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Determination of Nutritional Status of Pre-School Children in Urban and Rural Households using Anthropometric Measurements: A Case Study of Kabarnet Division, Kenya

Robert M. Aming'a
Department of Science Education
University of Eldoret, Kenya
aminga2006@yahoo.com

Charlotte A. Serrem
Department of Family and Consumer Sciences
University of Eldoret, Kenya
charlottejes@gmail.com

Grace M. Mbagaya
Department of Family and Consumer Sciences
University of Eldoret, Kenya
mbagayag@gmail.com

Abstract: *Food security has currently received a lot of attention globally but particularly in the developing countries Since the first World Food Conference of 1974, the main focus has shifted from global and national to household and individual food security and from food availability to food accessibility. However, food insecurity is still a challenge. UN Food and Agriculture Organization estimates that 239 million people in sub-Saharan Africa were hungry/undernourished in 2010. Additionally, Sub- Saharan African countries had an increase in the average prevalence of stunting of children less than five years of age, with the number increasing from 35 million in 1980 to 47 million in 1995. This number is expected to rise to over 49 million by 2015. This study thus aimed to investigate the nutritional status of pre-school children in urban and rural households of Kabarnet division, Baringo district. This was done to ascertain the current health and nutritional status of the Kenyan preschoolers population at large.The study was conducted in Baringo County which is in the Rift Valley region in Kenya.The study population was all pre-school children aged 3 to 5 years (36-60 months) living in households within the selected locations in Kabamet division of Baringo County.Using the national prevalence levels of stunting of 33.1% for BaringoCounty, a sample size 340 respondents was chosen.For anthropometric data collection, measurements were taken twice during the study (i.e. first and second surveys). These measurements included height, body weight and mid-upper arm circumference of the sampled children.Data was entered and analyzed using Statistical Package for Social Sciences (SPSS) version 21. The findings indicated that there existed a high level of food insecure households (57.2%) in the second survey which was a clear indication of the food security problem. Rural households (REL) were less (7.5%) food secure than urban (UKM) households (12.5%) three months after harvest. In both surveys most of the food secure households had an average daily income of more than Kshs. 100.Malnutrition levels in Kabarnet division were high among the pre-school children in both surveys. Both male and female children were equally malnourished. However, higher rates of stunting were reported among male children in both surveys. The study recommends that programs and interventions, which are aimed at improving household food security and malnutrition among pre-school children in Kabamet division, BaringoCounty, should be put in place to include both rural and urban households.*

Key Words: *Nutritional Status, Urban and Rural Households, Anthropometric Measurements.*

I. Introduction

Since the World Food Conference of 1974, food security has received a lot of attention particularly in the developing countries (Maxwell& Slater, 2003). The main focus has shifted from global and national to household and individual food security and from food availability to food accessibility (Barrett& Maxwell, 2007).

Studies conducted by Nakabo-Ssewanyana (2003) and UNDP (2010) have indicated that everyday about 1 billion people in developing countries go without food. For instance, in South Asia one person in four goes hungry while in sub-Saharan Africa it is as high as one in three. UN Food and Agriculture Organization estimates that 239 million people in sub-Saharan Africa were hungry/undernourished in 2010 (UNDP, 2010; Fields, 2015). In Kenya more than three-quarters of food insecure people are in rural areas and half of these live in farm households in marginal lands such as Baringo district where this study was done (Von Braun, 2007; Ngugi&Nyariki, 2005).

There are important differences between household food security issues in rural and urban areas. As indicated in some studies (Nakabo-Ssewanyana, 2003; UNDP, 2010; Melgar-Quinonez*et al.,* 2007), household food security in urban areas is primarily a function of the real wage rate and of the level of employment. The deplorable health environment in poor urban areas sometimes makes the urban food security situation qualitatively different from the rural situation (Von Braun, 2007). Although the prevalence of food insecurity is lower in urban areas than in rural areas, urban poverty with chronic food insecurity will become an increasingly important problem in the future (Maxwell, 1999; Ruel*et al.,* 1998).

Globally, the number of stunted children declined from 221 million in 1980 to 100million in 2010 (Black*et al.,* 2013). Sub- Saharan African countries had an increase in the average prevalence of stunting of children under five years of age, with the number increasing from 35 million in 1980 to 47 million in 1995 (Grantham-McGregor*et al.,* 2007). This number is expected to rise to over 49 million by 2015 (Von Braun, 2007). The Eastern Africa region is the most affected in sub-Saharan Africa. Between the period 1980-2000, the number of stunted pre-school children increased from about 12.9 million to 24 million. This trend is estimated to continue, leading to about 25 million stunted children by 2015 (Bhutta& Black, 2013).

One of the major goals of the Kenyan government is to improve the quality of life of its population (Godfray*et al.,* 2010). It is the government's policy that nutrition objectives are considered in development projects and that priority is given to collection and analysis of information on nutritional status of the population so that programs to eliminate nutritional deficiencies may be designed (GoK, 2007). However, according to the Welfare Monitoring Surveys (WMS) as at 2006, Baringo district had 33.1% of pre-school children stunted, 11.3% were acutely wasted and 31.0% were underweight (Muoki, 2012). The Kenya Demographic and Health Survey (KDHS, 2003) findings indicated that 31% of pre-school children in Kenya were stunted with 11 % being severely stunted. Compared to national levels, the results of the KDHS (2003) showed no significant improvement in percentages of stunting, under nourishment and underweight in Baringo district (UNICEF, 2010; KDHS, 2003). Prevention of malnutrition becomes more feasible and cost effective if the groups at risk are identified in time and the causes of malnutrition are clearly understood. Against this background, there is a need to continually investigate the underlying causes of child malnutrition in different communities and settings. Therefore the purpose of this study was to investigate the nutritional status of pre-school children in urban and rural households of Kabarnet division, Baringo district. This was done to ascertain the current health and nutritional status of the Kenyan preschoolerspopulation at large.

II. Methodology

The study was conducted in Baringo County which is in the Rift Valley region in Kenya. The county has a population of 555,561 (2009 census) and an area of 11,075.3 km^2 (4,276.2 sq mi) (KNBS, 2013). The county is occupied by the Tugen, Pokot and Njemps.A cross-sectional study was conducted in the two locations (Rural Ewalel Location- REL and Urban Kabarnet Municipality-UKM) of BaringoCounty.

The study population was pre-school children aged 3 to 5 years (36-60 months) living in households within the selected locations in Kabamet division of BaringoCounty.The sample size was determined as recommended by Wittes (2002). Using the national prevalence levels of stunting of 33.1% for Baringocounty (KDHS, 2003), a sample size 340 respondents was chosen.

A structured interview was used to get qualitative data from the mothers/caregivers of the pre-school children involved in the study. In addition, the mother/caregiver reported the age of the child. The reported age was cross-checked from either the immunization cards/birth certificates or birth notification certificates.

For anthropometric data collection, measurements were taken twice during the study (i.e. first and second surveys). These measurements included height, body weight and mid-upper arm circumference of the sampled children. The measurements were taken at the children's home under a shade. For all measurements heavy clothes were removed. The children wore only light clothes. Two research assistants worked together to ensure correct positioning of the child for accurate and reliable results. After positioning the child each researcher took the measurements separately and the two sets were compared. If there was no difference it was recorded as correct. Whenever there was a difference, which exceeded the pre-set limit of ten millimeters in height and five hundred grams in weight, the measurements were repeated and the average measurement was recorded.

The height was taken while the child stood on a horizontal surface against a wall with heels together, chin tucked and stretched upwards to full extent and the head in the 'Frankfurt plane'. The hands and arms hanged relaxed and the feet flat on the ground. While in the same standing position, the Mid-upper arm circumference was taken with the participants in a standing position. The participant's arms hanged relaxed just away from the trunk. The measurements were taken perpendicularly on the axial line of the upper arm at the level marked for the triceps skin fold. Measurements were done with reinforced plastic tapes in duplicate and accurate to the nearest 0.1cm. The cutoff point was put at 9.0cm. The body weight was measured by digital

pressure sensitive bathroom scale precise to nearest 0.1kg. The weighing scale was calibrated regularly with standard weights.

Data was entered and analyzed using Statistical Package for Social Sciences (SPSS) version 21.0 for windows 2007.

III. Results And Discussion

Socio-demographic characteristics

The study established the socio-demographic characteristics of the respondents as these are likely to influence household food security, diet and nutritional status of the pre-school children. The findings of the study showed that majority of the households in REL 146 (91.3%) and UKM 121 (75.6%) were male- headed (Table 1).UKM had more female-headed households 39 (24.4%) compared to REL households, which had 14 (8.7%). All the respondents (mother/care giver) in the urban households were employed unlike the rural households, which had 10 (6.3%) of the respondents unemployed. This implies that majority of respondents (24.4%) in the urban areas were employed compared to their counterparts in the rural areas (8.7%). Most of the respondents were in full time employment (68.1% for REL and 75.6% for UKM).The results also indicated that all the respondents had formal education with most having attained high school education (66.3% for REL and 60.6% for UKM households). About a third (29.4%) of UKM household heads had formal education beyond high school. Majority of the respondents in UKM and REL households (70% and 68% respectively) were married. In UKM households a bigger number (52%) of the study children belonged to the age category 45-51 months.

Table 4.1: The socio-demographic characteristics of the households

Variable description	UKM (n= 160)		REL (n=160)	
	Frq	%	Frq	%
Household head				
Male	121	75.6	146	91.3
Female	39	24.4	14	8.7
Occupation of mother/caregiver				
Off farm employment	–	–	39	24.3
Permanent employment	121	75.6	109	68.1
Casual employment	39	24.4	2	1.3
Unemployed	-	-	10	6.3
Level of education of mother/caregiver				
Beyond high school	47	29.4	39	22.5
High school	97	60	106	66.3
Lower/upper primary	16	10	18	11.3
Age categories of the study children				
36-44 months	32	20	29	18
45-51 months	83	52	90	56
52-60 months	45	28	41	26
Marital status of the respondents				
Married	112	70	109	68
Single	29	18	35	22

Nutritional status during the two surveys

According to the findings of the study, pre-school children in the first survey had stunting, wasting and underweight levels of 34.1%, 9.8% and 31.2% respectively (Table 2).

Table 2: Nutritional status during the two surveys

Survey	Height-for- age (stunting) -2SD	Weight-for- height (wasting) -2SD	Weight-for- age (underweight) -2SD
First survey (n=320)	34.1	9.8	31.2
Second survey (n=320)	34.3	11.7	32.0

In the second survey the pre-school children had stunting, wasting and underweight levels of 34.3%, 11.7% and 32.0% respectively. Generally the results show that the preschool children were more malnourished in the second survey as indicated by the t-test (Table 3). The t-tests show that at the significance level of 0.05, stunting $p = 0.045$, wasting $p = 0.000$ and underweight $p = 0.029$. This means there was a significant difference of means of the levels of nutritional status of pre-school children between the two surveys. It means the nutritional status of the pre-school children were significantly different during the two surveys. The percentage of wasting was particularly high in the second survey.

Table 3: t-test for nutritional status during the 2 surveys

Nutritional status per survey		F	Sig.	t	df	Sig. (2-tailed)	Mean Std. Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Height-for-age (stunting)	Equal variances assumed	2.55	0.11	1.436	638	0.045	-0.791	6.92E-02	0.655	2.547
Weight-for-height (wasting)	Equal variances not assumed	1.26	0.00	3.406	638	0	-0.661	6.92E-02	0.655	2.547
Weight-for-age (Underweight)	Equal variances assumed	1.55	0.11	2.2	638	0.029	-0.641	6.92E-02	0.655	2.547

Nutritional status in REL and UKM households

The findings of the study indicate that the percentage of stunting, wasting and underweight in the first survey for UKM households was 11.1%, 4.6% and 11.9% respectively (Table 4). REL households had 23.0%, 5.2% and 19.3% percentages of stunting, wasting and underweight respectively in the first survey. Pre-school children from REL households were more malnourished in the first survey. Stunting was 11.1% and 23.2% for UKM and REL households' pre-school children respectively in the second survey. Wasting was 5.7% and 6.0% for UKM and REL households' pre-school children respectively in the second survey. Underweight was 12.3% and 19.7% for urban and rural households' pre-school children respectively in the second survey. Both surveys indicate that the pre-school children from REL households were more malnourished than those in UKM households. The percentages of stunting, wasting and underweight rose in both UKM and REL households in the second survey.

Table 4: Nutritional status in REL and UKM households during the two surveys

Surveys	Location	Height-forage (stunting) -2SD	Weight- for- height (wasting) -2SD	Weight-forage-(underweight)-2SD
1st survey (n=320)	UKM (n=160)	11.1	4.6	11.9
	REL (n=160)	23	5.2	19.3
2nd survey (n=320)	UKM (n=160)	11.1	5.7	12.3
	REL (n=160)	23.2	6	19.7

The results (Table 5) show that at the significance level of 0.05, stunting $p = 0.045$, wasting $p = 0.030$ and underweight $p = 0.029$. This means there was a significant difference in means of nutritional status of pre-school children between REL and UKM households in the first survey. It indicates that there were significant differences in the nutritional status of pre-school children in REL and UKM households in the first survey.

Table 5: t-test for location of a household and nutritional status during the 1st surveys

Nutritional status per survey		F	Sig.	t	df	Sig. (2-tailed)	Mean Std. Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Height-for-age (stunting)	Equal variances assumed	2.547	0.111	1.006	638	0.045	-0.491	6.92E-02	0.6554	2.547
Weight-for-height (wasting)	Equal variances not assumed	1.256	0.001	8.436	638	0.03	-0.567	6.92E-02	0.6554	2.547
Weight-for-age (Underweight)	Equal variances assumed	1.547	0.111	9.996	638	0.029	-0.7	6.92E-02	0.6554	2.547

The results (Table 6) show that at the significance level of 0.05, stunting p - 0.001 wasting, p = 0.000 and underweight p = 0.009. This means that there was a significant difference of means of nutritional status of pre-school children between REL and UKM households in the second survey. It indicates that there were significant differences in the nutritional status of pre-school children in REL and UKM households in the second survey.

Table 6: t-test for Location of a household and nutritional status during the second survey

Nutritional status per survey		F	Sig.	t	df	Sig. (2-tailed)	Mean Std. Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Height-for-age (stunting)	Equal variances assumed	3.588	0.111	1.536	638	0.001	-0.871	6.92E-02	0.6554	2.547
Weight-for-height (wasting)	Equal variances not assumed	1.256	0.001	1.006	638	0.000	-0.861	6.92E-02	0.6554	2.547
Weight-for-age (Underweight)	Equal variances assumed	1.547	0.111	1.500	638	0.009	-0.811	6.92E-02	0.6554	2.547

Nutritional status by age category by survey

The findings of the study indicate that in the first survey, stunting was high among the 52-60 month olds (15.1%) (Table 7). Wasting was high among the 36-44 month old (4.2%). Underweight was noted in the 45-51 month old (18.2%). In the second survey, stunting was still higher among the 52-60 month old (15.2%). Wasting was high among the 36-44 and 45-51 month old (4.5%). Underweight was highest among the 45-51 month old (18.3%). The results reveal a high prevalence of malnutrition among preschool children aged 36-60 months in Kabamet division.

Table 7: Nutritional status by age category during the two surveys

Survey	Age category in months	Height-for-age (stunting)-2SD	Weight-for- height (wasting) -2SD	Weight-for-age (underweight)-2SD
1st survey	36-44	10.3	4.2	7.0
	45-51	8.7	3.8	18.2
	52-60	15.1	1.8	6.0
2nd survey	36-44	10.2	4.5	7.4
	45-51	8.9	4.5	18.3
	52-60	15.2	2.7	6.3

Nutritional status by sex by survey

According to the findings of the study, in the first and second surveys stunting was high among male pre-school children (24.0%) compared to the female pre-school children (10.1 %) (Table 8). Wasting and underweight was high among females (6.4% and 18.0% respectively). The trend of stunting, wasting and underweight remained the same for both sexes in the two surveys except that the percentages were higher in the second survey. The results in Table 4.29 indicates that at the significance level of 0.05, stunting p = 0.023, wasting p = 0.11 and underweight p = 0.000. This means there was a significant difference of means of

nutritional status between male and female pre-school children in the two surveys. It means that sex had a significant effect on nutritional status of pre-school children.

Table 8: Nutritional status by sex during the two surveys

Survey	Sex	Height- for- age (stunting)-2SD	Weight- for- height (wasting) -2SD	Weight-for-age(underweight)-2SD
1st survey	Male	24.0	3.4	13.2
	Female	10.1	6.4	18.0
2nd survey	Male	24.1	4.7	13.6
	Female	10.3	7.2	18.4

Table 9: t-test for nutritional status by sex during the two surveys

Nutritional status and sex		F	Sig.	t	df	Sig. (2-tailed)	Mean Std. Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Height-for-age (stunting)	Equal variances assumed	4.253	0.111	1.512	638	0.023	-0.871	6.92E-02	0.6554	2.547
Weight-for-height (wasting)	Equal variances not assumed	2.365	0.001	1.567	638	0.011	-0.761	6.92E-02	0.6554	2.547
Weight-for-age (Underweight)	Equal variances assumed	1.222	0.111	2.122	638	0.000	-0.511	6.92E-02	0.6554	2.547

IV. Conclusion

There is a problem of household food security in Kabamet division, which is significantly influenced by seasonality and location of the households, household headship and average daily household income. The high level of food insecure households (57.2%) in the second survey is a clear indication of the food security problem. Rural households (REL) were less (7.5%) food secure than urban (UKM) households (12.5%) three months after harvest. In both surveys most of the food secure households had an average daily income of more than Kshs. 100.

Malnutrition levels in Kabarnet division were high among the pre-school children in both surveys. Both male and female children were equally malnourished. However, higher rates of stunting were reported among male children in both surveys.

From the findings, it was concluded that household food security has a significant influence on diet and nutritional status of pre-school children in urban and rural households of Kabamet division, Baringo district during the two different seasons.

V. Recommendation

Programs and interventions, which are aimed at improving household food security and malnutrition among pre-school children in Kabamet division, Baringo district, should be put in place to include both rural and urban households. Efforts to improve household food security and child nutrition in Kabamet division should be broad based so as to include poverty reduction by increasing household incomes accompanied by improvements in education of the population.

Women empowerment in Kabarnet division should be top on the agenda and supported by the government. The education of mothers/caregivers is important for controlling income. The preferences of mothers/caregivers and fathers differ and could suggest that the partners' power over resources is a function of their education. This calls for longterm investment in formal education of girls beyond primary level and informal education of women in Kabarnet division. Nutrition education for the mother/caregivers on regulation of quantities of food intake and balancing and varying foods will go along way in improving the nutritional status of pre-school children in Kabamet division.

Further research is recommended to establish the possible reasons for the high rates of stunting among male pre-school children in Kabamet division as revealed in the study. The researcher also recommends on future research to assess the physiologic and psychological effects of periodic food fluctuations on children's health.

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