

Diet Diversity of Complementary Foods: A Case Study of Mulot Division, Narok County

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Abstract

Diet diversity is an important element of a high quality diet. Intake of a varied diet increases the chances of a person meeting their essential nutrient intake. Young children in particular need energy and nutrient-dense foods to meet their dietary needs. According to literature, diets high in diversity are recommended for the first two years in life as this stage involves rapid physical, cognitive and social development. The purpose of this study was to investigate the diet diversity of complementary feeds in children aged 6-59 months in Mulot Division. A descriptive research design was adopted in this study. Four villages to participate in this study were randomly selected. A care giver with a child within the target group was randomly selected. Interview schedules generated data on child feeding practices. Data was entered into and analyzed using the Statistical Package for Social Sciences (SPSS) computer software Version 20 (2007). Tests run were Spearman's correlation analysis and Analysis of variance (ANOVA). A p-value of $p < 0.05$ was considered significant. The results showed that 83% of the respondents had a high diet diversity score, while the rest had a medium diet diversity score. No child had a poor score on diet diversity. Results also showed that 41.7% of children were still being breastfed while 61.7% were bottle fed. Sixty-six (66 %) percent of the children had been started on complementary foods, while 56% had been exclusively breast-fed. There was a significant relationship between diet quality and the diet diversity score ($p < 0.05$). Most of the children had an adequate intake of nutrient by the use of the 7 day recall. No significant correlation between socio-economic status with diet diversity was found ($p < 0.05$). Most children were fed on a medium diverse diet; a majority of the mothers were not compliant with the recommended child feeding practices, particularly breastfeeding beyond six months even after introduction of complementary foods and bottle feeding. Policies should be formulated to educate mothers and care givers on the importance of exclusive breastfeeding and discourage bottle feeding of young children.

Key Words: Diet Diversity, Nutrient Adequacy, Infant, Feeding

INTRODUCTION

Malnutrition is one of the most serious World Health problems (WHO, 2008) and a global burden (UNICEF, 2006). Worldwide, more than 1 billion people are undernourished (WFP, 2005) and out of these, 420 million children are estimated to be wasted and about 180 million weigh less than they should for their age (WHO, 2008). In Kenya, chronic malnutrition is the common form of under-nutrition (Ngare & Mutunga, 2006). Thirty-five percent (35%) of children below 5 years are stunted while 8% and 23% are wasted and under-nourished respectively (IMAM, 2008). This value is

approximately 1.5 million Kenyan children under 5 years (GoK, 2009). The causes of childhood malnutrition are many and complex. Malnutrition contributes to more than half of all under-five childhood deaths throughout the developing world; and has been responsible directly or indirectly for about 60% of the 10.9 million deaths annually of which over two-thirds of these deaths; are often associated with inappropriate feeding practices, occurring during the first year of life (WHO and UNICEF, 2003). An estimated 54% of all under-five deaths in developing countries are associated with malnutrition resulting from poor feeding practices in the first year of life (Black *et al.*, 2008).

The first two years of life involve rapid physical, cognitive and social development that requires optimal nutrition. Adequate infant and young child feeding practices are needed to support this development and provide protection from the risk of morbidity and mortality in low-resource environments (Tushar, 2014). Childhood malnutrition is associated with increased susceptibility to infections, and poor cognitive and motor development. Again, growth failure during infancy and early childhood has been reported to lead to nutrition and health problems later in life (Victoria *et al.*, 2008). In Kenya and many other developing countries, poor quality diets and infections are the major reasons attributed to childhood malnutrition (WFP, 2007). Poor quality diets are low in calories and most essential nutrients. Dietary diversity has long been recognized as a key element of high quality diets (Ruel, 2002). Increasing the variety of foods consumed has been recommended by most dietary guidelines (WHO/FAO, 1996; Drewnowski *et al.*, 1997) because it ensures adequate intake of essential nutrients and thus promote good health and nutrition. According to Hatloy *et al.* (1998), dietary diversity is defined as either the total number of foods consumed or the total food groups consumed. Nutrients essential for child growth and development do not come from a single food item but rather from a diet composed of a number of food items. A measure of the nutritional quality of the diet may therefore be its diversity. Healthy diets are therefore said to be those that are most varied (Hatloy *et al.*, 2000; Kant, 1996).

All people, particularly children need a variety of foods to meet requirements for essential nutrients, and the value of diverse diet has long been recognized. Lack of diet diversity is a particular severe problem in the developing world; where diets are predominantly based on starchy staples and often include few or no animal products and only seasonal fruits and vegetables. Thus, in the context of many developing countries, monotonous diets based on a very small number of foods contribute to micronutrient malnutrition particularly in rural areas. In this context, a large proportion of calories may come from these staples with relatively low energy and very few micronutrients. For young vulnerable children the problem is particularly critical because young children need energy and nutrient dense foods to grow and develop.

Complementary foods fed to young children in Kenya are mostly plant-based (WFP, 2007) and tend to be low in a number of micronutrients. Emphasizing dietary diversity especially in developing countries is therefore particularly important for micronutrient status, as it ensures appropriate balance of micronutrients, and nutrient adequacy. A number of studies have linked dietary diversity to energy and nutrient intake among both adults and children in developed and developing countries such as Mali (Hatloy *et al.*, 1998; 2000) and Kenya (Onyango *et al.*, 1998). In spite of the well-recognized

importance of dietary diversity in health and nutrition, not much work has been done on the role dietary diversity plays in child health and nutrition in Kenya.

Narok, one of the counties in the former Rift Valley was recently hit by Maize Lethal Necrosis Disease which led to total loss of maize which is the staple food in the area. It has also experienced poor temporal distribution of rainfall and late planting which impinge on the food security status of the people. This paper presents findings of a research study carried out on children aged 6-59 months in Mulot Division, Narok County. The purpose of paper was to explore the diet diversity of complementary foods in children 6-59 months in Mulot Division, Narok County.

MATERIALS AND METHODS

Study Design, Setting and Subjects

A Descriptive research design was used in this study. Data was collected from mothers or care givers of children aged 6-59 months residing in randomly selected villages in Mulot Division between December 2013 and January 2014.

This research was carried out in Mulot Division, one of the divisions in Narok County. It lies between Latitudes $0^{\circ} 50'$ and $2^{\circ} 05'$ South and Longitudes $35^{\circ} 58'$ and $36^{\circ} 00'$ East. The county receives two rainy seasons with an average rainfall ranging from 500-1800 mm per year. The mainstay of the people is agriculture as the county is endowed with rich volcanic soil which is suitable for agriculture. There is growing of wheat, maize, millet and barley in both small and large scale depending on the size of the land. Horticulture and other forms of olericulture are practiced. Livestock keeping is also prominent particularly among the pastoral Maasai community. The animals kept are goats, cows, and sheep. They are kept for both milk and meat production.. This research was carried in Mulot Division that was hardly hit by Maize Lethal Necrosis Disease which led to total loss of maize, the staple food in the area. It has also experienced poor temporal distribution of rainfall, late planting which impinge on the food security status of the people.

According to the MoH (2012), Narok County has 151,334 children aged under 5 years. The study sample was drawn from the target population who were children between the ages 6-59 months. Households were randomly selected to participate. Households with a child in the target group were identified through village lists. Mulot division is made of 7 villages. Four out of the seven villages were chosen to participate in the study through random sampling. In the four villages, participants for the study were sampled using cluster sampling technique, where the entire population was divided into groups, or clusters and a random sample of these clusters selected. In a household with twins, one of them was randomly chosen to participate in the study. The sample size was 60 based on Fischer's Formula (1991).

The researcher administered a structured questionnaire to the mothers and care takers of the children and filled their responses. The questionnaire consisted of the following sections; A and B. Section A contained socio-demographic questions while section B

contained child health and feeding practices questions and the food group recall questions.

The food items/groups listed in the questionnaire was categorized into 7 main food groups: cereals, starchy tubers and roots; legumes and nuts; meat, fish, poultry and eggs; vegetables (including green leafy vegetables; fruit; oils and fats; milk and dairy products. In the itemized 7- day recall, the mothers or caregivers were required to recall the foods (both solid and beverages) they have fed their child on, the amount, the frequency and the number of snacks given between meals. Dietary diversity scores for each child were calculated based on their complementary foods given.

The scores were used as discrete quantitative variables and were also divided to distinguish diets of high, medium, and low diversity. Data was collected by interview method using a pre-tested schedule to ensure that there was no ambiguity and that the questions asked and the data collected was relevant to the study. Data was coded and converted into numerical codes and analyzed using Statistical Package for Social Sciences (SPSS) computer software Version 20 (2007). Tests run were Spearman's correlation analysis and Analysis of variance (ANOVA). A p-value of (<0.05) was considered significant.

Approval to carry out this study was granted by the Chief, Mulot Location and the University of Eldoret. Further, mothers were informed about the purpose of the study and consent obtained from them. Confidentiality of the respondents' information was ensured through use of codes so as to maintain anonymity.

RESULTS

Demographic and Socio-Economic Characteristics of the Respondents

Data was obtained from 60 respondents of whom most (80%) were mothers of the children while 20% represented guardians, aunts or grandmothers. Most (92%) were married, whereas 8% were single, divorced or widowed.

Of the respondents interviewed, 85% worked outside the home whereas 15% did not work away from home. Most (88.3%) of the respondents attended school whereas 11.7% did not attend school. Of those who attended school, 16.7% attained primary level education, 25% secondary education, 25% attained higher education and 33.3% underwent vocational training.

More than half of the respondents (66.3%) earned income $>$ Ksh. 5000, 15% earned Ksh. 2000-5000, 1.7% earned income of Ksh. 1000-2000 and 5% earned Ksh. 500-1000.

Child Information

This study involved a total of 60 children; 32 male and 28 female children. The children had a mean age 12 ± 4 months. No visible signs of malnutrition were observed in any of the children at the time of study.

Infant and Young Child Feeding Practices

Hygiene and sanitation practices: A majority of the respondents (76.7%) washed their hands with soap and water after visiting the toilet, preparing food, after changing diapers and before feeding the child. About half (55%) washed their children's hands also using soap and water before eating and after they visited the toilet. Most (73.3%) of the respondents covered their foods with lids or cloths to prevent the food from contamination while 70% of stored left over foods in the open without covering them with cloth or putting them in the shelves.

Exclusive breastfeeding, continued breastfeeding and bottle feeding: Most of the mothers (61.7%) fed their children using a bottle (Figure 1). This is a high percentage considering that the children at this age should be fed using a spoon, cup and plate. A significant percentage of children (40%) were not exclusively breastfed for six months (Figure 2) while 41.7% of the children were breastfed beyond the sixth month after introduction of complementary foods.

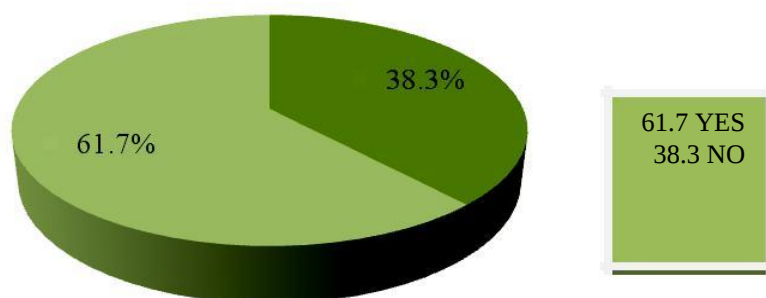


Figure 1. Bottle fed children

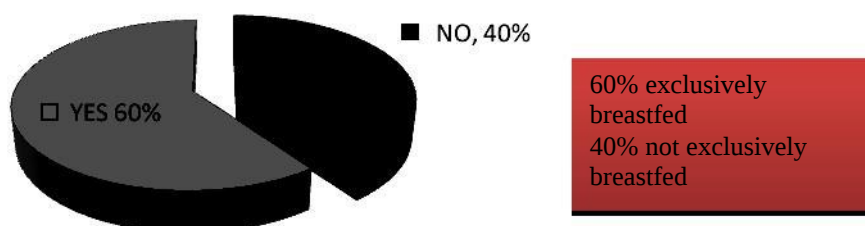


Figure 2. Exclusively breastfed children

Diet Diversity Score

Most (83%) of the children in the study had a medium diversity score while 17% had a high score (Figure 3). This model of scoring was adapted from Mozambique where a consumption of 0-3 food groups represented a low score, 3-5 a medium score and 5-7 foods from the food groups represent a high diet diversity score. In this study, none of the children at the time of the study had eaten foods within two food groups. This is an indication that that most of the children were fed on diverse diets and that most of the children were well nourished.

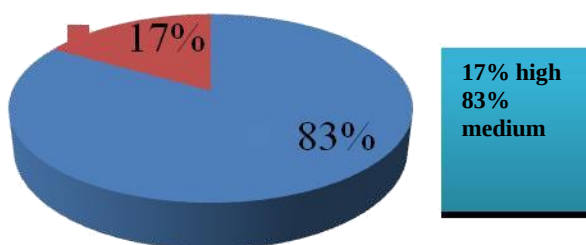


Figure 3. Diet diversity score

Nutrient Adequacy of the Diet

The 7 day food recall was used to determine the nutrient adequacy of the children's diet. Results show that 66.7% of the children studied ate legumes, 97.6 % milk products such as fresh milk and *mursik*. 76.7% of them ate Vitamin A rich fruits and vegetables, 46.7% ate meat, poultry and eggs. Seventy three percent (73.3%) ate food made with fat as most of these foods were fried. while 100% had eaten a starch carbohydrate (Table 1).

Table 1. Food groups eaten using 7-day recall

Food Eaten	N	%
Carbohydrates from grain such as maize, rice, wheat; yams, sweet potatoes, cassava	60	100
Legumes such as beans, lentils, soya, pulses	40	66.7
Vitamin A rich fruits and vegetables	46	76.7
Meat, poultry, eggs	28	46.7
Foods made from fat frying used as the cooking method	44	73.3
Coffee, tea , water	60	100

The major contributors of energy were grains such as maize, wheat, millet, rice in that order. Tubers such as white potatoes, cassava and non- coloured sweet potatoes were also the major carbohydrates that contributed to the energy intake. This is because all the children were reported to have eaten from this food group. Fat was consumed by a considerably high percentage of the children. The most prominent method of cooking the foods was frying. This is an indication that fat and oil were included as ingredients during cooking of the meals. Milk, eggs and meat contributed to protein of high biological value in that order.

No child reported to have eaten fish within the recall period. A slightly low number of children ate meats and eggs which are rich sources of Iron and zinc and are the predominant *_problem_* nutrients at this particular stage of growth and development. This means that the children could not meet their nutrient adequacy of the vital nutrients.

Most of the children took Vitamin A rich vegetables and fruits. This food group included an array of the vegetables and fruits that were in season. These included spinach, kales, tomatoes, red-yellow sweet potatoes, mangoes, oranges and avocados. Furthermore, this group of food is rich in Vitamin C which is paramount as it serves to strengthen the immunity. This shows that most of the target population was meeting their Vitamin A

and C intake. Forty (40) out of the sixty (60) children ate legumes such as beans, lentils and soya within the recall period.

Predictors of Diet Diversity

The maternal level of education and their earning was used to predict diet diversity. Both ANOVA and Spearman's correlation were run to test the correlation between the two variables and diet diversity.

Maternal level of education: Spearman's correlation was run to determine correlation between maternal level of education and diet diversity. The lowest level of education attained was primary school which was defined as a mother who attended school up to standard eight. Lower secondary education was defined as mother who only attended form one while upper secondary education meant the mother left school at form three. Higher education meant those who proceeded for further studies after their fourth form. Others included the group of mothers who went for vocational training without consideration of the level of education achieved, while '_none_' stood for those who never went to school at all.

Diet diversity score, both medium and high, was run against the level of education and the count of mothers in each category taken. The results showed that mothers with higher education had the highest medium diet diversity score followed by those who attended upper secondary education and those who attended vocational training. High diversity score was also evident in mothers who attended school to higher education than those who never went to school at all and those who attended school to primary level.

Maternal economic status: Spearman's correlation was run to determine the association between the mothers' earning and diet diversity score. The earnings were plotted against the number of the mothers in each of the diversity scores. The results show that the highest count of mothers with a medium diversity score earned over Ksh. 5000. Further, the study also revealed that those who earned Ksh 500-1000 had a lower score of both diversity scores.

DISCUSSIONS

Exclusive breast feeding is widely recognized as the optimal means of feeding and caring for the young infants during the first few months of life (Brown *et al.*, 1995). For optimal growth, it is recommended that infants be exclusively breastfed for the first six months of life. WHO (2002) recommends exclusive breast feeding for the first six months of life and continued breastfeeding until the age of two years and beyond. Overall, sixty (60%) of the children had been exclusively breastfed for the first six months of life at the time of data collection. For the other (40%) children, it was noted that most of their mothers had a strong intention of exclusively breastfeeding for up to six months. This indicates that mothers have good intentions of exclusively breastfeeding for about six months but, introduce complementary feeds earlier than the intended age. This raises questions as to whether the standard of six months, is unrealistic thus unattainable for this community whose malnutrition rates were also low. Nationally, in Kenya only 14% of infants were exclusively breastfed up to the age of six months, while the remaining majority

complementary foods had been introduced. A two-year prospective study in Nairobi's, low-income region, Kangemi, established that by the age of one month 75% infants had received complementary fluids and feeds and by the fourth month 94% had received complementary feed (Mukuri *et al.*, 1999). Besides, a comparative study between a World Vision project and non-project areas in Makueni District indicated that 37.5% and 68.3% in the project and non-project areas respectively, introduced complementary feeds within the first three months (Macharia *et al.*, 2004). Similarly, a study in the Central region of South Africa, indicated that exclusive breastfeeding during the first three months was uncommon as mothers tended to introduce complementary feeds at an early age, with 56% of the infants receiving some form of supplement by the end of the first month (Mamabolo *et al.*, 2004).

This study found that the practice of continued breastfeeding beyond six months in Mulot Division was not in full compliance with the international recommendation which states that children should be exclusively breastfed for six months, and continued breastfeeding up to the second year after introduction of complementary foods in the sixth month. This study found out that most (58.3%) children of this age group were not continually breastfed beyond six months after the introduction of complementary foods. Studies in Malawi revealed that children who were given foods according to the timing set by the World Health Organization as well as continued breastfeeding after six months were found well-nourished as compared with children who were introduced to solids too early (Madise & Mpoma, 2007).

Bottle feeding is discouraged because improper sanitation and formula preparation with bottle feeding can introduce pathogens to the infant, putting the child at a greater risk of illness and malnutrition (USAID, 2001). Most (61.7%) mothers did not use safe modes of giving fluids and foods to the child such as cups, spoon and bowls/plates. Contradictory findings by Torimiro *et al.* (2004) in Nigeria indicated that 78.3% of the mothers were not using feeding bottles. In a low-income peri-urban community, Shamin *et al.* (2006) established that out of 105 mothers, 102 were using feeding bottles with teats for infants with or without breastfeeding. This was a very high prevalence of bottle-feeding compared to present study. Additionally, because of the associated exposure to pathogens and interference with successful breastfeeding, current feeding recommendation strongly encourages proper hygiene and high standards of hygiene throughout childhood (PAHO/WHO, 2003). Most of the caregivers practice proper water, hygiene and sanitation where 73.3% cover left over foods, 76.7% wash their hands with soap and water. This is particularly before preparing foods and feeding the child. These practices go along with reducing the incidences of diarrhoea which could be an underlying factor to malnutrition (UNICEF, 2007).

The 7 day food recall used showed that 83% of the children in the study had a medium diversity score while 17% had a high score. This points out that the children consumed most of the foods within the major food groups; and this is an indication of a high diet diversity which translates to adequate nutrient intake. Onyango *et al.* (1998) found that dietary diversity as defined by the number of different foods consumed was associated with nutrient intake in 154 Kenyan children of 1-3 years of age. Tarini *et al.* (1999) looked at the association between diversity and nutrient intake also confirmed the positive association between dietary diversity and intake of a variety of nutrients.

However, an additional study conducted in Ghana and Malawi reports only a weak association between diversity and nutrient intakes (Ferguson *et al.*, 1993). Food intake was measured by weighing over a 3-day period in rural children from Ghana and Malawi. The average number of different food items consumed per day was the measure of dietary diversity. One major limiting factor in this present study is that it did not involve the biochemical analysis to determine the nutritional status and the levels of the various nutrients in the children.

The results from the present study show that there is little association between diet diversity and socio-economic status. Other studies have found contradictory results on the same. Hatloy *et al.* (2000) also tested the association between dietary diversity and socioeconomic status. The results showed that dietary diversity increases with socioeconomic status both in urban and in rural areas, and irrespective of the diversity indicator used (FVS or DDS). Ferguson and colleagues (1993) also made reference to differences in dietary diversity between households from different socioeconomic status in their study among pre-school Ghanaian and Malawian children and found that diet diversity and socio-economic status was correlated (Ferguson *et al.*, 1993). The strong association between dietary diversity and household socioeconomic characteristics documented here confirms the need to control for socio-economic factors when assessing the relationship between dietary diversity and child nutrition and health outcomes. Failure to do so could lead to gross overestimations of the magnitude of this association and of the real potential of dietary diversification interventions to improve child nutrition and growth. The most important thing to note about this study is that the monthly wages of the subject was used as an indicator of economic status and not all the monthly or the annual returns of the families; which would have given a clearer figure of the status. This thus could have brought the differences in the study.

Results from this study shows that there is a high correlation between diet diversity score and diet quality. Diversity scores seem to be useful proxies of diet quality. Correlation coefficients for the association between DDS and diet quality in children in this study differed from those of other validation studies (Steyn *et al.*, 2006; Kennedy *et al.*, 2006). Despite differences in magnitude of coefficients, all studies, including this, found a positive correlation of DDS with measures of diet quality and/or quantity, thus confirming the usefulness of DDS to reflect diet quality. Studies in Mali (Hatloy, Torheim, & Oshaug, 1998) and Viet Nam (Ogle, Hung, & Tuyet, 2001) compared a food variety score with a food group indicator and found that both indicators were significantly associated with nutrient adequacy. A study in Mali, however, demonstrated that food group diversity was a stronger predictor of nutrient adequacy than the simple count of individual foods. Krebs-Smith and colleagues also compared three dietary diversity indicators with respect to their association with dietary quality and found that variety between the five major food groups studied (Krebs-Smith *et al.*, 1987). They concluded that, for simplicity, dietary diversity might best be assessed by measuring intake of foods from each of the major groups. In this study, it is worth noting that the study was conducted when most coloured fruits and vegetables were in season. Thus a study done when the fruits are out of season would give inconsistent results. Forty out of the sixty children took legumes such as beans, lentils and soya within the recall period. These are proteins of low biological value (with exception of soya), and they contain a considerable amount of tannins and other anti-nutritional factors which might bind vital

micronutrients for growth such as zinc, phosphorous and calcium. This could be exacerbated by the fact that all children took tea which has high levels of tannins and oxalates. Nevertheless, they contain considerable amounts of essential amino acids, proteins and high levels of B- Vitamins and Iron. In addition, dietary diversity has been consistently associated with dietary quality (often measured as nutrient adequacy) despite differing methods and scoring systems (Ruel, 2003), confirming that the association is robust.

In sum, this study showed that DDS are useful proxies of micronutrient density of foods consumed by children 6-24 months.

CONCLUSIONS AND RECOMMENDATIONS

Overall, diet diversity score and nutrient intake adequacy and quality was high and compliant to the recommended. This could have contributed the acceptable nutrition status among the children. Therefore, the mothers and the caregivers should be encouraged to continue feeding their children with highly diversified diets. Importance of exclusive breastfeeding for the first six months of age, continued breastfeeding after six months of age and avoidance of bottle feeding of the child, in its contribution to healthy growth and development should be taught to the mothers and caregivers; The families should introduce fish as part of their proteins of high biological value; In order to meet the Millennium Development Goals, there is the need to strengthen nutrition education among mothers/caregivers

From the results of this study, it can be concluded that; The children are fed on moderately diversified diets; The mothers practice poor child feeding practices in terms of exclusive breastfeeding, continued breastfeeding after the sixth month and bottle feeding and that there was no correlation between socio-economic status and diet diversity at 0.05 confidence interval.

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BIO-DATA

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