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Feeding Practices and Nutrition Status of Children Aged 6-23 Months in Daycare Centers in Mwea, Kirinyaga County

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Abstract

Introduction: Malnutrition, the precursor to morbidity and mortality in young children is mainly severe during the period of complementary feeding between 6 and 23 months and is a great public health concern in sub-Saharan Africa. Assessment of nutritional status is a key aspect of gauging childcare feeding practices. Malnourished children are at higher risk of infections, impacting negatively on their health. Documentation on the nutritional status of children in daycare centers is scanty, thus masking their health trends. The main objective of this study was to determine the feeding practices and nutritional status of children aged 6-23 months in daycare centers in Mwea, Kirinyaga County, Kenya

Methodology: One hundred and sixty-five caregivers with young children in 20 day-care centers were purposively sampled after obtaining informed consent. Obtained data on nutrition status was collected using structured questionnaires, focus group discussions, and observation checklists and analyzed statistically.

Results: The minimum acceptable diet was achieved by only 18.9%, while minimum meal frequency was achieved by 53.1%. Undernutrition was indicated by wasting-9.7%, stunting- 24.2%, underweight- 6.1%; and overweight- 30.3%. Most affected were females and older children were more likely to be malnourished. Factors found significantly associated with nutrition status included the child's age, mother's age, education, minimum acceptable diet, and household size.

Conclusion: Child feeding practices were greatly variable and inadequate. The main meals of children were poor- lacked diversity, and essential nutrients and were therefore exposed to increased risk of diseases.

Recommendation: Caregivers should improve on child feeding practices, provide adequate nutrient-rich foods, and follow nutrition guidelines.

Keywords: Feeding practices, nutrition status, young children, daycare center, malnutrition, Kirinyaga County

1. Introduction

A child's nutritional status is an indicator of general well-being and health. Infant and young child feeding practices are the most effective interventions to improve child health and nutrition (Muluye *et al.*, 2020). Influenced by food intake the quantity and quality of foods ingested and the child's physical health, it affects all aspects of the child's health in terms of growth, development, and physical activity. Anthropometry is the most common method of nutritional status assessment in under-fives, involving measurement of the length/height, weight, and mid (upper) arm circumference of a child. These are compared with accepted national and international standards of expression to determine a child's nutrition status (De Onis, 2006; WHO, 2011). The quality of care given to infants and young children is a vital factor in growth and development. Optimum growth can only be achieved if the child's characteristics, needs, and developmental levels are considered in day-to-day childcare practices (Dewey & Brown, 2003).

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Malnutrition is a public health problem worldwide, principally in sub-Saharan Africa. This nutritional shortage is particularly severe during the period of complementary feeding between 6 and 24 months (Euphrasie, *et al.,*2019). The age of 6–23 months is the space of opportunity and the significant stage to heighten child growth and development to prevent undernutrition (Dewey& vitta, 2013; http://www.thousanddays.org/).Due to work-related activities, many parents have turned to daycare centers for childcare services. These centers are not all reliable as champions of quality child nutritional care, however, home care can also be a contributor to malnutrition when done wrongly.

Studies were done on some daycare attendees linked daycare attendance with poor nutritional status such as being underweight, malnutrition, or over-nourished (Blossner *et al.*, 2005). A study done in the Port Harcourt metropolis between November 2011 and July 2012 in 200 daycare centers showed that 3% of children were underweight, 5.5% were stunted, 7.1% were wasted, and 21.3% were overweight (Agbedeyi *et al.*, 2015). Recent studies show improved child health outcomes in Kenya. For example, high levels of child malnutrition have been documented with the national prevalence of stunting at 18% (KNBS and ICF. 2023). One of the most effective interventions in childcare practices in improving child health involve optimal infant and young child feeding programs. In 2006 an estimated 9.5 million children died before their fifth birthday, and two-thirds of these deaths occurred in the first year of life (Bryce *et al.,* 2005, 2008). At least 35 percent of child mortality is associated with undernutrition. This prevents children who recover from attaining their complete developmental potential. It has been shown that about 32% of children developing countries who are 5 years and below are stunted and 10% are wasted. It is estimated that 1.4 million deaths and 10% of the disease burden in younger children less than 5 years occur due to sub-optimal breastfeeding, especially on non-exclusive breastfeeding in their first 6 months of life (Black *et al.*, 2013).

The impact of childcare practices on the health of children and the importance of encouraging exclusive breastfeeding has gained increased recognition in the recent past (Okochil, 2016). Breastfeeding is more nutritious, more hygienic, and cheaper than bottle-feeding and in addition, confers Immunity to infants against common infections. Moreover, breastfeeding promotes healthy birth spacing. In places where families are generally poor, health services inadequate, and hazardous environmental conditions exist, exclusive breastfeeding is beneficial. Thus, the United Nations Children's Fund (UNICEF) has made the promotion of breastfeeding one of the major components of its strategy to improve child survival (UNICEF, 2013).

Complementary feeding is defined as the process that starts when breast milk alone is no longer sufficient to meet the nutritional requirements of infants and therefore other foods and liquids are needed along with breast milk. The target age range for complementary feeding is generally taken to be 6 to 24 months of age, even though breastfeeding may continue beyond two years. A review of feeding guidelines promoted by various national and international organizations has shown that there are inconsistencies in the specific recommendations for feeding infants and young children (WHO, 2011). Some of the feeding guidelines are based more on tradition and speculation than on scientific evidence or are far more prescriptive than is necessary, regarding issues such as the order of foods introduced and the amounts of specific foods to be given. To avoid confusion, a set of unified, scientifically based guidelines is needed, which can be adapted to local feeding practices and conditions (PAHO/WHO, 2002).

Globally, 148 million children under-fives are underweight for their age and an estimated 178 million have stunted growth in developing countries. Over 2 million deaths are directly attributed to stunting and severe wasting (UNICEF, 2010). The majority of these children live in Asia (111.6 million) and Africa (56.9 million). Africa is the only continent in which malnutrition among children is rising. The report by Kenya Demographic and Health Survey showed that child malnutrition rates are high with a quarter of the acutely malnourished children living in some parts of western Kenya. The Survey data shows that the nutritional status of children below five years has improved slightly in the past few years. At the national level, 35 percent of children under five are stunted, up from 33% in 2003. Further, 7% of children are wasted and 16% are underweight down from 20% in 2003 (KDHS, 2008/9).

About a quarter (26%) of children in Kenya are stunted, 4% are wasted while11% are underweight. In Kirinyaga County, the prevalence of stunting is at 20.9%, wasting 4.7% and 9.0% are underweight respectively according to the Kenya National Bureau of Statistics (KNBS, 2015). This is an improvement compared to the Kenya Demographic Health Survey (KDHS, 2015) findings, which indicated that 35% of children under five years were stunted, 8% of children were wasted and 14% were underweight. Malnutrition leads to morbidity and mortality thus lowering productivity. These pose challenges to achieving Kenya's Vision 2030 and the proposed Sustainable Development Goals in Kenya and Kirinyaga County.

Household expenditure influences complementary feeding which in turn affects the nutrition status of children (WHO, 2011). Persons who had stunted in infancy incline to have learning challenges. As a result, they are less prepared when they enter the job market and earn lower wages than those who were never stunted. Their lifetime incomes are assessed to be 10 percent less than their counterparts (UNICEF, 2007). The best bet is to tackle the fundamental causes of malnourishment regardless of food availability.

Children from well-to-do families continue to suffer from unsuitable infant feeding, lack of healthy food variety, poor sanitation, and poor healthcare services. For that reason, it is important to address child malnutrition, by mobilizing professionals working in multiple sectors, including education, health, agriculture, water and sanitation, and social areas.

2. Materials and Methods

2.1 Study Area

The study was conducted in purposively selected daycare centers in Ngurubani, Kimbimbi, and Kutus, Mwea Constituency, Kirinyaga County. The three areas had a large number of formal and informal workers who sought daycare services. The main economic activity in the region is rice farming as the major cash crop although other crops and fruits are grow as well.

2.2 Study Design, Population, Selection Criteria

The study adopted a cross-sectional design and utilized both quantitative and qualitative techniques. The study population comprised caregivers with children aged 6-23 months in daycare centers. Inclusion criteria included mothers and caregivers of children who gave informed consent to participate in the study. Those excluded included mothers and caregivers of children who refused to consent, visiting mothers, and caregivers. Also excluded were mothers/caregivers whose children had been hospitalized more than one week before the onset of the study, children with birth defects, those receiving nutritional supplements, and those declared malnourished before six months.

2.3 Sampling and Sampling Procedure

Twenty daycare centers were purposively selected from the 35 day-care centers in the sub-county. The selection criteria were daycare centers with 12 or more 6-23-month-oldchildren.Random sampling of the targeted population was done. All eligible children in the 20 selected day care centers were equally considered for inclusion. A sample size of 165 participants was calculated using Fisher *et al.*, (1998) formula $n = z^2pq/ d^2$ to get the desired minimum sample population from the target population considering a 95% confidence level.

2.4 Data Collection

Pertinent caregiver data was collected using an interviewer-administered structured questionnaire, anthropometric measurements taken, and focus group discussion conducted for first-time mothers on challenges in feeding practices, dietary intake, morbidity factors, water, and sanitation. Data on feeding practices were collected using a 7-day frequency questionnaire and a 24-hour dietary intake and an information guide for key informants was used.

Daycare centers were visited once during which the questionnaires were administered and anthropometric measurements of the children taken. The respondent was the mother or the caregiver of the children. Two readings were taken for both weight and height and the average of the two was recorded. Weight was noted to the nearest 0.1kg with minimum clothing. Height was taken using the UNICEF-recommended height board with a headstand to the nearest 0.1cm. In cases where age was not known height measurements were taken for children measuring 85cm and above. All children stood upright for height to be taken. Calibration with known weight was also done on the weighing scales before and during the exercise.

A 24-hour recall was registered from the mothers of the children. Two focus group discussions (FGD) of 45-60 minutes each were conducted among 8-12 caregivers purposely recruited in each center with prior arrangements, tape-recorded and non-verbal communication documented by the field assistant.

2.5 Data Analysis and Presentation

All data sets were subjected to rigorous checking to identify and correct mistakes at the field level daily. The data from 24-hour recall were analyzed by use of Nutri-survey computer software, and anthropometric data were entered and analyzed using ENA computer software version 2010 and exported to SPSS version 17. Data from the questionnaires were analyzed using SPSS version 17. Descriptive statistics were used to describe the socio-demographic and economic characteristics of the population, dietary intake, nutritional status, and morbidity

status of the children. Chi-square and regression analysis was performed to test the variables, statistical significance was pegged at *p*-value of <0.05.

2.6 Ethical Consideration

Ethical approval was sought from the Kenyatta National Hospital / University of Nairobi Ethical Review Committee. Permission to undertake the survey and access the facilities and the participants was sought from the County Director of Health and county director of education in Kirinyaga County. Participants were requested to sign an informed consent before they were accepted to participate in the study.

3.0 Results

3.1 Social Demographic Characteristics of the Caregivers

The majority of the respondents were Christians (93.3%) while 6.7% were Muslims. Majority- 54.5%- of the respondents were married, 39.5% single, divorced or separated were 3.6%, and 2.4% were widowed. The respondents could also be categorized as married (54.5%) and unmarried (45.5%) individuals. The households headed by males were 53.9% while those headed by females- were 46.1%. The highest level of education of mothers/caregivers who had attained primary education was 37%; secondary 55.2%; and tertiary 7.9%.Those in formal salaried employment were 12.1%, farmers- 7.9%, those who were self-employed or in business were 33.3%, housewives were 4.2%, and 42.4% were casual laborers. Regarding occupation of the household head, formal/salaried employment was 17.0%, casual labor, 47.3%, farmers- 8.5%, and business/self-employment was 27.3%.Casual labor is usually intensive and demanding. Any parent involved in this type of work may not have enough time for young children and may need to employ a nanny or take the child to daycare centers for some time.

Table 1: Socio-demographic and economic characteristics of households

Socio-demographic and economic characteristics of households (N=165)

Religious background		Frequency	Percent
	Christian	154	93.3
	Muslim	11	6.7
Marital status	Married	90	54.5
	Single	65	39.4
	Divorced/separated	6	3.6
	Widow	4	2.4
Highest Level of education	Primary	61	37.0
	Secondary	91	55.2
	Tertiary	13	7.9
Occupation of the mother	Formal/salaried employment	20	12.1
	Farmer	13	7.9
	Self-employed/business	55	33.3
	Housewife	7	4.2
	Casual labor	70	42.4
Household head	Male	89	53.9
	Female	76	46.1
Occupation of the household head	Formal/salaried employment	28	17.0
	Casual labor	78	47.3
	Farmer	14	8.5
	Business/self-employment	45	27.3
Household size	2	33	20.0
	3	63	38.2
	4	47	28.5
	5	15	9.1

	6	7	4.2
Main Household source of income	Business	50	30.3
	Casual labor	77	46.7
	Farming	13	7.9
Number of children	1	78	47.3
	2	60	36.4
	3	18	10.9
	4	9	5.5
Number of children below 5 years category	1 child	155	93.9
	2 children	10	6.1
Method of food acquisition	Purchased	159	96.1
	Farming	13	7.9
	Donation	4	2.4

3.1.1 Demographic characteristics of children and mothers

The study revealed that the highest proportion of children- 49.1% was between the age of 12 and 17 months, 35.8% falling between the age of 18 and 23 months, 8.5% were between age of 9 and 11 months, while 6.7% were between the age of 6 and 8 months. The children were placed into two categories: those ranging between 6 and 12 months (21.8%), and those ranging from 13 to 23 months (78.2%). The mean age of their mothers was 29 years. They were divided into three age groups: those under the age of 20, those between the ages of 20 and 34, and those between the age of 35 and 49 as shown in Table 2.

Table 2: Demographic characteristics of children and mothers

Demographic characteristics (N=165)		
Age	Frequency	Percent
6-8 months	11	6.7
9-11 months	14	8.5
12-17 months	81	49.1
18-23 months	59	35.8
Age category (child)		
6-12 months	36	21.8
13-23 months	129	78.2
Sex of child		
Male	83	50.3
Female	82	49.7
Age of mother/caregiver		
< 20 years	10	6.1
20-34 years	120	72.7
35-49 years	35	21.2

3.1.2 Characteristics of day care centers

Table 3 show characteristics of daycare centers including period of existence of the center, child feeding frequency, food packaging and length of stay of individual child. Majority (40%) of the daycare centers were in existence about 3 to 4 years followed by those that are more than 4 years old which constituted 30%. About 52% of the children normally spent 6-8 hours and about 50% were fed more than 3 times in a day. Slightly more than 69% of the meals were packed in plastic containers.

Table: 3 Characteristics of day care centers

Characteristics of day care centers

Source of information (N=20)	**Frequency (No.)**	**Percent (%)**
Owner	12	60
Managers	8	40
Period of existence of day care center		
Less than 1 year	1	5
1-2 years	3	15
2-3 years	2	10
3-4 years	8	40
More than 4 years	6	30
Child feeding frequency at the day care center (N=165)		
Once	2	1.2
Twice	61	37.0
Thrice	20	12.1
More than thrice	82	49.7
Food packaging material (N=165)		
Plastic material	132	69.1%
Metallic	45	23.6%
Melamine	14	7.3%
Child main activities at the day care center		
Play	160	97.0
Sleeping	5	3.0
Child length of stay at the day care center (N=165)		
Less than 4 hours	3	1.8
4-6 hours	6	3.6
6-8 hours	85	51.5
8-10 hours	56	33.9
More than 10 hours	15	9.1

3.2 Child feeding practices among children aged 6-23 months

3.2.1 Breastfeeding

Majority (95.8%) of children in this study were breastfed, while a few (4.2%) were never breastfed. The findings show that the majority of the respondents breastfed their babies, while a few did not due to medical conditions. The FGDs with the mothers of the sampled children also revealed some important information: "*we could not breastfeed when we were sick because we could make our babies sick".* The study found that many (64.2%) of children were still breastfeeding, with only 35.8% not being breastfed. Generally, those who stopped breastfeeding at 6-8 months were (1.8%), 9-11 months were (57.1%), 12-17 months were 23 (28.4%), 18-23 months were 11.6 (18.6%), and those who never breastfed were 7 (4.2%).

3.2.2 Complementary feeding practices

Most mothers (51.5%) indicated that they introduced complementary feeds to their children between 1 and 3 months while others (35.2%) introduced feeds between 4 and 5months. Results of FGDs revealed that poverty drove them to complementary feeding before 6 months: *"We earned very little for home use, sometimes depended on donations from friends and families for upkeep which was also not enough to buy quality food".* None of them introduced other foods in less than a month. Those who introduced the feeds at/above six months were only 13.3%.

3.2.3 Minimum meal frequency

Meal frequency is the number of times a child is fed in 24 hours. In FGDs, it was revealed that some skipped some meals: "*sometimes we only took tea in the evening because we could not afford to buy food because of lack of money*". Minimum meal frequency is the percentage of breastfed and non-breastfed children aged 6-23 months who received soft, solid, and/or semi-solid foods (including milk feeds for non-breastfed children) for the set minimum number of times or more. In the non-breastfed group, 83.1% received minimum meal frequency while 12-17-month group attained 61.7%.

3.2.4 Food intake

A 24-hour recall was used to assess the food intake of the children. Caregivers/mothers were requested to remember the type of foods fed to children the previous day. A varied diet provides essential vitamins, minerals, and other nutrients that are necessary for optimal physical and cognitive development. An outline of diverse dietary ingredients respondents indicated to have fed the children such as vegetables, rice, yoghurt and various fruits are shown below. The most consumed were porridge (90.3%), ugali (61.8%), milk (70.9%) and rice (56.4%). FGD revealed that they fed their children according to their taste: "*we fed our children foods which they liked most. Sometimes the baby refused completely what we were told to feed them*". This concurred with report by KIIs in health facility: "*Some parents are telling us that their babies vomited when given some type of foods and changed food type to what the babies liked*".

3.2.5 Dietary diversity

The eight food groups considered in this study in determining dietary diversity included breast milk, grain root and tubers, dairy products (milk, yoghurt, cheese), flesh foods (meat, fish, poultry), eggs, vitamin-A rich fruits and vegetables, other fruits and other vegetables. Consumption of dairy products topped the list with 76.4% followed by Vitamin-A rich fruits and vegetables (75.2%). Grains, roots and tubers group was observed as third consumed with 72.1%. Breast milk was consumed by 64.2% followed by other fruits and vegetables which were consumed by 69.1%. Legumes and nuts were consumed by 35.0% of the children while 29.6% consumed vitamin A rich fruits and vegetables. Flesh foods (meat products) were consumed by 32.7%.

There was very low consumption of legumes, nuts and seeds (15.2%) among children aged 6 to 23 months. To assess the minimum dietary diversity score of children, a cut-off of a minimum of 5 food groups of the 8 food groups set by WHO was selected since it relates with quality diets for both breastfed and non-breastfed children. Those who met minimum dietary diversity were 44.8%.

3.2.6 Minimum Acceptable Diet (MAD)

The proportion of breastfed and non-breastfed children aged 6-23 months who received a minimum dietary diversity including at least two milk feedings for non-breastfed children the previous day was determined. In the 6–8-month category, about 73% achieved MAD. The 18-23 month-group had the least children who achieved minimum acceptable diet at 23.7%.

3.3Hygiene and sanitary practices among children in daycare centers

Good hygiene and sanitary practices including access to clean water and toilet facilities are essential for children aged 6-23 months since they are at a vulnerable stage of their development and are more susceptible to illnesses and infections.

3.3.1Access to clean water source

Over 45% of the households reportedly use piped water, 42.4% used water from a river while 12.1% got water from boreholes. Those who boiled water before use were 41.2% while those who treated water using chlorine (water guard) were 6.1%. Sixty percent of daycare centers used piped water. Those who used water from rivers, bought from vendors, were 40% and none used water from boreholes. On the aspect of water treatment, 20% boiled water for drinking while 80% treated water using chlorine.

3.3.2 Access to toilet facilities

All daycare centers (100%) had access to toilet facilities at their compound. Similarly, all the 165 households reported to have access to toilet facilities. Slightly more than 39% of mothers used pit latrines, 36.4% ventilated improved pit latrine (VIP) while 24.2% used cistern flush units. In daycare centers, those who had ordinary pit latrines were 20%, VIP- 70% while flushing toilets were available in only 10% of the centers.

3.3.3 Hand washing hygiene practices

About hand hygiene practices, 41.2% of household caregivers used soap when washing hands, 44.8% washed hands before feeding the baby, 36.9% before preparing food while 30.3% washed hands after visiting the

toilet. Similarly, daycare caregivers washed hands before preparing meals for children (100%), feeding- 70%, changing diapers- 60%, after visiting the toilet- 100% and 50% used soap and water when washing hands.

3.4 Morbidity status

In this study, young child and infant morbidity was determined based on a two week recall by the mother/ caregiver of each child. Most of the kids had not been sick two weeks prior to the study. Fever and cough dominated the list of ailments with 71.8% prevalence. Diarrhea and vomiting had a prevalence of 66.7% and 38.9%, respectively, overall illness occurrence was 23%.

3.4.1 Health seeking behavior and interventions

Most of the caregivers (51.3%) sort help from public health facilities as their first point of contact. Others sought medical help from Chemists (10.35), private entities (5.1%), others from CHWs (12.8%), relatives and friends (10.2%) and a few from herbalists (5.1%) while others bought medicines from general shops. Vaccination, vitamin A administration and deworming trend among the children was that by the third month, all the children (100%) had received the prescribed vaccine. Vaccination to children 9-23 months was also 100%. In 18–23-month, group, 89.8% had received the vaccines. Total vaccination status was at about 96%, vitamin A uptake at close to 97% and deworming was about 97%.

3.5Nutrition status of children in the day care centers

Boys were affected more than girls. The age group which had more children was 12-17-month age group which comprised of 49.1%, and the one with the least children was 6–8-month age group with 6.7%. The prevalence of underweight, stunting and wasting of children was determined. Weight for age Z-score (WAZ), length/height for age Z-score (LAZ) and weight for length/height Z-score (WLZ) were determined respectively as per WHO (WHO, 2006). We presented the nutritional status as normal (>-2 to < +2 Z-score), moderately malnourished (<-2 to -3 Z-score), severely malnourished (<-3 Z-score) and overweight (>+2 Z-score). Global acute malnutrition (GAM)- (<-2 Z- score) included severely undernourished and moderately malnourished children in all the parameters.

3.5.1Prevalence of acute malnutrition based on weight-for-height z-scores

Boys were more affected than girls on all indices. Severe malnutrition was noted in 1.2% of the boys but there were no girls with severe malnutrition. In the age-group setting, severe wasting was only witnessed in 7.1% of 9-11 age-group of the children. Moderate wasting was distributed among other groups except 6-8 which had none, but was more (8.6%) in 12-17 age-group. Total wasting resulted to 7.9% in all the age groups.

Table 4: Prevalence of acute malnutrition based on weight-for-height z-scores by sex

Weight-for-height z-scores (95% C.I.) for males and females

	All n = 165	**Boys** n = 83	**Girls** n = 82
Global malnutrition (<-2 z-score)	(13) 7.9 % (4.7 - 13.0)	(10) 12.0 % (6.7 - 20.8)	(3) 3.7 % (1.3 - 10.2)
Moderate malnutrition (<-2 z-score and >=-3 z-score)	(12) 7.3 % (4.2 - 12.3)	(9) 10.8 % (5.8 - 19.3)	(3) 3.7 % (1.3 - 10.2)
Severe malnutrition (<-3 z-score and/or oedema)	(1) 0.6 % (0.1 - 3.4)	(1) 1.2 % (0.2 - 6.5)	(0) 0.0 % (0.0 - 4.5)
Total	13 (7.9%)	10 (12.0%)	3 (3.7%)

3.5.2 Prevalence of underweight based on weight-for-age z-scores (sex and age group)

Both girls and boys had underweight. The most affected were boys with 9.6% underweight (5.0-17.9, 95% C.I.), 8.4% moderately underweight (4.1-16.4, 95% C.I.) and 1.2% severely underweight (0.2-6.5, 95% C.I.). No severely underweight children were found in the girls' category.Moderately underweight in the age group categories was highest in children aged 12-17 (4.9%) months old while those severely underweight were found in the 18-23 age-group (1.7%).

The 6-8 age-group had no underweight children and no children were found with oedema (Table 5). In this study, the percentages of children aged 6- 23months who were underweight was 10 (6.1%).

Table 5 Height-for-age z-scores for age groups

Height-for-age z-scores for age groups

		Severe underweight (<-3 z-score)		Moderate underweight (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-8	11	0	0.0	0	0.0	11	100.0	0	0.0
9-11	14	0	0.0	2	14.3	12	85.7	0	0.0
12-17	81	0	0.0	4	4.9	77	95.1	0	0.0
18-23	59	1	1.7	3	5.1	55	93.2	0	0.0
Total	165	1	0.6	9	5.5	155	93.9	0	0.0

3.5.3 Prevalence of stunting based on height-for-age z-scores

Interpretation of the prevalence of stunting was done using the new prevalence index developed in 2019, by WHO-UNICEF (2021). Girls were more moderately stunted (15.9%, 9.5-25.3 -95% C.I.) than boys (13.3%, 7.6-22.2, 95% C.I.). Severe stunting was found in the 12-17 (14.8%) and 18-23 (6.8%) age groups out of 81 and 59 children respectively. Moderate stunting was found across all the age groups but majority (23.7%) were from 18-23 age group. In all the age groups, over 69% of the children presented with normal scores. Total stunted children in the daycare centers were 40 (24.2%).

3.5.4 Prevalence of overweight based on weight for height cut off's and by sex (no oedema)

Girls were more affected (23.2% 15.4-33.4, 95% C.I.) than boys (19.3% 12.2-29.0 95% C.I.) in the overweight category as well as in the severely overweight category (11.0% 5.9-19.6, 95% C. I.). Total overweight and severely overweight were 50 representing 30.3% of the children. Majority of overweight (28.4%) children were in the 12-17 age group while majority of severely overweight (11.9%) were in the 18-23 age group. No severe overweight children were detected in the 6-11 age groups.

3.5.5Factors associated with nutrition status

Many factors were assessed but those found significant were child age category **(**AOR = 26.082, C.I, 2.615-260.134, *P* = 0.005); marital status (AOR = 0.446, C.I, 0.212-0.939, *P* = 0.034) and MAD (AOR = 2.383, C.I, 0.427-13.282, *P* = 0.022), and were the predictors of the children's nutrition status among children 6-23 months old in daycare centers in Mwea, Kirinyaga County.

3.5.6 Association between socio- economic, demographic factors and complementary feeding practices

Table 6 shows results of the associated parameters. Child age (χ^2= 14.1, *P*- 0.003), mothers age (χ^2= 6.06, *P*- 0.041), mother's occupation (χ^2= 11.2, *P*-0.024), and household size (**χ^2=** 8.397**,** *P*-0.015) were significantly associated with complementary feeding practices. Those children aged 12-17 months were 3.452 more likely to meet the minimum acceptable diet as compared to those aged 18-23 months (OR = 3.452; CI, 1.624-7.339). In addition, those children aged 9-11 months were 3.538 times more likely to meet the minimum acceptable diet as compared to those aged 18-23 months (OR = 3.538; CI, 1.050-11.927).

Table 6 Socio- economic, demographic factors and complementary feeding practices

Socio- economic, demographic factors and complementary feeding practices

Category	Complementary feeding practices		χ^2	P value	OR	CI
	N	%				
Child age category	**Met minimum acceptable diet**		14.1	**0.003***		
6-8 months	2	1.2		0.775	0.786	0.151
9-11	7	4.2		**0.042***	3.538	1.050
12-17	40	24.2		**0.001***	3.452	1.624
18-23	13	7.9				
Child sex	**Met minimum acceptable diet**		0.004	0.952		
Male	31	18.8				
Female	31	18.8				
Mothers age	**Met minimum acceptable diet**		6.060	**0.041**		
< 20 years	2	1.2		0.070	4.750	.880
20-34 years	41	24.8		**0.034***	2.288	1.065
35-49 years	19	11.5				
Marital status	**Met minimum acceptable diet**		4.243	0.236		
Single	36	21.8				
Married	20	12.1				
Separated	3	1.8				
Window	3	1.8				
Mother's occupation	**Met minimum acceptable diet**		11.203	**0.024***		
Housewife	3	1.8		0.296	2.338	.475
Employed	7	4.2		0.342	1.679	.576
Business	28	17		**0.002***	3.233	1.512
Farmer	7	4.2		**0.038***	3.637	1.074
Casual worker	17	10.3				
Household size	**Met minimum acceptable diet**		8.397	**0.015***		
2 people	10	6.1		0.164	2.754	.662
3-4 people	49	29.7		**0.012***	5.087	1.422
5-6 people	3	1.8				

***Significance level P<0.05*

4.0 Discussions

4.1 Socio-demographic and social economic characteristics

The Socio-demographic and social economic factors influence the nutrition status of children aged 6-23 months. In this study, majority of the respondents were married and over a half of the households were headed by males. These finding are in agreement with the findings of the Kenya Demographic Health Survey 2022 (KNBS and ICF. 2023), and that of Beteb*et al,* 2017 in Ethiopia. Heads of households assign resources for food and other household requirements and are thus influential in the overall home decisions. Factors including source of income plays an important role in influencing the nutritional status of children (Korir, 2013)

Education is an important factor in the nutrition status and more than half (55.2%) of the respondents had undergone secondary education. The higher the education of the parents/guardians, the better was the nutrition status. An advancement in educational levels of mothers increased chances of better nutrition (KNBS, 2014). A recent study that concurs well with this one has shown that twenty-two percent of children born to mothers with no education are stunted, as compared to 9% of children born to mothers with higher education (Euphrasie, *et al.,* 2019).

However, the prevalence of stunting has decreased distinctly since 1993, with evidently decrease witnessed between 2008–09 (35%) and 2022 (18%)(KNBS and ICF. 2023). This could be accredited to easier caregiver access to learning services and probably due to government subsidies in the education sector. Regarding employment, slightly over 42% of the mothers were in casual labor and only slightly over 33% were in business. Those who were employed were a mere 12% and the income of most of them was low. Caregivers who were married were more than half, and over 50% of them had secondary education. These findings are in agreement to those of studies in Ethiopia by Tefera and Desalegn et al, where 94.4% of caregivers were married and approximately half (52.8%) had at least secondary education. In the same study, more than half (57.4%) of the children were male and about 40% were aged between 12 and 17 months old (Tefera, 2018; Desalegn *et al.,* 2019).

4.2 Feeding practices of children aged 6-23 months

4.2.1 Breastfeeding

Breastfeeding is a natural and beneficial way to provide nourishment to infants and young children. According to the World Health Organization (WHO, 2008), breastfeeding should be continued for up to two years of age and beyond. Breast milk provides essential nutrients, antibodies, and other substances that promote growth and development, and help protect against infections and diseases. As babies grow, breast milk continues to adapt to their changing nutritional needs. About 4.2% were never breastfed because of medical conditions of the mothers. By the time of conducting this study, 57.1% of the 9–11-month age group and 28.4% of 12-17 age group had stopped breastfeeding. According to FGDs, sickness of mothers contributed greatly to stoppage of breastfeeding: "*We could not breastfeed our babies after we were found infected with dangerous diseases. The health workers instructed us to refrain from breastfeeding children when we were found infected with HIV, TB and other diseases*". This was confirmed by KIIs in the health facilities: "*To avoid cross-infection, we advise mothers to stop breastfeeding immediately and feed the babies milk formulars and supplements; instruct them to attend clinics monthly for further check-up"*

4.2.2Introduction to solid and semi-solid foods

The recommended age for introduction of solid and semi-solid food is 6 months (Betebo et al., 2017). In this study, 51.5% were introduced to complementary feeding between 1 and 3 months. These findings on early introduction of solid foods resonates well with other findings in Kenya (Korir, 2013).Only 13.3% started complementary feeding at the recommended age of 6 months. Results from FGDs revealed that poverty contributed to early initiation of complementary feeding: "*We ate very little or skipped a meal because we didn't have enough food therefore breast milk was always little for the kid, making her/him to cry a lot. We were forced to look for something to feed the kid on to stop the hunger pains*". Dietary diversification is key in making sure that the child gets maximum nourishment (Shitemi*et al*., 2017). It requires that a child is fed from the main food groups- roots and tubers; legumes and nuts; cereal grains, dairy products; vitamin-A rich fruits, flesh foods (meat, and liver/organs); eggs and vegetables (Beyene*et al.,* 2015, WHO and UNICEF 2021). The World Health Organization recommends timely introduction of nutritionally adequate, safe and appropriate complementary foods (WHO & UNICEF, 2021). However, early introduction of complementary foods displaces breast milk and is associated with increased risk of malnutrition in children (Betebo et al, 2017). This could be the case in this study bearing in mind that a good percentage introduced complementary too early.

4.2.3 Minimum meal frequency

For a child to attain optimum growth, acceptable meal frequency is essential in ensuring optimal growth in children aged 6-23 months old as it is related to the total daily nutrient intake. Recommendations by WHO sets a minimum of two meals for breastfed infants aged 6-8 months old, a minimum of three meals for breastfed children aged 9-23 months and a minimum of four meals for infants and children aged 6-23 months who are not breastfed (WHO, 2008). Those children who did not meet minimum meal frequency were more than those who attained. Similarly, most non-breastfed children met the minimum meal frequency as compared to breastfed children. This is in agreement with the meal frequency among children reported in the Kenya Demographic Health Survey which reported that the minimum meal frequency for non-breastfed was more than the breastfed children (KDHS, 2002; KNBS and ICF. 2023).

4.2.4 Dietary diversity

Dietary diversity is the total number of food groups consumed in a day. Despite the benefits of consumption of a minimum of 5 out of 8 food groups as recommended by WHO (WHO 2017, WHO & UNICEF, 2021), majority of the children in this study had consumed food from 4 food groups mainly grains such as porridge, ugali, milk, rice, vegetables and fruits in that order. In order of frequency, the food groups with highest percentage of usage were dairy products, vitamin-A rich fruits & vegetables, cereal grains, other fruits and lastly breast milk, in that order.

These findings are similar to a study in done in the Republic of Congo by Ekesa et al. in 2011. Dietary diversity is an important factor in ensuring high quality diets and increasing the consumption of a variety of foods ensures adequate intake of nutrients hence improved nutritional status and health status. This study concurs with the Kenya Demographic Health Survey report (KDHS, 2022; KNBS and ICF. 2023).

On challenges on food diversity, FGDs revealed that poverty was the main cause of poor diversification: "*we bought what we could afford with the little we were paid regardless of the type. Even our children did not like some foods we gave them and sometimes vomited, forcing us to give them alternatives like Weetabix".* Cereal grains topped the list of the most frequently consumed food group (porridge, rice, ugali) in this study which are poor diet choices, most commonly associated with the low-income group. These findings resonate well with similar studies done elsewhere (Udoh&Amod, 2016; Shitemi*et al.,* 2017.

Dietary diversity scores have been found to be associated with WAZ, LAZ and WLZ of infants and young children. Our study agrees with another one done by Demmelash et al. (2020), who found an association between dietary diversity and WAZ, LAZ and WHZ.

4.2.5 Minimum acceptable diet (MAD)

Minimum acceptable diet achievement is a major challenge in many developing countries including Kenya. In this study less than a half of children (37.6%) achieved minimum acceptable diet. This is slightly more than the national study which found out that 31% of children aged 6–23 months were fed a minimum acceptable diet (KNBS and ICF. 2023). Those mothers who were self-employed/business were three times more likely to meet the minimum acceptable diet as compared to those who engaged in casual labor (OR = 3.233; CI, 1.512-6.915). Moreover, those mothers who were engaged in farming were four times more likely to meet the minimum acceptable diet as compared to those who engaged in casual labor (OR = 3.637; CI, 1.074-12.315). These findings resonate well with another study conducted by Mbagaya in Western Kenya (Mbagaya, 2009). These finding implies the need for caregivers to put more effort in providing quality and quantity of complementary foods given to their children.

4.2.6 **Hygiene** and sanitary **practices among children in daycare centers**

Hygiene practices and good sanitation involves various environmental aspects. These include access to safe drinking water, access to toilet facilities, hand-washing hygiene and environmental sanitation. Access to safe and clean drinking water and good sanitation is a human right as specified by United Nations General Assembly (WHO, 2011). In this study, 45% and 60% of households and daycare centers respectively had access to piped water. The rest of the water was got from vendors who fetched from nearby rivers. For the water sourced from vendors, majority of the households boiled water while majority of the daycare centers treated the water using chlorine tablets. Clean drinking water, access to basic toilet facilities and good hygiene is essential for the survival and development of young children.

According to WHO, 80% of the diarrhea cases globally are due to unsafe water, inadequate sanitation and insufficient hygiene (WHO, 2017). This study revealed that out of the sick children a whopping 66.7% had diarrhea episodes. This was well above the national figure of 14% reported in Kenya Demographic Health Survey of 2022 (KNBS and ICF. 2023). It means that either the drinking water or the environment were contaminated with disease agents and needed urgent attention. In the present study, 42. % reportedly boiled water before drinking, a higher percentage than that reported in another study done by Demmelash *et al.* (2020) who found that only 11.4% treated water by boiling. Others who treated water using chlorination were only 6.1%. Children are particularly vulnerable to infections at the weaning period, and poor food hygiene practice and subsequent diarrhea may contribute to stunting (Badriyah & Syafiq, 2017).Also, poor food hygiene practice is one of the major contributors to childhood diarrhea and up to 70% of diarrhea episodes in developing countries (Agustina *et al.,* 2013).

Control of human waste is as important as garbage collection since they contain disease agents which must not be let to multiply. In the present study, all the households had access to a toilet facility and these findings are similar to other findings by Korir (2013) in Nairobi and Bakari et al. (2017) in Kwale. Similarly, all the care centers had access to toilet facilities. Majority of the households had the ordinary pit latrine while the centers had VIP latrines. Flush toilets were also available at household and care centers. Safe containment of waste in households ensures that diarrheal disease agents are prevented from multiplication and transmission (WHO 2017). By practicing good hygiene and sanitary practices, caregivers can help reduce the risk of illness and infections among children aged 6-23 months. Parents and caregivers play a crucial role in promoting good hygiene and sanitation practices and should ensure that their children are following them consistently.

Hand-washing hygiene is a crucial activity which must be observed. A simple act of hand-washing at most critical times reduces water and sanitation diseases considerably (CDC, 2016). The rate of hand washing in this study was higher (after visiting the toilet- 30.3%; before feeding the baby 44.8%) than that reported in a similar study by Demmelash et al. (2020) which reported 9.3% and 8.9% respectively. However, a study conducted in Bangladesh by Luby *et al.,* (2009) reported that 59.2% and 43.2% of mothers always washed their hands with soap after toileting and before feeding, respectively, almost similar to the study.

In this study, most respondents reported using soap when washing their hands before feeding a child, after visiting the toilet or when preparing food. However, few reported washing their hands after changing diapers. This study concurs with that of Ongeta (2021) who found similar results. This is also in agreement with a study by Saleh *et al.* (2014) which found that global hand washing was between 2-35%. A study conducted in Bangladesh by Luby*et al.,* (2009) reported that 59.2% and 43.2% of mothers always washed their hands with soap after toileting and before feeding and concurs well with this study.

4.2.7 Child Morbidity pattern and health-seeking behavior

Child morbidity is a reflection of the prevalence of diseases within a population. This study found that 23% of the children had fallen sick two weeks prior to commencement. Most of the children had fever and cough representing 71.8% followed by diarrhea- 66.7%, vomiting- 38.9% and finally skin conditions with 25.6%. These are the main causes of infants and young child morbidity and mortality in Kenya (KNBS 2014).Robust health is significant for young children for strong immunity and appropriate growth.

About health-seeking behavior, 51.3% of the care givers sort assistance from public hospitals and clinics. These findings agree with study findings of Korir (2013) in Nairobi, and those of Macharia (2018) in Isiolo County and Bakari*et al,* (2017) in Kwale. Those who sort treatment from private clinics were only 15.4%. Others who sort assistance from various entities including community health workers (12.8%), herbal practitioners (5.1%), relatives (10.3%), and kiosks (5.1%). Reasons were varied including belief, proximity, time and knowledge. The high prevalence of diarrheal and vomiting match findings of a similar study by Korir (2013) in Nairobi. This could be due to the fact that a good number of household (52.7%) do not treat drinking water and more than 50% do not observe hand hygiene before engaging in household chores, after toileting and before feeding the babies.

Those household whose main source of income was formal employment were 0.139 times less likely to get sick as compared to those whose main source of income was farming (OR = 0.139; CI, 0.013-1.501). In addition, those household whose main source of income was business were 1.296 times more likely to get sick as compared to those whose main source of income was farming (OR = 1.296; CI, 0.310-5.418). Besides, those household whose main source of income was casual labor were 1.170 times more likely to get sick as compared to those whose main source of income was farming (OR = 1.170; CI, 0.292-4.682).

Regarding child vaccination status, 95.8% of children had been fully vaccinated. By three months, all the children had received the required vaccinations (100%), but by age 18-23 months only 89.8% had received the necessary vaccinations. A record by KDHS 2022, shown that vaccination record was seen for 76% of children age 12–23 months. Two percent of children age 12–23 months had received no vaccinations (KNBS and ICF, 2023). Hence there were children who had not yet to receive all the required vaccinations as shown in our study despite the spirited campaigns by both governmental and non-governmental organizations to have all children fully immunized. Our study resonates well with a study done in East African region aimed at determining factors influencing young child morbidity, which found that not all children between 6 and 24 months had received full immunization (Gewa& Leslie, 2015).

Deworming bi-annually is recommended to children, especially those within the age bracket of children in this study. However, little attention seems to have been given since out of 129 eligible for deworming, only 69.8% of children had received deworming tablets. Another essential component in child nutrition is vitamin A supplementation, yet about 4% of children were yet to receive any at six months. These findings, however, are lower than that of a study in the East African region where 33% of children had not received Vitamin A supplements (Gewa& Leslie, 2015).

4.2.8. Nutritional status of children in daycare centers in Mwea

Nutrition status of young children is often used as a nutritional representative of an entire population. Malnutrition, the major determinant of nutritional status is gauged using three main parameters; underweight, wasting and stunting. These results from inappropriate complementary feeding by caregivers. Nutrition status is a state of an individual's health in relation to their diet and nutrition. It includes an assessment of the adequacy of nutrient intake, the presence of nutrient deficiencies or excesses, and the overall impact of diet on health. Determining factors include age group, sex, activity level, medical conditions, medications, and food choices.

Knowing nutrition status of children is essential for their growth and development record. Young children require a balanced diet that includes all essential nutrients such as protein, carbohydrates, fats, vitamins, and minerals, to support their physical and cognitive development. Good feeding is a pre-requisite to good nutritional status in any given time of human life, as malnutrition is likely to strike those who lack nutritionally adequate diets.

Malnutrition in children aged 6-23 months consisting mainly of wasting, underweight and stunting is a serious concern as it can lead to stunted growth, weakened immune systems, and even death. In this study, it was affecting boys (12%) more than girls (3.7%) against global nutrition of 7.9%. This is in agreement with similar studies by Macharia, (2018) and Katepa-Bwalya et al. (2015) which had found that boys were more malnourished than girls. However, studies by Ndemwa *et al.* (2017) in Kwale County established that 18.9% of children were acutely malnourished, way higher than our findings.

Malnutrition in this age group can occur due to various factors such as inadequate dietary intake, poor feeding practices, and underlying health conditions leading to impaired intellectual performance, low productivity and increased risks of non-communicable disease hence increased risks of mortality (Mueni, 2007).

The prevalence of underweight (6.8%) observed in the current study were lower that reported by the Kenya Health and Demographic Health Survey of 2014 (KDHS, 2015) for children aged 6-59 months old where 11% were underweight. Wasting in our study was slightly higher (7.9%) than the 4% observed in that study. However, stunting was lower (24.2%) than the 26% reported in the same report. Girls were more moderately stunted (15.9%, 9.5-25.3 -95% C.I.) than boys (13.3%, 7.6-22.2, 95% C.I.). Difference could be due to the study demographics and set up. Severe stunting found in the 12-17 (14.8%) and 18-23 (6.8%) age groups indicate that older children were more likely to be stunted than younger children probably because younger children draw more attention than their counterparts. It was also noted that overweight children were more affected than the older children and affected more girls than boys. This is an indicator that older children and more so, older girls were more likely to be overweight than boys.

4.2.9 Factors influencing nutrition status of children

Many factors come into play when considering nutrition status of children. Factors significantly associated with nutrition status included child age category (AOR = 26.082, C.I, 2.615-260.134, $P = 0.005$); marital status (AOR = 0.446, C.I, 0.212-0.939, $P = 0.034$) and MAD (AOR = 2.383, C.I, 0.427-13.282, $P = 0.022$) and were main predictors. Likewise, those children who met the minimum meal frequency were 2.404 times more likely to have optimal nutrition status as compared to those who did not meet (OR 2.404; CI, 1.261-4.584); and those children who met the minimum dietary diversity score were 1.935 times more likely to have optimal nutrition status as compared to those who did not meet (OR 1.935; CI, 1.039-3.603) and beat malnutrition

Children whose mothers had a parity of more than three were shown to be malnourished compared to those whose mothers had a parity of three and below. Poverty and poor knowledge of mothers regarding child feeding practices are significantly associated with malnutrition (Kishoyian*et al.*, 2017). The contrast in the results could be due to differences in socioeconomic status and nutrition knowledge of caregivers.

Poor environment and lack of hand-washing are recipe for diarrhea, respiratory and helminths infections (Kihagi, 2012).These and others probably influenced care, health and nutrition status of the children. In the recent past, studies have found that wealthier households have undergone sharper decreases in malnutrition than poorer households. This could be because of easier access to health care services, increased wealth and improved sanitation (Headley &Hoddinoff, 2015; Saito *et al.,* 2016; Angdembe*et al.,* 2019). This study is in agreement with that of Cunningham *et al.,* (2017) which found that improvements in maternal education greatly influenced the outcome of nutrition status.

4.2.10 Association between socio- economic, demographic factors and complementary feeding practices

Social- economic and demographic factors have been shown to be significantly associated with complementary feeding. In the current study, the children who were from younger mothers, in business, farming or smaller households were significantly more likely to achieve the minimum meal frequency. Similarly, those children aged 12-17 months were three times more likely to meet the minimum acceptable diet as compared to those aged 18-23 months (OR = 3.452; CI, 1.624-7.339). In addition, those children aged 9-11 months were also three times more likely to meet the minimum acceptable diet as compared to those aged 18-23 months (OR = 3.538; CI, 1.050-11.927). Other studies including one by Korir (2013) established that occupation of mother and the age of mother were associated with achievement of minimum meal frequency of the children. Minimum dietary diversity, minimum meal frequency and minimum acceptable diet are the drivers of quality complimentary feeding for nutritional status of children aged 6-23 months, influenced by socio demographic and economic factors of the households (KNBS and ICF. 2023).

5.0 Conclusions

Child feeding practices were poorly variable and inadequate leading to poor nutrition since main meals of children lacked diversity, was less frequent, and minimum acceptable diet was not met for good nutrition, and were therefore exposed to increased risk of malnutrition. Washing hands with water and soap was a mere 41.2% depicting poor sanitary and hygiene practices. Likewise, poor food and water conservation lead to common illnesses like diarrhea (66.7%), fever (71.8%) and vomiting (38.9%). Deworming and children immunization was not complete thus aggravating more infections related to environmental conditions. Nutrition status was influenced by nutritionally inadequate foods, child's age, levels of education of the mother, poverty, hygiene, frequency and minimum acceptable diet per child.

5.1 Recommendations

Child feeding practices should be improved, nutrient-rich foods provided and nutrition guidelines on good feeding practices followed. Improvement in environmental and socioeconomic conditions especially on clean water, proper hygiene, and acquiring nutritional knowledge is paramount. Behavior of mothers to seek knowledge on best practices of food choices and frequency of feeding should be encouraged. Mothers should also be encouraged to continue breastfeeding during the second year of life and use cheap, locally available complementary foods to provide balanced minimum dietary supplements for their children. Infant and young child feeding guidelines especially on minimum meal frequency should be used as a base for nutritional education to all caregivers.

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Conflict of Interest

The authors declare that they have no competing interests.

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