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Original Article

Seasonal Variations in Food Insecurity Prevalence of Mother-Child Dyads in Seme Sub-County, Kisumu, Kenya

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ABSTRACT

Food insecurity remains a major impediment to the attainment of adequate health outcomes among the population. This is attributable to the adverse implications that food insecurity poses on the nutritional status of the populations. Globally, in the year 2021, an estimated population of 3.1 billion people (42%) faced unprecedented food crisis evident by inability to afford a healthy meal. Meanwhile, global rates of stunting attributable to food insecurity among children under the age of sixty months was 22.3%. In Kenya, close to 32% of the populations are acutely food insecure and require urgent food insecurity interventions. Kisumu County is a food import county; hence, decline in food supplies in the counties it depends on for food supply results in food crisis amongst its populace. Women and children are disproportionately affected by food insecurity due to gender and age related factors. Rural populations are often worse affected by food insecurity as evident by high rates of stunting experienced in rural areas when compared to overweight rates that are more in urban areas. It is on this basis that we sought to assess the prevalence of food insecurity among mother-child dyads drawn from Seme Sub-County, a rural area in the County of Kisumu, Kenya. We used a longitudinal study design adopting repeated cross-sectional measures to assess food security status of a sample of 201 mother-child pairs during planting and harvesting seasons. Food security status of mothers was assessed quantitatively using Household Food Insecurity Access Scale. Children's food security status was assessed using Prevalence of Undernourishment as indicated by the anthropometric measurements. Qualitative data were further synthesized using Key Informant Interviews and Focus Group Discussions to complement quantitative data on prevalence of food insecurity among mother-child dyads. Data was analysed descriptively to indicate proportions of mothers and children depicting various food insecurity classifications. The mean HFIAS score for season I; 11.22 (± 5.36 SD) was statistically significantly different (higher) than mean HFIAS score for season II; 9.63 (± 5.18 SD) at $\alpha \leq 0.05$ (t-test: p=0.003). During planting season, a majority of the mothers; 134 (70.9%) experienced severe food insecurity prevalence and during harvesting season, a majority of the mothers; 117 (61.9%) experienced severe food insecurity prevalence. In planting season, almost three-quarters of the children; 137 (72.5%) were food secure as they had normal weight-for-age Z score (were not underweight). On the other hand, slightly higher than

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average; 102 (54.0%) of the children were food secure during harvesting season. These findings demonstrate suboptimal variations in prevalence of food insecurity across the two seasons. Mothers were more likely to experience severe food insecurity prevalence than children. Thus, there is a need to develop adequate interventions aimed at optimizing intra-household food distribution dynamics as means of ensuring adequate food security for both mothers and children in the study area.

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INTRODUCTION

Food security occurs as one of the major determinants of individual's nutritional status; hence, is a core determinant of population health (Cole et al., 2018). Food security connotes to situations where all household members can sustainably economic, social, and physical access to food that is prepared and provided in a hygienic environment (Militao et al., 2023). The food should further be nutritious and should meet dietary needs and food preferences of the household members (Deaton & Scholz, 2022). This means that food security comprises of different dimensions, which are inter-related. Food availability is one the dimensions and it manifests in having food in sufficient quantity and quality that satisfy individual dietary needs and preferences. Food access is the second dimension that manifests when an individual or household has the financial means that enable them to acquire food. The third component is food utilization, which refers to having access to an adequate diet clean water, and hygiene services that enable an individual to use the food consumed to nourish themselves and meet their physiological needs (Manikas et al., 2023). The fourth component, food stability, connotes to the ability to cope with food insecurity-related shocks.

Food insecurity often manifests in the form of hunger, which is a painful sensation attributable to lack of food (Wrabel & Caiafa, 2018). A reflection on the prevalence of hunger attributable to food security shows that it remained the same from the year 2021 to 2022 where close to 9.2% of the world's population were affected (FAO, IFAD, et al., 2023). This prevalence shows an increase from the 7.9% that was reported in the year 2019. An estimated population of 735 million people experienced hunger in the year 2022 compared to 122 million people who experienced hunger in the year 2019. It is projected that by the year 2030, close to 600 million people will be chronically undernourished as a result of food insecurity (Beyene, 2023). In Africa, it is estimated that 20% (282 million people) of its population are facing an unprecedented food crisis resulting in acute food insecurity (FAO, AUC, et al., 2023). Ensuing analysis of food security situation in Africa shows that the continent is off-track in meeting the food and nutrition security

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targets enshrined in the Sustainable Development Goals.

In Kenya, statistics from the 2023 show that there was an unprecedented deterioration in food security situation whereby more than 5.4 million Kenyans were acutely food insecure (FEWS NET, 2023). In Kisumu County, the food poverty rate is 61%, which means that most of it residents acquire food using socially unacceptable means (FEWS NET, 2023). Women and children bear a huge burden of food insecurity, whereby they are often disproportionately affected by food insecurity crisis (Savary et al., 2022). Populations drawn from rural areas are often worse affected by food insecurity; hence, food insecurity crisis is further exacerbated amongst women and children drawn from rural regions such as Seme County in Kisumu County, Kenya. The objective of this study was to assess seasonal variations in food security status of mother-child dyads in Seme Sub-County, Kisumu County, Kenya. Thus, this paper reports on season variations in food insecurity prevalence of mothers and children aged 12-36 months drawn from Seme Sub-County, Kenya.

MATERIALS AND METHODS

The study used a longitudinal study design whereby repeated observational community based cross-sectional descriptive surveys were undertaken on mother and child pairs from Seme Sub-County of Kisumu County, Kenya. Precisely, data on food security status of mothers and children were collected during two study periods; planting and harvesting seasons. Quantitative data on mothers and children food security status were collected from the sampled mother-child dyads. Qualitative data that complemented data on food security status were collected through Key Informant Interviews (KII's) and Focused Group Discussions (FGD's). Food security status of mothers was accessed using Household Food Insecurity Access Scale (HFIAS) whereas that of children was collected using Prevalence of Undernourishment (PoU).

The study recruited a sample of 201 mother-child dyads from a total of 508 mother-child dyads identified from the records kept by the Community Health Promoters (CHP's) in the Sub-County. The 201 mother-child dyads were proportionately recruited from the four (4) electoral wards of Seme Sub-County. Systematic random sampling approach was used to select individual participants from each of the four electoral wards of Seme Sub-County, Kenya. Participants for KIIs and FGDs were purposively recruited as means of allowing diversity of responses for the qualitative data. The KIIs comprised food security experts whereas the FGDs primarily comprised of selected participants occupying positions of influence in their households.

Data on prevalence of food insecurity was analysed descriptively as a means of depicting proportions of each food security status of the mother-child respondents. For mothers food security status, the HFIAS tool comprised nine (9) questions that were evaluated together in order to enable quantitative assessment and classification of food insecurity prevalence categories. The HFIAS is based on 30-day recall and comprises of two types of questions; nine "occurrence" and nine "frequency of occurrence" questions. As such, a participant is initially asked if a given food access condition was experienced (yes or no), if the response is affirmative, the participant is further asked on the frequency of occurrence (rarely, sometimes, or often). The questions speak of experiences attributed to different levels of food insecurity severity, which constitute a measurement scale. Responses from HFIAS can be transformed into categorical or continuous indicators of food security. On a continuous scale, scores for each response to the frequency of occurrence question(s) are summed up (rarely=1, sometimes=2, often =3). As such, a higher score demonstrated increased household food insecurity experiences. On a categorical scale, HFIAS scores were transformed into categories derived during analysis whereby frequency of occurrence was coded as "0" for all the cases whereby the response to corresponding occurrence HFIAS

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question was "no" before assigning the food insecurity category codes; 1=food secure, 2=mildly food insecure access, 3=moderately food insecure access, and 4=severely food insecure access. Therefore, prevalence of household food insecurity (household food insecurity access prevalence) was calculated and mother's food security status classified into four categories; food secure, mildly food insecure access, moderately food insecure access, and severely food insecure access (*Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide | Food and Nutrition Technical Assistance III Project (FANTA)*, n.d.).

Food security status of children was assessed based on PoU as indicated by weight-for-age Z score; hence, children food security status was classified into three categories; food secure (normal weight-for-age Z score; ≥ -2), moderately food insecure (moderate malnourished; < -2 to ≥ -3 weight-for-age Z score), and severely food insecure (severely malnourished; weight-for-age Z score; < - 3). Quantitative data is presented in the form of tables and figures. Qualitative data were analysed manually through triangulation based on emergent themes. The qualitative data were presented verbatim with quantitative data.

RESULTS

The study targeted 201 participants; however, twelve (12) questionnaires were rejected for being incomplete; hence, a response rate of 97.9% was attained. *Table 1* shows varying food insecurity-related experiences and coping strategies of mothers during season I. Mean HFIAS score for season I was 11.22 (± 5.36 SD). The highest score reported in season I was 26 out of the possible 27 as reported by 1(0.5%) of the mothers. The lowest score for the same season was 0 as reported by 1(0.5%) of the mothers.

Table 1 Mother's food insecurity experiences and coping options season I

Food Insecurity domain	No	Rarely	Sometimes	Often
	n (%)	n (%)	n (%)	n (%)
Fear to lack enough food	29(15.3)	54(28.6)	58(30.7)	48(25.4)
Failed to eat preferred foods	27(14.3)	60(31.7)	70(37.0)	32(16.9)
Reduced food varieties	28(14.8)	46(24.3)	62(32.8)	53(28.0)
Eat food they really didn't want	26(13.8)	73(38.6)	59(31.2)	31(16.4)
Eat smaller portions of food	34(18.0)	48(25.4)	67(35.4)	40(21.2)
Reduced eating times	47(24.9)	51(27.0)	52(27.5)	39(20.6)
No food at all	107(56.6)	48(25.4)	29(15.3)	5(2.6)
Slept unsatisfied	90(47.6)	69(36.5)	21(11.1)	9(4.8)
Gone hungry day and night	141(74.6)	33(17.4)	13(6.9)	2(1.1)
Mean HFIAS: 11.22 (± 5.36 SD)				

Mother's food insecurity experiences and coping options generated using descriptive statistics (frequencies, mean, Standard Deviation (SD), and proportions)

Table 2 shows varying food insecurity-related experiences and coping strategies of mothers during season II. Mean HFIAS score for season II was 9.63 (± 5.18 SD). For season II, the highest HFIAS score reported was 27 reported by 1(0.5%) mother whereas the lowest score was 0 reported by 7(3.7%) mothers.

Table 2 Mother's food insecurity experiences and coping options season II

Food Insecurity domain	No	Rarely	Sometimes	Often
	n (%)	n (%)	n (%)	n (%)
Fear to lack enough food	37(19.6)	54(28.6)	69(36.5)	29(15.3)
Failed to eat preferred foods	33(17.5)	61(32.3)	70(37.0)	25(13.2)
Reduced food varieties	42(22.2)	50(26.5)	70(37.0)	27(14.3)
Eat food they really didn't want	38(20.1)	79(41.8)	51(27.0)	21(11.1)
Eat smaller portions of food	45(23.8)	61(32.2)	64(33.9)	19(10.1)

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Food Insecurity domain	No	Rarely	Sometimes	Often
	n (%)	n (%)	n (%)	n (%)
Reduced eating times	50(26.5)	62(32.8)	56(29.6)	21(11.1)
No food at all	92(48.7)	68(36.0)	22(11.6)	7(3.7)
Slept unsatisfied	114(60.3)	58(30.7)	15(7.9)	2(1.1)
Gone hungry day and night	155(82.0)	29(15.3)	4(2.1)	1(0.5)
Mean HFIAS: 9.63 (± 5.18 SD)				

Mother's food insecurity experiences and coping options generated using descriptive statistics (frequencies, mean, Standard Deviation (SD), and proportions)

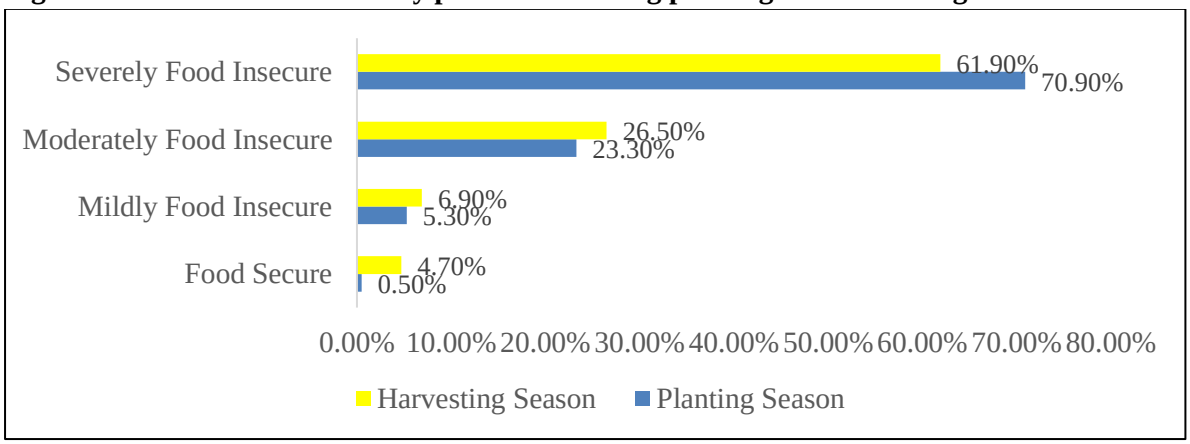
The mean HFIAS score for season I; 11.22 (± 5.36 SD) was statistically significantly different (higher) than mean HFIAS score for season II; 9.63 (± 5.18 SD) at $\alpha \leq 0.05$ (t-test: p=0.003). This shows that there were variations in food security status of the mothers across the two study seasons.

During planting season, a majority of the mothers; 134 (70.9%) experienced severe food insecurity prevalence and during harvesting season, a majority of the mothers; 117 (61.9%) experienced severe food insecurity prevalence as shown in *Figure 1*.

Information from the FGDs demonstrated a constant state of worry among household members on due to apparent household hunger attributable to limited ability to earn sustainable livelihoods that can enhance their purchasing power.

> *" … In most cases, it is a challenge to provide foods for my family on a sustainable basis. This creates a feeling of shame as a family provider "bread winner" tasked with the responsibility of catering for my family.* (Male FGD, 2022).

Figure 1: Mothers food insecurity prevalence during planting and harvesting seasons



In planting season, almost three-quarters of the children; 137 (72.5%) were food secure as they had normal weight-for-age Z score (were not underweight). On the other hand, slightly higher than average; 102 (54.0%) of the children were food secure during harvesting season as shown in *Table 3.*

This study reports an observed weight-for-age Z score mean of -0.69 (±1.06 SD) and -1.18 (±1.28 SD) during season I and season II, respectively. The mean weight-for-age Z score for season I; -0.69 (±1.06 SD) was statistically significantly higher than the mean weight-for-age Z score for season II; -1.18 (±1.28 SD) at $\alpha \leq 0.05$ (t-test, p<0.0001).

Information from the KIIs showed that coping strategies adopted by households affected by food insecurity were likely to compromise the overall food and nutrition security of the children.

> *"… Households use different "food buffering" options where preference for food provision may be given to household members considered more vulnerable such as the elderly, the sick, and children …"* (KII_3, 2022).

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Table 3: Children's food (in) security status (PoU) planting and harvesting seasons

	Planting season		Harvesting season	
Food Security Status	**n**	**%**	**n**	**%**
Food Secure	137*	72.5*	102*	54.0*
Moderate Food Insecurity	46	24.3	59	31.2
Severe Food Insecurity	6	3.2	28	14.8

*Children's food security status prevalence categories generated using descriptive statistics (frequencies and proportions), *: majority of the participants*

DISCUSSION

The projected reduction in food security correlated with risks posed by climate change to mothers in Sub-Saharan Africa (SSA) in indigenous communities is challenging, complex, and under-researched. A high proportion of lactating mothers globally are highly vulnerable to nutritional deficiency due to dietary monotony and food insecurity, which are significant under-nutrition determinants (Singh et al., 2020). The real definitions of food security abound since its revolution shifted from emphasizing on food access and production (Krause et al., 2019). Embracing Food and Agriculture Organization's view at the 1996 Global Food Summit is vital because it postulates that the meeting achieves Food security; "all people, at all times, have economic and physical access to nutritious, safe, and sufficient food to meet their food preferences and dietary needs for a healthy and active life." According to a previous empirical recommendation (FAO et al., 2021) food security encompass four dimensions namely; stability, access, availability, and utilization. Globally, another research (Birch, 2014) affirms that SSA leads in under-nutrition prevalence, with more than 22% of the population suffering from malnutrition. This is attributed to climate change, which is affiliated with dwindling food security and propagating undesirable health outcomes (Gallegos et al., 2023).

Mothers in low-resources regions are susceptible to adverse health impacts due to climate change that derails food production (Chanza & Musakwa, 2022). Another empirical research (Singh et al., 2020) on food insecurity and dietary diversity among lactating women in Nepal Mountains used the Minimum Dietary Diversity Score tool to measure food insecurity and dietary diversity in Bajhang District. The study confirmed that dietary diversity and food security were low at 53.5% and 54.0%, respectively. In the present study, severe food insecurity prevalence of mothers was higher; 137 (71.0%) and 121 (62.7%) in season I and season II, respectively. The high prevalence of severe food insecurity in season II, albeit being a harvesting seasons may be as a result of poor agro-ecological conditions of the study area, which may not guarantee sufficient food production (Gewa et al., 2021). According to earlier experiential research (Ingutia & Sumelius, 2022), women encounter constraints in accessing an adequate and quality diet due to limited food production. Hence, ensuring inevitable food security among indigenous societies depend on continuous access to sufficient traditional food resources in households during drought seasons. The above findings correlate with the previously mentioned earlier study (Singh et al., 2020) where mothers with a minimum dietary diversity were 8.5 times food insecure compared with elevated dietary diversity during drought seasons.

A correlation of findings drawn from the current study are observed in another study done in Zambia, Malawi, and Zimbabwe (Kiptot et al., 2014). The study indicated that most households adopt varying coping options when dealing with hunger emanating from drought. Foods such as fruits and its products gathering in Central and West Africa is a known coping strategy during periods of food insecurity, particularly in semi-arid areas during lean seasons (Vall et al., 2011). Seasonal variations in consumption, availability, and food production are typical in subsistence agricultural economies such as those of the study area; Seme Sub-County. Deductively, mothers drawn from the present study setting; Seme, Sub-

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County are vulnerable to substantial alterations throughout the year due to high food costs in the local market and crop production variability (Gewa et al., 2019). In summary, financial constraints may persuade mothers to purchase staple food rather than a diverse diet for sustainability (Adeyanju et al., 2023).

CONCLUSION

The study observed that mothers were more predisposed to severe food insecurity prevalence during both study seasons. On the other hand, a high proportion of the children were food secure during both study seasons. However, a high proportion of children were food secure during planting season when compared to those who were food secure during harvesting season. This shows that intra-household food distribution dynamics might have favoured adequate food provision to mothers than children. As such, there is a need for development of strategies that can enhance adequate intra-household food distribution in the study area.

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Availability of Data and Materials

As per the privacy and confidentiality provisions in the informed consent, the dataset generated and analysed for the study are not available publicly. However, data can be obtained from the corresponding author (kenkipton@gmail.com) upon reasonable request.

Author's Contributions

The author's responsibilities were as follows: KKT developed the research protocol and manuscript, ACO and CO reviewed/revised the study protocol, and data collection approaches. KKT performed data entry, cleaning, analysis and reporting. All authors made equal contributions to the development of the manuscript.

Ethics Approval and Consent to Participate in the Study

A research permit was sought from the National Commission for Science, Technology, and Innovation. Ethical clearance was obtained from Institutional Scientific Ethics Review Committee of the University of Eastern Africa, Baraton (Approval Number: UEAB/ISERC/02/01/2023). Informed written and voluntary consent was obtained from all the participants and data was anonymized to ensure confidentiality.

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