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Nutrition Quality of the Child Feeds Used Among Children Aged 6 to 24 Months in Marsabit County

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Abstract

Child feeding practices is considered one of the determinants of malnutrition in under-fives. Inadequate feeding practice is often a greater factor of malnutrition than lack of food. Globally, 1 in 3 children under the age of five are not obtaining adequate nutrition thus are not growing well. In ASAL regions of Kenya, the main driver of acute malnutrition is poor dietary intake coupled with inappropriate feeding practices. In Marsabit County, undernutrition prevalence varies in different sub-counties. There are areas where malnutrition is very high whereas other areas are relatively low. In the same setting however, there are children with good health and nutritional status. Therefore, this study aimed to determine nutrition quality of the child feeds used among children aged 6 to 24 months in Marsabit County. This study adopted an experimental design for laboratory analysis of the food samples. Snowballing technique was used to select 9 women groups with children aged 6-24 months for participatory assessment of child feeding practices. Focus Group Discussion and key Informant Interview guides for qualitative data. A child food sample collection guide was used during collection of child feeds for laboratory analysis. Univariate analysis was used

to obtain frequency distribution of nutrition quality of the child feeds. The study concludes that nutrition quality of feeds has a significant effect on child feeding practices in Marsabit County, Kenya. Based on the findings this study recommends that the Marsabit County government should promote the use of traditional food processing methods, such as fermentation, germination, roasting, drying, and frying, through community nutrition programs to enhance the nutrient content of child foods. These programs should focus on educating mothers and caregivers on how to effectively apply these methods to local foods to improve their nutritional value.

Keywords: Nutrition Quality of the Child Feeds, Child feeding

Introduction

Globally, 1 in 3 children under the age of five are not obtaining adequate nutrition thus are not growing well (UNICEF, 2019). Data indicate that the burden of malnutrition is much higher in South Asia and Africa relative to other parts of the world (Duran et al., 2006). Inadequate infant and young child feeding practices contribute to high rates of malnutrition in Kenya (USAID, 2018). In ASAL regions as well, the main driver of acute malnutrition is poor dietary intake exacerbated by reduced milk production and consumption, which forms the main diet for children (IPC, 2021). Childhood malnutrition results from a number of factors that are related to sub optimal nutrition and recurrent infectious diseases such as diarrhea and acute respiratory infection (UNICEF, 2013). Nutrition and health outcomes of a child depend on the level of nutrients consumed in daily food intakes. Consumption level is determined by the quality and quantity of a dish. High quality and enough quantities to meet body needs results in good health whereas consumption of poor quality and inadequate quantity results in health deficits (Goldbohm et al., 2016).

Over the years, child malnutrition in population level, has received attention and recognition in developing countries, especially in resource limited settings. Poor areas are often considered to be lacking food resource, ASAL regions in Kenya for instance. Poor nutrition status reported across the ASAL counties is majorly due to poor dietary intake coupled with inappropriate feeding practices. Marsabit County, in particular, poor feeding practices as a result of food insecurity brought about by prolonged drought contribute to limited availability of varieties of food in the community. Such situations continue to undermine the health and nutrition status of young children. Although exclusive breastfeeding rates is very high in Marsabit, (84.54%), malnutrition rates are very high. According to Standardized Monitoring and Assessment of Relief and Transitions (SMART) survey findings conducted annually in the county, varying trends of undernutrition

prevalence have been reported in different sub-counties. There are areas where malnutrition is very high whereas other areas are relatively low. In the year 2022 for instance, severe acute malnutrition prevalence in Laisamis was 5.5%, in North Horr it was 4.4%, in Moyale it was 2.2% and in Saku sub-county it was 1.2%. However, in the same sub-counties, within the same environment, there are children with optimal health and nutrition status. This could be attributed to caregivers successfully applying positive deviant child feeding practices that the caregivers of undernourished children are not practicing. Therefore, this study aimed to determine nutrition quality of the child feeds used among children aged 6 to 24 months in Marsabit County.

Methods

A cross-sectional study design was used to collect data. Both quantitative and qualitative approached were employed. A total of 9 women groups were included in this process

Analytical food samples were calculated according to Cochran, 1977 as follows:

$$n = \frac{\sigma^2 z^2}{e^2}$$

Where;

n = sample size (unit)

σ= standard deviation of the sample (σ = 15)

e = acceptable sampling error ≈ (±5%)

z = z value at reliability level or significance level is 1.96 corresponding to 95%

Therefore,

$$n = \frac{15^2 \; x \; 1.96^2}{5^2} = 35 \text{ samples}$$

However, according to Cochran (1977), the cost of sampling can be included in the equation as well. Therefore, suitable number of samples based the available cost estimates for nutrient analysis in the laboratory was:

Cost of one sample = Ksh 30,800

Available total cost for nutrient analysis= 460,000

Therefore, final samples to be analyzed = $\frac{460000}{30800}$ = 15 samples

A semi-structured questionnaire was used to obtain information on maternal knowledge on child feeding practices and the deviant child feeding practices. An interview guide was used to collect data on positive deviant child feeding practices from the positive deviant mothers.

Qualitative data were collected through free uninterrupted conversations between the women during focus group discussions. The FGDs were based on narrative interviews that were recorded in totality for later on transcription. The FGD discussants were identified through snowball sampling technique, with the entry point being the women groups from various communities in the county. A total of 9 women groups were included in this process. It is through these groups that food samples for laboratory analysis were obtained. A total of 10 samples were collected as shown in Table 1.

Table 1: Sample foods for laboratory analysis

No	Women Group	Child foods collected for Nutrient content analysis
1	Jiru Dansa Women Group	Koche: Dried mix (Barley, goat meat- mix of mandazi eggs, flour, milk, sugar, water, oil, ghee, cardamom urgo, sugar
2	Sakuye Cultural Group	Porridge mix: maize, beans (little amount), peanuts (roasted), cassava, sorghum palm/pearl millet, omena (sardines)
3	Dub Goba Women Group	Porridge mix: Cassava Omena (sardines), wheat, groundnut, sorghum, millet, barley, salt
4	Biftu Cultural Group	Porridge mix : sorghum, omena (sardines), terere/rafu, peanut, fenugreek, barley, cardamom, teff, maize, beans
5	Kayolaida Women Group	Qaboth: Maize, barley, sorghum (Germination process)
6	Star Women Group	Porridge mixture (for 6-12 months' child) with pumpkin flesh Porridge mixture (1yr-5yrs): Unique here are the pumpkin seeds which are dense in antioxidants and micronutrients
7	Fin Horacha Women Group	Paw paw jam Dried kales (sukuma wiki)

Qualitative data from recorded FGDs was transcribed to texts by a local translator. The transcripts were then translated back to English. Two coders read the text files and then developed codes from the patterns found in the data independently. Differences in coding was discussed and resolved by consulting other researchers with experience in qualitative research. Data was managed using SPSS version 25 (IBM Corp, 2017). Descriptive data was analyzed using means, standard deviations, frequencies and percentages. Inferential statistics was conducted through use of correlation and regression analysis to show the relationship between the independent variables and the dependent variable.

Table 2: Macronutrient Lab Analysis Results

Sample ID	Energy (kcal)	Protein %	Carbohydrates	Fat %	Fiber %
Infants reference (6-12 months) per day	700	11g	95g	30g	5g
Children reference (13-24 months) per day	1300	13g	150g	39g	14g
Fermented porridge mix (6-24) Star	347.09	12.41	62.1	5.45	2.92
Non - fermented porridge mix (6-24) Star	367.26	11.31	67.77	5.66	2.92
Fermented porridge mix (2-6 yrs) Star	351.17	10.18	65.53	5.37	1.93
Non - fermented porridge mix (2-6 yrs) Star	368.38	11.28	72.22	3.82	2.71
Fermented porridge mix (Dub-Goba)	369.04	11.11	71.07	4.48	1.47
Non- Fermented porridge mix (Dub-Goba)	374.35	9.71	73.28	4.71	1.49
Fermented porridge mix (Sakuye)	330.39	8.49	70.8	1.47	1.55
Non- Fermented porridge mix (Sakuye)	366.21	8.04	75.57	3.53	1.65
Qaboth (Kayolaidha) (Germinated)	363.91	8.13	75.76	3.15	1.55
Marqa	370.73	2.53	85.02	2.45	1.55
Koche (Jiru)	404.05	61.72	8.31	13.77	2.51
Koche (Biftu)	515.94	22.31	40.93	29.22	0.91
Pawpaw jam	304.99	0.79	74.94	0.23	0.69
Dried Sukuma wiki	292.59	19.88	47.44	2.59	8.88
Butter (Milk fat)	868.17	1.35	4.26	93.97	0.55

Results

Nutrient Quality of Child Feeds

The objective of the study was to determine nutrition quality of the child feeds used among children aged 6 to 24 months in Marsabit County. The respondents were requested to rate their level of agreement on various statements relating to nutrition quality of the child feeds used among children aged 6 to 24 months in Marsabit County. The results are as indicated in the following sub sections.

Macronutrients and Energy (per 100g)

In feeding and nutrition process, macronutrients are the nutrients that are consumed in large quantities for provision of energy. These include carbohydrates, proteins and fats (Sparingly) In this case, the sampled foods were subjected to nutrient analysis, which was further compared with the Recommended Dietary Allowance (RDA) of children aged 6-12 months and 13-24 months respectively.

The results indicated provision of 70 to 85 percent of the RDA for children aged 6-12 months and 13-24 months respectively as in Table 3. This is in relation to the average number of feeding frequency indicated by the societal actors, as 4 times in 24 hours.

On foods that were considered as snack, *Biftu Koche* has higher nutritional content as compared to the *Jiru Koche*, as a result of the variation in ingredients. Dried vegetables are also important in provision of energy, proteins and fiber, during the dry seasons, as compared to complete absence of the vegetables.

With reference to butter (milk fat), this is a good source of energy, with provision of 868.17 Kcal per 100g, and when available, can be used in small amounts to boost the energy requirements of complementary feeding.

Porridge mix from Dub-Goba group both fermented and non-fermented have a higher provision of energy, proteins and carbohydrates, as compared to the porridge mixes of star women group (Uvji). This is due to the variation of ingredients, mixing ratio, where the star porridge mix has less carbohydrate food sources.

Micronutrients and Antioxidant Stimulants

Micronutrients are those that are required in small quantities, with functions of building immunity in the body. These include vitamins and minerals. In any human growth and development, all micronutrients are important. However, in child feeding, Vitamin A, Iron, Zinc and Vitamins of B group are required in higher amounts. The sampled foods were analyzed to determine the content of these. The results are as indicated in Table 3.

Table 3: Micronutrient Lab Analysis Results

Sample ID	Vit A	Vit. C mg	Vit B1	Vit B2	Vit B3	Vit B6	Vit B9	Fe (mg/kg)	Zn (mg/kg)	Cu (mg/kg)	Total phenolic Content (mg/100g)
Infants reference (6-12 months) per day	-	50	0.3	0.4	6	0.3	80	11	20	220microg	
Children reference (13-24 months) per day		15	0.5	0.5	10	0.5	150	7	20	340micg	
Fermented porridge mix (6-24) Star	0.03		15.21	1.47	65.26	1.72	0.96	131.5	22.58	2.95	
Non - fermented porridge mix (6-24) Star	0.04		64.34	0.61	66.95	2.43	0.26	80.34	14.19	3.09	
Fermented porridge mix (2 – 6 yrs) Star	0.03		17.18	2.22	75.44	0.71	1.28	148.82	26.84	2.67	
Non - fermented	0.04		16.43	1.21	95.75	0.61	0.96	127.6	23.09	3.06	

porridge mix (2- 6 yrs) Star										
Fermented porridge mix (Dub-Goba)	0.43		17.9	0.19	46.93	1.73	0.26	124.74	32.89	2.63
Non- Fermented porridge mix (Dub-Goba)	0.11		16.43	1.91	77.67	1.86	1.28	122.48	33.27	3.40
Fermented porridge mix (Sakuye)	1.96		13.93	0.67	39.17	3.70	0.55	82.6	25.73	2.54
Non- Fermented porridge mix (Sakuye)	0.01		12.33	1.70	55.58	1.67	2.98	36.7	28.95	3.22
Qaboth (Kayolaidha) (Germinated)	0.003		21.74	1.22	0.74	1.49	9.45	66.35	26.02	2.95
Marqa	0.13		44.73	1.80	32.94	0.69	1.94	42.42	33.34	3.01
Koche (Jiru)	0.99	7.97	132.00	0.75	26.20	1.79	2.36	78.99	52.76	3.00
Koche (Biftu)	0.76	17.35	67.02	0.59	28.60	1.37	15.98	86.97	35.21	BDL
Pawpaw jam	14.2 B-carotene		60.89	1.54	0.10	15.55	0.76	15.34	44.83	12.25
Dried Sukuma wiki									37.3	9.38
Butter (Milk fat)									7.34	3.75

									5.66	254.83
									BDL	42.75

* ND- Not done
* BDL – Below Detectable Limits

The results indicated an increased concentration in some of these micronutrients, in fermented porridge mixes than non-fermented porridge mix and other feeds. This is as a result of removal of some nutrient inhibitors, which bind the micronutrients, reducing their bioavailability. The nutrients of concern are mainly Zinc and Iron. Zinc plays an important role in immunity buildup, while iron is vital for transportation of oxygen.

For instance, the fermented porridge mixes for Star and Dub goba, had higher concentration of iron than their non-fermented counterparts. Hence, fermentation is a food processing mechanism that is to be promoted.

Correlation Analysis

This research adopted Pearson correlation analysis to determine how the dependent variable (child feeding practices in Marsabit County, Kenya) relates with the independent variable (nutrition quality), (Table 4)

Table 4: Correlation Coefficients

		Child Feeding Practices	Nutrition Quality of Child Feeds
Child Feeding Practices	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	278	
Nutrition Quality of Child Feeds	N	278	
	Pearson Correlation	.813**	1
	Sig. (2-tailed)	.001	
	N	278	278

From the results, there was a very strong relationship between nutrition quality of food and child feeding practices in Marsabit County, Kenya (r = 0.813, p value =0.001). The relationship was significant since the p value 0.001 was less than 0.05 (significant level). The findings are in line with the findings of Kasimba, *et al*, (2019) who indicated that there is a very strong relationship between nutrition quality and child feeding practices.

Regression Analysis

Multivariate regression analysis was used to assess the relationship between independent variable (nutrition quality of food) and the dependent variable (child feeding practices in Marsabit County, Kenya), (Table 5)

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.877[a]	.769	.768	.10412

a. Predictors: (Constant), nutrition quality of food

The model summary was used to explain the variation in the dependent variable that could be explained by the independent variables. The r-squared for the relationship between the independent variables and the dependent variable was 0.769. This implied that 76.9% of the variation in the dependent variable (child feeding practices in Marsabit County, Kenya) could be explained by independent variable (nutrition quality of food).

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 510.14 while the F critical was 2.405. The p value was 0.002. Since the F-calculated was greater than the F-critical and the p value 0.002 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of nutrition quality of food on child feeding practices in Marsabit County, Kenya. (Table 6)

Table 6: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	102.028	1	25.507	510.14	.002[b]
	Residual	13.653	276	.0500		
	Total	115.681	277			

a. Dependent Variable: child feeding practices in Marsabit County, Kenya
b. Predictors: (Constant), nutrition quality of food

The regression model was as follows (Table 7):

Table 7: Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.335	0.085		3.941	0.000
nutrition quality of Child Foods	0.341	0.091	0.340	3.747	0.003

$$Y = 0.335 + 0.341X_1 + \varepsilon$$

According to the results, nutrition quality of food has a significant effect on child feeding practices in Marsabit County, Kenya β1=0.341, p value= 0.003). The relationship was considered significant since the p value 0.003 was less than the significant level of 0.05. The findings are in line with the findings of Kasimba, *et al,* (2019) who indicated that there is a very strong relationship between nutrition quality and child feeding practices.

Discussion

Nutrient Quality for Child Feeds

The study concludes that nutrition quality has a significant effect on child feeding practices in Marsabit County, Kenya. Laboratory analysis results on nutrient content of child foods as well indicated high nutrients levels especially for foods that have gone through fermentation, germination, roasting, drying, frying processes. This agrees with the mothers' perception of these foods as of good quality.

Recommendation

The study recommends that the Marsabit County government should promote the use of traditional food processing methods, such as fermentation, germination, roasting, drying, and frying, through community nutrition programs to enhance the nutrient content of child foods. These programs should focus on educating mothers and caregivers on how to effectively apply these methods to local foods to improve their nutritional value. By integrating laboratory findings with traditional knowledge, this approach can ensure that children in Marsabit County receive high-quality,

nutrient-dense diets, particularly in resource-constrained environments. Moreover, local health and agricultural authorities should support the dissemination of this knowledge through demonstrations and nutritional guidelines, reinforcing the positive impact of these methods on child health.

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