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The Burden of Malnutrition among Children: A Case of Kisumu County

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Abstract

The combination of childhood underweight and overweight are challenges facing Kenya and Sub-Sahara Africa. The prevalence of these forms of malnutrition has been escalating with the main causes being poor policies and household food insecurity. This study aimed at assessing the prevalence and determinants of childhood underweight and overweight in Kisumu County, Kenya. A quantitative cross-sectional study design was employed with 415 children aged below 24 months recruited in the study. Children were grouped into age strata then randomly selected into the study. Child's weight, date of birth was collected and Weight for Age Z-scores calculated based on WHO Z-scores. Chi-square tests analyzed the association between childhood malnutrition and the independent variables while multinomial logistic regression determined the effect of outcome variable on the independent variables. The level of significance was set at P≤0.05. A total of 10% and 13% of children were underweight and overweight respectively. Only 47% of children were exclusively breastfed with 17% having stopped taking breast milk when they were aged 6 months and below. Chances of being underweight were 4 times high for children aged between 6 to 12 months [RRR: 4.959: 95% CI: 1.278-19.248; p=0.021], 5 times high for those whose mothers were either single or divorced or married [RRR: 4.581: 95% CI: 1.778 -11.801; p=0.002] while risks of being overweight were 50% high among still breastfeeding [RRR: 4.761: 95% CI: 1.251–18.114; p=0.022] and 30% high for those whose parents paid house rent of more than Ksh 3,000 per month [RRR: 3.344: 95% CI: 1.199–9.325; p=0.021]. Strategies to promote education on breastfeeding, house ownership, marriage, child care and nutrition interventions targeting children below two years were recommended.

Keywords: Malnutrition, Underweight, Overweight, WHO Z Scores, Kisumu

BACKGROUND

The combination of childhood underweight and overweight are challenges facing the health sector in Kenya and other Sub-Saharan African Countries. Higher cases of childhood underweight and overweight are now new norms in developing nations (Micha *et al.*, 2020). The combination of these forms of malnutrition reflects the two sides of one predicament in a similar population with the surge in these cases warranting urgent interventions (M De Onis *et al.*, 2003; Elizabeth, 2019; Micha *et al.*, 2020). Over 190 million children in the world are underweight compared with the WHO growth standards with Africa carrying the highest-burden (Black *et al.*, 2008; World Health Organization, 2014b). The prevalence

has been escalating and has resulted in more than 4 million deaths with the main cause being high levels of food insecurity, famine, poverty and poor policies (Black et al., 2003; Caulfield, de Onis, Blössner, & Black, 2004; Mercedes De *et al*., 2003; Luo & Hu, 2002; Von & Joachim, 2007). Even though Kenya recorded a slight decline in childhood underweight from 16% in 2009 to 11% in 2015, the efforts to combat this are still very low. A total of 7% of children in Kisumu County were found to be underweight (KNBS & Macro ICF, 2010, 2015; Masibo & Makoka, 2012). According to KDHS 2015 report, the proportion of children who are underweight in Kenya was 11%, a prevalence that was slightly lower than Tanzania 14%, Uganda 13% Algeria 3.7% (Kenya National Bureau of Statistics et al., 2015; KNBS & Macro ICF, 2015). The mortality rate of Under- Five in Kenya is 39 deaths per 1,000 live births indicating that one child in every 19 dies before its fifth birthday while one in every 26 does not survive to celebrate its first birthday (KNBS & Macro ICF, 2010, 2015). This is a major concern particularly in the move towards achieving the Sustainable Development goals (SDG) especially on achieving and promoting decent health and wellbeing for all (Sachs, 2012).

An increase in childhood overweight is a menace in the world (Tzioumis & Adair, 2014) and is a worrying pandemic that nations are struggling with (Lachat *et al*., 2013; Wojcicki & Heyman, 2010; World Health Organization, 2009a). In 2019, approximately 39 million children were overweight (World Health Organization, 2020) with sub-Saharan Africa accounting for more than 30% of the cases (World Health Organization, 2014a). Kenya recorded a slight decrease in the prevalence of childhood overweight from 5% in 2008/09 (KNBS & Macro ICF, 2010) to 4 % in 2014 (KNBS & Macro ICF, 2015). Cases have been high among the urbanites but recent evidence has shown the rural population is also affected. It is therefore no longer linked with the social class in the communities (Monteiro *et al*., 2004). KDHS report revealed that 4% of children who were overweight were from Kisumu county (KNBS & Macro ICF, 2015). Poor dietary practices and physical inactivity are the main contributors of childhood overweight and has been associated with adult obesity, increased risk of Non-communicable Diseases, psychological morbidity, premature mortality due to reduced quality of life and negative economic impacts (Hammond & Levine, 2010; Popkin & Doak, 1998; World Health Organization, 2015). More often, overweight children tend to be stigmatized and have low self-esteem (Wallander *et al.*, 2013).

Breastmilk is the gold standard for infant feeding because of its unmatched benefits. It has a perfect mix of all key nutrients essential for growth and development, is easily digested, has adequate antibodies that protect the infant against diseases, infections and episodes of diarrhea thus reducing chances of hospitalizations (Shamir, 2016) and has a protective effect against overweight and underweight. UNICEF recommends that children should be exclusively breastfed for the first six months of life but in Kenya, only 61% benefited from this recommendation (World Health Organization, 2001). It has been estimated that 6% of the Kenyan population live with HIV/AIDS with 14% of them being from Kisumu County (KNBS & Macro ICF, 2010). There exists a strong relationship between nutrition and HIV/AIDS. HIV/AIDS weakens the body's immune system, increases vulnerability to diseases thus increasing demand for energy requirements. If this demand is not met, then nutrition deficiency is likely to occur leading to undernutrition (Duggal *et al.*, 2012). This study aimed at assessing the status and determinants of malnutrition in Kisumu County, Kenya.

MATERIALS AND METHODS

Study Area

The study was conducted in Nyakach Sub-County, one of the seven sub-counties of Kisumu County. The sub-county has seven wards and as of 2019, it had a total population of 150,000 in a land area of 326.70 km^2 (Kenya National Bureau of Statistics, 2019).

Research Design and Sampling Procedures

This was a cross-sectional study design that recruited 415 children aged below 24 months. Nyakach sub-county was purposely sampled due to the high rates of HIV, poverty and malnutrition. Children were grouped into the strata of the following ages in months; below 6, >6 to ≤12, >12 to ≤18; and >18 to ≤24 in which a total of 85, 120, 121 and 92 children from each age strata were sampled respectively. Households were then randomly selected from the community units obtained from Kisumu County, Ministry of Health. From each household, an eligible child who was aged less than 24 months was selected considering the target number of children in each stratum. If a household had more than 1 child and qualified for the study, then the youngest eligible child was selected.

Ethical Considerations

Trained Research Assistants explained the purpose of the study to the caretakers and requested them to assent on behalf of the children. Interviews were conducted and weight measurements in centimeters of children were taken. Ethical approval and clearance were sought from Moi University Institutional Research and Ethical Committee *Approval number 0001567*.

Data Collection Instruments, Reliability and Validity

Questionnaires on demographic and socio-economic characteristics were administered to the caretakers and weights for children taken. Children were weighed with very light clothing and in instances where children were irritable, caretakers were weighed holding their children and then their weights subtracted. Caretakers were requested to give information on child sex and date of birth. This was confirmed from a child's health records (World Health Organization, 2010a).

Data Analysis

Weight for Age Indice (underweight) was computed based on WHO Z scores by child's date of birth, sex, weight and date of the survey into the ENA for SMART software (Drillien, 1958; Erhardt & Golden, 2007; Mercedes *et al.*, 2004). Children's Z scores that were ≤-2SD were classified as underweight while those ≥ 2 were classified as overweight (World Health Organization, 2006). Chi-square tests analyzed the association between the child's nutritional status and independent variables while multinomial logistic regression determined the effect of child nutritional status on the independent variables. The level of significance was set at $P<0.05$. Findings were presented using tables, bar charts and graphs.

RESULTS

Table 1 described the characteristics of 415 children from Kisumu County. It showed that 29% of children were aged between 6 and 12 months while 50% of children were male. A total of 70% had mothers who were married while 59% of mothers and 61% of fathers were earning less than Ksh 3,000 per month. Only 39% of mothers had schooled up to primary school. A total of 52% of children lived in permanent houses while 42% lived in double-roomed houses and 30% lived in their own family houses.

Table 1: Descriptive characteristics of the study population

Characteristic		N = 415	Percentage
Child's age	< 6 months	82	19.76
	>6 to ≤12 months	120	28.92
	>12 to ≤18 months	121	29.16
	>18 to ≤24 months	92	22.17
Child's sex	Male	208	50.12
	Female	207	49.88
Marital status	Single/divorce/widow	125	30.12
	Married	290	69.88
Mother income (Ksh)	<2,999	244	58.80
	>3,000	171	41.40
Father income (Ksh	<2,999	255	61.45
	>3,000	160	38.55
Mother Education	≤Primary	161	38.80
	Secondary	160	38.55
	Tertiary	94	22.65
Type of housing	Semi-permanent	214	51.57
	Permanent	201	48.43
Size of housing	Single	145	34.94
	Double	176	42.42
	≥3 rooms	94	22.65
Rent amount (Ksh)	None	128	30.84
	<3000	198	47.71
	>3001	89	21.45

Prevalence of Malnutrition among Children

Figure 1 showed the prevalence of underweight and overweight among children as per their age groups. A total of 10% were found to be underweight while 13% were overweight. Of those aged between 13 and 18 months, 12% were underweight while 21% of those aged between 19 and 24 months were found to be overweight.

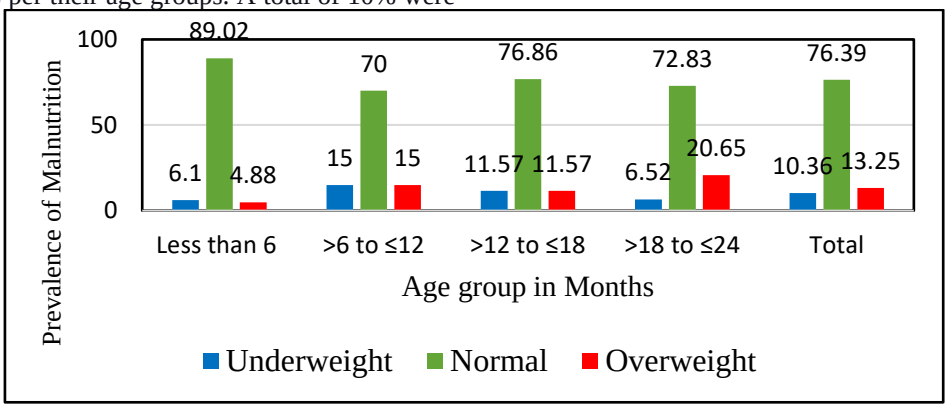

Figure 5: Prevalence underweight and overweight per age groups among children.

Status of Exclusive Breastfeeding and Time when Child Stopped Breastfeeding

Figure 2 summarized the prevalence of exclusive breastfeeding among the children and it revealed that only 47% of children in Kisumu County were exclusively breastfed for the first 6 months of life. It further

showed that 32% of children were exclusively breastfed for 4 to 5 months only.

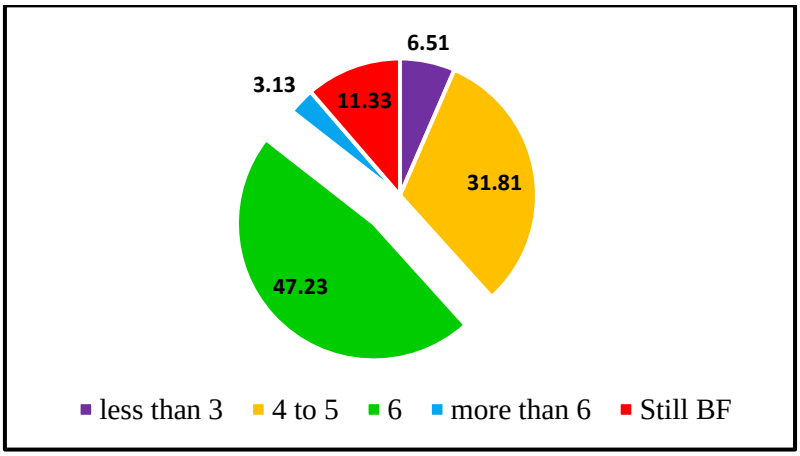

Figure 6: Prevalence of exclusive breastfeeding in the study sites.

Figure 7 showed the time when child stopped breastfeeding. It revealed that 17% of children stopped breastfeeding when they were aged less than 6 months while 4% stopped when they were aged between 18 and 24 months.

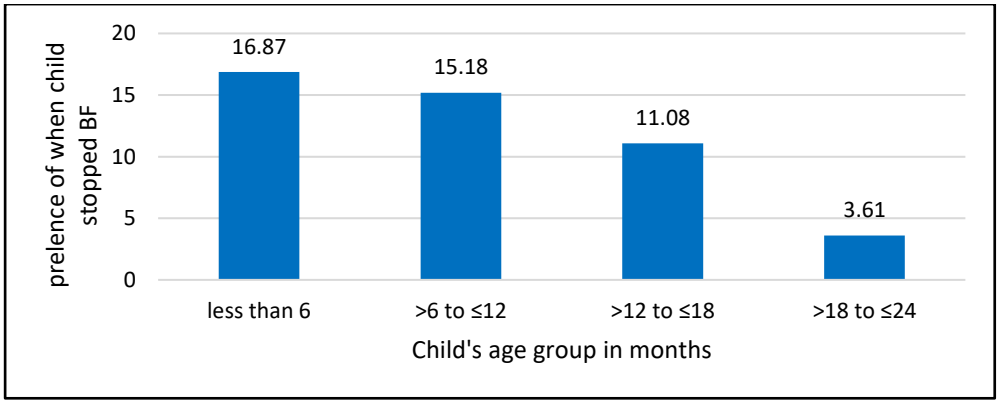

Figure 7: Time when child stopped breastfeeding.

Association between Childhood Malnutrition with Independent Variables

The bivariate analysis sought to assess the relationship between childhood malnutrition and independent variables. It found that there was an association between childhood malnutrition and their age groups, (p=0.011) status of exclusive breastfeeding (p<0.001), a time when child stopped breastfeeding (p=0.003), mother's marital status (p<0.001) and the monthly amount family paid for house rent (p=0.010). This is as shown on Table 3.

Table 2: Association between child overweight with independent variables in the study sites

Characteristics		Underweight	normal	overweight	P value
Prevalence of overweight		**10.36**	**76.39**	**13.25**	
Child age group in months	< 6	6.10	89.02	4.88	**0.011**
	>6 to ≤12	15.00	70.00	15.00	
	>12 to ≤18	11.57	76.86	11.57	
	>18 to ≤24	6.52	72.83	20.65	
Duration of Exclusive breastfeeding	Less than 3	7.41	92.59	0.00	**< 0.001**
	4 to 5	11.36	74.24	14.39	
	6	12.24	74.49	13.27	
	More than 6	0.00	23.08	76.92	
Time when child stopped breastfeeding	Still BF	4.26	95.74	0.00	
	Less than 6	20.00	72.86	7.14	**0.003**
	6 to 12	19.05	74.60	6.35	
	13 to 18	4.35	78.26	17.39	
	19 to 24	0.00	86.67	13.33	
	Still BF	6.79	76.92	16.29	
Mother's marital status	Divorced/ single	5.60	88.00	6.40	**0.001**
	Married	12.41	71.38	16.21	
Mother income (Ksh)	<2,999	3.69	79.92	16.39	**<0.001**
	>3,000	19.88	71.35	8.77	
Amount of rent paid	None	8.59	85.94	5.47	**0.010**
	>3000	9.60	74.24	16.16	
	>3001	14.61	67.42	17.98	

Effect of Childhood Malnutrition on the Independent Variables

Logistic regression analysis was conducted on the factors that had p ≤0.05 from the bivariate analysis. It revealed children who were aged between 6 to 12 months had 4 times higher risks of being underweight compared to those aged less than 6 months [RRR: 4.959: 95% CI: 1.278-19.248; p=0.021] while children whose mothers were married had 5 times higher risks of being underweight compared to those whose mothers were either single or divorced or married [RRR: 4.581: 95% CI: 1.778 - 11.801; p=0.002]. The analysis further revealed that children who were still breastfeeding had 50% chances of being overweight compared to those who stopped breastfeeding at the age of 6 months and below [RRR: 4.761: 95% CI: 1.251–18.114; p=0.022] while the chances of children whose parents pay house rent of more than Ksh 3,001 per month had 30% higher risks of being overweight compared to those living in their own homes [RRR: 3.344: 95% CI: 1.199 – 9.325; p=0.021]. This is summarized in Table 4.

Table 3: Regression analyses on childhood overweight and independent factors

Nutritional status / Independent variables		Relative Risks Ratio	95% Conf. Interval	P-value
Underweight				
Child age in months	< 6 months	1		
	>6 to ≤12 months	4.959	1.278 to 19.248	0.021
	>12 to ≤18 months	3.140	0.856 to 11.516	0.084
	>18 to ≤24 months	1.397	0.333 to 5.860	0.648
Time when child stopped BF	Less than 6			
	6 to 12	0.983	0.335 to 2.888	0.975
	13 to 18	0.122	0.021 to 0.693	0.018
	19 to 24	8.001	0.000	0.989
	Still BF	0.381	0.135 to 1.076	0.068
Mother's Marital status	Single/divorce/widow	1		
	Married	4.581	1.778 to 11.801	0.002
Amount of rent paid in Ksh	None			
	<3000	2.158	0.804 to 5.794	0.127
	>3001	2.609	0.950 to 0.030	0.063
Normal		**Base**		
Child age in months	< 6 months			
	6 to 12 months	1.575	0.437 to 5.677	0.487
	13 to s 18 months	1.315	0.364 to 4.754	0.676
	19 to 24 months	2.339	0.635 to 8.609	0.201
When child stopped BF	Less than 6			
	6 to 12	1.810	0.349 to 9.376	0.479
	13 to 18	2.170	0.451 to 10.433	0.333
	19 to 24	0.612	0.058 to 6.420	0.682
	Still BF	4.761	1.251 to 18.114	0.022
Mother's Marital status	Single/divorce/widow			
	Married	3.430	1.222 to 9.928	0.019
Amount of rent paid in Ksh	None			
	<3000	2.283	0.883 to 5.904	0.088
	>3001	3.344	1.199 to 9.325	0.021

DISCUSSION

This study aimed at assessing the prevalence and determinants of childhood underweight and overweight among children in Kisumu County. This study found that a total of 10% of children were underweight while 13% were overweight. KDHS 2014 reported a prevalence of 8% for underweight and 1.6% for overweight in Kisumu County which was lower compared to the results of this study (KNBS & Macro ICF, 2015). Nutrition interventions in developing countries mostly

focus on undernutrition while overweight has been highly neglected (AAbdeen & Collaboration, 2017). Researchers have also associated undernutrition with developing countries and overnutrition cases to developed nations, a trend that is now reverse (Lachat *et al.*, 2013; Wojcicki & Heyman, 2010; World Health Organization, 2009a). The higher prevalence of overweight among children in Kisumu County could be attributed to children feeding on high-calorie diets and being involved in fewer activities with long periods on the screens and electronics. This predisposes them to weight gain at an early age. Culturally, communities have perceived overweight children as those that are healthy and are being taken care of well by their parents. With this in mind, parents tend to feed them with lots of unhealthy foods as they grow so that they can fulfill the community expectations if this diet is combined with less activity levels, children tend to be overweight and become vulnerable to non-communicable disease later in life (Hendriks, 2019). Overweight children are at times overfed since their parents think that food is never enough for them while in some communities, grandparents view them as a sign of their success and they recover easily from illnesses (Hendriks, 2019; Hoang *et al*., 2018). Results of this study agreed with desk review paper that had found an increase in childhood overweight worldwide (AAbdeen & Collaboration, 2017)

UNICEF recommends that all children be exclusively breastfed for the first six months of life because of its benefits to children but only 61% of Kenyan children were exclusively breastfed with this study revealing that only 47% of children benefited from exclusive breastfeeding. Women experience challenges that might hinder the promotion of exclusive breastfeeding that include but are not limited to; lack of knowledge, bad cultural practices, insufficient supply of milk, illnesses and diseases, returning to work with lack of employer support and embarrassment about breastfeeding in public (Ulumbi, 2014). Further, only 32% and 6% benefited from exclusively breastfed for 4 to 5; and less than 3 months respectively. This study found that child's age, time child stopped breastfeeding, mothers' marital status and status of house rent as factors associated with child's nutritional status. As children grow, they start exploring the environment around them and may predispose themselves to contaminants like soil and dirty toys thus becoming vulnerable to infections and malnutrition (Geneva, 2001). At this age also, mothers' attentions to the children maybe diverted to other activities like other pregnancies, other young children and or assume that children are old enough to take care of themselves. According to KDHS 2014 and other studies, 58% of children were introduced to complementary at an early age between 4 and 5 months (KNBS & Macro ICF, 2015; World Health Organization, 2001). Early cessation of exclusive breastfeeding and stopping child from breastmilk completely in poor settings like in Kisumu County could be due to the high prevalence of HIV; illness by mother and or child, early pregnancy and demographic factors like parental education and socio-cultural practices and high poverty levels (Doherty *et al.*, 2012; Mukuku *et al.*, 2019). Mixed feeding at an early age is usually discouraged because it exposes children to malnutrition and more often, the feeds could be of low quality nutritionally, insufficient in form of quality and the amount in relation to child's needs; and the environment for preparation might not even be fit hygienically (World Health Organization, 2009b). Mothers who were married had higher chances of children being underweight compared to those who were either single, divorced or widowed. Chances of married women having more children and more household members are high and this affects household food security thus predisposing them children to malnutrition as this agreed with other studies (Amrullah *et al*., 2019; Tabrizi *et al*., 2018; Yikii, *et al.*, 2017). Other factors like child's sex, mother's education, father's income and house characteristics were not associated

with child's nutritional status in Kisumu County. This contradicted a study in Mexico that found these factors as determinants of child overweight (Hernández *et al.*, 2003). Families have always given house rent priority in their budget to avoid being evicted. This denies families the opportunity to buy foods that are nutritious for the household members. These nutritious foods like fruits and vegetables; animal proteins like eggs, milk and beef are usually expensive to buy. Lack of money to buy foods that provide key nutrients predisposes individuals to malnutrition including Protein Energy Malnutrition (PEM) and this agreed with a study conducted in Iran (Ekhlaspour *et al*., 2019) and Ethiopia (Chane *et al*., 2018; Debebe & Zekarias, 2020).

CONCLUSION AND RECOMMENDATIONS

It was found that 10% and 13% of children in Kisumu County were underweight and overweight respectively. The dual burden of malnutrition exists in the County. Only 47% of children benefit from exclusive breastfeeding for the first six months of their lives and 17% of children stopped breastfeeding when they were aged below 6 months. The child's age, time child stopped breastfeeding, mothers' marital status and amount of house rent paid were factors found to be associated with child nutritional status. Education on the importance of breastfeeding, strategies on housing ownership by the government and nutrition interventions targeting children below two years be recommended. Further research on the determinants of childhood malnutrition is explored.

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