

# Prevalence and association of Vitamin D deficiency and Dry eye

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## Abstract

**Background:** Dry eye is a multifactorial disease causing a high number of ocular morbidity. Recently vitamin D has been added to the list but a causal association is yet to be established. This study was carried out to establish an association between dry eye and Vitamin D deficiency. **Aims:** To correlate prevalence of vitamin D deficiency in all the dry eye patients visiting Eye OPD at tertiary hospital, to correlate prevalence of dry eye in Vitamin D deficient patients diagnosed in medicine and orthopaedics departments at the tertiary care and to determine the association between dry eye and vitamin D deficiency. **Methods:** After taking informed consents patients were enrolled in this study and divided into two groups using purposive sampling. Group 1 was all vitamin D deficient patients which were referred from Orthopaedics and medicine department and group 2 which was all dry eye diagnosed patients. In group 1, prevalence of dry eye was calculated and in group 2, prevalence of Vitamin D deficiency was calculated. Then association of Vitamin D deficiency and Dry eye was calculated using Chi square test. **Results:** A total of 101 patients were enrolled in the study. In group 1, out of 51 patients, 10 patients (19.60%) fulfilled the criteria of Dry eye and in group 2, 17 out of 50 patients had vitamin D levels less than 12 ng/ml. We observed a significant association between Vitamin D deficiency and dry eye (p-value < 0.01; OR - 101.1; 95% CI: 5.9 - 1721.0). **Conclusion:** There is a significant association between dry eye and vitamin D deficiency.

**Key Word:** Vitamin D deficiency, Dry eye syndromes, tertiary healthcare, morbidity

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## INTRODUCTION

Dry eye is one of the most prevalent disease with which the patients visit an ophthalmologists. Approximately 25 % of the patient load in ophthalmology outpatient department is of dry eye patients. The prevalence of dry eye has been reported in range from 5 percent to as high as 50 percent in different populations across the world (this disparity may be due to difference in diagnostic criteria of different studies, unique characteristics of the

investigated populations and other factors). According to TFOS DEWS II definition of dry eye(2007) is : “Dry eye is a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles.” Dry eye is divided into two types: aqueous deficiency and evaporative type. Among the factors cited for dry eyes: autoimmune diseases such as Sjogren’s syndrome or lupus syndrome; any ocular surgery, antiglaucoma medicines, Vitamin A deficiency, contact lens use, computer vision syndrome, meibomian gland disease and recently added to list is Vitamin D deficiency. Many studies have demonstrated association between vitamin D and dry eye, But some others have demonstrated that there is no correlation between dry eye and low vitamin D levels. Dry eye being the most common cause of ocular morbidity still needs to be explored but whether vitamin D is a factor associated and should the treatment protocol include Vitamin D

supplementation yet needs to be established. Keeping this in mind the following study was done in a north Indian institute to see whether there is any association between low vitamin D levels and dry eye.

**METHODOLOGY**

This study received Institutional Ethics Committee approval from Punjab institute of Medical Sciences (Approval Number 1500000591), and informed written consent was obtained from all participants. The conduct of the research project adhered to the tenets of the Declaration of Helsinki.

**Inclusion criteria**

There were two study groups

**Group 1:** Vitamin D deficient referred to ophthalmology department, these participants were screened for signs of dry eye and

**group 2:** diagnosed as dry eye in ophthalmology Outpatient department were subjected to test of vitamin D levels

**Exclusion criteria**

children below 18 years of age, Pregnant females, history of any refractive or intraocular surgery, any pre-diagnosed ocular surface disease and contact lens users. Criteria used for diagnosing dry eye: Participants were assessed by Schirmer's test, tear break-up time test (TBUT), ocular surface disease index (OSDI), Fluorescein staining scores (FSS). Any patient having one out of these 4 criteria was labelled as dry eye: Schirmer

test <10mm or TBUT <10 seconds or FSS>0 or OSDI> 12. Criteria for diagnosing Vitamin D deficiency: Vitamin D levels were measured using chemofluorescence. Any level less than 12 ng/dl was labelled as vitamin D deficient. Data collection: In group 1(vitamin D deficient): number of dry eye and non dry eye patients was noted and prevalence of dry eye in Vitamin D deficient was calculated. In group 2 (Dry eye patients): number of vitamin d deficient and non deficient was calculated and prevalence of Vitamin D deficiency in dry eye patients was calculated. Association between Dry eye and vitamin D deficiency was calculated using Chi square test.

**RESULTS**

The mean age was 46.38 ± 13.69 years. 51 patients were included in group 1: Vitamin D deficient referred from elsewhere and 50 patients were included in group 2: dry eye patients and their serum 25(OH)D levels were checked.

Group 1: Mean serum 25(OH) D level of 51 patients was 7.45 ± 5.98 ng/ml in group 1. Tear break-up time (TBUT) mean was 11.105 seconds, Schirmer's score mean was 11.54, fluorescein staining score was 0, OSDI scores were 12.5. Out of 51 patients, 10 patients (19.60%) fulfilled the criteria of Dry eye. The parameters of dry eye vs non dry eye patients in vitamin D deficient group are as given in Table 1

**Table 1:** Age, gender vitamin D levels, TBUT, Schirmer's test, FSS and OSDI in vitamin D deficiency patients of dry eye vs non dry eye subset

	Age	Gender	Vitamin D levels	TBUT	Schirmer's score	FSS	OSDI
Dry eye patients N=10	58.5 years	Females= 9 Males =1	7.0 ± 5.98 ng/dl	4.33 seconds	8.55 mm	0	14.5
Non dry eye N=41	45.5years	Females =29 Males=12	7.9 ± 5.98 ng dl	13.55 seconds	14.01mm	0	10,0

**Group 2:** All the 50 patients fulfilled the criteria used for dry eye. The mean TBUT was 5.302 seconds, mean Schirmer score was 8.55, Fluorescein staining score was 0.098 and OSDI score was 24.2. Mean Vitamin D levels were 25.55 ± 5.98 ng/ml. 17 out of 50 patients had vitamin D levels less than 12 ng/ml. The parameters of dry eye patients in vitamin D deficient and non deficient is given in Table number 2

**Table 2:** Age, gender vitamin D levels , TBUT, Schirmer's test, FSS and OSDI in Dry eye patients of Vitamin D deficient vs non Vitamin D deficient subset

	Age	Gender	Vitamin D levels	TBUT	Schirmer's score	FSS	OSDI
Vitamin D deficient N=17	52.5 years	Females= 10 Males =7	11.0 ± 5.98 ng/dl	7.33 seconds	8.55 mm	0.11	25.5
Non Vitamin D deficient N=33	56.33years	Females =20 Males=13	40.1 ± 5.98 ng dl	6.55 seconds	8.45mm	0.09	24,0

**Association of Vitamin D deficiency and dry eye:** In present study, we observed a significant association between Vitamin D deficiency and dry eye as per table 3

**Table 3:** Association of Vitamin d deficiency and Dry eye

Vitamin D deficiency	Dry Eye		Total
	Present	Absent	
Present	27 29.7%	41 60.3%	68 100.0%
Absent	33 100.0%	0 0.0%	33 100.0%
Total	60 59.4%	41 40.6%	101 100.0%

Chi-square - 31.04; p- value<0.01 (OR - 101.1;  
95% CI: 5.9 - 1721.0)

## DISCUSSION

Dry eye syndrome (DES) is a chronic ocular surface disease with symptoms of irritation, dryness, grittiness, ocular fatigue, redness, burning and soreness.<sup>i</sup> Many studies have reported dry eye as one of the most frequently encountered ocular morbidities.<sup>ii</sup> So importance of the treatment of this high morbidity disease is much warranted and in this relation many have advocated the association of vitamin D deficiency. But the association of dry eye and vitamin D is yet to be established. In this study, we evaluated the prevalence of dry eye among vitamin d deficient and prevalence of vitamin D deficient in dry eye disease. We also evaluated if there is any association of Vitamin D deficiency and dry eye, In the population of Vitamin D deficient the prevalence of dry eye was 19.6 % However in one of the studies<sup>iii</sup> the prevalence rate was much higher in Vitamin D deficient i.e. 74% of the vitamin D deficient women had dry eyes according to TBUT scores compared to 12% of the controls .In another study<sup>8</sup> which had comparable results to our study, prevalence of dry eye in Vitamin D deficient patients was reported as 10.3%. We found no studies which reported that all vitamin D deficient patients will develop dry eye. In study population of dry eye patients( group 2) , the prevalence of Vitamin D deficiency was 34% which is comparable to a study done by Yang CH *et al*<sup>7</sup> , where it was reported 41% of dry eye patients had vitamin D deficiency. We couldn't find studies regarding prevalence of vitamin deficiency in dry eye. Most of studies done were on correlation of average Vitamin D levels in the dry eye group. We found a significant association between Vitamin D deficiency and dry eye (p- value<0.01; OR - 101.1; 95% CI: 5.9 - 1721.0) in our study. This is in accordance with many studies<sup>4,5,6,10</sup> which have demonstrated association between vitamin D deficiency and dry eye. However we would like to state that dry eye is a multifactorial disease and all the Vitamin D deficient will not develop dry eye and all the dry eye patients will not have vitamin D deficiency. We warrant further study to see the effect of supplementation of Vitamin D

in dry eye to see whether it is a causal association or not.

## LIMITATIONS

The present study has some limitations that warrant consideration. First, the cross-sectional design precludes any conclusions regarding causality. The severity of dry eye was not correlated with vitamin D levels

## CONCLUSION

Dry eye and vitamin D deficiency have a positive correlation. However all the dry eye patients do not have vitamin D deficiency and all the vitamin D deficient do not develop dry eye. A casual association between Vitamin D deficiency and dry eye needs to be explored.

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