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Original Article

Community Food Systems and the Nutritional Status of Children 6-24 Months in Obunga Slums, Kisumu Kenya: A Cross-Sectional Study

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ABSTRACT

Kenya is grappling with many public health problems; one of the most critical is childhood malnutrition. Underweight rates are 11%, stunting at 26%, and wasting at 4%. In Obunga slums, stunting was 40.2% for children below sixty months, underweight at 10.2%, and wasting at 9%. Globally, children between 6-24 months contribute the most to malnutrition among under-fives. Nevertheless, after 24 months, stunting, an indicator of chronic malnutrition, is irreversible. Obunga slums, compared to other slums in Kenya, registered the highest levels of stunting at 40.5% despite various interventions. Some of the risk factors that recurrently exist as determinants of nutritional status in urban slums are socio-demographic factors. Other potential factors that seem to be ignored are the food systems-related socio-demographics, which seem to be in constant aetiology. This study determined the relationship between community food systems and the nutritional status of children between 6-24 months. Specifically, to assess the nutritional status and determine the relationship between the community food system and nutritional status. A cross-sectional design was adopted, and households with a child aged 6-24 months in Obunga slums were included. A sample of 189 children was selected through a simple random sampling technique. A questionnaire was used to collect data on community food systems. The anthropometric assessment was used to collect data on the nutritional status of the children. Data analysis was done through descriptive statistics and binary logistic regression. The results reveal that the study had 189 children, 108 males and 81 females. Prevalence of wasting was at 3.2%, overweight at 6.9%, stunting at 27.0%, and underweight at 7.4%. Community Food Systems: An increase in the food sources increased the prevalence of underweight both at a (Crude O.R. =19.500, C.I. =1.61-236.61) and at an (A.O.R. = 21.331, C.I. =1.370-332.239). While frequency in the child consumption of food from restaurants/hotels increased wasting by 14 times (A.O.R of 14.52, C.I. = 1.39 -151.71 P<0.05). However, purchasing foods from restaurants and hotels reduced stunting by 0.13 times (A.O.R = 0.13, C.I. = 0.02 - 0.90, P<0.05). This study enumerated insight that may allow appropriate intervention programs to help align community food systems and mitigate child malnutrition in Obunga slums and other urban slums.

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INTRODUCTION

Child malnutrition has been a rural problem in developing economies. This trend is reflected in Kenya as well, in the national demographic health surveys (KDHS, 2022 n.d.). However, rapid urbanisation has led to the emergence of deprived urban neighbourhoods, commonly known as slums, that have a negative impact on the predictors of childhood undernutrition. Urban slums reflect higher than public health cut-off points for stunting, an indicator of chronic malnutrition, which is irreversible after 24 months. Obunga slums had the highest levels of stunting at 40.2% (Omondi & Kirabira, 2016). Improving children's diets from 6-24 months is highly instrumental as well-nourished children quickly accumulate human capital, such as cognitive skills, and subsequently higher incomes in adulthood. Food Environments, including markets and supermarkets, street foods and restaurant food, influence diet disparities, which influence health disparities (Neff et al., 2009).

Globally, disparities exist in the food environment in each country. In the US, large supermarkets have been found to sell a variety of cheaper foods due to their economies of scale (Neff et al., 2009; Treuhaft & Karpyn, 2010). The supermarkets are found chiefly in urban areas and are inaccessible to persons of low income and from rural regions (Neff et al., 2009; Treuhaft & Karpyn, 2010). In rural areas, more convenience stores are found amongst persons of low income and communities of colour. They usually stock more processed foods, few fresh items, and low-quality and less healthy foods compared to stores in high-income, predominantly white communities (Neff et al., 2009; Treuhaft & Karpyn, 2010). Research shows that access to supermarkets reduces rates of obesity as they have more diversity of healthy foods (Larson et al., 2009). In Kenya, however, a dietary revolution is happening among supermarket shoppers, with people eating more processed foods. This has led to an increase in Body Mass Index (BMI) and fasting blood glucose (Demmler et al., 2018). While shopping in the traditional (kiosks, small shops, daily markets) did not affect adult BMI (Demmler et al., 2018). Good market access among caregivers with nutrition knowledge increases the dietary diversity of children (Chikhungu et al., 2014; Hirvonen et al., 2017; Stifel & Minten, 2017). In Malawi, access to daily markets reduced stunting in children by up to 21% (Chikhungu et al., 2014).

Compared to the food that is prepared at home. Fast food restaurants serve bigger portions of foods high in calories, sugar, fat & sodium but very low in fruits & vegetables (Neff et al., 2009; Wilcox et al., 2013). Consumption of these foods

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increases adolescents' and children's daily total energy intake (Powell & Nguyen, 2013). It has been associated with increased adult BMI (Larson et al., 2009) and increased risk for adult chronic disease development (Wilcox et al., 2013).

On the other hand, street foods are sold in informal sectors and consist of cooked food, snacks and soft drinks (Claasen et al., 2016). Street foods are low in fibre and micronutrients but high in energy and fats (Claasen et al., 2016; Gupta et al., 2016). These foods pose serious health risks due to unhygienic preparation and handling of street foods (Alimi, 2016; Muinde & Kuria, 2005). The highest street food consumers are low-income, as persons of higher incomes usually prefer regulated fast-food outlets and supermarkets (Alimi, 2016). In Kenyan slums (Viwandani and Korogocho), street food consumption is high, as it is considered cheap, and there is no need to buy fuel to prepare it (Kimani-Murage et al., 2014). While in rural areas, street foods significantly contribute to the rural household income and may replace home-cooked meals because of easy accessibility (Claasen et al., 2016).

This research therefore sought to establish the relationship between community food systems and the nutritional status of children aged between 6-24 months, and this was done through two research questions.

- To assess the nutritional status of children between 6-24 months in Obunga Slums in Kisumu, Kenya.
- To determine the relationship between the community food systems and the nutritional status of children between 6-24 months in Obunga slums, Kenya.

RESEARCH METHODOLOGY

Study Area

The Obunga slums are located in Kisumu County, on the Eastwards side; the coordinates are -004'44" N and 34045'53E. It has a total land area of 1.39 sq. km. It encompasses five smaller regions: Kasarani, Central 1, Central 2, Kamaokowa and Sega Kamakura. Obunga slums are next to the Kisumu Industrial area; it has emerged due to a shortage of affordable housing in Kisumu City. Most persons are from the Luo and Luhya communities, with a few from other Kenyan ethnic groups, while the main religions in the place are Islam and Christianity.

Most people in the area are immigrants searching for work from the nearby rural areas with little to no education, thus making it difficult to get sustainable and well-paying jobs. Women have resorted to fishmongering as a source of income. Unfortunately, the fish sold in the Obunga slums is not fresh from the nearby Lake Victoria but remains from fish factories in Kisumu. To provide for their families, women have also resorted to brewing alcohol, which is illegal and quite lethal due to the use of forbidden substances to make it potent. On the other hand, the men are engaged as motorbike drivers or construction workers in nearby affluent areas; they also pull handcarts, locally known as mkokoteni. Most buildings are made of iron sheets and wood, and their condition is poor. The sewerage and drainage system are non-existent, there is no piped water, and few households have electricity.

Study Population

The study focused on children between 6-24 months residing in Obunga slums, plus their caregivers. As of the time of data collection, 274 households were listed as having children between 6-24 months. Listing was done to ascertain the actual numbers because Obunga slums have very rapid migration in and out of the slums. The household was the unit of analysis, and respondents were the caregivers with children between 6-24 months.

Inclusion Criteria consisted of households with children aged 6-24 months residing in the Obunga slums.

Exclusion Criteria: Households with children aged 6-24 months residing in the Obunga slums had deformities and abnormalities (congenital disorders.) The congenital disorders were established through observations, caregivers'

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reports, and child records in the Mother and Child Booklet.

Study Design

A cross-sectional design was adopted, where data was collected once and analysed. This design expedites the collection of quantitative data. It makes it easier to determine how the study's dependent and independent variables are related (Crossa, 2003). The design will enable the constitution of a hypothesis that can be subjected to analytical study. The merits behind cross-sectional design include exposure and outcome being measured simultaneously, data being collected once and then analysed, and it describes both absolute and relative risks.

Sample Size Determination and the Sampling Procedure

Sample Size Determination

The sample size was determined according to Fisher et al.,1998 formula (Jung, 2014) using the formula.

$$n = \frac{Z^2 pq}{d^2}$$

Where: n = represented the minimum sample size (for a population > 10,000) required, Z = the standard normal deviate at the required confidence level (set at 1.96 corresponding to 95%, Confidence level adopted for this study); p = population proportion estimated to be stunted in Obunga. This now stands at 40.2% (Okeyo, 2015), q = 1-p, d= level of statistical significance set (5%)

Therefore, on substitution

$$n = \frac{1.96^2 * 0.402 * (1-0.402)}{0.05^2} = 369.40$$

However, since the targeted population was 274 eligible households, the final sample size (nf) was adjusted as follows:

nf = n÷ {1÷(n/N)}

Where: nf = desired sample size (when the target population is less than 10,000) 1.742, n= desired sample size (when the target population is greater than 10,000), N= the desired sample size (target population)

nf= 274 ÷ {1+ (274/369.40)} = 157.29

A non-response rate of 20% was added to cover the anticipated non-responses and fouled (spoilt) questionnaires (Okeyo, 2016.)

157.29 + (20/100) 157.29 = 188.748 ≈ 189

Sampling Procedure

To select the 189 respondents' simple random sampling techniques were used. This was done in the following way.

- The first step was to assign all the households with children between 6-24 months numbers 1-274, having determined the population size of 274 and a sample size of 189.
- In Step 2, I established my starting point by closing my eyes, randomly opening a page, and dropping my finger.
- In Step 3, I wrote four pieces of paper to choose the direction (Up to down, down to up, left to right, and right to left), then I folded the pieces of paper, shook them, and chose the direction from left to right.
- In Step 4, I selected the first 189 unique numbers by reading from a table whose last three digits were between zero and 274. This was done because 274 is a 3-digit number.
- Numbers were not repeated once chosen.
- In Step 5, I chose a new starting point as I arrived at the end of the table before meeting my target of 189 unique numbers, and I changed the direction to up and down until I was done.

Data Collection Instruments

Questionnaire: A consolidated questionnaire was used to collect data on community food systems.

Anthropometric Assessment Form: An anthropometric data collection form was used to gather information on the children's height, weight, and age.

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Data Collection Procedures

Questionnaire

The researcher sat down with caregivers and asked questions in the interview, and they were answered. The data was input into Kobo Collect, an open-source mobile data collection platform, and all collected data has been safely stored in Geo-points.

Data was collected on community food systems, including supermarkets and markets, restaurants, and street foods.

- **Supermarkets and Markets:** Data was collected on access to supermarkets and traditional markets, which included open-air markets, local shops, and mama kibanda. Data was also collected on access to the same markets.
- **Restaurants and Street Food:** Data was collected on the availability of street foods and restaurants. Where restaurants were established, eateries that sold food and street foods were foods sold in the open air or semi-permanent structures. These foods were packaged foods or freshly cooked foods. The utilisation of these foods was measured by caregivers reporting if they had given these foods to the child in the week preceding the survey.

Anthropometric Assessment

This was measured through the recumbent length of each child. Each child's length was measured twice to the nearest 0.1 cm, and measurements were repeated when there was a deviation of >±0.5 cm. This was done through an infant/child length and height wooden measuring board by UNICEF. A child would be placed between the two slanting sides on their back. The head would gently be put against the top end, and the legs gently pushed downwards by the caregiver. The footpiece was slowly moved to the child until it pressed softly against the child's soles, and the child's feet were at right angles to the legs.

Weight was then measured to the nearest 0.1 g using the SECA Model 881 digital scale (SECA GmbH, Hamburg, Germany). The children would have minimal clothing to avoid errors.

The validity of the weighing scale was done by placing a standard 20-kilogram weight on the scale every morning to ensure the scale could accurately measure 20 kg. If any error was seen, the scale was adjusted. The standard weight would be placed on the scale three consecutive times to ensure it has similar results three times, ascertaining its reliability. The anthropometric measures were done by taking two measures of weight and two measures of height; if the weight measure varied by plus or minus 0.1 kg, it would be repeated. If the height measure varied by plus or minus 0.1 cm, it would also be repeated.

Pre-testing

The pre-testing was done on 19 respondents, who accounted for 10% (Whitley, Jr. & Kite, 2012) of the calculated sample, after which appropriate adjustments were made to the tool. The pre-testing was done in the Nyalenda slums, an informal settlement in Kisumu County. The results obtained helped to rework the questionnaire and standardise it.

Reliability and Validity

Reliability was done using the test-retest method, where the questionnaire was administered to the same respondents after one week. This was done to ensure that the participants understood the question that had been asked. Adjustments were then made to the questionnaire. Experts in nutrition and dietetics, including supervisors, colleagues in nutrition and dietetics, and representatives from the public health school, determined the questionnaire's content validity.

Measurement of Variables

Independent variables

The Independent variable was the community food systems, which comprise data and information on supermarkets and markets, restaurants, and street foods.

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- **Supermarkets and Markets:** As part of the food environment, purchases from supermarkets were determined by asking where the household buys food to feed the child. The utilisation of the same foods was also accessed.
- **Restaurants and Street Foods:** This comprised of restaurants, which were established premises selling cooked food that the caregiver has access to, while street foods comprised of foods prepared or sold in the streets or semi-permanent structures.

The information solicited was used to facilitate the assessment of community food systems that can influence the nutritional status of children living in Obunga slums between 6-24 months of age.

Dependent Variable

The nutritional status of the child was the dependent variable. This was treated as both a categorical variable and a continuous variable. The categorical variables were wasting, stunting and underweight, which reflect WAZ, LAZ, and WLZ below -2 standard deviations, below the population median, and overweight, the WLZ above 2 standard deviations above the population median. To measure the length for age Z Scores (LAZ), the child's length and age were plotted against the WHO Length for age growth charts. To measure weight for length Z-scores (WLZ), the child's weight and age were plotted against the WHO weight for length growth charts. To measure weight for age Z-Scores (WAZ), the child's weight and age are plotted against the WHO weight for age growth charts.

Data Analysis

Data was imported from Kobo Collect to Microsoft Excel. Anthropometric data and information were entered into the ENA for SMART Software. Scores for height and nutritional status were generated based on WHO Child Growth Charts and Reference 2007 charts for children aged up to two years. Then all the data was imported into the Statistical Package for Social Sciences (SPSS) Version 25 (Illinois, Chicago). Data analysis was done through descriptive statistics and Inferential Statistics. Frequencies and proportions presented data analysed through descriptive statics through tables and text. Binary logistic regression was done to determine the relationship between community food systems and the nutritional status of children between 6-24 months in Obunga slums. Crude Odds Ratio (COR) and Adjusted odds ratio (AOR) with Confidence Interval (C.I.) were then computed in binary logistic regression based on a 95% level of significance to test the strength of the association between nutritional status and community food systems in the Obunga slums.

Ethical Considerations

Ethics Approval

This study involved human participants, and all methods and procedures strictly adhered to the **Declaration of Helinski**. The study was reviewed and granted ethical approval by the Maseno University Ethics Review Committee (MUERC) [Ref Number: MSU/DRP/MUERC/00659/19] and also from the National Commission for Science, Technology, and Innovation [NACOSTI] in Kenya [Permit No: NACOSTI/P/19/73570/28259]. The Kisumu County Office permitted the study to be carried out [Ref No: ADM/4/8/VOL.XI/78].

Informed Consent

An **Informed Consent** was signed by the parent or legal guardian of the child aged 6-24 months before the study began, and a copy of the signed informed consent form has been kept. This was done to ascertain their willingness for their children to be part of the study. Before signing the informed consent, the participants were informed of the intent of the research and its benefits. They were allowed to participate or withdraw from the study at any time if they wanted to. Benefits of the study to the participant included free nutrition assessment of the child, and all the malnourished children would be linked with the nearest health facility for nutrition and medical care. All the participants were assured of confidentiality and

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anonymity. Data collection was done using Kobo Collect, and after collection, it was immediately uploaded to the private account of the researcher on the KOBO toolbox, where nobody could access it. The raw data was stored there, downloaded to SPSS, and shared only with the supervisors for guidance in data analysis to maintain confidentiality. Anonymity was assured by concealing the names of the participants and by using pseudo numbers.

RESULTS

In this chapter, the study's findings are presented under the following sub-headings per the study objectives: The nutritional status of children between 6-24 months and the relationship between community food systems and nutritional status.

Nutritional Status of Children between 6-24 Months

The study consisted of 189 children, and all the children completed the study. 108 (57.1%) males and 81 (42.9%) females aged 6-24 months. The prevalence of wasting was 6 (3.2%), and girls were more wasted as compared to boys at (4.9%) and (1.9%) percent, respectively. The prevalence of overweight was 13 (6.9%), and girls were still more overweight than boys at (9.9%) and (4.6%) respectively. The prevalence of stunting was (27.0%), with boys more stunted than girls at (31.5%) and (21%) respectively. The prevalence of underweight was at 7.4%, with boys more underweight at 9.3% and girls at 4.9%, as seen in *Table 1*.

Table 1: Distribution of children by nutritional status prevalence and sex

Nutritional Status Prevalence	Gender					
	Female		Male		Total	
	N	(%)	N	(%)	N	(%)
Wasted (<-2 z-score)	4	(4.9%)	2	(1.9%)	6	(3.2 %)
Overweight (>2 z-scores)	8	(9.9%)	5	(4.6%)	13	(6.9%)
Stunted (<-2 z-score)	17	(21%)	34	(31.5%)	51	(27.0%)
Underweight (<-2 z-score)	4	(4.9%)	10	(9.3%)	14	(7.4%)
Normal	48	(59.3%)	57	(52.8%)	105	(55.6%)

Community Food Systems and Nutritional Status

This was done by establishing the relationship between the two major blocks of community food systems, which included supermarkets and markets, restaurants and street food, and the nutrition status of children between 6-24 months in Obunga Slums, Kenya.

Supermarkets and Markets

Characteristics of Supermarkets and Markets

The results show the factors caregivers consider regarding supermarkets and markets. Most people bought food from local shops (84.7%) and local vegetable stalls (68.3%), as shown in *Table 2*.

Supermarkets and Markets Associated with Nutritional Status

The food sources were categorised, with one food source representing supermarkets as places of access to food, two food sources representing food access from both supermarkets and open-air markets, three food sources representing food access from supermarkets, open-air markets and local shops, and four food sources represented food access from supermarkets, open-air markets, local shops and local vegetable stalls. The results revealed that an increase in the food sources increased the prevalence of underweight both at a (Crude O.R. =19.500, C.I. =1.61-236.61) and at an (adjusted O.R. = 21.331, C.I. =1.370-332.239) as shown in *Table 3*.

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Table 2: Distribution of households by characteristics of supermarkets and markets

Characteristics		f	%
Source of Food	Supermarkets	18	9.5
	Open-air markets	90	47.6
	Local shops	160	84.7
	Local vegetable stalls	129	68.3
Distance of the supermarket from the house	Less than 1 km	6	3.2
	Less than Kim but more than 1 Km	6	3.2
	More than 5 km	13	6.9
	N/A (Do not buy from Supermarkets)	164	86.8
Distance of the open-air market from the house	Less than 1 km	52	27.5
	Less than 5 km but more than 1 Km	17	9.0
	More than 5 km	21	11.1
	N/A (does not usually go to the open market)	99	52.4

Table 3: Supermarkets and Markets Associated with Nutritional Status

Characteristics	Sig	Crude O. R	Confidence intervals	Sig	Adjusted OR	Confidence Intervals
WASTING						
Number of Food Sources						
1 food source	0.49	Ref	Ref	0.88	Ref	Ref
2 food sources	0.71	0.65	0.07 - 6.50	0.71	0.64	0.06 - 6.87
3 food sources	0.90	0.84	0.05 - 14.08	0.62	0.46	0.02 - 10.12
4 food sources	0.32	4.33	0.24 - 79.59	0.81	1.51	0.06 - 38.48
Distance of the Supermarket from the house	0.12	0.55	0.25 - 1.18	0.38	0.67	0.27 - 1.64
Distance of the market from the house	0.19	0.66	0.36 - 1.23	0.26	0.66	0.33 - 1.35
STUNTING						
Number of Food Sources						
1 food source	0.29	ref	Ref	Ref	0.35	ref
2 food sources	0.42	1.51	0.56 - 4.04	0.38	1.57	0.58 - 4.30
3 food sources	0.52	0.65	0.17 - 2.42	0.61	0.69	0.17 - 2.88
4 food sources	0.28	2.63	0.46 - 15.11	0.36	2.40	0.37 -15.56
Distance of the Supermarket from the house	0.55	0.87	0.55 - 1.39	0.63	0.88	0.52 - 1.49
Distance of the market from the house	0.54	1.08	0.84 - 1.39	0.88	1.02	0.77 - 1.36
UNDERWEIGHT						
Number of Food Sources						
1 food source	0.02	Ref	Ref	0.11	Ref	ref
2 food sources	0.68	1.57	0.19 -13.31	0.56	1.95	0.21- 18.15
3 food sources	0.40	2.69	0.26 - 27.48	0.26	4.65	0.33 - 65.61
4 food sources	0.02*	19.50	1.61 -236.61	0.03*	21.33	1.37 - 332.24
Distance of the Supermarket from the house	0.06	0.57	0.32 - 1.02	0.35	0.69	0.31 - 1.51
Distance of the market from the house	0.62	0.90	0.60 - 1.35	0.45	1.25	0.70 - 2.23

**p<0.05*

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Restaurants and Street Foods

Purchase of Food from Restaurants and Street Foods

The results below show only 14.8% of the caregivers bought food from restaurants, and 84.7% bought street food. In the week preceding the survey, only 3.7% of the children aged 6-24 months had consumed food from restaurants, while 64.6% had consumed street foods.

Table 4: Univariate analysis of restaurants and street foods

Characteristics		f	%
Purchase of food from restaurants/hotel	Yes	28	14.8
Frequency of food purchases from the restaurants/hotel	Daily	1	0.5
	Weekly	3	1.6
	Monthly	3	1.6
	Rarely	24	12.7
	Never	158	83.6
Consumption of food from the restaurants/hotels in the past week	Yes	7	3.7
Purchase of street foods	Yes	160	84.7
Frequency of purchasing street food	Daily	25	13.2
	Weekly	113	59.8
	Monthly	10	5.3
	Rarely	16	8.5
	Never	25	13.2
Consumption of street foods in the past week	Yes	122	64.6

Restaurants and Street Foods Associated with Nutritional Status

The results show the association between restaurant and street food and the nutrition status of a child. The results reveal that buying food from restaurants or hotels and child consumption of food from restaurants or hotels in the week preceding the survey were significantly associated with wasting and stunting. Where frequency in the child consumption of food from restaurants/hotels increased wasting by 14 times at (Adjusted Odd's Ratio of 14.52, C.I. = 1.39 -151.71 P<0.05). However, purchasing foods from restaurants and hotels reduced stunting by 0.13 times (Adjusted Odd's Ratio of 0.13, C.I. = 0.02 - 0.90, P<0.05).

Table 5: Restaurants and Street Foods Associated with Wasting

Characteristics	Sig	Crude OR	Confidence intervals	Sig	Adjusted OR	Confidence Intervals
Wasting						
Purchase of food from restaurants/hotel	0.22	3.02	0.53 - 17.33	0.95	0.91	0.06 - 1 4.27
Frequency of food purchases from restaurants/hotels.	0.03*	0.45	0.22 - 0.93	0.43	0.63	0.20 - 1.97
Child consumption of food from the restaurants/hotels	.003*	17.80	2.62 - 120.93	.025*	14.52	1.39 - 151.71
Purchase of street foods	0.93	0.90	0.10 - 8.03	0.49	0.32	0.01 - 8.18
Frequency of purchasing street food	0.98	1.01	0.52 - 1.96	0.51	0.71	0.26 - 1.98
Child consumption of street foods.	0.91	1.10	0.20 - 6.18	0.92	1.12	0.11 - 11.70

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Characteristics	Sig	Crude OR	Confidence intervals	Sig	Adjusted OR	Confidence Intervals
Stunting						
Purchase of food from restaurants/hotel	0.02*	0.18	0.04 - 0.77	0.04*	0.13	0.02 - 0.90
Frequency of food purchases from restaurants/hotels.	0.09	2.09	0.89 - 4.92	0.77	0.86	0.32 - 2.35
Child consumption of food from the restaurants/hotels	0.45	0.44	0.05 - 3.75	0.78	0.70	0.06 - 8.28
Purchase of street foods	0.09	2.60	0.86 - 7.88	0.07	4.60	0.89 - 23.80
Frequency of purchasing street food	0.29	0.86	0.65 - 1.14	0.36	1.25	0.77 - 2.04
Child consumption of street foods.	0.48	1.28	0.65 - 2.54	0.71	1.18	0.50 - 2.81
Underweight						
Purchase of food from restaurants/hotel	0.95	0.96	0.20 - 4.52	0.41	0.37	0.03 - 3.82
Frequency of food purchases from restaurants/hotels.	0.41	0.75	0.37 - 1.51	0.54	0.72	0.26 -2.02
Child consumption of food from the restaurants/hotels	0.05	5.67	0.99 - 32.32	0.07	7.41	0.88 - 62.66
Purchase of street foods	0.91	1.10	0.23 - 5.17	0.57	0.52	0.05 - 5.10
Frequency of purchasing street food	0.68	0.91	0.56 - 1.46	0.61	0.83	0.40 - 1.72
Child consumption of street foods.	0.58	1.41	0.42 - 4.67	0.55	1.63	0.33 - 8.12

*p<0.05

DISCUSSION

The Nutritional Status of Children

The results reveal that the prevalence of stunting was 27%, which was higher than both the global levels, where 22.3% of children are stunted (WHO, 2023). The newly released Kenyan demographic health survey shows that stunting has decreased to 18% (KDHS, 2022). The report shows that children in urban areas have improved nutrition status, with stunting at 12%, and in rural areas, the levels were at 20%. The nutrition rural-urban divide is usually a result of food availability, higher purchasing power, access to health care, education, good sanitation & clean water, which improve the nutrition status of children (Fagbamigbe et al., 2020; FAO et al., 2023). However, slum areas lack these protective factors. Studies consistently show that slum areas report very high levels of malnutrition (Abuya et al., 2012; Kimani-Murage et al., 2015; Omondi & Kirabira, 2016). The data also reveals that wasting was at 3.2%, lower than the national level of 5%, while overweight was at 6.9%, higher than the national level of 3% (KDHS, 2022). The rising levels of overweight children were also seen among slums in Nairobi at 9% (Kimani-Murage et al., 2015) and India, with overweight at 11% (Bhattacharyya et al., 2021). These results show the need for longitudinal studies that could help better understand the causes of the double burden of malnutrition in urban slum areas.

Relationship between Community Food Systems and Nutritional Status

The results show that most caregivers bought food from the local shops and vegetable stalls around the homes, and were easily accessible by foot. The

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presence of supermarkets and markets has been shown to affect nutrition outcomes differently among adults. In high-income countries, the presence of supermarkets reduced obesity (Larson et al., 2009; Neff et al., 2009; Treuhaft & Karpyn, 2010). While in low-income countries, supermarkets increase obesity (Demmler et al., 2018; Khonje et al., 2020). In Obunga slums, in this study, it was seen that access to markets, supermarkets, and local retailers increased the prevalence of underweight, which was in contrast with other studies that showed access to daily markets decreased stunting (Chikhungu et al., 2014; Hirvonen et al., 2017). The results were also in total contrast to a study in rural Kenya by Debela et al. (2020), which showed that purchasing food from supermarkets reduced stunting, underweight and wasting. In Zambia, purchases from local retailers also increased child height (Khonje et al., 2020). The contrasts are seen because supermarkets have been shown to have improved variety and food diversity. However, they sell more processed foods than traditional markets (Khonje et al., 2020). Thus, caregiver knowledge of purchasing might have led to the negative effect of markets & supermarkets on weight for age z-scores in Obunga slums.

Street foods have been considered time-saving and relatively cheap, as they can be bought in small quantities. However, they are usually inadequate due to poor nutrient density and might not be safe; street food consumption was high, with over 80% of caregivers purchasing it. This was in line with data from Kenyan urban slums (Kimani-Murage et al., 2015). However, very few caregivers purchased food from hotels at less than 15%. Child consumption of restaurant/hotel food in the week preceding the survey increased wasting, but interestingly, the purchase of restaurant foods slightly reduced stunting. These results reveal the need for a longitudinal study that would be able to understand why there is an enormous increase in wasting. While high Street food consumption was not associated with either positive or negative outcomes on nutrition status. In other studies, however, consumption of street foods has been shown to worsen nutrition outcomes in children (Prasodjo et al., 2017). These might be due to their unhygienic preparation and handling of the foods (Alimi, 2016).

CONCLUSION

The focus of this study was on potential risk factors for malnutrition among children in urban slums, which seem to be ignored. The study had 189 children, and it was realised that consumption of foods from restaurants/hotels increased stunting. However, at the same time, the purchase of food from restaurants/hotels reduced stunting slightly. While an increase in the food sources increased the prevalence of underweight. The study reveals that food sources and food consumption from restaurants/hotels might be a source of malnutrition, thus the need to conduct longitudinal studies to understand better these factors and the outcomes over a long period. The study also has enumerated insight that may allow appropriate intervention programs to help align community food systems and mitigate child malnutrition in Obunga slums and other urban slums.

DECLARATIONS

Consent for Publication

Not applicable.

Availability of data and materials

Data is available upon request from the corresponding author.

Competing Interest

The authors declare that they have no competing interests.

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Authors Contributions

UK, CA & DO contributed significantly to the conception and design, data collection, analysis,

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and interpretation; participated in the writing of the article or critically revised it for important intellectual content; agreed to submit it to the current journal; gave final approval of the version to be published; and agreed to be responsible for all aspects of the work.

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