

*Full Length Research Paper*

# Prevalence of xerophthalmia and associated factors among school age children of Fadis, Oromia regional state, Eastern Ethiopia: School based cross-sectional study

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Vitamin A deficiency has long been a public health nutritional problem among children across the world, affecting mostly children in sub-Saharan African countries including Ethiopia. Vitamin A deficiency causes xerophthalmia, a range of eye conditions from night blindness to more severe clinical outcomes such as keratomalacia and corneal scars, and permanent blindness. Therefore, this study aimed to assess prevalence of xerophthalmia and associated factors among Fedis primary School children, Oromia National Regional State, Eastern Ethiopia. A cross-sectional study was conducted on randomly selected 738 children of age 6 to 12 years. Data were collected using structured interview based questionnaires and ocular examination was carried out by ophthalmologic nurse to identify xerophthalmia. The data were entered into Epi data version 3.1. and exported to SPSS version 20 for analysis. Bivariate analysis and multivariate analysis were performed. Odd ratio together with 95% CI was estimated to identify factors associated with xerophthalmia. Level of statistical significance was declared at  $p < 5\%$ . The prevalence of Bitot's spot, night blindness and xerophthalmia was 2.8% [95%CI (1.82 to 4.24%)], 14.2% [95%CI (11.85 to 16.89%)] and 14.6% [95%CI (12.2 to 17.3%)], respectively. The odds of xerophthalmia is 0.13 times less among uneducated mother/caregiver [AOR=0.13, 95%CI (0.03-0.55)]. Children whose family produce cash crop were 4.80 times more affected by xerophthalmia [AOR=4.80, 95% CI (1.55 to 14.83)]. The odds of xerophthalmia among the children from household which have no latrine is 1.92 times higher [AOR=1.92, 95% CI (1.06 to 3.48)]. In general, the prevalence of xerophthalmia was very high and remains a public health issue. Cash crop production, maternal education and availability of latrine were factors associated with xerophthalmia. Therefore, awareness creation to the community and emphasis on vitamin A rich food consumption for prevention of vitamin A deficiency was highly recommended.

**Key words:** Prevalence, Xerophthalmia, Bitot's spots, vitamin A deficiency, Night blindness, school age children.

## INTRODUCTION

Vitamin A deficiency is a major contributor to child mortality (Vitamin A global Initiative, 1997). Deficiency of

vitamin A has long been identified as a serious and preventable nutritional disease. It also contributes

significantly, even at sub-clinical levels, to morbidity and mortality from common childhood infection. Studies suggest that ill health and risk of death from some infection are also increased even in children who are not clinically deficient but, whose vitamin A body store is depleted (WHO, 1996).

Vitamin A deficiency causes xerophthalmia, a range of eye conditions from night blindness to more severe clinical outcomes such as keratomalacia and corneal scars, and permanent blindness (Imdad et al., 2010). Xerophthalmia, which includes night blindness, Bitot's spots, corneal xerophthalmia and keratomalacia, remains the leading cause of blindness among children in developing countries (McLaren and Frigg, 2001).

Though one of the main causes of xerophthalmia is poor intake of vitamin A rich foods, it is also associated with poverty, ignorance, faulty feeding habits among the entire population but young children in particular. The main underlying cause of VAD as a public health problem is a diet that is chronically insufficient in vitamin A that can lead to lower body stores and fail to meet physiologic needs (WHO, 2009).

Health of a child is a growing concern all over the world with rapid economic growth and social changes both in developed and developing parts of the world. Nutritional status during school age is a major determinant of nutritional and health status in adult life. Health hazards associated with under nutrition and micro nutritional deficiencies remain major public health problems (Nigudgi et al., 2012).

Vitamin A deficiency is a major nutritional concern in poor societies, especially in lower income countries (WHO, 2009). Vitamin A (VA) deficiency exists as a public health nutrition problem among children in 118 developing countries around the globe, with the South-East Asian Region harboring the maximum number of cases (Ahmed et al., 1997). Approximately, 250,000 to 500,000 children in the developing countries become blind each year due to vitamin A deficiency, with highest prevalence in Africa and South East Asia (Swar et al., 2014).

Eyesight is the most important source of information about one's environment and hence is the vital developmental significance. Childhood blindness has profound consequences not only for individual child, but also for the family & community. Visual impairment is a worldwide problem that has a significant socioeconomic impact (WHO, 2011). Data on the prevalence and causes of blindness and severe visual impairment in children is needed for planning and evaluating preventive, curative, special education and low vision services for children (WHO, 2011).

In Ethiopia, studies in 1990s showed that signs of

vitamin A deficiency did not show any correlation with occupation and education of head of household and household size (Wolde-Gebriel et al., 1991), malnutrition (Lemma and Mariam, 1996; Moore et al., 2013) and low income (Lemma and Mariam, 1996). There are no up to date literatures in survey area and even a country literatures on exophthalmia are scarce

## MATERIALS AND METHODS

School based cross sectional study was carried out from April 15, 2015 to May 15, 2015 among school age children in Fedis woreda. Fedis woreda is one of the 19 Woredas of East Hararghe zone which is 545 km away from Addis Ababa and 20 km from Harar town. The woreda has 2 urban and 17 rural kebeles. The total population in the woreda is 140316. The woreda has 1 preparatory school, 1 secondary school, 57 rural and 2 urban primary schools.

Sample size was determined by using a single population proportion formula which took the following assumptions into consideration. Proportion of school age children with VAD to be 10.7% (Asrat et al., 2002), 95% level of confidence ( $Z=1.96$ ); 3% marginal error ( $d = 0.05$ ), design effect 1.5. The sample size was calculated by using EPI INFO computer Software version 3.5.1 and non-response rate of 10% was considered. The final sample size was 738. After the lists of school students were obtained from primary school, systematic sampling method was employed. Finally, 738 participants were included in the study with non-response rate of 10%.

Mothers or immediate care takers of study subject, those who live within the kebele of selected school were invited to the school for data collection day. The data was collected using structured questionnaire prepared by reviewing prior study and other materials on the topic. This questionnaire has six parts such as: part one: socio-demography of child, part two: socio-demography of parent, part three: mother's/care takers information about health and nutrition, part four: the dietary pattern of child, part five: history of child night blindness and part six: clinical (sign and symptoms of xerophthalmia). The data collection team was comprised of seven (7) members, four (4) clinical nurse, two (2) public health officer field supervisors and one (1) research supervisor. The data collectors for interviewing and clinical examination were clinical nurses (ophthalmologist), who have had experience of working in health facilities for more than 5 years. Data were entered into EPI data version 3.1 and exported to SPSS version 20.0 software package for analysis. The data were analyzed using both binary and multiple logistic regressions to determine the effect of various factors on the outcome variable and to control confounding effect. The results were presented in the form of tables, figures and text using frequencies and summary statistics such as mean, standard deviation and percentage to describe the study population in relation to relevant variables. The degree of association between independent and dependent variables were assessed using odds ratio with 95% confidence interval.

Ethical approval was obtained from Institutional Health Research Ethics Review Committee (IHERC), Haramaya University, College of Health and Medicine Science. Supportive official letter was obtained from Zonal, Woreda Education Office and from selected school directors, respectively. Additionally, written consent was obtained from each study subject's guardians before proceeding to

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**Table 1.** Socio-demographic characteristics of children and their parents/caregivers of Fedis primary school children, Fadis, Eastern Ethiopia, April 15, to May 15, 2015 (n= 738).

<b>Variables</b>	<b>Frequency</b>	<b>Percent</b>
<b>Sex</b>		
Male	452	81.2
Female	286	38.8
<b>Children age</b>		
6-8 years	296	40.1
9-10 years	309	41.9
11-12 years	133	18.1
<b>Respondent</b>		
Father	392	53.1
Mother	346	46.9
<b>Ethnicity</b>		
Oromo	720	97.6
Amharic	15	2.0
Others	3	0.4
<b>Religion</b>		
Muslim	703	95.3
Christian	35	4.7
<b>Father education</b>		
Illiterate	711	96.3
Literate	27	3.7
<b>Mother education</b>		
Illiterate	727	98.5
Literate	11	1.5
<b>Father occupation</b>		
Farmer	729	98.8
Daily Laborer	5	0.7
Employed	4	0.5
<b>Mother occupation</b>		
Housewife	732	99.2
Merchant	3	0.4
Employed	3	0.4
<b>Climatic zone</b>		
Lowland	291	39.4
Highland	447	60.6
<b>Head of household</b>		
Father	723	98.0
Mother	15	2.0
<b>Farm size</b>		

Table 1. Contd

less than half an hectare	260	35.2
Greater than half an hectare	478	64.8
<b>Harvest cash crops</b>		
Yes	721	97.7
No	17	2.3
<b>Types of cash crops</b>		
Khat	724	98.1
Coffee	14	1.9
<b>Livestock</b>		
Yes	734	99.5
No	4	0.5
<b>Milk livestock</b>		
Yes	537	72.8
No	201	27.2
<b>Household Annual Income</b>		
Less than 1000	661	89.6
1000-1500	27	3.7
Greater than 1500	50	6.8

data collection. The consent form of the questionnaire was read to each participant, and the participants who agreed were included in the study and all this consent procedure were documented on each questionnaire. Confidentiality was assured before conducting the data collection. Voluntary verbal consent was obtained since the study does not adversely affect participants' rights and welfare. This procedure of voluntary verbal consent was approved by institutional Health Research Ethics Review Committee (IHERC), Haramaya University, College of Medicine and Health science.

## RESULTS

### Socio-demographic characteristics

From all the 738 respondents selected, all were included in the analysis giving a response rate of 100%. The mean age of the respondents was 8.92 years ( $SD \pm 1.675$ ). Majority of the respondents were male 452 (81.2%), Muslims by religion 703 (95.3%), Oromo by ethnicity 310 (97.6%). Concerning the parents' education, 648 (81.4%) fathers and 711 (96.3%) mothers of respondents were illiterate. Two hundred and ninety one (39.4%) of the children were living in lowland, whereas 447 (60.6%) were living in highland. Great majority (98%) of households were headed by father and similarly, great majority (97.7%) of household produced cash crops and

greater than one-third (35.2%) of households own half or less hectares of farm land (Table 1).

### Mothers/care taker's awareness on nutrition and child feeding pattern

With regards to mothers/care giver, two hundred and twenty eight (30.9%) of the mothers/care giver had health education on nutrition, and only one-third of the mothers/care givers knew that vitamin A deficiency is a preventable cause of night blindness, while 222 (30%) of them know vitamin A rich food sources.

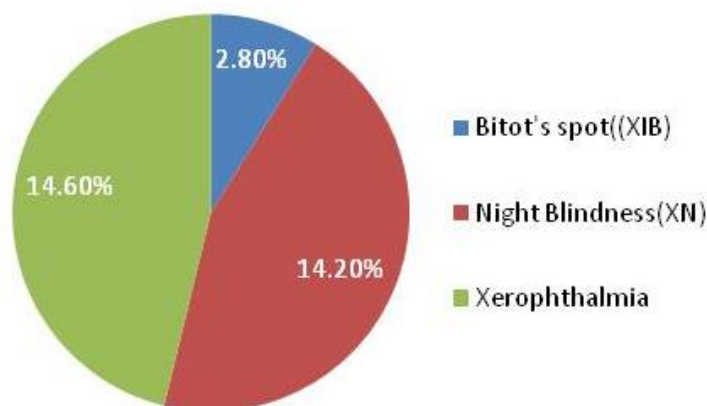
Concerning feeding practice of children, most respondents 488(66.1%) gives milk to their children every day and 306 (27.9%) of them give their children milk 1-2 times per week. Majority of the respondents 376 (50.9%) reported that they did not feed their child with animal products (meat/eggs). Nearly one tenth of the mothers/care taker (11.1%) give their child fruit every day, while 62.7% of them never give fruit to their children. And, 306 (41.5%), 333 (45.1%), 164 (22.2%), and 276 (37.4%) of the respondents fed their children with vegetable and legumes, 1-2 times per week and once every month, respectively. Nearly two third (67.5%) of the household did not have latrine (Table 2).

**Table 2.** Mother's/care taker's awareness on nutrition and child feeding pattern of Fedis primary school children, Fedis, Eastern Ethiopia, April 15, 2015 to May 15, 2015 (n= 738).

<b>Variable</b>	<b>Frequency</b>	<b>Percent</b>
<b>Got health education on nutrition</b>		
Yes	228	30.9
No	510	69.1
<b>Know VAD is preventable</b>		
Yes	224	30.4
No	514	69.6
<b>Know causes of VAD</b>		
Yes	253	34.3
No	485	65.7
<b>Know Vitamin A rich food sources</b>		
Yes	222	30.1
No	516	69.9
<b>Milk consumption</b>		
everyday	488	66.1
1-2 times per week	206	27.9
Once Per month	31	4.2
Never	13	1.8
<b>Eat animal product(Meat/EGGS)</b>		
Every day	47	6.4
1-2times per week	126	17.1
Once every month	189	25.6
Never	376	50.9
<b>Eating fruits</b>		
Every gay	82	11.1
1-2 per week	193	26.2
Never	463	62.7
<b>Eat vegetables</b>		
Once everyday	82	11.1
1-2 times a week	306	41.5
Once every month	333	45.1
Never	17	2.3
<b>Eating legumes</b>		
Every gay	164	22.2
1-2 per week	276	37.4
Never	298	40.4
<b>Sources of drinking water</b>		
Public tap	19	2.6
Pond	719	97.4
<b>Have latrine</b>		
Yes	240	32.5
No	498	67.5

Table 2. Contd

Child has infectious disease		
Yes	8	1.1
No	730	98.9



**Figure 1.** Prevalence of xerophthalmia among Fedis primary school children, Fadis, Eastern Ethiopia, April 15, 2015 to May 15, 2015 (n=738).

### Prevalence of xerophthalmia

The prevalence of Bitot's spot, night blindness and xerophthalmia was 2.8 [95%CI (1.82-4.24%)], 14.2 [95%CI (11.85-16.89%)] and 14.6% [95%CI (12.2-17.3%)], respectively (Figure 1).

### Factors associated with xerophthalmia

The result of binary logistic regression showed that among socio-demographic and information of parents of the child, household crop production, farm size, got health education, mother education, knowing source of vitamin A, eating fruit and vegetables and having latrine was significantly associated with xerophthalmia. Sex, age, head of household and household income was not statistically associated with xerophthalmia (Table 3).

### Multivariate analysis of factors associated with xerophthalmia

Variables with p-value <0.05 during bivariate analysis were taken for multiple logistic regression and the result of multiple logistic regression showed that variables: mother education, availability of latrine and harvesting cash crop have an association with xerophthalmia.

The odds of xerophthalmia is 0.13 times less among uneducated mother/caregiver when compared with mother/

caregivers with some educational background [AOR=0.13, 95%CI (0.03-0.55)]. Households that produce cash crop were 4.80 times more affected by xerophthalmia than those who do not produce cash crop [AOR=4.80, 95% CI (1.55-14.83)]. In this study, the odds of xerophthalmia among the children from household which have latrine is 1.92 times higher when compared with children household without latrine [AOR=1.92, 95% CI (1.06-3.48)] (Table 4).

### DISCUSSION

In this study, the prevalence of xerophthalmia among school children was assessed. The overall prevalence of xerophthalmia in school children was found to be 14.6% which is much more higher than that of the study conducted in Jimma town which was 0.6% (Getaneh et al., 2000) and study conducted in Arsi Zone, Ethiopia and Southeastern Asia which was 10.7% (Asrat et al., 2000) and 10.9% (Singh and West, 2004), respectively. But it is less than that of the study conducted in Bushulo South Ethiopia which was 20% (Moore et al., 2013).

This study showed that maternal education has unexpected negative association with xerophthalmia. The odds of xerophthalmia are 87% less likely among uneducated mother/caregiver when compared with mother/caregivers with some educational background.

This is consistent with study conducted in Republic of Benin (Reed et al., 1996). It could be that maternal

**Table 3.** Bivariate analysis of factors affecting xerophthalmia among Fadis primary school children, Fedis, East Ethiopia, April 15, 2015 to May 15, 2015 (n= 738).

Variables	Xerophthalmia			
	Yes	No	Chi-square( $\chi^2$ )	p-value
<b>Age</b>				
6-8	41	260	1.99	0.37
8-10	43	265		
Greater than 10	24	105		
<b>Sex of child</b>				
Male	62	390	0.79	0.37
Female	46	240		
<b>Household Head</b>				
Mother	103	620	4.28	0.05
Father	5	10		
<b>Household income</b>				
Less than 1000	99	562	0.61	0.74
1000-5000	3	24		
Greater than 5000	6	44		
<b>House hold land size</b>				
less than half an hectare	46	214	3.00	0.08
Greater than half an hectare	62	416		
<b>Household Cash crop production</b>				
Yes	100	621	14.64	0.001
No	8	9		
<b>Got health education on nutrition</b>				
Yes	19	209	10.49	0.001
No	89	421		
<b>Mother educational status</b>				
Illiterate	102	625	14.24	0.002
Literate	6	5		
<b>Know source of Vitamin A</b>				
Yes	18	204	10.82	0.001
No	90	426		
<b>Consume fruits and vegetables</b>				
Every day	8	74	9.24	0.01
One to two times a week	59	247		
Never	41	309		
<b>Having functional latrine</b>				
Yes	20	220	11.30	0.001
No	88	410		

education enabled women to participate in activities outside the home without simultaneously ensuring adequate child care.

Households who produce cash crop were 4.80 times more affected by xerophthalmia than those that do not produce cash crop. This might also be related to poor utilization of crop and lay emphasize on marketing and

dark green leafy vegetables grown in the area usually sold to the nearest town and not consumed locally. This finding coincided with the study conducted in Wukro, Ethiopia (Kassaye et al., 2001) and India (Dhadave et al., 2013).

In this study, the odds of xerophthalmia among children from household which have latrine is 1.92 times higher

**Table 4.** Multiple logistic regression analysis of factors associated with xerophthalmia among Fedis primary school children, Fadis, Eastern Ethiopia, April 15 to May 15, 2015. (n= 738).

Variables	Xerophthalmia		
	Yes	No	AOR (95CI)
<b>Age</b>			
6-8	41	260	1
8-10	43	265	0.76(0.44-1.31)
greater than 10	24	105	0.95(0.05-1.79)
<b>Sex of child</b>			
Male	62	390	0.76(0.49-1.17)
Female	46	240	1
<b>Farm size</b>			
less than half an hectare	46	214	1.10(0.67-1.74)
Greater than half an hectare	62	416	1
<b>Household Cash crop production</b>			
Yes	100	621	<b>4.80(1.55-14.83)*</b>
No	8	9	1
<b>Got health education on nutrition</b>			
Yes	19	209	1
No	89	421	1.02(0.20-5.25)
<b>Mother educational status</b>			
Illiterate	102	625	<b>0.13(0.03-0.55)*</b>
Literate	6	5	1
<b>Know source of Vitamin A</b>			
Yes	18	204	1
No	90	426	2.10(0.42-10.90)
<b>Consume fruits and vegetables</b>			
Every day	8	74	1
One to two times a week	59	247	1.31(0.25-3.31)
Never	41	309	0.64(0.25-1.62)
<b>Having functional latrine</b>			
Yes	20	220	1
No	88	410	<b>1.92(1.06-3.48)*</b>

when compared with children from household which have no latrine. This is consistent with the study reported in India (National Nutrition Monitoring Bureau, 2006; Laxmaiah et al., 2013) where xerophthalmia is significantly lower among children from household having latrine when compared with those from household without latrine. Age, sex, consumption of green vegetables and fruits and maternal awareness on benefits of vitamin A does not explain xerophthalmia.

## CONCLUSIONS

In general, the prevalence of xerophthalmia was very high and remains a public health issue in this study. Household crop production, maternal education and availability of latrine are factors associated with xerophthalmia. Therefore, awareness creation to the community and emphasis on vitamin A rich food consumption for prevention of vitamin A deficiency is



highly recommended. Effective vitamin A deficiency prevention strategies like supplementation, fortification and diversification of diet should be employed to prevent vitamin A related ocular and other disorder among school aged children.

### Conflict of interests

The authors have none to declare.

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