

Survey on Consumption of Vegetables and Fruits in a Coastal District in Ghana

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Abstract

In 2000, The World Health Organisation reported that at least 254 million preschool children suffer from subclinical vitamin A deficiency (VAD) globally. Vitamin A deficiency adversely affects growth, reproduction and resistance to infection, which could have serious economic consequences for a nation in terms of increased medical cost and reduced workforce. Strategies to reduce VAD included periodic vitamin A supplementation of children, but this is donor-dependent and therefore not sustainable. Dietary diversification in low income groups using beta-carotene rich foods such as orange fleshed foods and green leafy vegetables is being advocated. For an effective nutrition promotion drive, however, it is important to study the foods consumed in a particular locality so as to design an appropriate intervention package for that community. The current work therefore surveyed the consumption of vegetables and fruits in a coastal district of Ghana so as to identify the potential vegetables that could be promoted in the district for improving their vitamin A status. The results showed that several fruits and vegetables are eaten in the district, but the potential beta-carotene rich ones that could be promoted on a sustainable basis are mangoes and drumstick leaves. Mangoes are abundant in the district during the two fruiting seasons and could be easily accessed by the inhabitants. Likewise, drumstick leaves are available all year round and these could be incorporated into selected recipes in the school feeding programme, and could also be used in making convenience foods for easy access.

Keywords: Beta-carotene, vitamin A deficiency (VAD), green leafy vegetables, fruits

1. Introduction

Vitamin A deficiency (VAD) is a major public health problem in many developing countries including Ghana. The World Health Organisation (WHO) and the United Nations Children's Education Fund (UNICEF) estimated that at least 254 million preschool children suffer from clinical and subclinical VAD globally (WHO/UNICEF, 1995; WHO, 2000). In 1997 Ghana's Ministry of Health (MOH) reported that 79.3% of children under five years in some coastal communities surveyed had sub-clinical vitamin A deficiency (MOH, 1997; WHO, 2000). The consequences of VAD include adverse effects on growth, reproduction and resistance to infection, with the most severe being xerophthalmia which could eventually lead to blindness (WHO, 1995). Periodic administration of large doses of vitamin A supplements has been implemented to reduce the serious consequences of VAD (Kandlakunta *et al.*, 2008). However, supplement distribution is supported by international organizations (WHO/UNICEF/IVAAG, 1988), and for sustainability it must be repeated routinely. Apart from being costly, it also needs appropriate health care infrastructure to ensure broad coverage (Jalal *et al.*, 1998). It is however becoming clear that daily consumption of local β -carotene rich foods could serve as a cheap way of improving vitamin A status of low income groups which are most often the populations at risk (Persson *et al.*, 2001). These foods include orange-fleshed sweet potatoes, carrots, many fruits including mangoes and green leafy vegetables such as amaranth and drumstick leaves. The Plan of Action of the International Conference of Nutrition (ICN) also recommended the adoption of dietary based strategies for vitamin A in low income countries (FAO/WHO, 1993). Singh *et al.* (2001) reported that 95% of the β -carotene in India comes from greens and 90% of this is provided by green leafy vegetables.

Several workers have quantified carotenoid levels in leafy green vegetables (Aizawa and Inakuma, 2007; Raju *et al.*, 2007; Bhaskarachary *et al.*, 2006; Chanwitheesuk *et al.*, 2005) and have reported that this class of food is a potential source of β -carotene that could be tapped for improving vitamin A status (Nambiar *et al.*, 2003). Nambiar and Seshadri (2001) also reported that administration of both fresh and dehydrated *Moringa oleifera* (drumstick) leaves improved retinol levels significantly over the baseline levels in a rat model and also observed improved growth parameters in the *M. oleifera* fed rats as against those fed on synthetic vitamin A. Similarly, a controlled study conducted at Noguchi Memorial Institute for Medical Research at the University of Ghana showed that *M. oleifera* was non-toxic to laboratory animals, and that *M. oleifera* leaf powder fortification could improve the haemoglobin and retinol levels of laboratory rats (NMIMR, 2002, unpublished). Ullah *et al.* (2011) fed 10 volunteer adults with 240g spinach daily for a week and found significant increases in serum retinol over baseline values. This finding was in agreement with a study conducted by Agte *et al.* (2006) who also observed significant increases in β -carotene levels when they supplemented 100g GLV/day. As far back as 1970, Lala and Reddy reported a mean absorption of 70% of β -carotene from amaranth fed to malnourished children.

Saint Saveur and Broin, (2010) also indicated that 100g of fresh *M. oleifera* leaves could theoretically cover 100% of the daily needs of vitamin A which ranges from 400 μ g retinol equivalent for young children to 1,000 μ g retinol equivalents for breastfeeding women. Similarly, 10g of *M. oleifera* leaf powder could cover 50-100% of the daily recommended vitamin A requirements for all age groups. Thus in developing countries with high burdens of VAD and abundance of green leafy vegetables and provitamin A-rich fruits, consumption of these foods could be a cheap and sustainable means of resolving this public health concern.

However, for effective nutrition promotion, it is necessary to identify the vegetables and fruits consumed in any locality, evaluate the β -carotene content of those vegetables and fruits to determine their suitability for promotion before designing a promotion package for the community. This study therefore, sought to collect data on the consumption of vegetables and fruits in a coastal district in Ghana.

2. Study Area

The survey was carried out in Ada-East district of the Greater Accra region, within the coastal savannah zone of Ghana, which was part of the former Dangme-East district. The 2010 census put the population of the district at 130,975 with 68,801 (52.53%) being females and the remaining 62,174 (47.47%) being males (Ada-East District Assembly, 2013). The district covers an area of 525 km and it has a wet season (March–September) and a dry season (October–February) with a mean annual rainfall of 750mm. Majority of the inhabitants are fishermen, fishmongers and peasant farmers who cultivate onions, okro, tomatoes, pepper, maize and cassava mainly. Temperatures are high in the district throughout the year and range from 23°C to 28°C with a maximum of 33°C during the very hot periods. The district experiences heavy rainfalls during the rainy seasons (March - September).

3. Subjects and Methods

The study subjects were men and women randomly selected from the study area. One hundred and thirteen (113) adults were randomly selected from Kasseh (which is along the main Accra to Aflao road) to Alavanyo (a community along the coast) for questionnaire administration. Questions posed included the types of vegetable eaten in the area and the frequency of consumption of these vegetables. The study was conducted in March to April, 2012. The sample size was estimated based on the number recommended for mini surveys (surveys that use a small sample size and concentrate on a few variables) by Kumar (1990).

3.1 Interview

All respondents were administered with structured questionnaire to collect data on the types of vegetables and fruits consumed in the area. The survey further asked questions on how often these vegetables and fruits are consumed. The vegetables covered in the study included cocoyam (*Xanthosoma sagittifolium*) leaves, garden eggs (*Solanum melongena*), okro (*Abelmoschus esculentus*), fresh/dried pepper (*Capsicum annum*), onions (*Allium cepa*) (large/small), tomatoes (*Lycopersicon esculentus*), amaranth (*Amaranthus hybridus*), tossa (*Corchorus olitorius*), African spinach, (*Talinum triangulare*), leafy eggplant (*Solanum macrocarpon*), and drumstick (*Moringa oleifera*). Respondents were asked to identify the vegetables they use in preparing food from the list of vegetables provided, and also any other not mentioned.

3.2 Staples Intake

Respondents were also asked to indicate the types of staples they consume in the district from a list of staples provided.

3.3 Data Analysis

The data were entered into Microsoft Excel (2007) spreadsheet and analysed with same software. Percentages and frequencies were calculated and presented as bar charts.

3.4 Ethical Issues

Ethical clearance was sought from the ethical committee of the Noguchi Memorial Institute for Medical Research.

4. Results and Discussion

4.1 Staples Intake

The basic diet of the community comprised carbohydrates (cassava, maize and rice). Yam, cocoyam and plantain are also consumed occasionally. Cowpea and peanuts are also important sources of protein in addition to fish, in the district. Children eat the same food that adults also take. On the average, people take two main meals a day.

4.2 Vegetable Consumption

Figure 1 shows vegetable consumption in the district. Vegetables consumed in the district include cocoyam leaves, garden eggs, tomatoes, pepper, onions, okro, African spinach, leafy eggplant, and amaranth. One hundred percent (100%) of the respondents consumed cocoyam leaves, garden eggs, tomatoes, pepper, onions and okro; 70.8% consumed tossa, 56.6% consumed African spinach, 49.6% consume leafy eggplant, 52% consumed

drumstick leaves whilst 23% consumed amaranth. With the frequency of consumption, 81.1% ate vegetables on daily basis, whilst 12.6% ate it once a week; 4.5% ate vegetables 3 times a week with 0.9% each eating them when available or occasionally. Survey of the local market also showed that these vegetables are sold on market days which are held twice a week. However, with the exception of onions, okro, tomatoes and pepper and drumstick, all the other vegetables are not cultivated in the district. Tossa, amaranth and leafy eggplant are brought in by traders from neighbouring South Tongu and Akatsi districts on market days. Cocoyam leaves are brought by traders from Accra. Drumstick plants were found growing in most households from inland to the coastal communities in the district.

4.3 Fruit Consumption

In Figure 2, the types of fruits eaten in the district are shown. Fruits consumed in the district include bananas, oranges, pineapple, mangoes and watermelon. With the exception of avocado pear which is consumed by only 29% of the respondents, all other fruits are consumed by more than 90% of the respondents, with 72.6% of respondents consuming fruits on daily basis. About 10.6% of the respondents indicated that they consume the fruits once per week. Fifteen percent of the respondents said they consume fruits three times per week. Two respondents indicated that they consume the fruits seasonally. Survey on fruit cultivation showed that the area is noted for growing local mangoes and watermelon. These are marketed during the peak seasons in big markets as well as the local market. All other fruits are brought from elsewhere and sold in the market and the communities. Accessibility to adequate amounts of those fruits not cultivated in the district, therefore will be dependent on the availability of financial resources.

Raju *et al.*, 2007 reported that fresh onions contain 16.90 mg/100g beta-carotene from work they did in India. They also reported values of 18.67mg/100g for amaranth. Red chilli (*Capsicum annum*) contains 1310µg/100g, tomato (*Lycopersicum esculentus*) 59.7µg/100g, okro (*Abelmoschus esculentus*) 69.0µg/100g (Kandlakunta, 2007). Tomato, pepper and onions are consumed normally as part of all salty foods in the community. These vegetables are those grown in the district, and are normally available for consumption during the cropping season. However, onions and pepper are used as spices, so although they contain some level of β-carotene, they may contribute only negligible amounts to the diet of the people. *M. oleifera* has been reported to contain 18.9mg β-carotene/100g dried leaves (Fuglie, 1999) whilst Glover-Amengor and Mensah (2012) reported 31mg/100g in dried leaves. Amaranth also contains 18.67% β-carotene of fresh weight (Raju *et al.*, 2007) with mangoes containing 3.21mg/100g and pawpaw, 0.74mg/100g (Veda *et al.*, 2007); thus *M. oleifera*, amaranth and mangoes are potential sources of β-carotene for the district. Whereas mango production is seasonal (two seasons per year), *M. oleifera* is a perennial crop that when well promoted could serve as a good source of vitamin A. It is already grown in the district and hence its promotion could possibly help reduce or even eliminate VAD. Nutrition educational messages should include behaviour change campaigns that will make the people see the need for consuming the vegetables and fruits on daily basis. Innovations in food processing should focus on the incorporation of *M. oleifera* leaf powder into snacks and convenience foods such as *ofam*. (baked ripe plantain, roasted maize meal and palm oil blend).

School feeding programmes have the potential of incorporating *M. oleifera* into the children's food. Nambiar *et al.*, (2003) assessed the feasibility of introducing dehydrated *M. oleifera* leaves into the salty recipes provided by a supplementary food component of an integrated child development scheme. They reported a high compliance of the recipes by the children. Thus the school feeding programme in the district could initiate the campaign by incorporation of fresh leaves and/or leaf powder into selected recipes. Glover-Amengor *et al.*, (2012) reported that *M. oleifera* leaf powder could be stored safely at room temperature for 6 months without deterioration in quality hence the leaves could be processed into powder to ensure easy access. Improved mango varieties could be introduced alongside the local ones which are not as fleshy as the exotic varieties. These could be dehydrated using the cheap solar energy that is available for most parts of the year. Dried mangoes could be served as snacks during off season to ensure all year round availability of the fruit.

WHO/NUT/96.10. pp. 66. World Health Organization, Geneva.

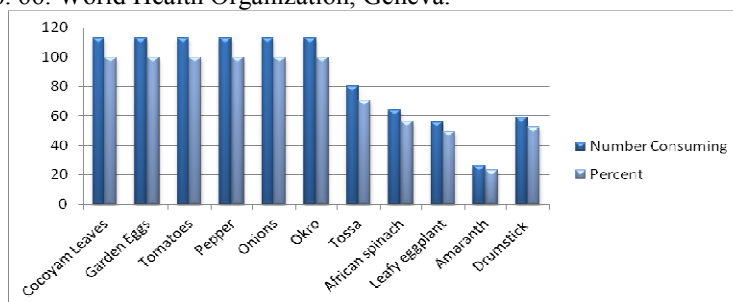


Figure 1: Types of Vegetables Consumed in the Ada-East District

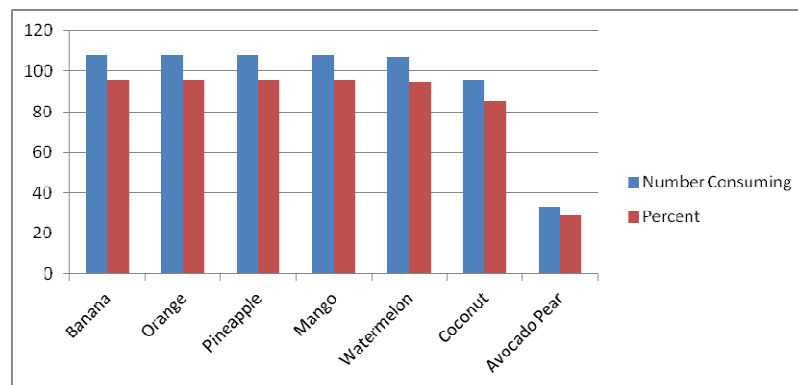


Figure 2: Types of Fruits Consumed in the Ada-East District

5. Conclusion

Several vegetables and fruits are consumed in the Ada-East district of Ghana. However, drumstick (*M. oleifera*) leaves and mangoes are the potential β -carotene rich foods that could be promoted in the district, because they are readily available, mangoes during the two production seasons, and drumstick all year round. Mangoes are eaten during the production seasons, but thereafter, are no longer consumed. Drying of mangoes towards the lean season could also be explored to augment what is obtained from drumstick leaves and also to maintain diversification. Amaranth which is poorly consumed in the district could also be promoted as another source of β -carotene. The coastal communities use irrigation to produce onions and cabbages, so when amaranth is also introduced, it could serve as an additional source of income as well. The school feeding programme should be targeted for the initial nutrition promotion drive.

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