

Research Application Summary

Role of cassava in nutrition of 2-5 years old children in coastal Kenya

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Abstract

Cassava roots are a good source of calories in the tropics. However, they lack most of the other nutrients such as Zinc, Iron and Vitamin A. Populations that solely rely on cassava are therefore prone to suffer deficiencies from most of these nutrients. With the extensive promotion of cassava production in Coastal Kenya, this study was conducted to understand the contribution of cassava in nutrition of 2-5 years old children in Coastal Kenya. The average amount of cassava consumed by each child every consumption time was assessed, and the calories and protein energy derived from that amount calculated and expressed as percentage of Recommended Dietary Allowances (RDA) for age and sex. Dietary diversity and immunization status were assessed, and nutritional status measured. A cross-sectional descriptive survey with some analytical component was carried out in Coastal Kenya. The study subjects were 220 children selected through systematic random sampling. The findings showed that 98% of the households fed their children with cassava. At every consumption time, children obtained 22% of their daily energy requirement from cassava. Among the available cassava based products, boiled roots were the most frequently consumed and provided the highest amount of calories every consumption time, while the leaves, although moderately consumed, provided the highest amount of protein. The mean dietary diversity score of the children was 5.2 with a standard deviation of 1.45. Most of the children consumed protein rich foods more than three times in a week. Prevalence of stunting was 29%, while prevalence of wasting and underweight was 10% and 8%, respectively. The study concluded that cassava serves as a good source of energy for households in Coastal Kenya. Consumption of cassava does not lead to malnutrition, but over-dependence on it without adequate dietary diversification pre-disposes one to the risk of dietary deficiencies.

Key words: Coastal Kenya, cassava, consumption, energy, malnutrition

Résumé

Les racines de manioc sont une bonne source de calories sous les tropiques. Cependant, ils manquent de la plupart des autres nutriments tels que le zinc, le fer et la vitamine A. Les populations qui dépendent uniquement du manioc sont donc sujettes à des carences de la plupart de ces nutriments. Avec la promotion à grande échelle de la production de manioc dans les zones côtières du Kenya,

cette étude a été menée pour comprendre la contribution du manioc à la nutrition des enfants de 2 à 5 ans dans les zones côtières du Kenya. La quantité moyenne de manioc consommée par chaque enfant à chaque consommation a été évaluée, et les calories et l'énergie protéique dérivées de cette quantité calculées et exprimées en pourcentage des apports nutritionnels recommandés (ANR) pour l'âge et le sexe. La diversité alimentaire et l'état d'immunisation ont été évalués et l'état nutritionnel a été mesuré. Une enquête descriptive transversale avec une certaine composante analytique a été réalisée dans la région côtière du Kenya. Les sujets de l'étude étaient 220 enfants sélectionnés par échantillonnage aléatoire systématique. Les résultats ont montré que 98% des ménages nourrissaient leurs enfants avec du manioc. A chaque consommation, les enfants ont obtenu 22% de leurs besoins énergétiques quotidiens en manioc. Parmi les produits à base de manioc disponibles, les racines bouillies étaient les plus consommées et fournissaient la plus grande quantité de calories à chaque fois, tandis que les feuilles, bien que modérément consommées, fournissaient la plus grande quantité de protéines. Le score moyen de diversité alimentaire des enfants était de 5,2 avec un écart-type de 1,45. La plupart des enfants ont consommé des aliments riches en protéines plus de trois fois par semaine. La prévalence du retard de croissance était de 29%, tandis que la prévalence de l'émaciation et de l'insuffisance pondérale était respectivement de 10% et 8%. L'étude a conclu que le manioc est une bonne source d'énergie pour les ménages du Kenya côtier. La consommation de manioc n'entraîne pas de malnutrition, mais sa dépendance excessive sans une diversification alimentaire adéquate prédispose au risque de carences alimentaires.

Mots-clés: Kenya côtier, manioc, consommation, énergie, malnutrition

Introduction

In Kenya, like other African countries, cassava is strategically valued for the role it plays in ensuring food security, income generation and employment creation, thus improving the livelihoods of the rural population (Lukmanji *et al.*, 2008). It serves as an important crop in poverty alleviation and as a source of raw materials for agro-allied industries, with a huge potential for the export market. Cassava, yams and sweet potatoes are important sources of food in the tropics. The cassava plant however, can be regarded as the most important crop, in terms of area cultivated and total production (Akinpelu *et al.*, 2011). It gives the third highest yield of carbohydrates per cultivated area among crop plants, after sugarcane and beet root. The importance of the crop to many African countries is also reflected in the name given to the plant in some West African countries, agbeli, meaning there is life (Akinpelu *et al.*, 2011). A wide range of products can be processed from cassava as demonstrated by data from the collaborative study of cassava in Africa (Kenyon *et al.*, 2006). In West Africa for example, it is principally consumed in fermented form as a meal known as 'gari'. In addition, the crop can also be processed into starch for many food and non-food uses. Cassava flour is used in preparation of porridge, ugali, bread, biscuits, confectionery, pasta and couscous-like products and in the preparation of adhesives while cassava starch is used in foodstuff and can also be used for alcohol production, among other agro-based industrial uses (Kenyon *et al.*, 2006).

Cassava roots however, contribute to calories, but lack most of the other nutrients. They have the lowest protein-energy ratio (P: E) of approximately 2% compared to other staple crops (Lukmanji *et al.*, 2006). Though the leaves have a higher proportion of proteins, minerals and vitamins than the roots, the roots still remain the most important portion of the plant due to their high consumption levels. Although cassava remains to be an important food security crop for a majority of the populations that rely on it as a staple food, there is need for proper diet diversification to meet all their nutrient needs to avoid deficiencies. Furthermore, a study by Stephenson *et al.* (2010) in western Kenya and the Lake Victoria region indicated that 89% of Kenyan children in the study population obtained >25% of their daily energy from cassava and 53% of them had inadequate protein intake. There is need therefore to establish the contribution of cassava in nutrition of 2-5 years old in Coastal Kenya, a region that is experiencing extensive promotion of cassava production.

Materials and methods

A cross-sectional survey was conducted in May 2014 in three randomly selected Counties of Coastal Kenya: Kwale, Mombasa and Kilifi Counties. Through systematic random sampling, 220 households with children 2-5 years old from 20 villages were sampled. The primary care-givers were interviewed to obtain information on various socio-demographic characteristics, cassava production and consumption practices and various dietary practices. The anthropometric measurements of the respective 2-5 years old children were taken which included weight, height and Mid-upper arm circumference (MUAC). Weights of children were measured to the nearest 0.1 kg using a portable Salter scale calibrated at regular intervals. Height was measured using a wooden height board to the nearest 0.1 cm, and the MUAC was measured using MUAC tapes recommended by UNICEF. Face to face interviews were conducted by trained enumerators from the study region using pre-tested questionnaire. Food frequency questionnaires, dietary diversity questionnaire and 24-hour recall techniques were used to estimate energy and protein intake obtained from cassava, frequency of consumption of various cassava based products, and dietary diversity of the children.

Weight for height (WHZ), weight for age (WAZ) and height for age (HAZ) z-scores were derived using WHO reference standards for determining nutritional status of children. The results were classified as wasting, underweight and stunting if they had a z-score of below minus two for WHZ, WAZ and HAZ, respectively.

Results

Irrespective of whether household produced cassava or not, cassava was consumed in 98% of the households studied, including by children aged 2-5 years old. Forty five percent (45%) of these households obtained their cassava through own production, 44% from local open air markets, 8% obtained from other farmers, while 3% of the households obtained from supermarkets. The study subjects differed in their preference for cassava based products. Most of the cassava consumers (76%) preferred Boiled cassava roots. This was followed by cassava leaves by 9% of the consumer, cassava chips preferred by 7%, cassava crisps by 5%, while 3% of the consumers preferred raw cassava or a combination of more than one form. The frequency of consumption of various cassava based products is as shown in Table 1. When compared to the common starchy staples, cassava ranks fourth in terms of frequency of consumption (Table 2).

Table 1. Frequency of consumption of cassava based products by children in Coastal Kenya

Cassava based products	Frequency					
	More than once daily (%)	Once daily (%)	3-6 times per week (%)	Once or twice per week (%)	Once per month or less (%)	Never (%)
Crisps	2	3	9	16	24	46
Ugali	0	3	6	4	6	81
Porridge	0	1	4	6	9	80
Gari	0	1	2	4	9	83
Boiled cassava	1	2	18	34	25	20
Fries	0	2	11	25	30	31
Leaves	1	1	9	16	28	45

Table 2. Frequency of consumption of cassava based products in comparison with common starchy staples in Coastal Kenya

Starchy staple	Frequency of consumption					
	More than once daily (%)	Once daily (%)	3-6 times per week (%)	Once or twice per week (%)	Once per month or less (%)	Never (%)
Cassava based Products	2	3	18	34	26	17
Maize	29	43	26	2	—	—
Irish potatoes	9	19	33	24	10	5
Rice	2	7	42	32	14	3
Sweet potatoes	1	1	6	17	45	30

Children 2-5 years obtained more energy from cassava fries (327.1 kcal), followed by boiled cassava (325.7 kcal) and gari (269.4 kcal) at any consumption time while Cassava based ugali and porridge provided less energy at any consumption time (Table 3). Cassava leaves provided the least amount of energy but highest amount of proteins any time they were consumed compared to other cassava based products.

Table 3. Average amount of energy and protein derived from cassava based products by children in Coastal Kenya

Cassava products	Average amount consumed by the children			
	Energy (kcal)	% RDA (1500kcal)	Protein (g)	% of RDA(15g)
Crisps	130.6	8.7%	0.9	6%
Ugali	134.7	9%	1.0	6.7%
Porridge	156.7	10.4%	1.1	7.3%
Gari	269.4	17.9%	2.0	13.3%
Boiled cassava	325.7	21.7%	2.4	16%
Fries	327.1	21.8%	2.4	16%
Leaves	29.3	1.9%	4.3	28.7%

Results on the diversity of the diet of 2-5 years children during the 24 hours preceding the study, analyzed out of eight food groups, indicated that the mean dietary diversity score (DDS) of the children was 5.2. Only 12.3% of the children had a mean dietary diversity score of less than three food groups. However, barely 2% of the studied children consumed food from all the eight food groups. Majority of the children were provided with protein rich foods more than three times per week as shown in the Table 4.

Table 4. Frequency of consumption of protein rich foods by children 2-5 years in Coastal Kenya

Food item	More than once daily (%)	Once daily (%)	3-6 times per week (%)	Once or twice per week (%)	Once per month or less (%)	Never (%)
Eggs	1	5	17	38	25	14
Fish	4	20	38	27	8	3
Chicken or other fowl	1	3	4	25	54	13
Meats	1	3	11	36	32	16
Milk and its products	14	25	20	18	12	11
Pulses	9	18	34	26	10	3

Prevalence of stunting among the 2-5 years old children in the study region was 29%, the level of wasting was 10% while only 8% of the children were underweight. The mean MUAC of the children was 15.4 cm. Only 5% of the children were moderately malnourished according to MUAC measurement. Ninety four (94) percent of the children had received all the necessary immunizations, 45% of these were confirmed from the clinic cards issued at the Health Centers while 49% were as confirmed by their mothers.

Discussion

Cassava is a highly accepted crop in the coastal region of Kenya, and it has a great potential of increasing household food security, as shown by the high levels of consumption of the crop in the region. The possibility of processing cassava into various products enables households to create variety of foodstuffs with cassava, which is important in improving the organoleptic properties of cassava based products and creates opportunities for improving the nutritional value of these products. Both roots and leaves are consumed by majority of the population, with 55% of the population indicating that they consume cassava leaves. This shows appropriate utilization of cassava, since the leaves are known to be even more nutritious than the roots. Boiled cassava roots however remain the most commonly consumed cassava product in the coastal region, followed by cassava fries, cassava leaves and cassava crisps, respectively. Utilization of some cassava based products such as cassava porridge. Consumption of ugali and gari is quite low, although ugali and porridge from cereals are popular in Kenya. This indicates need for intensive promotion of these products in Kenya, since value added cassava based products are more suitable in ensuring improved food security situation in future.

Majority of the children in households studied consumed diets rich in proteins. The results of the 24-hour dietary diversity score showed that majority of the children were fed with meats (including fish), legumes, milk and its products or eggs in the past one day. Consumption of fish and sea foods was quite impressive, whereby more than half of the children had consumed these products in the previous 24 hours, which is a good indication of ensuring dietary protein adequacy. This is an important factor in preventing deficiencies among children in cassava consuming regions, since most protein rich foods are also high in most micronutrients which is deficient in cassava.

The nutritional status of the children in Coastal Kenya shows that the prevalence of malnutrition using the three indicators measured is lower than the national average figures, reported by the Kenya Demographic and Health Survey (KNBS and ICF Macro, 2010). This includes stunting levels which were at 29%, wasting at 10%, and underweight at 12.6%, while the national average figures of are 35% for stunting, 17.2% for wasting and 16% for underweight. This therefore shows that the levels of malnutrition among children under five all over Kenya are not attributable to cassava consumption, but may be due to other factors, including the children in non-cassava consuming regions.

Conclusion

Root based cassava products provide a good source of energy for households in Coastal Kenya, though their protein content is low. Cassava leaves are, however, rich in protein and more consumer awareness creation would be beneficial in enhancing their utilization. Incorporation of the leaves in cassava based products could also be a positive strategy in improving the nutritional value of cassava based products. Adequate dietary diversification is also highly recommended to populations relying on cassava as their main source of

energy, in order to substitute for the nutrients deficient in cassava.

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References

- Akinpelu, A.O., Amangbo, L.E.F., Olojede, A.O. and Oyekale, A.S. 2011. Health implications of cassava production and consumption. *Journal of Agriculture and Social Research* 11 (1): 118-125.
- Lukmanji, Z., Hertzmark, E., Mlingi, N., Assey, V., Ndossi, G. and Fawzi, W. 2008. Tanzanian Food Composition Table. Tanzania Food and Nutrition Centre (TFNC), Dares Salaam, Tanzania.
- Kenya National Bureau of Statistics and ICF Macro. 2010. Kenya Demographic and Health Survey 2009. Calverton, Maryland: KNBS and ICF Macro.
- Kenyon, L., Anandajayasekeram, P. and Ochieng, C. 2006. A synthesis/ lesson learning study of the research carried out on roots and tuber crops commissioned through the DFIDB RNRRS research programmes between 1995 and 2005. pp.1-52.
- Stephenson, K, Rachel, A., Sally, M., Rhoda, N., Busie, M.D, Simon, G., Ada, M. and Mark, M. 2010. Consuming cassava as a staple food places children 2-5 years old at risk for inadequate intake, an observation study in Kenya and Nigeria. *Nutrition journal* 9:1-6.