

## Original Article

# Vitamin A nutrition among East Timor refugee children

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**Background and Objectives:** Children age 6 to 72 months, living in refugee camps are at increased risk of developing vitamin A deficiency (VAD), resulting in increased morbidity and mortality. Due to poverty, often this population group has limited access to foods containing vitamin A from animal-based food sources and do not commonly consume available foods containing beta-carotene. To date, there is a paucity of data on vitamin A intake in young refugee children. To determine vitamin A intake in children ages 6 to 72 months at refugee camps in East Timor. **Methods and Study Design:** A cross sectional study was carried out among children ages 6 to 72 months at refugee camps near Dili, East Timor. A detailed vitamin A intake questionnaire was ascertained from the primary caretaker, and the criteria and indicator cut off values suggested by World Health Organization (WHO) were used to classify the populations' vitamin A risk. **Results:** Although animal sources of vitamin A were limited due to costs, all 89 children commonly consumed fruit containing vitamin A sources more than 3 times a week. Most children (69.7%) had been breast fed regularly, while 30.3% combined with bottle milk. 80.9% of children received vitamin A supplementation. **Conclusion:** Children in East Timor refugee camps have adequate vitamin A intake.

**Key Words:** vitamin A deficiency, East Timor, children, refugee, nutrition

## INTRODUCTION

Vitamin A deficiency (VAD) is a serious problem in underdeveloped countries.<sup>1-5</sup> Annually, 140 million pre-school children suffer from VAD and there is an increased risk of morbidity and mortality, particularly in young children.<sup>6</sup> Furthermore, inadequate living conditions among refugees from poverty have been associated with high mortality in children and infants from VAD.<sup>7,8</sup> Vitamin A supplementation in a capsule form has been shown to reduce mortality in children.<sup>2,5</sup> The World Health Organization (WHO) has found that when food with high vitamin A content was consumed less than 3 times a week, there was a high risk of VAD in more than 75% of the vulnerable groups.<sup>9</sup>

A child with borderline or marginal vitamin A intake often has limited vitamin A stores. Dietary restriction in times of famine may result in rapid depletion of their already limited reserves.<sup>10,11</sup> Studies have shown that significant VAD has been found in children age between 6 months and 6 years – a critical age period when complementary food / family diet which represents a large proportion of the child's diet is inadequate.<sup>3,5</sup> Breast milk is a rich source of vitamin A and VAD rarely occurs when a child is breast fed.<sup>12</sup>

The aim of the study was to examine the vitamin A status of children at the refugee camps in Dili, East Timor, and determine their dietary and socioeconomic factors. We also wanted to evaluate the delivery of basic health

services at the refugee camps and in their original villages prior to displacement.

## METHODS

The study was carried out from July 2006 until November 2006, during Timor Leste civil conflict. We performed a cross-sectional study at two refugee camps at Dili, the capital city of East Timor. Children between 6 months and 6 years of age were enrolled in the survey, as this group was particularly at risk of VAD. Children less than 6 months were excluded if there was diarrhoea or fever in the last two weeks. A child information questionnaire which focused on the dietary intakes, sources of vitamin A rich fruits and vegetables, breast feeding practices, and socioeconomic factors was completed by the interviewer and mother of the household in the local language. The household questionnaire form was based on the WHO guidelines for assessment VAD.<sup>13</sup> Additionally, a semi-quantitative/qualitative food consumption questionnaire was also completed which included dietary patterns, food

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**Table 1.** Populations at risk of VAD based on WHO nutritional and diet-related indicators

WHO indicator	Suggested prevalence
Breast-feeding pattern	
<6 months of age	<50% receiving breast milk
≥6 to 18 months of age	<75% receiving vitamin A-containing foods in addition to breast milk, 3×/week
Food availability	
Market	DGLV unavailable ≥ months/year
Household	<75% consume vitamin A rich food 3 times/week
Dietary patterns	
6-72 month old children	<75% consume vitamin A rich foods at least 3 times/week
Semi-quantitative/qualitative food frequency	Foods of vitamin A content eaten <3 times/week

VAD: vitamin A deficiency; DGLV: dark green leafy vegetables.

availability, and cultural beliefs concerning vitamin A rich food. Parental consent was obtained for all children prior to enrolment. Ethics approval was obtained from the Ministry of Health, Timor Leste prior to study commencement and the study conformed to the provisions of the Declaration in Helsinki. Quality control measures were used during the interview process by the primary investigator (MC), who was present during each interview.

Data were analysed with the SPSS version 13.0 statistical package. Univariate analysis comprised determination of simple frequency distribution of selected variables. Mean, median and range were calculated for all parameters. The criteria and indicator cut off values suggested by WHO in 1996 were used to classify the populations' vitamin A status. The results were calculated, tabulated and analysed to compare the prevalence of VAD indicators as suggested by WHO (Table 1).

## RESULTS

89 children from 51 households were studied from different refugee camps around Dili.

### *Breast feeding pattern and weaning practices*

18 infants (20.2%) were still breast fed. They were 6 to 8 months of age. 28.1% of surveyed mothers stopped breast feeding their infants around 3 to 6 months of age. However, some mothers chose to breast feed until the child was 33 months old. The population introduced breast milk to their child; 69.7% between 12 months to 24 months and 30.3% provided combined powdered milk. 39.3% had solid food introduced by 4.6 months (range 2–8 months). The WHO cut off values, indicated that this population was not at risk of VAD.

### *Dietary food intake*

Table 2 shows that the children consumed fruit and vegetables containing vitamin A more than 3X / Week. Mango was the most common food source for vitamin A and drumstick leaves was minimally consumed. The number of children consuming fruits such as mango, banana and papaya were all greater than 25%. Whole fish was consumed by 46% of children more than 3 times a week. 64.1% people consumed eggs more than 3 times a week. Animal sources of vitamin A such as liver, meat, and eggs were consumed infrequently by 65.9%. The mean intake (number of days/week) for eggs, fish, meat, liver and fish oil were 2.56, 2.0, 1.07, 0.66, and 0.03, respec-

tively. Using WHO cut off values, this population was not at risk of VAD.

When enquired, most parents understood about sources for vitamin A. Commonly consumed foods containing vitamin A came from the market. Only a few participants had their own garden and they were people who lived outside Dili where their village could provide land for garden. Prohibitive costs were the main reason why rich sources for vitamin A were not consumed. Table 3 lists further reasons why more vitamin A rich food were not consumed.

### *Vitamin A supplementation*

Vitamin A supplementation was provided to the children in the study as part of the Department of Health's Initiatives to prevent VAD. In this survey, 80.9% of children received vitamin A supplementation at a single dose of 100 000 IU, usually at the age of 23 months.

### *Socio-economic factors*

25.5% of the study population did not have regular income. 35.3% had a small business (e.g., small shops), 7.8% sold produce (e.g., fruits and vegetables) in the market, and the rest (31.4%) had regular incomes working as a teacher or in public employment. Most (62.7%) earned \$100 to 200 per month, while 33.3% earned less than \$100 per month.

### *Water supply and sanitation*

Most of the population used or had access to safe running water and some of them combined the use of bore water and running water. When they lived in their original villages, 29.4% used bore water and running water, because running water was not regularly available for use. So, they had to use bore water when the running water was

**Table 2.** Weekly vitamin A food intake (Plant origin >3 days/week)

Vegetables/fruit	Percentage
Mango	73
Banana	43.8
Papaya	33.7
Tomato	17.9
Carrot	4.5
Avocado	2.2
Dark green leafy vegetable	60.5
Cassava	6.7
Drumstick leaves	1.1

**Table 3.** Reasons why rich vitamin A rich food was not consumed

Reason	Frequency	Percentage
"Not available"	16	18
"Too expensive"	31	34.8
"Child does not like it"	10	11.2
"Child too young"	11	12.4
"Expensive and child does not like it"	6	6.7
Total	89	100

stopped. 70.6% had access to safe water and nobody used river water. In refugee camps, most people had access to safe water and adequate sanitation including human-waste disposal that was provided by international agencies and the local government. There is a high probability of VAD if <50% of household had a safe water supply.

#### *Access to healthcare*

In this survey, everyone (100% of population) visited the medical clinic when they had a health problem.

#### **DISCUSSION**

VAD mostly occurs in developing countries in areas such as Africa, South East Asia, and the Pacific region.<sup>1-5,14,15</sup> The daily recommended vitamin A intake is 180 to 450µg a day.<sup>16</sup> As a result of political instability, many poor people from the surrounding villages with limited food and sanitation, and limited access to the health services, relocate temporarily into refugee camps in Dili. A combination of war, civil unrest and hostile environment also often results in limited harvest of foods rich in vitamin A such as DGLV and fruits, which needs continual water supply for growth. Despite a combination of war, civil unrest, displacement and socioeconomic stagnation, we found that the refugee children at East Timor were not at risk of developing VAD, using the cut-offs suggested by WHO. Moreover, most children were breast fed till 12 to 24 months and had received vitamin A supplementation.

Most households had completed senior high school as Dili was the capital city of East Timor during the Indonesian occupation and the government provided more funding for high schools in Dili. Only a small minority did not have formal schooling, due to troubled times. These people moved from villages to Dili after East Timor gained independence in 1999 because their houses had been burnt by the pro-Indonesian militia. The population in East Timor commonly has access to health services because the area in which they live has a nearby clinic. Even in the refugee camps, the Department of Health provided every camp with a health services unit in addition to a good water supply and sanitation, thereby reducing the risk of VAD.

In East Timor, most mothers had a good understanding of vitamin A-rich foods. Vegetables and fruits were their main non-animal sources of dietary vitamin A or fat, which facilitates absorption of vitamin A sources. From the 51 household respondents, all children consumed rice as the main food. In East Timor, most people ate rice as staple food, sometime, they combined this with corn or sweet potato. Markets in Dili provide mainly seasonal

food containing vitamin A sources, such as mango, banana, papaya, avocado, orange and some DGLV that are available all the time. The East Timorese who were either in poverty or from low income backgrounds, relied in less expensive vitamin A source such as fruits and vegetables because food from animal origins rich in vitamin A are relatively expensive. They ate plant based food containing vitamin A more than 3X/week, as evident in our survey. Mango was the most common fruit source for vitamin A (more than 73% consumption), as it was in season and most people had mango trees in their backyards. However, the actual quantity of mango eaten was difficult to estimate accurately since children had easy access to the food. The weekly frequency of mango intake presented in Table 2 may therefore be an underestimated value. Bananas and papayas were scarcer and less available in the market, with 43.8% and 33.7% consumption (more than 3 times a week). Drumstick leaves were not often eaten as it was not readily available and less people understood its function as a vitamin A source. 74.2 percent of the subjects we surveyed consumed DGLV such as "kangkung" and "sawi" which is recognized as a source of vitamin A more than 3X/week with rice as their main food. However, perishable foods such DGLV can be costly in refugee camps and logistically difficult to be purchased in large quantities and stored, transported, and distributed to refugees. Carrots and tomatoes were minimally consumed by children, as they were more commonly grown in higher altitude areas within the country. Avocados, guavas and oranges, were consumed infrequently or not at all as they were scarce in the market because some of them were seasonal.

In East Timor, most households earned less than \$200 a month. These low-income families often are unable to afford frequent consumption of food of animal origin. A community reliant on plant based food is at high risk of VAD when vitamin A and carotene-rich food becomes limited in the market. Countries with long periods of short vegetative supply and relatively constant hot temperature are known to have VAD problems compared to those with stable water supplies.<sup>17</sup> The risk of VAD is greater when consumption of foods of animal origin is irregular. Thus, it is important to identify and promote locally grown vitamin A rich food and to also understand the underlying traditional beliefs and cultural practices in the country.<sup>18,19</sup> For instance, most East Timorese still believe that children should not consume foods containing high protein because such 'animal protein food is bad for the child'.<sup>20</sup>

In our study, only 30.3% of children received additional powdered milk. The Timor Leste department of Health, encourages people to give only breast milk without mixing with the others milk. VAD rarely occurs as long as a child is breast fed because breast milk consists of retinol in a readily absorbable form. Children under 6 months, therefore is conferred passive immunity and vitamin A directly from their mother's breast milk.<sup>12</sup> However, studies have included at risk VAD groups such as lactating women, infants and children during the period of complementary feeding and fully weaned children up to 5 years of age.<sup>21,22</sup>

Limitations of our study should be noted. Our collected data is probably accurate when considering things like consumed DGLV as well as seasonal food, fish and eggs. However, data on regular food consumption patterns during pregnancy and lactation, complementary feeding for infants were unavailable and would have been useful for future studies. Moreover, a semi-quantitative assessment of dietary vitamin A intake could not be performed since children age 6 to 72 months ate varying amounts and the sample size was rather small for a meaningful outcome measure. Furthermore, the survey did not include the households' access to their land because the population lived in the city and most people did not have their own land. In many rural areas where absence of land ownership or access to land commonly occurs, labourers live in poverty. Traditional practices may have allowed the tenant farming to continue on unfavourable terms, without the possibility of producing enough food to meet the family's direct consumption needs.

Prevention of VAD is vital. Surveillance in refugee camps via interviews with staff working in such places may bring to light useful information. The simplified dietary assessment empowers local government units and non-government organizations to assess VAD in their areas and facilitates feedback to mothers of children at-risk through nutrition education and counselling.<sup>23</sup> Efforts to improve vitamin A intake can be improved through dietary modification, food fortification, and periodic supplementation.<sup>2,24-26</sup> Nutritional education can increase dietary intake rich in vitamin A produce, such as fruits (e.g., mangoes, papayas, palm fruit) and DGLV on a daily basis, mixed with small amount of edible oil to enhance absorption. Furthermore, carotene rich sources such as red palm oil snacks could be used to combat VAD.<sup>26-28</sup>

Community-based food production programmes supporting the expansion of vegetable production in camp gardens and the raising of poultry not only generate income, but also socially uplift households.<sup>29,30</sup> Community based health education in the context of comprehensive VAD eradication strategy, could have a positive impact on the attitude of respondents towards changing their traditional beliefs and lead to sustainable behavioral changes.

To sum up, we found that vitamin A nutrition was not a concern among the refugee children in East Timor, who had good access to vitamin A rich food, despite some of these foods being expensive. Future studies is warranted to evaluate dietary supplementation using affordable locally available food sources.

#### AUTHOR DISCLOSURES

The authors declare no conflict of interest.

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