
Consumption of packaged food at home and at the childcare	No	3 (0.90)	36 (11.1)	8 (2.5)	$x^2(5, N=325) = 5.914, p < 0.52$		
	Yes	36 (11.1)	161 (49.5)	81 (24.9)			
Child feeding frequency at the childcare centres- daily	Feeding three times a day	7 (2.2)	38 (11.7)	15 (4.6)	$x^2(2, N=325) = .249, p < 0.883$		
	Feeding two times in a day at the centre	32 (9.8)	159 (48.9)	74 (22.8)			
<b>Underweight (WAZ score)</b>							
Variables	Categories	Moderately underweight ( $\leq -2$ SD to $\geq -3$ ) N (%)	Normal ( $> -2$ to $+1.99$ ) N (%)	Severely underweight $< -3$ N (%)	Chi-q $x^2$ test		
Consumption of packaged food from home at the childcare	No	4 (1.2)	40 (12.3)	3 (0.9%)	$x^2(2, N=325) = 2.411, p < 0.300$		
	Yes	32 (9.8)	209 (64.3)	37 (11.4)			
Child feeding frequency at the childcare centres- daily	Feeding three times a day	7 (2.2)	35 (10.8)	18 (5.5)	$x^2(2, N=325) = 21.948, p < 0.000$		
	Feeding two times a day at the centre	29 (8.9)	214 (65.8)	22 (6.8)			

**Table 4:** association between nutrition status of children and childcare hygiene practices, the study was conducted between August 2023 to March 2024

<b>Wasting (WHZ)</b>							
Variables	Categories	MAM ( $\leq -2$ SD $\geq -3$ SD) N (%)	Normal ( $> -2$ to $+1.99$ ) N (%)	Obesity ( $> +3$ ) N (%)	Overweight ( $> +2$ to $+3$ ) N (%)	SAM ( $< -3$ ) N (%)	Chi-q $x^2$ test
Handwashing Practices of children	No	5 (1.5)	129 (39.7)	10 (3.1)	20 (6.2)	20 (6.1)	$x^2(5, N=325) = 17.215, p < 0.004$
	Yes	7 (2.1)	118 (36.3)	0 (0)	11 (3.4)	5 (1.5)	
<b>Stunting (HAZ)</b>							
Variables	Categories	Moderately stunted ( $\leq -2$ SD $\geq -3$ SD) N (%)	Normal ( $> -2$ to $+1.99$ ) N (%)	Severely stunted $< -3$ SD N (%)		Chi-q $x^2$ test	
Handwashing practices of children	No	33 (10.2)	82 (25.2)	69 (21.2)		$x^2(2, N=325) = 46.428, p < 0.0005$	
	Yes	6 (1.8)	115 (35.4)	20 (6.1)			
<b>Underweight (WAZ)</b>							
Variables	Categories	Moderately underweight ( $\leq -2$ SD $\geq -3$ SD) N (%)	Normal ( $> -2$ to $+1.99$ ) N (%)	Severely underweight $< -3$ SD N (%)		Chi-q $x^2$ test	
Handwashing practices of children	No	27 (8.3)	128 (39.4)	29 (8.9)		$x^2(2, N=325) = 11.814, p < 0.03$	
	Yes	9 (2.8)	121 (37.2)	11 (3.4)			
<b>Wasting (WHZ)</b>							
Variables	Categories	MAM ( $\leq -2$ SD $\geq -3$ SD) N (%)	Normal ( $> -2$ to $+1.99$ ) N (%)	Obesity ( $> +3$ ) N (%)	Overweight ( $> +2$ to $+3$ ) N (%)	SAM ( $< -3$ ) N (%)	Chi-q $x^2$ test
Potties availability and in use	No	6 (1.8)	117 (36)	8 (2.5)	15 (4.6)	14 (4.3)	$x^2(5, N=325) = 5.407, p < 0.368$
	Yes	6 (1.8)	130 (40)	2 (0.6)	16 (4.9)	11 (3.4)	
<b>Stunting (HAZ)</b>							
Variables	Categories	Moderately stunted ( $\leq -2$ SD $\geq -3$ SD) N (%)	Normal ( $> -2$ to $+1.99$ ) N (%)	Severely stunted $< -3$ SD N (%)		Chi-q $x^2$ test	
Potties availability and in use	No	25 (7.7)	78 (24)	57 (17.5)		$x^2(3, N=325) = 19.115, p < 0.000$	
	Yes	14 (4.3)	119 (36.6)	32 (9.8)			
<b>Underweight (WAZ)</b>							
Variables	Categories	Moderately underweight ( $\leq -2$ SD $\geq -3$ SD) N (%)	Normal ( $> -2$ to $+1.99$ ) N (%)	Severely underweight $< -3$ SD N (%)		Chi-q $x^2$ test	
Potties availability and in use	No	22 (6.8)	111 (34.2)	27 (8.3)		$x^2(2, N=325) = 9.531, p < 0.009$	
	Yes	14 (4.3)	138 (42.5)	13 (4)			
	Tap	32 (9.8)	236 (72.6)	37 (11.4)			

**Table 5:** food commonly consumed by children in childcare centres, study done between August 2023 to March 2024

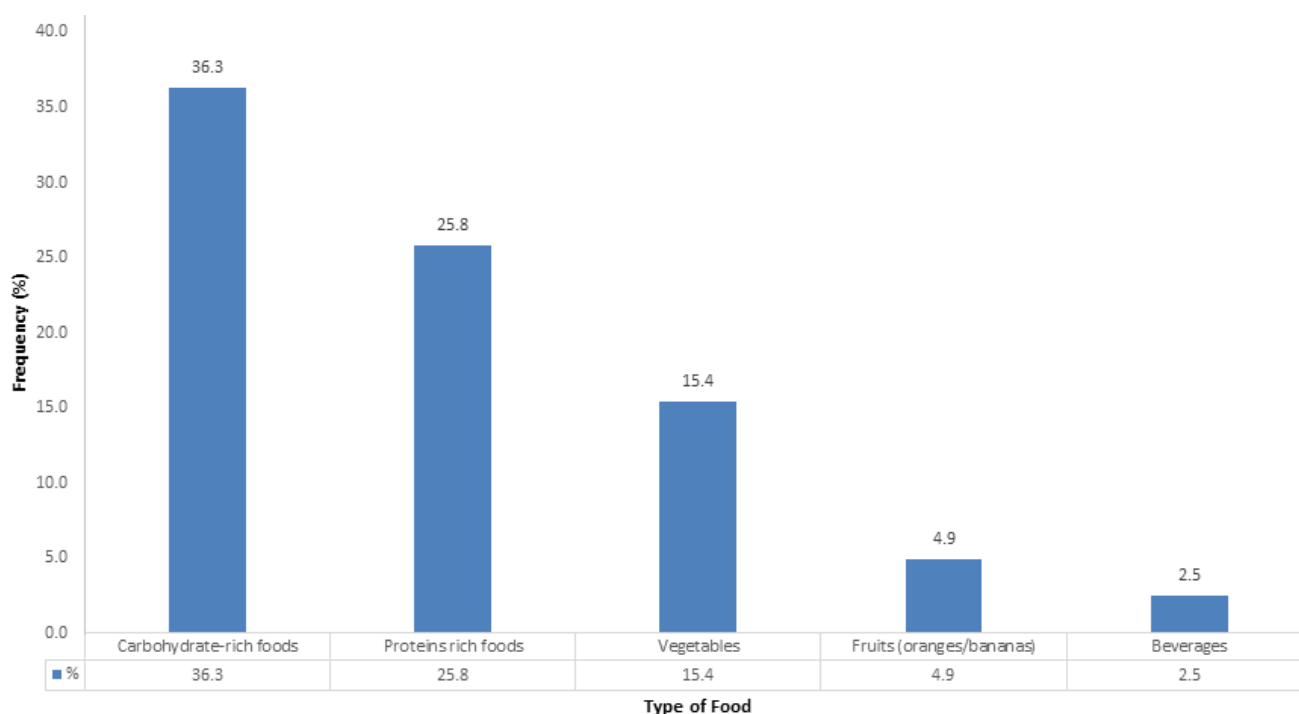
The food children ate at the childcare centres	Frequency	%	Type of food group
Porridge	26	100	Carbohydrate-rich food - tubers/cereals
Cabbage	26	100	Vegetable
Rice	25	96.2	Carbohydrate-rich food- cereals
Beans or green lentils	25	96.2	Protein-rich food -legumes/lentils
Green grams	25	96.2	Proteins-rich food-lentils
Green vegetables	24	92.3	Vegetables
Mashed potatoes	17	65.4	Carbohydrate-rich food -tubers
Fruits	16	61.5	Fruits
Mashed banana	13	50	Carbohydrate-rich food -tubers
Ugali	12	40	Carbohydrate-rich food - tubers/corn
Eggs	10	38.5	Protein-rich food -animal-rich
Milk	9	34.6	Protein-rich food -animal products
Tea	8	26.7	Beverage
Beef	7	23.3	Protein-rich food -animal source
Cooked bananas	7	23.3	Carbohydrate-rich food -tubers
Mandazi	5	16.7	Carbohydrate-rich food - wheat
Noodles	4	13.3	Carbohydrate-rich food -wheat/cereals
Fish	4	13.3	Protein-rich food -animal source
Spaghetti	4	13.3	Carbohydrate-rich food-wheat/cereals
Bread	3	10	Carbohydrate-rich food-wheat/cereals
Sardine cyprinid (Omena)	3	10	Protein-rich food -fish/animal source
Chapati	2	6.7	Carbohydrate-rich food-wheat/cereals
Lablab Beans	1	3.3	Protein-rich food -legumes/lentils

**Table 6:** association between nutrition status and age and sex characteristics of children, study done between August 2023 to March 2024

<b>Wasting WHZ score</b>							
Variables	Categories	MAM ( $\leq -2$ to $\geq -3$ SD)	Normal ( $> -2$ to $+1.99$ )	Obesity ( $> +3$ )	Overweight ( $> +2$ to $+3$ )	SAM ( $< -3$ )	Chi-q $\chi^2$ test
		N (%)	N (%)	N (%)	N (%)	N (%)	
Child's Age	24-30	7 (2.2)	155 (47.7)	7 (2.2)	13 (4)	14 (4.3)	$\chi^2(5, N=325) = 6.437, p < 0.266$
	6-23	5 (1.5)	92 (28.3)	3 (0.9)	18 (5.5)	11 (3.4)	
Child's sex	Female	6 (1.8)	126 (38.7)	7 (2.2)	13 (4)	8 (2.5)	$\chi^2(5, N=325) = 7.599, p < 0.180$
	Male	6 (1.8)	121 (37.2)	3 (0.9)	18 (5.5)	17 (5.2)	
<b>Stunting HAZ score</b>							
Variables	Categories	Moderately stunted ( $\leq -2$ to $\geq -3$ SD)	Normal ( $> -2$ to $+1.99$ )	Severely stunted $< -3$ SD	Chi-q $\chi^2$ test		
		N (%)	N (%)	N (%)			
Child's Age	24-30	24 (7.4)	106 (32.6)	66 (20.3)	$\chi^2(3, N=325) = 11.268, p < 0.10$		
	6-23	15 (4.6)	91 (28)	23 (7.1)			
Child's sex	Female	17 (5.2)	106 (32.6)	37 (11.4)	$\chi^2(3, N=325) = 5.542, p < 0.136$		
	Male	22 (6.8)	91 (28.0)	52 (16)			
<b>Underweight WAZ score</b>							
Variables	Categories	Moderately underweight ( $\leq -2$ to $\geq -3$ SD)	Normal ( $> -2$ to $+1.99$ )	Severely underweight $< -3$ SD	Chi-q $\chi^2$ test		
		N (%)	N (%)	N (%)			
Child's age	24-30	19 (5.8)	144 (44.3)	33 (10.1)	$\chi^2(2, N=325) = 9.720, p < 0.008$		
	6-23	17 (5.2)	105 (32.3)	7 (2.2)			
Child's sex	Female	14 (4.3)	130 (40.0)	16 (4.9)	$\chi^2(2, N=325) = 3.788, p < 0.150$		
	Male	22 (6.8)	119 (36.6)	24 (7.4)			

**Table 7:** prevalence of child nutrition status, study done between August 2023 to March 2024

Nutritional status	All	Centre-based childcare centre	Home-based childcare centre
	N (%)	N (%)	N (%)
<b>Stunting (HAZ)</b>			
Moderately stunted ( $\leq -2$ SD $\geq -3$ SD)	39 (12)	19 (5.8)	20 (6.2)
Normal ( $> -2$ to $+1.99$ )	197 (60.6)	131 (40.3)	66 (20.3)
Severely stunted ( $< -3$ )	89 (27.4)	47 (14.5)	42 (12.9)
<b>Underweight (WAZ)</b>			
Moderately underweight ( $\leq -2$ SD $\geq -3$ SD)	36 (11.1)	23 (7.1)	13 (4)
Normal ( $> -2$ to $+1.99$ )	249 (76.6)	152 (46.8)	97 (29.8)
Severely underweight ( $< -3$ )	40 (12.3)	22 (6.8)	18 (5.5)
<b>Wasting (WHZ)</b>			
MAM ( $\leq -2$ SD $\geq -3$ )	12 (3.7)	7 (2.1)	5 (1.5)
Normal ( $> -2$ to $+1.99$ )	247 (76)	156 (48)	91 (28)
Obesity ( $> +3$ )	10 (3.1)	5 (1.5)	5 (1.5)
Overweight ( $> +2$ to $+3$ )	31 (9.5)	17 (5.2)	14 (4.3)
SAM ( $< -3$ )	25(7.7)	12 (3.7)	13 (4)



**Figure 1:** food groups commonly given to children in childcare centres, study done between August 2023 to March 2024