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NUTRITIONAL STATUS OF CHILDREN UNDER FIVE YEARS AND ASSOCIATED FACTORS IN MBEERE SOUTH DISTRICT, KENYA

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ABSTRACT

Information on nutritional status of children under five years is an indicator of the nutritional situation in society. Identification of core factors influencing nutrition of this population supports plans to alleviate child malnutrition and its consequences. This study sought to determine the nutritional status of children under five years and associated factors in Mbeere South District in Kenya. A cross-sectional descriptive study was conducted using a structured questionnaire. A total of 144 households was randomly sampled and the nutritional status of one child from each household assessed using anthropometric measurements. Up to 39% of the children were stunted; 7.1% were wasted; and 18.1% underweight. The prevalence of stunting and wasting was significantly higher in boys than in girls (χ =6.765, P =.034) and (χ= 13.053, P = .036), respectively. The individual dietary diversity score showed that the most consumed food group was cereals. Eggs and meat were the least consumed foods. Low diversity scores were recorded for 41.9% of the children (<4 food groups), 35.7% had medium scores (4-5 food groups); while 22.5% had high scores (6- 8 food groups). There was significant association between household size and nutritional status (P =0.047). The findings indicate that malnutrition and dietary diversity are major challenges to good nutrition. Future interventions should focus on improving food access and availability for enhanced diet diversification for the rising population.

Key Words: Boys, dietary diversity, girls, malnutrition

RÉSUMÉ

L'information sur le status nutritionnel des enfants de moins de cinq ans est un indicateur de la situation nutritionnelle dans une société. L'identification des facteurs clés influençant la nutrition de cette population soutient les plans d'éradication de la malnutrition infantile et ses conséquences. Cette étude était menée pour déterminer le statut nutritionnel des enfants de moins de cinq ans et les facteurs associés dans le district de Mbeere Sud au Kenya. Une étude transversale était conduite avec un questionnaire structuré. Un total de 144 ménages étaient aléatoirement échantillonnés et le statut nutritionnel d'un enfant dans chaque ménage évalué par l'utilisation des mesures anthropométriques.Trente neuf pourcent des enfants étaient victimes du nanisme; 7.1% étaient maigres , et 18.1% avaient un poids inférieur à la normale . La prévalence du nanisme et de la maigreur était significativement élevée chez les garçons que chez les filles (c =6.765, P =.034) et (c = 13.053, P = .036), respectivement. Le score de la diversité diététique individuelle a montré que la plupart consommait la nourriture du groupe des céréales. Des scores bas de diversité étaient enregistrés chez 41.9% d'enfants (<4 groupes d'aliments), 35.7% avaient des scores moyens (< 4-5 groupes d'aliments); pendant que 22.5% avaient des scores élevés (< 6- 8 groupes d'aliments). Il y avait une association significative entre la taille des ménages et le statut nutritionnel (P =0.047). Ces résultats indiquent que la malnutrition et la diversité diététique constituent des contraintes

majeurs à une bonne nutrition. Des interventions futures devraient être centrée sur l'amélioration de l'accès et la disponibilité de la nourriture pour une meilleure diversification diététique face à la population croissante.

Mots Clés: Garçons, diversité diététique, filles, malnutrition

INTRODUCTION

Nutritional status of children is an indicator of the level of development and future potential of the community. The nutritional status of infants and children under five years of age is of particular concern since the early years of life are crucial for optimal growth and development (Preschulek *et al*., 1999). Nutritional deficiencies affect long term physical growth and development and may lead to high level of illness and disability in adult life. Moreover, high prevalence of malnutrition jeopardizes future economic growth by reducing the intellectual and physical potential of entire population (Kabubo-Mariara *et al*., 2006).

Undernutrition among children remains common in many parts of the world. According WHO (2011), about 178 million children under five years worldwide are too short for their age group; while 115 million are underweight. The same report showed that stunting rate among children is higher in Africa and Asia than elsewhere. In Kenya, 35% of children under five are stunted, while the proportion severely stunted was 14%; 16% are underweight (low weight-for-age) and 4% are severely underweight (KNBS, 2010).

The primary determinants of malnutrition as conceptualised by several researchers relate to unsatisfactory food intake and/or severe and repeated infections (Rowland *et al*., 1988; Schroeder *et al*., 1994; UNICEF, 1998) . The interactions of these conditions with the nutritional status and overall health of the child; and by extension of the populations in which the child is raised have been shown in the UNICEF Conceptual framework of child survival (UNICEF, 1998). The model characterises the correlates of malnutrition as factors that impair access to food, maternal and childcare, and healthcare. It is these very factors that impact the growth of children. Consequently, the assessment of children's growth is a suitable indicator for investigating the wellbeing of children, as well as for examining the households' access to food, health and care (UNICEF, 1998; de Onis *et al*., 2013).

The objective of this study was, therefore, to evaluate the three common indicators of malnutrition namely stunting, wasting and underweight, among children below the age of five in Mbeere South District (MSD) in Kenya as a basis for formulating appropriate policies and evidence based interventions for reducing the incidence of child malnutrition.

MATERIALS AND METHODS

Study site. The study was conducted in Mbeere South District in the Eastern province of Kenya. The District lies between latitudes 0° 202 and 0° 502 south and longitudes 37° 162 and 37° 562 ; and covers a total area of 1,321.5 Km^2 with a population of 130,185 persons (KNBS, 2010).

Study design and sampling. A cross sectional survey, both descriptive and analytical in nature was carried out using a pretested structured questionnaire. The questionnaire was designed to assess the nutrition status of children and its association with demographic, socio-economic characteristics of the household and dietary diversity of the child. The sampling unit for this study was the household with children aged 0-59 months of age and the respondents were the mothers or the principal caretaker of the index child.

Verbal consent from all caregivers/mothers of the sampled children was sought before administration of the questionnaire. All the information collected during the survey were treated as confidential and used for the purpose of the survey only.

A total of 144 households with children 0-59 months were selected for the study, by the random walk method. Once the interviewers got to the centre of the village, he/she spinned the pencil and followed the direction, enumerating the households on the right side. A child aged 0-59 months was purposively selected for the study

from each of the selected household. There was no target of a particular gender during sampling. Households with more than one child aged 0-59 months, only one child was selected for the assessment randomly by tossing a coin. It was assumed that children in the same household are subjected to the same conditions, hence any selected child could represent the household.

Data collection. The questionnaires comprised mainly of details on household profiles like age, sex, education level and occupation of household members, household size and marital status of the household heads. Data on sources of income and dietary diversity were also collected.

Anthropometric measurements taken for children aged (6-59) months included:

Date of birth. The date of birth for each child was inquired from the caretaker/mother and cross checked from immunisation cards and recorded in months.

Length/height. The length of each child aged 6-24 months was measured lying flat and centrally on measuring boards placed on a hard flat surface on the ground. The length was read to the nearest 0.1 cm (head and feet against the base of the board and foot piece respectively).

The height of children aged above 24 months was measured standing straight on measuring board placed on hard flat surface against a wall with line of sight perpendicular to the horizontal surface. The child's height was measured to the nearest one decimal place.

Weight. The child was put in the weighing pants and was gently lowered on the standardised Salter scale with the strap of the pant in front. The scale was hanged from a secure position; the child's weight read to the nearest one decimal place after the scale needle stabilises.

Data analysis. The Emergency Nutrition Assessment for Standardised Monitoring and Assessment of Relief and Transition (ENA for SMART) was used to compute Z-score (weight-for-age, height-for-age and weight-for-height) according to WHO reference standard (WHO, 2006), taking -2SD as cut-off points (underweight, stunting and wasting). The Statistical Package for Social Scientists (SPSS) version 20 was used to analyse demographic and socio-economic data. Data cleaning was done by running and tabulating all variable frequencies.

Frequencies and cross-tabulation were used to give frequencies, means, standard deviation in descriptive analysis on socio-demographic characteristics of households and nutritional status of study children.

The measure of dietary diversity score of the children was based on simple counts of the number of food groups consumed by the child in the past 24 hour. Eight food groups recommended by FAO (FAO, 2008) for assessing individual dietary diversity was used.

Bi-variate analysis was performed on various selected variables with nutritional indices of the children to determine possible associations.

ENA for SMART was used to convert raw anthropometric data (weight, height and age of the children) into anthropometric Z-score that was used to classify children into levels of nutritional status (stunting, wasting and underweight) Table 1.

RESULTS

Characteristic of study population. The household size ranged from two to eleven people. Age distribution of the household members was highly varied, with children aged between 6-17 years comparatively higher (27.8%). The children under five years comprised of 26.9% of the total population. The ratio of male to female in the study population was approximately 1:1.1. The dependency ratio of the population was 1.02.

The majority of the study population attended or was in primary school (71%). About 23.5% attended secondary school while only 2.0%

TABLE 1. Cut off points for malnutrition used in an under-five children study in Kenya

Indicators	Moderate (GAM)	Severe (SAM)
Wasting	WHZ; <-2 to >-3Z scores	WHZ; below -3Z
Underweight	WAZ; <-2 to >-3Z scores	WAZ; below -3Z
Stunting	HAZ; <-2 to >-3Z scores	HAZ; below -3Z

Source: World Health Organization, 2006

attained levels above this. The main occupation was farming (43.1%). Only a very small proportion (3.7%) of the study population had salaried employment.

One out of every 10 households was female headed. Majority (89.5%) of the household heads were married. Majority (57.7%) of the household heads were farmers. Only a very small proportion (10.6%) of household heads had salaried employment. About 15.5 % were self employed or engaged in small business and 14.1% were casual laborers. The others were either students (0.7%) or had no employment (1.4%). Although the study shows that all the household heads had some formal education, the highest education level attained by majority of the household heads was 5-8 years of primary education (63.2). Only 4.3% attended college.

The main source of income among the study population was sale of crops (42.7%), followed by sale of livestock (27.1%). The mean monthly household income in the study population was US$ 61.3. Majority (52.2%) of the households earned less than US$ 0.7 a day.

Malnutrition among the children. A proportion of 42% of the study children were boys and the rest girls. The mean age of the sampled children was 28.4 months, with the youngest being 0 months old and the oldest 59 months old. Overall, 61% of the children had normal height for their age. The prevalence of stunting among the children was 39%. About 28% of these were moderately malnourished; while the rest (11%) were severely stunted. Up to 92.9% of the children had normal weight for their height. Prevalence of wasting was 7.1%; about 5.5% moderately, while 1.6% was severely wasted. The prevalence of stunting and wasting was significantly higher in boys than in girls (χ =6.765, P =.034; χ = 13.053, P = .036, respectively).

There was no evidence of underweight observed among the children below the age of 6 months. However, for children aged 6-59 months, the prevalence of underweight was 18.1%, of whom 12.6% were moderately underweight while 5.5% were severely underweight. There were more underweight boys than girls, but a Chi-square test on the difference in the prevalence of underweight between the difference gender found no significant difference (P>.05)

There were significant differences in prevalence of malnutrition between age groups (Table 2). Stunting was lowest in the first year of life and highest in second and third years of life; while underweight and wasting was highest in the second year. Prevalence of underweight increased with age from the fourth year of life. No incidence of wasting was observed in the first year of life. Although the differences in prevalence

TABLE 2. Percent prevalence of global and severe malnutrition by age in Mbeere south district in Kenya

Age (months)	WAZ (Under weight)		HAZ (Stunting)		WHZ (Wasting)	
	<-3 z-scoren =12	<-2 z-scoren =23	<-3 z-scoren =14	<-2 z-scoren =49	<-3 z-scoren =2	<-2 z-scoren =9
6-11(13)	0	7.69	7.69	15.4	0	0
12-23(32)	6.25	25	25	43.8	0	18.8
24-35(31)	9.7	9.7	9.7	45.2	3.2	6.5
36-47(27)	0	11.1	0	37.0	0	0
48-59(24)	4.2	25	8.3	37.5	4.1	4.1
Total (127)	9.4	18.1	11.0	38.9	1.5	7.1
1P-value	.048*		.032*		.047*	
2P-value	.577		.030*		.858	

1P = value is pearson chi square significant level between age groups; 2P = value is pearson chi square significant level between girls and boys; * Indicate that the difference between malnutrition levels between age group and different sexes are significant at 0.05 levels of significance

of malnutrition were higher in boys than girls in all the indicators of malnutrition (wasting, stunting and underweight), the difference was significant only in height-for-age z-score (HAZ) (P< .05).

Dietary diversity score. The mean dietary diversity was 4.2 food groups, with a minimum of 2 and a maximum of 8 food groups. Cereals was the most popular food group consumed by children, followed by legumes, nuts and seeds at 97 and 76.8%, respectively. The eggs and meat food group was the least consumed, at 36 and 19.2%, respectively (Fig. 1).

In terms of dietary diversity score, majority of the children (41.9%) had low diversity (<4 food groups), and about 35.7% had medium diversity (4-5 food groups). Only 22.5% accessed high dietary diversity score (6- 8 food groups).

Association of selected variable with child nutrition status. The relationship between nutritional indicators based on wasting, stunting and underweight, and other socio-economic characteristics are shown in Table 3. Significant positive and linear relationships were found between underweight, stunting and wasting among the children of 0-59 months. Negative and significant correlations were observed between children's age and nutritional status based on wasting and underweight. Negative significant relationships was observed between the household size and nutritional status based on stunting and wasting. There were no

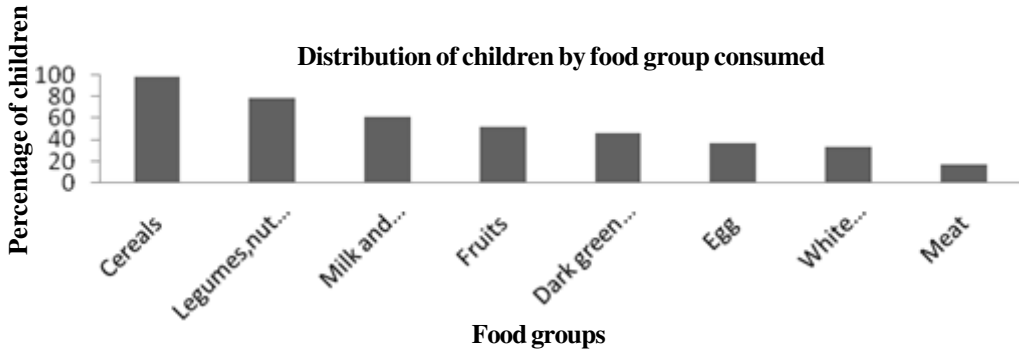

Figure 1. Distribution of children under five years by food group consumed in Kenya.

TABLE 3. Correlation coefficients of selected socio-economic factors and nutrition status among under five years children in Kenya

Variable	WAZ	HAZ	WHZ
	r	r	r
WAZ	1.000	.504*	.828*
HAZ	.504**	1.000	-.047
WHZ	.828**	-.047	1.000
Household size	.611	-.410**	-.402*
Education of household head	-.045	.036	-.052
Gender of household head	-.91	.013	-.013
Age of the child	-.296**	.544	-.243**
Household income	-.592	-.270	.576
Child dietary diversity	-.346	.312	.224

** Correlation significant at 0.01 level (2 tailed). *Correlation significant at 0.05 level (2 tailed); WAZ = weight-for-age z-score, HAZ = height-for-age z-score, WHZ = weight-for-height z-score

significant associations among the three indicators of nutritional, gender and education level of the household head. Similarly, there were no direct significant associations between household income and nutritional indicators. However, there was a significant association ($P<0.05$) between number of food groups consumed and household income.

DISCUSSION

Findings of this study shows that prevalences of underweight (18.1%) and stunting (39%) in Mbeere south district are higher than those reported by the Kenya Demographic Health Survey (KDHS) for national average 16 and 35%, respectively. This means that the situation in this area is worse off than the average area in Kenya.

According WHO classification for assessing severity of malnutrition in a population, prevalence of stunting (39%) was high. Besides, this translates to 39% stunted children who are unlikely to grow to their full potential both physically and mentally. The process of becoming stunted, due to restricted nutrient supply and/or frequent infection, is a common cause of both short stature and structural and functional damage to the brain, resulting in delay in the development of cognitive functions as well as permanent cognitive impairments (Kar *et al*., 2008; Kathryn *et al*., 2011).

The observation that the prevalence of stunting in the first year of life is low is similar to that from the finding of survey conducted earlier in Mbeere District (KNBS, 2009b) and Makueni (Macharia *et al*., 2005); whereby the prevalence of stunting was highest among children 12-35 months. This could be attributed to poor weaning and complementary feeding practices resulting into inadequate energy and protein intake. The poor feeding practices may be due to either lack of knowledge by the mother or lack of adequate food.

The negative and significant relationship observed between children's age and nutritional status based on stunting and underweight could be explained by the fact that as the child grows older he/she becomes more dependent and accesses different food than the younger infant who depends on what is provided by the caregiver/mother (Meme, 1996). However, in this study the prevalence of wasting and underweight seem to increase after the 48 months of age. This is probably due to increased physiological activities of the child at this age, which may necessitate more nutrient intake to support growth and development. Children at this age are outside homes either in school or playing, failing to feed regularly to replenish their energy.

The finding that prevalence of stunting and wasting was higher in male than female children concurs with that of national prevalence indicated in Kenya Demographic Health survey (KNBS, 2010). Other studies are required to explain the relationship between sex and nutritional status, which is an important phenomenon as far as understanding malnutrition is concerned.

The negative significant relationships among household size and stunting, and wasting could be explained by the fact that the family meal is distributed among large numbers of household members resulting to inadequate diet for an extended period eventually causing chronic malnutrition (Macharia *et al.*, 2005).

Contrary to other studies (Onyango *et al*.,1998; Ruel, 2002), this study did not find significant association between nutritional status and dietary diversity. Thus, malnutrition in this area might be caused by other factors other than just having a diversified diet. Additional studies are required to explain the cooking method and caloric adequacy of the complementary foods consumed by children in the study area. The high consumption of food items from mainly cereals observed in this study only confirms that the diets of the children were predominantly based on starchy staples. Besides lacking adequate nutrients, it is also possible that the quantity of carbohydrates obtained from these cereals group was still not adequate to meet the macronutrient needs of the children. From personal observations, the diets of children below two years mainly comprised of starchy staple (mashed banana and potatoes). While the intake of energy is important in diet, other nutrient such as vitamins, proteins and minerals are also necessary for healthy living. Moving from a monotonous diet to one containing a more diverse range of foods has been shown to increase intake of

energy as well as micronutrients in developing countries (Gina *et al*., 2007).

Although legumes, nuts and seeds were the second most popular food groups after cereals, the benefit from consumption of these food groups was not evident in determining nutritional status in this study probably because other factors like quality of the diet, quantity of food consumed and utilisation by the body are also determinant factors.

The lack of relationships between the nutritional status and gender of the household head as well as their education level could be attributed to the fact that the overwhelming majority of the household heads were male and also similar education level to impact difference in nutritional status.

CONCLUSION

The malnutrition rate among the children under five years in Mbeere South District of Kenya is high, clearly confirming that malnutrition is still a wide spread health problem. Diversity and quality of the meals of particularly children below 3 years is poor. Less than 25% of the children consume highly diversified; while over 40% consume poorly diversified diets. Future interventions should focus on improving food access and availability for enhanced diet diversification for the rising population.

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