Original article

Vitamin A deficiency status in Tigray Region, Ethiopia, 1996

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Abstract: A survey was conducted to determine the prevalence of xerophthalmia in Alaje and Samre weredas of Tigray Region, Northern Ethiopia, where EPI-plus and Wereda Integrated Basic Service (WIBS) approaches are being launched to prevent and control vitamin A deficiency. A total of 5,253 preschool children (PSC) were clinically examined between October and November, 1996 for ocular signs of xerophthalmia. Blood samples were drawn from 248 PSC for serum retinol levels(SRL).

The overall prevalence rates of night blindness (XN) and Bitot's spot (X B) for both weredas were 1
0.9% and 1.5%, respectively, with a higher prevalence rate in males than females (53 vs 26). Alaje wereda(EPI-plus) had XN=21(0.8%) and X B=38(1.4%), and Samre wereda (WIBS) had

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XN=25(1.0%) and X B=41(1.7%). No sex difference was seen in the prevalence rate of corneal 1
xerosis and keratomalacia (0.4%). The most affected age groups were children between five and six years of age. Both weredas showed the distribution of serum retinol levels to be deficient in 21(16.7%) in Samre and 19(15.5%) in Alaje, and low in 60(47.6%) in Samre and 57(46.7%) in Alaje. Low SRL is found to be highest among children between five and six years of age in males

and between two to three years of age in females in both weredas. The high prevalence rate of X B

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(three times higher than the WHO cut-off point), and the low level of serum retinol value found in this study indicates the need and urgency for the continuation of the aforementioned strategies of vitamin A deficiency control program launched in the Region until their impact is further evaluated. [*Ethiop. J. Health Dev.* 1999;13(2):87-91]

Introduction

Vitamin A deficiency (VAD) is a major public health problem in many developing countries (1-3). The incidence is particularly high among malnourished preschool children (PSC), and is more in males than females (4,5). In Ethiopia, various studies have established that VAD is a major public health problem in most parts of the country (6-12). Postums conducted clinical examination for xerophthalmia on 7,000 children of pre-school and school age during 1957/58. He found that 9% of the girls and 2.2% of boys showed Bitot's spots while approximately half of them had conjunctival xerosis (7). A national assessment of vitamin A status of children less than six years of age was carried out by the former Ethiopian Nutrition Institute in 42 semi-urban survey sites representing four ecological zones which were identified based on the type of staple food crops (8,9). The results indicated that the over-all Bitot's spot (X B) rate was 1% which was twice the cut-off point set by

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WHO for xerophthalmia level of public health significance. According to this rate, about 6-8 million of the under six children in the country are estimated to be at risk of vitamin A deficiency. The prevalence of Bitot's spot was found to be higher among children in pastoral areas (1.6%), followed by those living in grain-cropping (1.1%) and cash cropping zones (0.4%), and overall serum retinol levels were deficient in 16% and low in 44% of the children. The 1993 survey on VAD in four

weredas of Arsi Administrative Zone on 2005 children revealed a mean prevalence rate for X B of

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8.8%(11), which was 16 times more than the WHO cut-of point for X B, showing that the situation 1
is worsening. Although the primary health care system was chosen to serve as a strategy for combatting VAD and was introduced in many health institutions of the country, other new approaches or strategies are being tried in some part of

the country with the support of UNICEF. These approaches are supplementation of vitamin A through EPI-plus and WIBS, which is an additional approach of using non-health avenues to supplement vitamin A. Such approaches are being used in Tigray region where the magnitude of VAD is high, particularly, in Samre and Alaje weredas. Both weredas are belonging to cropping agroecological zone and are situated 50 and 90 kms south of Mekele, respectively. The main cereals produced in these areas are sorghum, teff, maize, and barely. The purpose of this study is to obtain a baseline information that can be used for the evaluation of the contribution of the aforementioned approaches/ strategies in the improvement of Vitamin A in Samre and Alaje Weredas of the Region by estimating the magnitude of xerophthalmia in PSC. **Methods**

A cross-sectional study was conducted in two weredas (Alaje and Samre) between October and November, 1996.

A stratified, multistage, cluster sampling was used to select the study population. Prior to the selection, administrative zones where EPI-plus and WIBS strategies are launched were identified. Of these, two zones were randomly picked and, from each of them, one wereda was selected randomly.

The size of the sample for the clinical examination of this study was defined with the objective of comparing prevalences of xerophthalmia in the study groups before and after programme implementation. Assuming that the average prevalence of xerophthalmia is 1%, the intervention was designed to test a 50% decrease in the incidence of xerophthalmia in the study groups with 80% power of demonstrating a significant difference at 5% level. On the basis of the statistical requirements, the pre-established sample size was about 2,842 preschool children in each wereda.

A fresh list of all peasants' associations (PAs) in the study weredas, including their population size, was prepared, and from this, a total of 15 PAs were randomly selected (eight in WIBS and seven in EPI-plus).

A total of 5253 PSC who were randomly selected were considered for clinical examination of xerophthalmia. Of these, 2,782 and 2,471 were from WIBS (Samre) and EPI-plus (Alaje), respectively. Serum retinol levels were measured on a randomly selected subsample of 248 PSC(126 in WIBS and 122 in EPI-plus) PSC after an informed consent was obtained from the mothers/care takers. A week before the actual study took place, a standardization of clinical examination among the physicians who participated in the study was done by an ophthalmologist in the region, in accordance with the WHO classification of xerophthalmia (2,13,14) in the nearby weredas. Blood was collected by venous puncture using a vaccutainer system. Blood specimens were centrifuged and the sera were stored in a refrigerator until they were transported to South Africa (University of Stellenbosch) for the analysis which was completed in a few days after arrival. Analysis was performed by high performance liquid chromatography (HPLC).

The collected data were then entered into a computer using SPSS/DE (statistical package for social science) and analyzed by SPSS and ANTHRO software. Chi square test was used to compare significance of differences.

Results

The prevalence of Xerophthalmia in Alaje and Samre Weredas, as determined by WHO classification, is shown in

The distribution of serum retinol value levels for the children from both weredas is presented in Table 3. The proportion of children whose serum retinol (SR) was deficient (< 0.35 µmol/l) in Samre and Alaje Weredas were 21 (16.7%) and 19 (15.6%), respectively, and the proportion of low level of SR (0.35-0.69
µmol/l) in Samre and Alaje were 60 (47.6%) and 57 (46.7%), respectively. Although, the proportion of deficient serum retinol value was higher in Samre wereda (WIBS), the difference noted is not significant ($P<0.05$). The overall serum retinol deficiency rate for both weredas was 40% (16.1%).

were not properly filled. The proportion of deficient and low serum retinol values was more in males than females. The prevalence of serum vitamin A deficiency, using serum retinol level,

appears to be highest among children between five to six years of age in males and between two to three years of age in females. However, for the age group of two to three years, the total number of serum samples was only 15.

Discussion

In Alaje and Samre Weredas of Tigray, night blindness was reported in 0.9%, which is below the WHO cut-off point of 1%, Bitot's spot in 1.5% against 0.5% (3-fold), corneal xerosis 0.2% against 0.01% (20-fold), and corneal scar in 0.2% against 0.05% (4-fold) exceeds the WHO criterion of cut-off point for Bitot's spot, corneal xerosis, and corneal scar, respectively, indicating that vitamin A deficiency and xerophthalmia is a public health problem in both weredas of Tigray Region. However, the overall prevalence of xerophthalmia found in Samre Wereda, when compared with Alaje, is higher, although no significant differences is noted when X1B is considered.

The extent of VAD in both Weredas of the Region was more signified by the finding that 16.1% and 63.3% of the present sample of preschool children had serum retinol levels less than 0.35 µmol/l and less than, or equal to, 0.70 µmol/l, respectively. These rates clearly show how severe the situation was in the studied areas when compared with the WHO cut-off points, 5% below 0.35 µmol/l and 20% less than or equal to 0.70 µmol/l. When the serum retinol results are desegregated by weredas, no significant differences is observed between the two Weredas with different strategies.

The high prevalence of VAD in both Weredas, as manifested by clinical signs and low serum retinol concentrations, can be attributed mainly to low dietary intake of vitamin A, which is the result of the mono-crop culture prevailing in the area. Some indications about the factors attributable to the high prevalence of VAD in the area in addition to low vitamin A intake, child illnesses and ecological factors are said to play a considerable role in the high prevalence of the deficiency state of vitamin A (15).

The higher proportion of males than females, with all clinical parameters of xerophthalmia, is similar to previous observations in the region and other parts of the country (8). The prevalence of serum retinol values below the WHO cutoff points was also higher for males than females. This may be due to, apart from sex differences, social and ecological factors.

The deficiency state which prevails more among older children is reported by IVACG (16,17) and is also in agreement with an earlier study conducted in the same Region (18). This is contrary to the general pattern of VAD which is believed to increase between 6 months and three years of age. This is the period when complementary foods and, later, the family diet represents a large proportion of the child's diet. These foods, frequently, do not contain enough vitamin A which could substitute the amount supplied from breast milk. An explanation forwarded for the present observation was the extended period of breast feeding by rural Ethiopian women up to the age of three years or more, which provided retinol in a readily absorbable form (15,18).

The observed high rate in males is probably due to reasons mentioned above (12) and the difference noted is statistically significant ($p<0.05$). Similar results were also noted by Zewdie and Teshome on vitamin A status survey of preschool children in Ethiopia during 1980/81 (9). There is a clear ground to say that VAD is a serious public health problem in both Weredas. Therefore, it is imperative to continue both strategies of VA supplementation recently initiated in the Region as part of the VAD control and prevention program until further impact evaluation study takes place.

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Table 1. **Baseline ocular signs of Vitamin a deficiency in children of Samre and Alaje Weredas by types of eye lesion, Tigray, North Ethiopia, 1996.**

Types of Xerophthalmia	Types of woredas		Samre	Total
	Alaje			
	N(%)	N(%)	N(%)	
Night blindness	21(0.8)	25	46(0.9)	
Bitot's spot	38(1.4)	41(1.7)	79(1.5)	
Corneal xerosis	2(0.07)	6(0.2)	8(0.2)	
Keratomalacia	……	1(0.04)	1(0.02)	
Corneal scar	3(0.1)	9(0.4)	12(0.2)	

Table 2**. Types of xerophthalmia by age and sex in Samre and Alaje Weredas, Tigray, North Ethiopia, 1996**

pes of rophthalmia	Distribution of sex and age breakdown (in months)											
	<12		12- 23		24- 35		36-45		46- 59		60- 72						Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
ght blindness	1		3		17		1		1				6	2	9	6	34	12
ot's spot	2		4		28		1		3		2		5	7	15	12	53	26
rneal xerosis			2				1		1						2	2	3	5
ratomalacia	1																1	
rneal scar			2						1		1				2	4	2	7

4			4	6	2	11	11	28	22	98	48
	9	49									

Table 3. **Serum retinol levels of children in Samre and Alaje Weredas, Tigray, North Ethiopia, 1996.**

Serum retionl (in umol/1)	Samre n(%)	Alaje n(%)	Total (n(%)
Deficient(<0.35 umol/1	21(61.7)	19(15.6)	40(16.1)
Low (0.35-0.69 umol/1)		60(47.6)	57(46.7)	117(47.2)
Normal(>0.70umol/1)		45(35.7)	46(37.7)	91(36.7)
Total examined		126(50.8)	122(49.2)	248(100)

Table 4. **Serum retinol values by sex and age in children of Samre and Alaje Weredas, Tigray, North Ethiopia, 1996.**

Age (in months) and number* of children by sex

Serum retinol (in umol/1)	12-35		36-59		60-72		Total	
	M	F	M	F	M	F	M	F
Deficient	0	2	12	6	13	7	25	15
Low	3	0	20	32	29	31	52	63
Normal	4	6	21	23	18	19	43	48
Total	7	8	53	61	60	57	120	126

* Since age was not filled for 2 children, they are excluded