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age of 5 years worldwide can be attributed to under nutrition.

According to the nutrition survey carried out in the larger Marsabit by UNICEF in April 2008, prevalence of Global Acute Malnutrition (GAM) was found to be 16% and Severe Acute Malnutrition (SAM) was 2.2%.

Despite progress in reducing the prevalence of undernourishment, some 794 million people were estimated to be undernourished between 2014 and 2016. FAO (2016). This is in agreement with report of UNICEF (2017) that the ongoing drought is having a devastating impact on food security, access to water and nutrition conditions, which has exhausted people's capacity to cope with other shocks especially in Northern part of Kenya where Marsabit County falls.

Drought is one of the major threats to food security and socio-economic development in Kenya, particularly in the ASALs that cover about 80% of the country's total land surface. (FAPDA, 2015). About 83% of Kenya's land mass is defined as ASAL. Within these ASAL areas, one third of the country's population lives along with 70% of the livestock herd (MALF, 2014). Ministry of Agriculture, Livestock and Fisheries. These regions are also characterized by low and erratic rainfall.

Being located within the so-called Somalia-Chalbi desert eco-climatic zone, and experiencing extremely low rainfall – ranging from 200 mm/year at the lowest parts to 800 mm/year at the areas of highest elevation, Marsabit County is characterized as an ASAL and in fact falls within the highest category (those with aridity extent of between 85-100%) ALRMP II (2009).

According to Marsabit County Integrated Development Plan (2013-2017), about 80% of the county's residents are pastoralists deriving their livelihood from livestock and livestock based activities. About 10% practice subsistence agriculture and reside mainly around Mount Marsabit which receives comparatively high rainfall. About 7% are involved in trade and the remaining meagre 3% are salaried employees

Majority of the Marsabit population are food insecure, the communities in this area depend on livestock and livestock products. Because of frequent drought, this type of livelihood is not very sustainable as livestock is susceptible to drought and die or become unproductive in large numbers due to lack of pasture and water in dry season. This has led to most people seeking other means

of livelihood. Some are frequently dependent on food aid. According to Kenya Food Security Steering Group (KFSSG, 2006), own food production in Marsabit accounted for only 10% of the annual food demand of 20,109 MT in 2006.

Food crises in the County are attributed to adverse climatic patterns that have adversely affected crop production and livestock rearing activities. Livestock and livestock-based industries support nearly 80% of the counties households. However, the reliance on livestock exposes these livelihoods to starvation and hunger in face of frequent droughts (KFSSG, 2006).

Dietary diversity was poor for majority of the pastoralists that were consuming 1-2 meals consisting of mainly cereals and oil (mainly sourced from relief food). During normal times, households consume 2-3 meals composed of cereals, milk, meat and pulses (Wambile, 2011).

The social protection aspect of safety nets are approaches that provide or substitute for income, and may include cash and in-kind transfer programs, subsidies, and labor-intensive public works programs. The most common types of food-based safety net modalities are supplementary feeding, food vouchers or stamps, food for work or asset and conditional cash transfers that also involve food (Fanzo, 2012).

Hunger Safety Net Program (HSNP) targets and help the poorest households. In the northern Kenyan environment, where mobility and poverty are tightly linked, HSNP transfers increase or help maintain mobility and reduce the likelihood of moderate malnutrition among children (Jensen *et al.*, 2014).

Despite the ongoing feeding interventions that target both malnourished children less than five years of age and pregnant and lactating women, the proportion of children at risk of malnutrition shows an increasing trend. The high rates of child under nutrition together with high rates of child mortality continue to deter the government's efforts to provide quality health care towards the reduction of mortality and malnutrition levels (Masibo, 2012).

While previous studies conducted have identified the magnitude and determinants of under nutrition in Kenya and other low-income settings, few studies have examined the malnutrition trends in counties whose main livelihood is pastoralism, and is also affected by recurrent famines such as Marsabit County. The objective of this study was

to explore the nutrition status trends of children and nutrition interventions in Marsabit County from 1998 to 2014.

## METHODS

This was a desk study that was based on the analysis of data from Kenya Demographic and Health Surveys (KDHS) between 1998 to 2014 and a systematic review of articles from other relevant sources to assess the occurrences of food crisis, the intervention carried out and impact of that nutritional intervention

### Health Survey Data

The KDHS data that was analyzed was published in 1998, 2003, 2009 and 2014. The survey covered the then provinces of Nairobi, Central, Coast Eastern, Nyanza, Rift valley and North Eastern. Kenya has several agro-ecologic zones. The Rift valley, Central and Western regions are characterized generally as medium to high potential as they have adequate rainfall for farming and agriculture. The main crops cultivated include especially tea, coffee, maize, wheat and horticulture. On the other hand the North Eastern and Eastern Provinces bordered by Somalia and Ethiopia, and characterized by frequent droughts and high levels of poverty and food insecurity, also has the highest burden of under nutrition in the country, Marsabit falls under this (Kenya: Nutrition Profile USAID, 2014).

For Marsabit County, the nutritional data was extracted from Multiple Indicator Cluster Surveys (MICS) and Millennium Development Goal (MDG) Indicators, Marsabit District, 2008 by (UNICEF), KDHS 2014 and FHI survey 2010.

The data analyzed included the nutritional status. The nutritional aspects of weight for age, height for age and weight for height were examined. The nutrition variables of stunting, underweight and wasting for Marsabit County, a low potential region were compared with those of other regions in Kenya.

The situation analysis was done by looking at one variable through "one-way analysis, showing a series of indicators by areas within the province. The data was broken down, to create new categories that gave a greater depth to the analysis.

Transformation of data was made and z-scores were created and recorded as height for age Z scores (HAZ), weight for age Z scores (WAZ) and weight for height Z scores (WHZ). For targeting ranking was used to provide a

comparison between sample domains for an outcome variable ranked by prevalence.

Data was analyzed using SPSS Version 19. Analysis was done at the descriptive, univariate, bivariate, and multivariate levels. The mean z-scores and standard deviations were calculated for the three anthropometric indices; (height-for-age, weight-for-age and weight-for height).

A systematic review was done to assess the background of food aid and nutritional interventions in Kenya, especially in Arid and Semi-Arid Lands (ASAL) of Kenya. Among the sources of data included from the Arid Lands Resource Management Project (ALRMPII) report (2011). Collected data consists of research articles and evaluation reports with the focus on the topic in question, reports conducted by the international organizations, such as FAO, WFP, UN and NGOs.

The events of food crisis intervention was examined by systematic review, key word search of 'food crisis', 'intervention', 'malnutrition' 'Kenya' and 'nutrition' were searched in PubMed, Embase, Ovidsp and other relevant sites. The criteria for inclusion were that the article should address food crisis occurrences, nutritional intervention in Kenya, which organization implemented the intervention and should be between the years 2000 to 2012.

A total of 21 articles which fit these criteria were found but only 13 articles were used to analyze the occurrences of food crisis and nutritional intervention in Kenya. Others articles were excluded because they primarily address mostly refugee intervention and did not meet the criteria for the analysis of this study.

The second part of systematic review examined the intervention type and impact of that intervention. The articles were searched using the key word, 'nutritional intervention, 'food intervention, 'Kenya and malnutrition. The search was done through PubMed and E-journals. 30 articles were found but only 10 articles met the criteria of having done the nutritional intervention and whether there was impact or not, within the period of 2000 to 2012.

## RESULTS

The national wide stunting prevalence was 29.3% in 2003 KDHS while it was 35.1% in 2009. Underweight prevalence was 19.9% in 2003 and 16.9% in 2009. For wasting the prevalence was 6.6% in 2003 and 9.3% in 2009. KDHS 2014 report result revealed that national nutritional status is declining as compared to previous KDHS however the

**Table 1: 2003, 2009 and 2014 KDHS: Nutritional Status of Children Below Five Years in Kenya**

Region	Nutritional Status								
	Stunted %			Underweight %			Wasting %		
	2003	2009	2014	2003	2009	2014	2003	2009	2014
Nairobi	18	34.9	17.2	6.5	18.2	3.8	4.4	9.9	2.5
Central	27.3	30	18.4	14.6	13	5.3	4.2	9	2.3
Coast	34.1	33.4	30.8	24.2	15.5	13.6	5.6	9.5	4.5
Eastern	33.1	36.6	30.1	21.7	17.8	12.2	3.9	11.3	4.4
Nyanza	29	37.9	22.7	14.6	19.4	7.4	2.7	9.9	2
Rift Valley	32	34.7	29.8	25.5	18.1	15.3	9.1	9.9	5.7
Western	28.8	33.4	25.2	18	13.9	9	4.7	7.4	1.9
N/Eastern	26	37.6	24.7	35.7	17	19	27.4	6.8	13.3
Total	29.3	35.1	26	19.9	16.9	11	6.6	9.3	4

nutritional status of Marsabit county are higher for all the three indices of stunting, underweight and wasting as shown in Table 1.

Table 2 shows nutritional status and outcome of Marsabit County in 2008 from multiple indicator cluster survey by UNICEF. Stunting prevalence was 20.1%; underweight was 28.5% and wasting prevalence was 13.6% and KDHS 2014 report. Figure 1 shows trends of nutritional status of children under five from KDHS 1998 to 2014 which is declining.

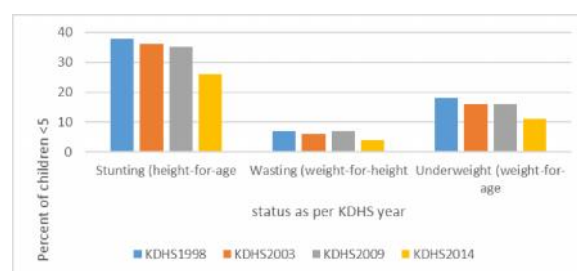
Data from 2006 KFSSG report shows that the percent of people needing food AID has increased from 5% in 2004 to 10% in 2009/2010.

**Table 2: Marsabit Nutritional Status**

	Nutritional Status of Marsabit County		
	Stunting %	Underweight %	Wasting %
MICS 2008	20.1	28.5	13.6
Survey 2010	30.1	25.4	12
KDHS 2014	26.5	30.1	16.3

*Data source: Multiple Indicator Cluster Surveys (MICS) and Millennium Development Goals (MDG) Indicators, Marsabit district, 2008 Nutritional status (below -2SD) Kenya Demographic and Health Survey (KDHS) 2014*

**Figure 1: Trends in Nutritional Status of Children Under Five Years**



**Note:** The data are based on the WHO Child Growth Standards adopted in 2006.

*Data source: Kenya Demographic and Health Survey (KDHS) 2014*

Table 3 shows that for the last 13 years the cause of food crisis is the recurrent drought and conflict. The nutritional intervention was carried out by WFP, UNICEF and other organization. Most interventions are in terms of general food distribution, supplementary feeding, therapeutic feeding and blanket feeding program.

Table 4 shows the articles that have nutritional intervention type either carried out on random trials or comparison group. The table has columns for the author and the year the study was done, it also examine the sample size, target group, the area where the intervention took place,

**Table 3: Trend of Nutritional Intervention in Marsabit County, from 2000 to 2016**

Year	Crisis	Organization and Intervention Type
2016/17	Severe drought	Red cross destocking programme, cash transfer
2015	Drought	USAID disaster risk reduction
2012	Drought/conflict	WFP/UNICEF- blanket feeding therapeutic feeding
2011	Poor rain/water shortage	no information on intervention
2010	Situation stable	no intervention
2009	Drought	WFP general ration
2008	Drought/conflict	WFP, Merlin supplementary feeding
2007	Drought/conflict	Kenya food security steering group
2006	Drought	UNICEF, WFP continuation of food distribution
2005	Drought	OXFAM, WFP general distribution
2004	Drought	OXFAM, WFP emergency general food distribution
2003	No data found	
2002	Drought	WFP general food ration
2001	Drought/conflict	WFP, UNICEF emergency general distribution
2000	Drought	WFP, OXFAM general food distribution

**Table 4: Studies that Examine Nutritional Intervention and its Impact**

Author/Year	Intervention Type	Target Population	Impact/Effect
Tomidi (2010)	Food distribution, for 7 months and education to care givers in intervention group	N = 139 (I) 143 (non I)	Significant difference in intervention group
		Under five 6-20 months in Yatta	Wasting in I group 0%
			Wasting in non I is 8.9%
Hall (2011)	Blanket supplementary feeding for 4 months	N = 902, children under five in Northern Kenya districts	No impacts observe mother giving different age at every visit
Aklilu (2002)	Food relief program and livestock destocking/restocking	House hold, N = 3 million in Kenya	Nutritional status of household improved
Suchdev (2012)	Marketing of sprinkle micronutrient powder	N = 1063, 6-35 months, biweekly visit, Nyanza 12 months of follow up	Improved anemia recovery, 0.9 g/dl in intervention group to 0.6 g/dl
Mukundi (2010)	School feeding program	N = 505, 96 weeks intervention in Embu	Positive significance in school attendance
Leube (2001)	Food for work in Makueni	N = 10864 household target women and children of under five	Alleviate immediate hunger



Table 4 (Cont.)

Lesorogol (2009)	Restocking of livestock in Samburu	N = 326 target household	Income support
Macharia (2012)	Amaranth grain and micronutrient powder in maize porridge	N = 279, 12-59 months children in 16 weeks in Mwingi	Reduce IDA in pre school children
Long (2011)	Supplementary feeding, porridge with milk and meat	N = 274, 11-40 months in Embu	Significant linear growth in milk group than meat group
Adango (2007)	Iron fortified maize flour	N = 516, 3-9 years in Malindi	decrease prevalence of iron deficiency

the duration of the study and whether the intervention had any impact.

## DISCUSSIONS

The results on nutritional status at national level shows that there was increased prevalence of stunting 29% in 2003 to 35% in 2009 and wasting 6.6% in 2003 to 9.3% in 2009. In Eastern province under which Marsabit district falls there was increase of stunting 33% in 2003 to 36.6% in 2009 and wasting from 3.9% in 2003 to 11.3% in 2009. Stunting is the indicator of chronic malnutrition which is due to long term deprivation of food and may be sign of poverty and recurrent crisis such as drought.

Global Acute Malnutrition GAM is the  $>-2$  Z score weight for height. According to WHO classification of malnutrition with corrective action if wasting rate falls between (5-9.9%), the situation is poor and proposed action is supplementary feeding. The weight for height in 2003 and 2009 KDHS at national level falls under this category. The Marsabit District data (MICS) by UNICEF shows underweight prevalence of 28%, stunting of 20% and wasting 13%. And KDHS 2014 shows 26%, 30% and 16% for the three indicators. The high prevalence of underweight indicate both acute and chronic nutritional situation.

GAM WH Z score of (10-14.9%) means the situation is serious according to WHO classification of malnutrition and corrective action to be taken is selective supplementary feeding of the malnourished population and the Marsabit situation 13% and 16% falls under this category according to MICS 2008 and KDHS 2014.

Since 1998, nationally stunting has declined from 38% to 26%, wasting has declined from 7% to 4%, and the proportion of underweight children has declined from 18% to 11% KDHS 2014. Kenya has met the 2015 Millennium Development Goal (MDG) target of reducing the prevalence of underweight children under age five to 11% (Ministry of

Devolution and Planning, 2013). However the same cannot be said for Marsabit County which has higher percent of stunting 26%, wasting 16% and underweight 30%. This could be attributed to frequent drought which causes malnourishment among children under five with short recovery period interval between the droughts.

It is due to this vulnerability in ASAL areas that a number of Donors and NGOs have focused special attention to this area. However, despite the humanitarian efforts including many years of food aid, levels of acute malnutrition have continued to remain high above the 15% emergency thresholds (WHO). During periods of food insecurity such as the drought experienced in 2008/09, the Arid and Semi-Arid (ASAL) districts saw very high levels of acute malnutrition  $>30%$  ( $<-2$  Z scores and oedema) in some districts Oirere (2010).

Kenya has experienced persistent drought and conflict over the past decade leading to sharp increases in food aid. In response, the government and aid organizations have implemented a range of interventions including free food aid, food for work, food for assets, and cash transfers, among other emergency interventions in the water, animal and human health, and livestock sectors, to reach the affected populations. By far, the main response has been emergency free food distribution, implemented both through the Government of Kenya and World Food Program (WFP) (Wambile, 2011).

The frequency table shows that for the last 13 years there has been recurrent drought and sometimes conflict (fighting over water and pasture) which leads to food insecurity and food crisis. Several organizations have been funding and implementing the nutritional intervention, these are World Food Program, UNICEF and other NGOs. The most common method of intervention was general food distribution, supplementary feeding and therapeutic feeding programs. Despite this food intervention the prevalence of under nutrition still remain very high.

According to study by Tomedi (2012) the aid and relief program in Sub-Saharan Africa usually distribute a commercially prepared fortified maize–soya or wheat–soya blend, often with vegetable oil, to vulnerable populations of young children. The intent is to reduce the high rate of child malnutrition in these populations, although the effectiveness of this approach has been questioned.

FAPDA (2015) report indicated that despite an increasing consensus on the need to adopt a holistic approach to nutrition, formal multi-sectorial and inter-ministerial collaboration is still lacking and nutrition-sensitive interventions are not adequately promoted. In addition, government spending on nutrition interventions remains limited, resulting in increased reliance on donor funding

Vouchers and cash transfer could be more effective as the people have choice in what to buy and eat and it also give them dignity of not queuing for relief food but buy locally available food from the retailers (ECHO, 2009). However report by FAO (2013) on Kenya, indicate that cash transfers on their own are unlikely to positively impact child malnutrition rates, for which complementary interventions are required. It found no evidence that the programme was having an impact on child nutrition rates. Further pointing that child nutrition is an area heavily influenced by a number of exogenous factors, beyond simple access to food.

Given that social assistance programmes in Kenya are fledgling and still struggle to deliver cash transfers in a regular and predictable way, particularly in the remote, rural areas where they are most needed, it is a priority to get safety nets in order first, and only then seek to strengthen linkages with other sectors (FAO, 2016).

The studies carried in the 10 articles examined the nutritional intervention type, in two of the article, the intervention type was food distribution and blanket supplementary feeding only the study with component of education to care givers had positive association as wasting in intervention group decreased, as for the blanket supplementary feeding evaluation there was no impact as the mothers give different age of children at each visit and sometime switch the children.

Two studies were on restocking and destocking of livestock, this is buying of livestock from pastoralist and redistributing them to poor household or slaughtering it for the villages to improve protein intake, the target group was the household and to some extent the children also benefit from the improved income of the family as they are able to

afford the food. The other studies were on fortification and micronutrient intervention, these intervention have been seen to have impacts of decreasing the prevalence of iron deficiency anemia. One study was on school feeding program and it had positive association in school attendance by the children where they get food for the day hence helping them to alleviate the immediate hunger.

## CONCLUSION

The study found that under nutrition prevalence has increased. Stunting and wasting prevalence at national level has increased in 2003 and 2009 KDHS data set. However in KDHS (2014) the trend has been on decline. Marsabit county result reveals that the prevalence of underweight and wasting are high than the national level. The persistent drought and conflict over the meager resources seem to escalate the problem of food crisis. The cause of the food crisis according to this study is drought and sometimes conflict and since the year 2000 the donors and the implementing agencies have been funding and providing food aid. However the impact of these interventions does not seem to be effective as the cycle of hunger and malnutrition continues in Marsabit County

For nutritional intervention to have an impact holistic approach of national policies and strategies on agriculture, food security and health should be put in place. Community participation and evaluation of intervention programs by all the stakeholders should be carried out. As Bantamen (2014) pointed out, prevention of malnutrition community based nutrition program should be established and implemented at all community levels and there should be well trained man power.

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