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Nutritional Security of Pre-school Children from Irrigators and Non-irrigators Households in Turkana County, Kenya

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Abstract

Turkana County is a region of soils of high agricultural potential but aridity hinders its exploitation. It is characterized by scarce, erratic rainfall patterns. Food security remains a challenge in Turkana County despite its potential. Malnutrition resulting from food insecurity is the major concern in Turkana County. Turkana County prevalence of global acute malnutrition has remained high above the World Health Organization (WHO) threshold that is 27.3%. The study was guided by sustainable development goals, the goal number two which talks about end hunger, achieve food security and improved nutrition and promote sustainable development and goal number three which talks about ensuring healthy lives and promote well-being for all at all ages. Malnutrition has been and continues to be responsible for over 60% of child mortality and therefore reduction of malnutrition is one of key ways of reducing child mortality. The current study investigated the contribution of small-scale irrigation interventions on nutrition status of pre-school children in Turkana County.

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Study objectives were; to evaluate nutrition status of pre-school children using anthropometry measurements among households practicing irrigation and those not practicing and establish the relationship. Cross-sectional, comparative and evaluation designs were used. Purposive and cluster sampling was done. Sample size was 420 (210 households practicing irrigation and 210 not practicing). A total of 845 children below 5 years were studied. The nutrition status of the pre-school children was poor across households practicing irrigation and those not practicing irrigation. The Chi square test of independence on the weight for age status for children below five years gave $X^2_{2, 0.05} = 90.439$. This shows that there was highly significant ($p<0.01$) association between the weight for age for children below five years and the irrigation status of the household. A test of deviation to analyze weight for age for children below five years across households doing irrigation indicated that there was significant ($p<0.05$) difference with $X^2_{1, 0.05} = 9.167$. The Chi square test of independence on the prevalence of weight for height for children below five years gave $X^2_{3, 0.05} = 21.798$. This shows that there was significant ($p<0.05$) association between the weight for height for children below five years and the irrigation status of the household. Non-food strategies may be needed to complement dietary practices to manage the malnutrition situation in Turkana County.

Keywords: Nutrition security; Irrigators; Nutrition status; households; pre-school; agriculture.

1. Introduction

Malnutrition is an important public health issue particularly for pre-school children who have a significantly higher risk of morbidity and mortality [1]. Malnutrition continues to be one of the world's most serious development problems [2], exacerbating the consequences of infectious disease and contributes to about 6 million deaths of pre-school children annually [3]. Mortality due to malnutrition accounts for 58 % of the total mortality among the children and malnutrition in the first two years is irreversible [4]. In a review of the effectiveness of agriculture interventions including; home gardens, livestock, combination of home gardens and livestock, cash cropping, and irrigation in improving nutrition outcomes, Reference [5] found that although most of these interventions increased food production, many did not necessarily improve nutrition or health within participating households. However, of those that had a positive effect on nutrition (19 out of 30 interventions reviewed), 14 invested in four or five types of capital as designated by the Sustainable Livelihoods Framework [5]. Among the most efficient interventions were those that focused on home gardens. The authors attribute this impact not only to the actual production of nutritious vegetables able to supplement the diet of participating households but also the income generated from the intervention. Targeting poor households in Turkana County, the small-scale irrigation projects mainly focuses on home gardens as a means to mitigate the impact of rising food prices on households, and to increase access to food. According to [6], this is accomplished in two ways. First, households will gain direct access to the fresh foods their garden produces, which in turn may ease the burden of food costs in proportion to income. Second, the production and sale of surplus food may provide a secondary source of income for households. In Kenya, a study [7], focused on production and utilization of vegetable in the kitchen garden in peri-urban and urban areas. What was not captured is the effect they may have on nutrition status of the household members and in particular the children. In addition there was no reference to arid and semi-arid areas where the current study was conducted. As such, the current study sought to provide information on the contribution of small scale irrigation on nutrition status

in the arid and semi-arid areas. The degree to which a household is food secure will determine the nutritional status of its members to a large extent [6]. While food security at household level is a main determinant of the nutritional status of the individual household members, malnutrition may be observed even in households that have enough access to food [8]. This applies especially to children [9]. Individual consumption is influenced by the food distribution within the food-sharing unit [10]. It is important to note that preferences for a certain kind of food also influences the individual consumption and this is sometimes hard to change [11]. Food insecurity seems to be associated with inadequate intakes of several nutrients, and children with low protein-energy and nutrient intake are more likely to have a number of illnesses [12]. Furthermore, food insecurity may affect children's health not only through biological mechanisms, but also through psychological factors related to intermittent availability of food, as argued by [11]. Then, children in households with food insecurity could have worse health compared to those in households with access to adequate food. An earlier study found hunger to be positively associated with chronic conditions, anxiety and depression among children in low-income households [14]. Unlike [15] however, these studies do not use nationally representative data. Data from National Health and Nutrition Statistics III, show that children in families that did not get enough food to eat have worse health outcomes, despite no significant results for iron deficiency [16]. A number of studies do not find evidence that food insecurity is associated with worse reported health and anthropometric variables [17]. The current study investigates the intra-household allocation of resources for food, and how food is prepared, distributed and consumed, as well as childcare practices that may affect the nutrition status of the pre-school children. This will be determined by establishing the dietary practices and maternal care of the pre-school children.

2. Materials and methods

Turkana community was the target population. In the current study, unit of observations included; households practicing irrigation and those not practicing irrigation. Key informants came from Ministry of Agriculture, Ministry of Public Health and Sanitation, Ministry of Special Programmes, Ministry of Medical Services, Ministry of Regional Development and Livestock Development and Office of the Prime Minister and the local provincial administration within Turkana County. The criterion for selecting Key Informants was their relevance to the area of study and their richness in information being sought. Units of analysis included; pre-school children, household heads and mothers, officers in the respective ministries mentioned above. Institutions like Non -Governmental Organizations, Community Based Organization, Faith Based Organizations, various food security committees at the district level were considered in the current study as units of observation. Households were selected on the basis of those practicing small-scale irrigation and those not practicing. The study employed multiple research designs. Comparative research design was used where respondents were drawn from zones where households were and were not practicing irrigation for comparison. Cross sectional Survey design was also used where data was collected at one point. Evaluation design was used to measure the contribution of small scale irrigation farming interventions to the nutrition status of pre-school children. The area of study was divided into nine strata based on administrative regions; Kaitilu (60 households), Lokori (60 households), Kainuk (80 households), Lokichar (100 households), Central (20 households), Kerio (20 households), Turkwel (20 households), Kalokol (20 households) and Lokitaung (40 households). Stratified random sampling was used to sample households in each stratum. Proportionate

allocation was used to determine sample size from each stratum. In selecting key informants from various ministries and departments, NGOs and agencies purposive sampling was used. The power of purposive sampling lies in selecting information rich-cases for in-depth analysis related to the central issues being studied. Within identified households all pre-school children were included in the study. This was through census method that reached 845 children. Data collected was edited, coded (open-ended questions) and entered into a spreadsheet in a standard format to allow for analysis of both descriptive statistics and inferential statistics where the Statistical Package for Social Sciences (SPSS) computer software was used. For demographic data, descriptive statistics was used to analyze data into means, medians, and proportions for continuous data while frequency distribution and Chi square for categorical data were used. Nutri Survey package was used to analyze data from 24 hour dietary recall and food consumption frequency. First level data analysis involved descriptive statistics (means, medians, mode and standard deviations) for continuous and frequency distributions for categorical data. Data were presented in pie charts, bar graphs and tables. Nutrition status of pre-school children was estimated from the weight for age (WFA), weight for height (WFH) and height for age (HFA) index values combined with the presence of edema. The indices were compared with [18] standards. Weight for age (WFA), Weight for height (WFH) and Height for age (HFA) indices were expressed in Z-scores. Severe malnutrition was defined as Z-score of <-3 SD and/or existing bilateral edema on the lower limbs of the child (Table 3.5). Moderate malnutrition was defined by WFH <-2 SD and >=-3 SD and no edema (Table 3.5). Data was grouped under the above categories and analyzed using descriptive and inferential statistics (Chi square test). For anthropometric data, EPI info with EPINUT version computer package for anthropometric variable was used for analysis.

2.1 Limitations of the study

The study limitations included:

1. Since a dietary recall was used for data collection, there was a possibility of biased data reporting. The data was validated by comparing data from the 24 hour recall to the food frequency questionnaire
2. Daily caloric intakes for the children did not consider breast milk intake. Nonetheless. 50.5% of the children were above 24 months of age, when children are no longer breastfeeding.

3. Results and discussion

3.1 Nutrition Status by Weight for Age

Prevalence of underweight by WHO Standards among those irrigating was high (33.0%) compared to households without irrigation farming interventions (30.4%). Among those doing irrigation there was smaller proportion of 5.0% with moderate underweight and 62.0% had normal weights. From the study findings, many children (29.0%) were moderately underweight with 40.5% normal weights. The Chi square test of independence on the weight for age status for children below five years gave X^2 2, 0.05 = 90.439. This shows that there was highly significant ($p<0.01$) association between the weight for age for children below five years and the irrigation status of the household. A test of deviation to analyze weight for age for children below five

years across households doing irrigation indicated that there was significant ($p<0.05$) difference with X^2 1, 0.05 = 9.167.

Table 1: Weight for Age among the Pre-School Children

Small-scale Irrigation	**Weight for age**							
	severe		**moderate**		**At risk**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Yes	21	5	138	33.0	259	62.0	418	100
No	130	30.4	124	29.0	173	40.5	173	100
Total	**151**	**17.9**	**262**	**31**	**432**	**51.1**	**845**	**100**

In Kenya, the prevalence of underweight is reported to be declining and currently stands at 18% [20] which is less than what was observed in the present study. Findings on the prevalence of wasting, however, is consistent with the findings of [21], which reported a prevalence of 12% of children under five years are underweight , while the proportion for severely underweight is 14%. Other studies further reported that low socioeconomic status impact negatively on nutritional status, an issue that predominantly featured as the main cause of malnutrition in this county [19]. Analysis of the indicator by age group shows that underweight is highest (34%) in children age 18-23 months and lowest (11%) in children age less than 6 months [2]. A higher proportion, (32%) of boys less than five years are underweight, compared with 26% of girls [2]. The current study findings are inconsistent with national values [19], thus there are higher values recorded in the present study than the national values especially for moderate underweight. Disparity could be due to the fact that the study was conducted in a region that has been marginalized and underserved over the years.

3.2 Nutrition Status by Height for Age

Stunting, an index of chronic under nutrition, was largely high among the study population. These findings are consistent with reports from [19] suggesting insignificant decline in under nutrition since 2003 according to their KNBS (2003) report. About 12.9% from irrigation sites and 13.6% from non-irrigation sites were severely stunted. There was a high disproportion among households with irrigation (28.0%; 59.1%) and those without (63.0%; 23.4%) for moderate stunting and normal, respectively. The Chi square test of independence on the prevalence of height for age for children below five years gave X^2 2, 0.05 =1.222. This shows that there was no significant ($p> 0.05$) association between the height for age for children below five years and the irrigation status of the household. A test of deviation to analyze height for age for children below five years across households doing irrigation indicated that there was no significant ($p> 0.05$) difference with $X^2$1, 0.05 = 0.027. The observed difference can be attributed to the intervention effect. To the expectation, the irrigating group had the highest proportion of children with normal height-for-age. Compared to the national mean of 29.9% [20], using socioeconomic indicators, Reference [2] also reported stunting rate in Kenya to be 35.6% and a range for

poor nations to be between 13-56%. According to [22], 35% of children below five years are stunted, while the proportion of severely stunted is 14%. The current study finding were in contrast with the above findings possibly because of the huge burden of a prolonged drought in this region that had been on for a long time compared to other parts of the country

Table 2: Height for Age among the Pre-School Children

Small-scale Irrigation	**Height for age**					
	severe		**moderate**		**At risk**	
	N	**%**	**N**	**%**	**N**	**%**
Yes	54	12.9	117	28.0	247	59.1
No	58	13.6	269	63.0	100	23.4
Total	**112**	**13.3**	**386**	**45.7**	**347**	**41.1**

According to data collected from the FGDs, key informants and records from relevant government ministries, majority (79.2%) of mothers in this region did not have formal education. When mothers have access to education and information, the household food security is likely to improve which then translates into improved nutrition, particularly among children. Compared to the national mean of 29.9% [19], using socioeconomic indicators, [2], also reported stunting rate in Kenya to be 35.6%, and a range for poor nations to be between 13 and 56%. According to [19], 35% of children below five years are stunted, while the proportion of severely stunted is 14%. the current study findings are in contrast with [21,2] findings, possibly because of huge burden of prolonged drought in this region that has been on for a long period of time compared to other parts of the country.Comparing the current study findings with [21] findings, there is variation. This could be due to regional disparities in stunting where there are a significantly high proportion of children exhibiting stunting in arid and semi-arid regions where Turkana County lies. In addition, as many parts of the world, children living in rural areas and children from poorer households are more likely to be malnourished [2]. One study indicated that stunting rate among children under five years was at 38.6% [22], which is slightly below the study findings, but it's important to note that even within Turkana county, there are regional disparities and that could be the reason for the differences.

3.3 Nutrition Status by Weight for Height

Study findings showed that 18.8% of the total pre-school children in all study sites were severely wasted, 24.3% were moderately wasted, 3.8% were at risk of wasting and 53.1% were normal. Households without irrigation farming interventions had higher proportion of 21.8% and 29.0% for severe wasting and moderate wasting respectively while those with irrigation farming interventions had a lower proportion of 15.8% and 19.4% for severe and moderate wasting, respectively. The Chi square test of independence on the prevalence of weight for

height for children below five years gave X^2 3, 0.05 = 21.798. This shows that there was significant ($p<0.05$) association between the weight for height for children below five years and the irrigation status of the household. A test of deviation to analyze weight for height for children below five years across households doing irrigation indicated that there was significant ($p< 0.05$) difference with X^2 3 , 0.05 = 9.044 with more children falling under the category of normal weight for height .

Findings of the current study show a higher proportion of the children with severe wasting (18.8%) and moderate wasting (24.3%) compared with [21] findings of 6.7%. Again, this could due to regional disparities whereby in Turkana County, there were more cases above the national average figure. From the [23] annual reports, prevalence of severe malnutrition is at 21.5% which is closely related to the study findings. Many children from both irrigating and non-irrigating households had malnutrition with higher prevalence proportions of moderate and severe malnutrition from non-irrigating. Higher proportions of children who were severely malnourished were from households without irrigation farming interventions. In the current study there was significant association between irrigation status and nutrition status. Intra-family food distribution may be implicated in child malnutrition for the current study. When this is not done properly, taking into account the nutrient needs of all the individual family members, it results in under-nutrition which is usually skewed towards children under five-years of age.

Table 3: Weight for height among pre-school children

Small-scale Irrigation	**Weight for Height**							
	severe		**moderate**		**At risk**		**normal**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Yes	66	15.8	81	19.4	16	3.8	255	61
No	93	21.8	124	29.0	16	3.7	194	45.4
Total	**159**	**18.8**	**205**	**24.3**	**32**	**3.8**	**449**	**53.1**

3.4 Nutrition Status by MUAC

Data in Table 4 points out that 9.2% of the pre-school children had MUAC of less than 11.5 an indication of severe malnutrition while 35.5% had MUAC of 11.5–12.4cm an indication of moderate malnutrition and 44.1%

with a MUAC of between 12.5-13.5 an indication of at risk of malnutrition. Using this nutrition indicator, many children (44.5%) from non-irrigation sites were moderately malnourished and only 26.3% from irrigation sites. According to the current study findings, 9.2% of the study children were moderately to severely malnourished using MUAC indication measure of muscle mass as well as mortality risk among children (WHO, 2006). This observation suggests a need for more nutrition intervention to ensure these children achieve their growth potential. The Chi square test of independence on the prevalence of malnutrition by MUAC indicator for children below five years gave X^2 3, 0.01 = 38.990. This shows that there was highly significant ($p<0.01$) association between the malnutrition by MUAC indicator for children below five years and the irrigation status of the household. A test of deviation to analyze MUAC distribution for children below five years across households doing irrigation indicated that there was significant ($p<0.05$) difference with X^2 3, 0.05 = 10.027. More children (51.4%) were at risk of malnutrition against other categories.

Table 4: MUAC Status among the Pre-School Children

Small-scale Irrigation	**MUAC (CM)**							
	normal		**At risk**		**moderate**		**severe**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Yes	60	14.4	215	51.4	110	26.3	33	7.9
No	34	8.0	158	37.0	190	44.5	45	10.5
Total	**94**	**11.1**	**373**	**44.1**	**300**	**35.5**	**78**	**9.2**

3.5 Weight for age in Relation to Age of Pre-School Children

From Table 1 below, study findings show that most of the children who were severely underweight were from age range 12 to 24 months, followed by age range 6-12 months and lastly 24-36 months (12%, 9.5% and 7.5% respectively). Among children with normal weights many were within age range of 12-24 months. But it's also important to note that out of the total pre-school children included in the study, many (40.2%) were within this age cohort, followed by 24-36 months (25.4%) and 6-12 months (22.8%). The Chi square test of independence on the relationship between age and weight for age status for children below five years gave X^2 8, 0.05 = 18.143. This shows that there was significant ($p<0.05$) association between the weight for age for children below five years and the age of the pre-school children. Therefore this implies that age did affect the distribution of weight for age among the pre-school children studied. A test of deviation to analyze weight for age for children below five years across the ages of the pre-school children indicated that there was significant difference with X^2 8 , 0.05 = 16.017. There were more children who were underweight between age 12-24months and fewer below six months. This could be because of breastfeeding done for children before age six months.

Table 5: Weight for Age among the Pre-School Children by Age

Age in months	U5 Underweight							
							Total	
	severe		moderate		At risk			
	N	%	N	%	N	%	N	%
0-6	2	0.7	2	1.4	9	2.1	**13**	**1.5**
6-12	80	29.9	32	22.1	81	18.8	**193**	**22.8**
12- 24	101	37.7	66	45.5	173	40.0	**340**	**40.2**
24- 36	63	23.5	34	23.4	118	27.3	**215**	**25.4**
36-59	22	8.2	11	6.9	51	11.3	**84**	**9.6**
Total	**268**	**31.7**	**145**	**17.2**	**432**	**51.1**	**845**	**100**

4. Conclusion

Many households are still poor irrespective of their access to small-scale irrigation. Therefore there was minimal contribution of irrigation intervention towards nutrition security of this community. This came out clearly in the FGDs that there are other correlates of poverty that must also be addressed in order for irrigation to have a lasting and deeper impact on food security resulting in nutrition security. Issues like family size, level of education, health and community governance need to be addressed. Hence, access to irrigation is only one of the necessary services essential for increasing the productivity and income of small-scale farmers. More research is needed on the nature of the interaction between food-based interventions with other health-related factors and how they collectively impact the nutritional status of the pre-school children. There is need to investigate impact of infections on nutrition status of pre-school children considering the high levels of malaria incidences and worm infestation that was observed within this area.

5. Recommendations

Non-food strategies may be needed to complement dietary practices in order to manage the malnutrition situation. These may include malaria control, supplementation and worm control through a massive deworming exercise, as well as making education information readily available to people.

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