

# Evaluation of tear secretion and tear film stability in patient with pterygium and normal individuals

Banerjee Chandan <sup>1\*</sup>, Mishra Surendra<sup>2</sup>

<sup>1</sup>Lecturer, Department of Ophthalmology, National Medical College, Birgunj, Nepal,

<sup>2</sup>Senior Resident, Department of Ophthalmology, National Medical College, Birgunj, Nepal.

## ABSTRACT

### Background & Objectives

Pterygium being a prevalent ocular surface lesion, alteration in normal functioning of tear film is noticed leading to various ophthalmic features which may be mild to vision threatening, thus, it should be investigated thoroughly to prevent, treat or limit complications.

### Material & Methods

This study was conducted at NMCTH, Birgunj from August 2018 to July 2019 taking sample size of 93 cases of pterygium and 186 non-ptyerygium patients with no ocular surface disorder and objective analysis was done by Schirmer's I without and with anaesthesia and Tear Breakup Time.

### Results

During the study period of one year, out of 93 patients in Pterygium group, 48 (51.6%) were male and 45 (48.4%) were female, Age of patients ranged from 26 - 71 years and the mean age was 47.8 years (SD  $\pm 11.09$ ). In age matched other non-ptyerygium group without ocular surface disorder 186 in number, 101 (54.3%) were male and 85 (45.7%) were female and average age was 42.16 (SD  $\pm 13.13$ ). On analyzing the objective tear film stability indices for both groups, I obtained mean SCH I without and with anesthesia and TBUT values as, 16.94 mm, 13.81 mm, 10.14 sec in pterygium cases respectively with their SD of  $\pm 5.61$ ,  $\pm 5.06$  and  $\pm 4.06$  respectively while indices of non-ptyerygium group were 20.39 mm, 16.74 mm, and 13.05 sec and SD was  $\pm 6.08$ ,  $\pm 5.25$  and  $\pm 4.32$  respectively. The statistical difference of dry eye indices between the pterygia group and the non pterygia group were significant with p-value  $< 0.001$ .

### Conclusion

There is statistically significant difference in dry eye results between pterygium patients and patients without pterygium, thus our study concludes with results that pterygium being an ocular surface disorder leads to instability of tear film and thus dry eye.

### Keywords

Tear film, Pterygium, Dry eye, Schirmer's I test without anesthesia, Schirmer's I test with anesthesia.

## INTRODUCTION

The ocular surface is a complex unit comprising various epithelial and glandular tissues namely cornea, conjunctiva, main lacrimal glands and accessory glands; gland of Krause and gland of wolfring. Glands present in the ocular surface secrete various components of tear film which forms the protective coat to the eyeball structures, provides lubrication to the ocular surface and eye lids,

provides smooth and regular optical surface for the eye, supplies nutrient to the ocular surface, protects ocular surface against pathogens by means of antibacterial substances and promotes tissue maintenance and wound healing of the surface.<sup>1-4</sup>

Ocular surface has a coat of tear film which itself has got three layers namely outer lipid layer, middle aqueous layer and inner mucous layer with entire thickness of 7 to 10 micron.<sup>5</sup>

The outer lipid layer is 0.1 micron thick consisting of mainly waxy and cholesterol esters and some polar lipids which are secreted by meibomian gland that is located in the tarsal plates of the eye lids, which open onto the lid margin just posterior to the eyelashes<sup>6</sup> and gland of zeiss and moll also have some contribution on it. Functions of this layer is to prevent evaporation of aqueous, enhancement of spread of tear film, prevention of contamination of tear film by the sebaceous secretions secreted by sebaceous glands, prevention of outflow of tears and sealing of the apposed lid margins during sleep.<sup>6-8</sup>

This layer contains the water soluble contents including water and electrolyte, anti bacterial proteins such as lactoferrin, lysozyme and immunoglobulin (IgA), vitamins (vitamin A), growth factors (epidermal growth factors, hepatocyte growth factor) and main function of this layer is to provide hydration to the mucous layer, supply oxygen and electrolytes to the ocular surface, antibacterial defense, maintenance and renewal of the ocular surface and promotion of healing via proliferation and differentiation of the ocular surface epithelial cells.<sup>2,4,9</sup>

The inner mucous layer is 1 micron thick which is a hydrated layer of mucoprotein rich sialomucin secreted by the conjunctival goblet cells and by striated squamous cells of the cornea and conjunctiva<sup>6,10</sup> that contributes to the stability of tear film as well as it protects cornea.

It can be considered as a degenerative condition of subconjunctival tissue triggered by some ocular surface disorder.<sup>11</sup> It develops in the form of horizontally oriented triangular growth of the abnormal tissue which may grow nasally or less frequently temporally.<sup>12</sup> Pterygium consists of three parts namely, cap, head and body, 'cap' is usually avascular structure that gets attached to the corneal surface, a 'head' at its apex encroaches cornea and the 'body' represents the main bulk of the pterygium over the sclera, and extends from the canthal region.<sup>13</sup>

Pterygia in which the episcleral vessel details are indistinctly seen or partially obscured are categorized as grade T2 (intermediate). Grade T3 (fleshy) denotes a thick pterygium in which episcleral vessels underlying the body of the pterygium are totally obscured by fibrovascular tissue.<sup>14</sup>

Another classification according to the degree of involvement of ocular surface is also commonly used. It also has three grades, pterygium is said to have grade I,II and III when pterygium is between the limbus and a point midway between the limbus and the papillary margin, when its head is present between a point midway between the limbus and the papillary margin – that is to say, the nasal papillary margin in case of nasal pterygium and the temporal margin in case of temporal pterygium and the pterygium that crosses the papillary margin respectively.<sup>15</sup>

It has worldwide distribution with prevalence ranging from 1.3 to 38.7%.<sup>16</sup> Incidence of pterygium increases with age and is mostly pronounced in age group of 40-60 years and has got male predominance, lower education level and rural habituation<sup>17</sup> some study showed female preponderance<sup>13</sup> and one study showed no gender variation, and pterygium is found to be twice to three times common in blacks than among whites<sup>11</sup> with various studies showing its higher prevalence in the areas with dry, warm climate and exposure to UVR-A and UVR-B.<sup>16,17</sup>

Also to mention, on the basis of occupational exposure it is found to be prevalent in the persons with outdoor jobs outdoor working, exposure to sun light or dust which leads to the idea that chronic ocular surface irritation may be the cause.<sup>18</sup>

At initial stage it presents as an elevated, fleshy mass on the bulbar conjunctiva near the limbus in the inter-palpebral fissure. It may further progress by developing engorged radial vessels over the pterygium making bulbar conjunctiva increasingly taut and cause symptoms of redness, irritation, lacrimation, photophobia, foreign body sensation, astigmatism and as it encroaches cornea to the visual axis it may lead to glare, decreased contrast sensitivity and grossly decreased vision and in advanced cases symblepharon formation may limit ocular movement and result in diplopia. Old and static lesions are associated with an arcuate line of iron deposition in the superficial cornea central to

the cap called Stocker's line.<sup>16</sup> Fuchs flecks are the minute gray blemishes that disperse near the head of pterygium are commonly found in cases of pterygium.<sup>19</sup>

The differential diagnosis of pterygium includes pinguecula, pseudoptyerygium, conjunctival tumors like papilloma, limbal dermoid, amyloidosis, lymphoma of conjunctiva, ocular surface squamous neoplasia, conjunctival intraepithelial neoplasia, conjunctival melanoma, primary acquired melanosis which can also coexist with pterygium<sup>15,20</sup> and the diagnosis of pterygium depends upon the history, examination and a combination of diagnostic studies.

The clinical tests commonly used are careful slit-lamp examination for grading of it usually done by simple grading system introduced by Tan DH, schirmer's test, the tear break up time, tear meniscus height, Rose Bengal staining, lessamine green staining to evaluate the nature of tear film. Tear film osmolarity, lysosome and lactoferrin, impression cytology and conjunctival biopsy assess quality and composition of tear film and ocular surface dryness can be evaluated.

Management approach to pterygium depends upon the signs, symptoms and grading of it. Mild symptomatic pterygia are managed by avoiding smoking or exposure to dusty environment. Topical preservative free lubricants, vasoconstrictors and mild non-penetrating corticosteroids whereas to protect from further progression U V blocking spectacles can be used.<sup>17</sup>

Various adjuvant therapies can be used with pterygium surgery to decrease the risk of recurrence after its surgical removal which includes cautery, Mitomycin C, 5-Fluorouracil, beta-irradiation, Ranibizumab, bevacizumab, loteprenol etabonate ointments, laser therapy with argon laser.<sup>12</sup>

In Nepal, there is no population-based study in relation to dry eye disease. However, in a hospital-based study from Nepal Eye Hospital, Kathmandu, Nepal showed female preponderance of 2.6:1 and the most affected age group was between 30 to 40 years which was 29%.<sup>21</sup>

As from the definition DED is a multifactorial disorder which involves multiple interacting mechanisms. Dysfunction of any of the components of lacrimal function unit components can lead to DED by causing alteration in the volume, composition, distribution and/or clearance of the tear film. Tear hyperosmolarity is one mechanism causing DED which can arise from either low aqueous flow or excessive tear film evaporation. Hyperosmolar tears can damage the ocular surface epithelium by activating an inflammatory cascade with release of inflammatory mediators into the tear while acute inflammation may initially be accompanied by increased reflex tearing and blinking, chronic inflammation may result in reduced corneal sensation and decreased reflex activities leading to increased evaporation and tear film instability.

It can be categorized broadly into aqueous deficient dry eye and evaporative dry eye. In ADDE Sjogren ( primary and secondary ) and non-Sjogren ( lacrimal gland insufficiency , lacrimal duct obstruction, reflex hypo lacrimation ) are included and in EDE , MGD , eyelid aperture disorders or lid/globe incongruity , blink disorders and ocular surface disorders are included.

With the greater potential towards overlapping between the two categories and decreased level of specificity in DED diagnosis, TFOS DEWS II brought the classification scheme to provide clarity in diagnosing DED from which various etiologies can be considered and appropriate management plan can be instituted. Various elements in the 2017 dry eye classification are - Symptoms without signs : neuropathic pain, Symptoms without signs : pre-clinical dry eye state, Signs without symptoms : reduced corneal sensitivity, Signs without symptoms : predisposition to dry eye.

Diagnosis of dry eye can be done by thorough ophthalmic examination starting from visual acuity assessment, careful examination under slit lamp using broad beam initially scanning the ocular surface and adnexa, looking for any debris in the tear film, mucous strands in conjunctival surface, punctuate erosions or coarse mucous plaque in corneal surface which are common findings in dry eye and specific tests for evaluation of dry eye status to assess the tear film instability, ocular surface damage and aqueous tear flow as described below.

Schirmer's test is the most commonly used technique for measuring tear production introduced in 1903 by Schirmer.<sup>11</sup> Jones later advocated the use of topical anesthesia combined with a Schirmer's test strip for 5 minutes to reduce the stimulating effect of the filter paper strip – the 'basal' tear secretion test.<sup>7</sup>

In Schirmer's I test without anesthesia, subjects are placed comfortably at rest informing them that they should keep the eyes closed for 5 minutes and extent of wetting of a 5x35 mm blotting paper strip/ Whatman filter paper number 41 is measured after folding 5 mm from one end and placing it

in the lower fornix, at the junction of outer one-third and inner two-thirds for 5 minutes. Wetting of more than 15 mm of strip after 5 minutes, measured from the folded end is considered normal.<sup>18</sup>

Schirmer I test with anesthesia can be done 15 minutes after the initial test in which basal secretion is measured. Proparacaine Hydrochloride 0.5% is installed into the lower conjunctival clu-de-sac, 1 drop installed 2 minutes apart and excess anesthetic solution is wiped off than after whatman 41 filter paper is placed in same manner as above and wetting is recorded 5 minutes later.

## Materials & Methods

NMCTH is one of the fine centers for ophthalmic evaluation in central southern region of Nepal. Many cases from different southern districts of Nepal like Parsa, Bara, Rautahat, and from Northern State of India like Bihar come to this center for medical and surgical purposes. So, cases taken from this place can reflect the disease pattern of the central southern region of our country. This study was carried out from 1<sup>st</sup> August 2018 till 30<sup>th</sup> July 2019 for a period of one year.

In this study, 93 patients of pterygium were included who had pterygium of different grades and laterality. Patients particular and proper history was taken specially focusing on the symptoms they are facing due to dry eye, place of residence and occupation was noted focusing on the nature of job which might be indoor or outdoor. Socioeconomic status and literacy was also documented and categorized under the modified kuppuswamy's socioeconomic status scale. History of medications used was noted with special concern. Any surgeries done in past which involves the ocular surface was noted. The study was conducted after approval from ethical committee.

Clinical examination was done by a comprehensive anterior segment evaluation using slit lamp bio microscopy by Zeiss slit lamp. For control group thorough history was taken as of cases and medications if used were noted and examined under slit lamp to rule out any occult ocular surface pathologies. After complete inspection of the patients under investigation assessment of dry eye was done.

Dry eye assessment included:

- a) Schirmer -1 test without anesthesia
- b) Schirmer-1 test with anesthesia
- c) Tear break-up time (TBUT)

These tests were performed on the day of presentation under normal environmental condition.

Schirmer 1 test without anesthesia was done to assess the aqueous tear production by placing the Schirmer strip, made up of Whatman no. 41 filter paper with dimension of 5 mm x 35 mm. The initial 5 mm of the schirmer strip was folded and kept at the junction of the lateral one third and medial two third of the lower fornix of the operated eye and was kept in situ for 5 minutes. The wetting of the strip at the end of 5 minutes was recorded.

Schirmer I test with anesthesia was done 15 minutes after the initial test in which basal secretion was measured. Proparacaine Hydrochloride 0.5% was installed into the lower conjunctivalclu-de-sac, 1 drop installed 2 minutes apart and excess anesthetic solution was wiped off than after whatman 41 filter paper was placed in same manner as above and wetting was recorded 5 minutes later.

Value less than 15 mm was considered abnormal. Further grading of severity of dry was done, with values between 10-15 mm it was considered mild dry eye, values between 5-10 mm were taken as moderate grade of dry eye and values less than 5 mm were considered as dry eye with severe grade.

The tear break-up time assessment was done and the readings were analyzed. This test was done for evaluating mucin component of the tear film. The tear film was stained by using fluorescein strips wetted with xylocaine drops. After putting the fluorescein drop in the lower fornix, patient was asked to blink frequently for few seconds and then asked to stop blinking. TBUT measures the appearance

of first dry spot over the cornea after the last complete blink in time period. This is evaluated under slit lamp bio microscopy using cobalt blue filter. Average of consecutive three readings was considered. Break up time less than 10 sec was considered abnormal.

### Data and Statistical Analysis

The data were recruited in on daily basis and interim analysis as well as calculation and tabulation of data was done by statistical software (IBM SPSS statistics version 21 and Microsoft Excel 2010). To test for level of significance, p value at 0.05 was taken. Frequency distribution and percentage was calculated as a part of descriptive statistic .Independent sample t test was applied when required for data interpretation in the continuous variables. Chi square test was also done for comparing the two groups of patient and Odds ratio was calculated to find out chances of occurrence of dry eye in patients with pterygium in comparison to normals and nature of work.

### Ethical consideration

Patients were included in my study after taking verbal and written consent. No financial burden was added to patients and no harm was made to patients. I have conducted this study after getting approval letter from sthe institutional review committee.

### RESULTS

A total of 279 patients were included in this study, out of which 93 patients were cases of pterygium fulfilling the inclusion criteria and 186 patients were age and sex matched non-ptyerygium group. Out of 93 cases studied, 71 (76.3%) had unilateral pterygium and 22 (23.7%) had bilateral pterygium and the left eye was involved in 42 (45.2%), right eye in 29(31.2%) and in 22 (23.7%) bilateral involvement of the eyes was seen in the pterygium patients.88 (94.6%) had nasal pterygium while only 5 (5.4%) had temporal involvement.

Table 1: Demographic distribution of the participants

Group	Pterygium	Non- Pterygium
Total number of patients	93	186
Male (%)	48 (51.6%)	101 (54.3%)
Female (%)	45 (48.4%)	85 (45.7%)
Mean age (years )	47.81±11.09	42.16±13.13

In total of 93 cases of pterygium, 48 (51.6%) were male and 45 (48.4%) were female with mean age of 47.81 years (SD ±11.09) and in control group 101 (54.3%) were male and 85 (45.7%) were female with mean age of 42.16 years (SD ±13.13).

### Graphical analysis

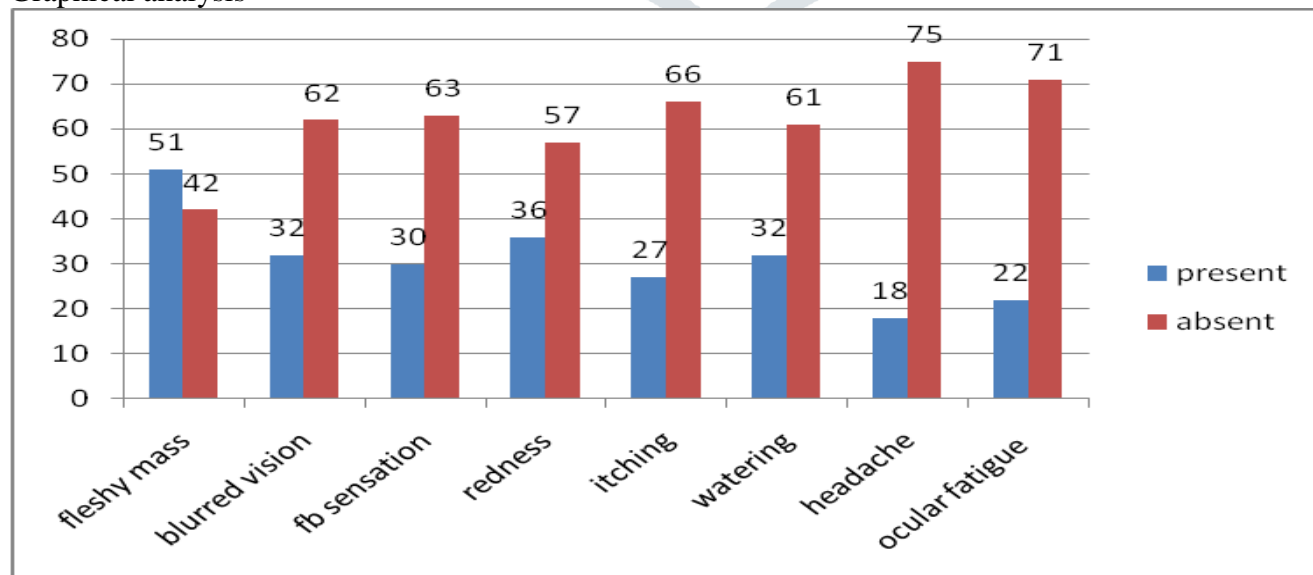


Figure 1: Chief Complaints and its frequency in pterygium group

Figure 1 describes about the chief complaints and its frequency in pterygium group. When analyzing complaints using the questionnaire which included eight questions pertaining to dry eye symptoms in patients of pterygium using the questions of presence or absence of a) Fleshy mass b) blurred vision c) foreign body sensation d) redness e) itching and burning sensation f) watering g) headache and h)ocular fatigue, most common presenting complaint was fleshy mass which was present in 51 patients followed by redness in 36, blurring of vision and watering in 32 patients, 30 patients also complained of foreign body sensation, 27 had itching and burning sensation, 22 patients complained of ocular fatigue and headache in 18 patients.

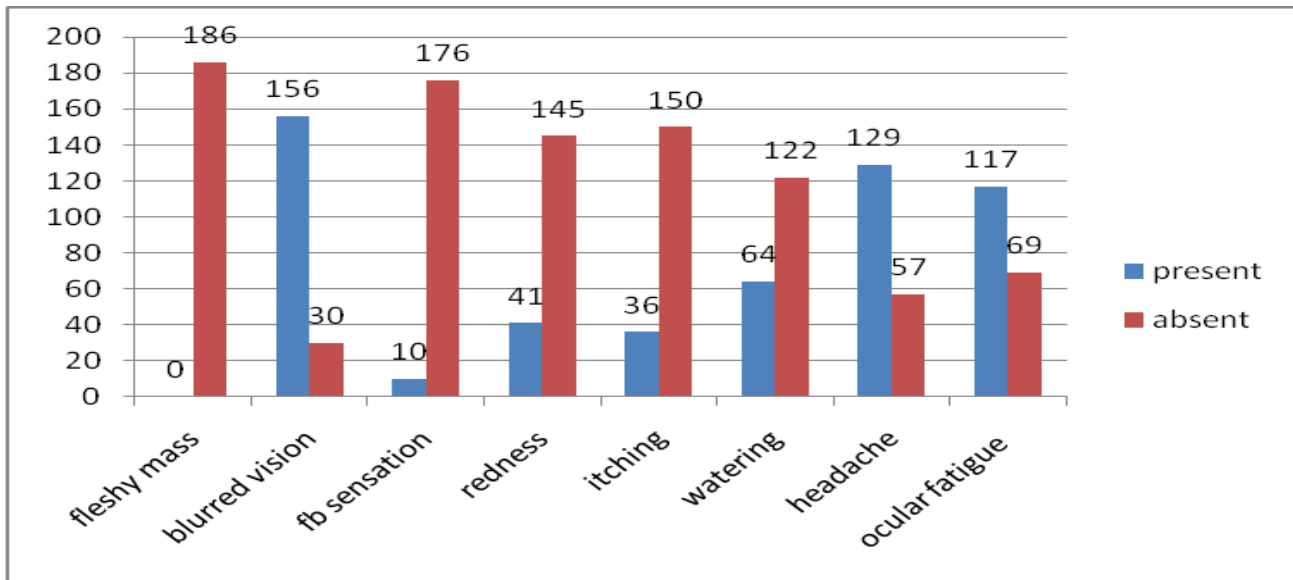


Figure 2: Chief complaints and its frequency in non- pterygium group

In Figure number 2 as of figure 1, same questions were asked to the non-terygium group. The result I obtained was as follows. Fleshy mass was not present in any of the controls. Blurring of vision was most common symptom presented by control group with 156 participants complaining of it followed by headache in 129, ocular fatigue in 117, watering in 64, redness in 41, itching and burning sensation in 36 and foreign body sensation in only 10.

Table 2: Demographic distribution of cases

Age group	Gender		Female	
	Male	Percentage	Frequency	Percentage
20-30	2	2.2	0	0
31-40	8	8.6	13	14
41-50	15	16.1	17	18.3
51-60	13	14	11	11.8
61-70	9	9.7	4	4.3
71-80	1	1.1	0	0
Total	48	51.6	45	48.4

Table 2 shows that age of patients ranged from 26 - 71 years with the incidence of largest number of pterygia in the fourth decade of life in both sexes which was 32 (34.4%) of total number of cases followed by patients falling in fifth decade 24(25.8%) .

Table 3 elaborates that, out of 93 patients 44 (47.3%) patients had grade I pterygia, 42 (45.2%) had grade II and 7(7.5%) had grade III pterygia showing their presentation at OPD at early stage of their disease. 76 patients (81.7 %) had progressive nature of pterygium while 17 (18.3%) had atrophic pterygium. In the pterygium group 71 patients had unilateral and 22 had bilateral pterygium of

various grades. And on the basis of location, 88 patients had nasal and only 5 patients had temporal pterygium.

Table 3: Pterygium morphology

		Number	Percentage (%)
Grading	Grade I	44	47.3
	Grade II	42	45.2
	Grade III	7	7.5
Nature	Progressive	76	81.7
	Atrophic	17	18.3
Laterality	Unilateral	71	76.3
	Bilateral	22	23.7
Location	Nasal	88	94.6
	Temporal	5	5.4

Table 4: Medical history of patients with pterygium

Medication used	Number of patients	Percentage (%)
None	45	48.4
Tear substitutes	33	35.5
Antibiotics with or without corticosteroids	7	7.5
No documents	8	8.6
Total	93	100

In my study 45 (48.4%) of patient used none of the medication while maximum number of patients 33 (35.5%) who used medication used tear substitutes, 7 (7.5%) used antibiotics with or without steroid and 8 (8.6%) had no documentation but used some kind of medications for their complaints.

Table 5: Tests for tear secretion and tear stability in all participants

Dry eye test	Pterygium (n=93)		Non-ptyerygium (n=186)		P-value
	Mean	SD	Mean	SD	
TBUT	10.14	±4.06	13.05	±4.32	<0.001
SCH I without anesthesia (mm)	16.94	±5.61	20.39	±6.08	<0.001
SCH I with anesthesia (mm)	13.81	±5.06	16.74	±5.25	<0.001

The mean Schirmer's test I without anesthesia was 16.94 mm with standard deviation of ±5.61 in pterygia group while it was 20.39 mm with standard deviation of 6.08 in the non-ptyerygium group. Likewise mean Schirmer's I test with anesthesia was 13.81 mm in pterygia group with SD of ±5.06 and 16.74 mm with SD 5.25 in non-ptyerygium group showing statistically significant difference between the two groups ( $P < 0.05$ ).

The mean TBUT in pterygium group was 10.14 sec ranging from 2-19 seconds and SD of ±4.06 while the mean TBUT and SD in non-ptyerygium group were 13.05 sec and ±4.318 respectively showing statistically significant difference between the two groups ( $P < 0.05$ ).

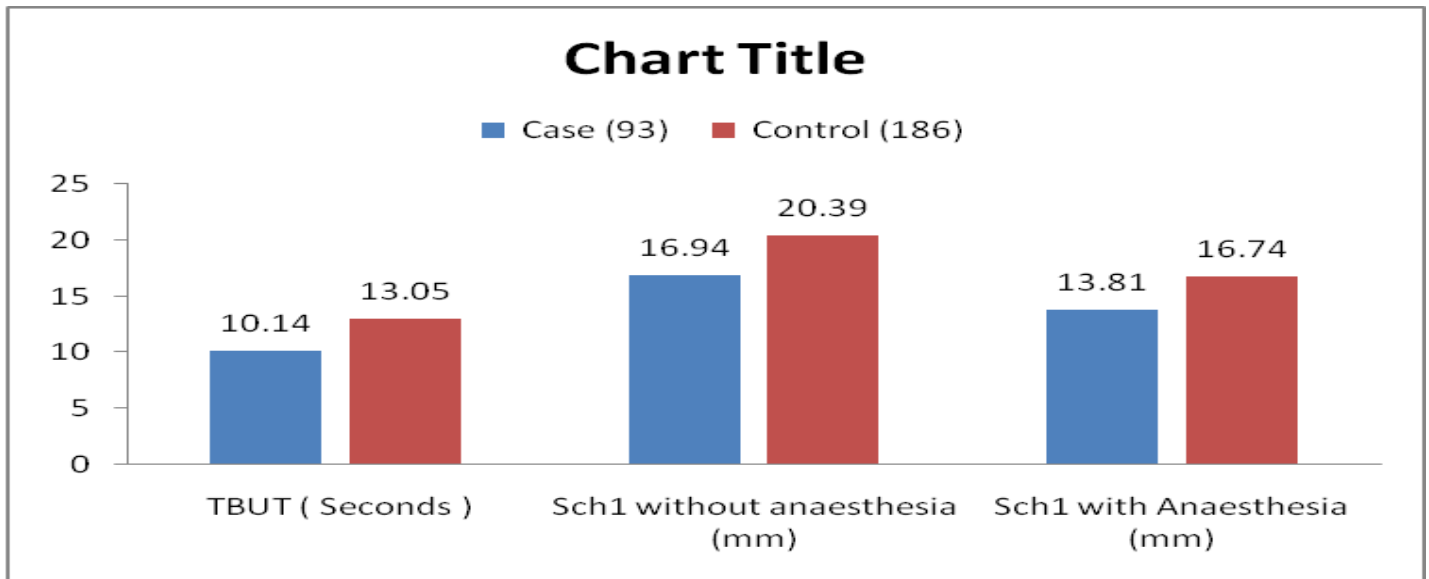


Figure 3: Bar diagram showing comparison of different assessment tools in participants

As of the above bar diagram of figure number 3, the mean Schirmer’s test I without anesthesia was 16.94 mm in pterygia group while it was 20.39 mm in the control group. Likewise mean Schirmer’s I test with anesthesia was 13.81 mm and 16.74 mm in control group showing statistically significant difference between the two groups ( $P < 0.05$ ).

Table 5: Degree of dry eye while using Schirmer’s I test without anesthesia in all participants

	SCH I without anesthesia (pterygium)		SCH I without anesthesia (non-pterygium)	
	Number	Percentage (%)	Number	Percentage (%)
Normal (>15 mm)	51	54.8	139	74.7
Mild (11-15)	29	31.2	34	18.3
Moderate (6-10)	12	12.9	12	6.5
Severe(2-5)	1	1.1	1	0.5
Total	93	100	186	100

P value: 0.010

Table shows that the Schirmer’s I test without anesthesia value less than 2 mm was neither seen on pterygium or non-pterygium groups so, very severe dry eye was not present in either of groups while severe dry eye i.e 2-5 mm was observed in 1 (1.1 %) in pterygia group and 1 (0.5 %) in non-pterygium, moderate dry eye i.e 6-10 mm was observed in 12(12.9%) in pterygia group and 12 (6.5 %) in non-pterygium group while mild dry eye i.e 11-15 mm was found in 29(31.2%) of pterygium and 34(18.3%) of non-pterygium patients. And finally normal range of Schirmer’s value i.e> 15 mm was observed in 51 (54.8%) of pterygium patient and 139 (74.7%) of non-pterygium group.

Table shows that SCH I with anesthesia value less than 2 mm was not observed on either cases of pterygium or non-pterygium group thus, very severe dry eye was not present in none of the group. . Severe dry eye was observed in 5 (5.4%) in pterygia group and 4 (2.2%) of non-pterygium group, Moderate dry eye was observed in 12 (12.9%) in Pterygia group and 18 (9.7%) of non-pterygium group, mild dry eye was found in 39 (41.9%) in cases and 45 (24.2%) of non-pterygium group and normal range of SCH I values were observed in 37 (39.8%) cases with pterygium and 119(64%) of non-pterygium group.



Table 6: Degree of dry eye while using Schirmer's I test with anesthesia in all participants

	SCH I with anesthesia (pterygium)	Percentage (%)	SCH I with anesthesia (non-pterygium)	Percentage (%)
Normal (>15 mm)	37	39.8	119	64
Mild (11-15)	39	41.9	45	24.2
Moderate (6-10)	12	12.9	18	9.7
Severe(2-5)	5	5.4	4	2.2
Total	93	100	186	100

## DISCUSSION

This study was done to evaluate the nature of tear film in patients with pterygium and comparing with that of normal individuals taking 93 cases of different grades of pterygium and 186 age and sex matched non-pterygium patients.

Pterygium is a degenerative disorder of conjunctiva with wide range of variation of prevalence in the different part of the world ranging 1.3 % to 38.7%<sup>22-29</sup> while dry eye is also the most prevalent ophthalmic problem that drags patients to seek appointment to the ophthalmologist with its prevalence from 5 % to as high as 75% which is age dependent.<sup>23</sup>

Different study used different parameters to evaluate the grades of pterygium and assessment of quality or nature of tearfilm that evaluates the degree of dry eye. Some study only conducted TBUT and compared to pterygium group and control group , some conducted Schirmer's I test without and with anesthesia for the evaluation of dry eye while some studies included TBUT, Schirmer's I test and rose bengal staining technique for assessing the nature of the tear film in patient with pterygium and compared with the control groups . Therefore, this study used diagnostic tools commonly used which are schirmer's test and TBUT and was designed in such a manner that a relationship between these conditions could either be proved or be ruled out.

In Nepal there is no data available about status of tear secretion and its stability in normal population thus this study also aimed to provide this information. Also to mention I, in this study have collected information about the education, socioeconomic status , occupation along with age and sex and have analyzed this information so as to withdraw some information about relationship between these demographic characteristics and risk of pterygium .

There are various studies showing the higher prevalence of pterygium in males<sup>11, 30</sup> while some studies showed female preponderance<sup>23, 30</sup> and one study showed no relationship with sex.<sup>13</sup> In the present study male had more prevalence of pterygium 45 out of 93 which is supporting the previous studies.

Various previous studies have shown that pterygium to be common in age group from 4<sup>th</sup> to 6<sup>th</sup> decade of life<sup>11, 30</sup> which is similar to my present study in which I found it to be common in 4<sup>th</sup> and 5<sup>th</sup> decades, pterygium was prevalent in both males and females of age group 41 to 50 years.

Earlier studies pointed out that pterygium occurs due to exposure to UV rays, dry climates and dusty environment<sup>6,27</sup> and various studies showed its prevalence higher in outdoor workers.<sup>28</sup> Present study also showed its prevalence more in outdoor workers in comparison to indoor workers as out of 93 patients with pterygium 51 (54.8%) were outdoor workers which is slightly higher than indoor workers 42 (45.2%).

The analysis of the chief complaints showed that every patient presented to our OPD had either 1 or more chief complaints .I had prepared questions in such a way that, it included commonly presenting complaints of patients with pterygium, dry eye and refractive errors .The questionnaire included 8 questions a) fleshy mass, b) blurred vision, c) foreign body sensation, d) redness, e) itching, f) watering, g) headache and h) ocular fatigue. Regarding the chief complaints, in some studies burning sensation, redness and irritation was found to be the most common dry eye symptom.<sup>11, 19</sup> In my study most common presenting complaint was fleshy mass which was chief complaints present in 51

patients. Redness, blurring of vision and watering was other main complaints present in 36, 32 and 32 patients. 30 patients complained of foreign body sensation, 27 complained of itching and burning. Ocular fatigue and headache was presenting complaint of 22 and 18 patients respectively. Thus, my study has similar results as other previously conducted studies directing towards conclusion that watering, redness, foreign body sensations are most common presenting complaints of patients with pterygium visiting opd.

While assessing the drug history of patients, in my study 45 (48.4%) of patient used none of the medication while maximum number of patients 33 (35.5%) who used medication used tear substitutes 7 (7.5%) used antibiotics with or without steroid and 8 (8.6%) had no documentation but used some kind of medications.

In this study mean Schirmer's I test without anesthesia was 16.94 mm (ranging 4-30mm) in pterygium group with SD±5.61 while mean was 20.39 mm (range 4-32 mm) in the non-terygium group with SD ±6.08 and Mean value of schirmer's I with anesthesia was 13.81mm (range 2-26 mm) in cases with pterygium with SD ±5.06 while 16.74 mm (range 2-25mm) in non-terygium group with SD ±5.25. Regarding TBUT, mean value was 10.14 sec with range 2-19 seconds and SD of ±4.06 in pterygium group and in non pterygium group mean, range and SD were 13.05seconds, 3-22 seconds and ±4.318 respectively. There was statistically significant difference between the two groups ( $P < 0.05$ ).

Regarding Schirmer's test I with anesthesia my results were consistent with results obtained in other studies conducted in south India<sup>19</sup> in which mean value was 11.23 mm and results of study were in consensus with Anbesse *et al.*, where mean value was  $10.11 \pm 4.81$  mm<sup>18</sup>.

The degree of dry eye in Schirmer's I without anesthesia was mild in 24 (25.8%), moderate in 12(12.9 %) and severe in 1 (1.1%) and degree of dry eye in Schirmer's test with anesthesia was mild in 31(33.3%), moderate in 11(11.8%) and severe in 5(5.4%) which is comparable with the results of degree of dry eye in previous study conducted in Nepal<sup>17</sup>.

One of the specific objectives of this study was to study the status of tear secretion in normal population in this geographical location for further reference. On the basis of results obtained from non-terygium group 47 out of 186 patients had abnormal schirmer's test without anesthesia values, 67 patients had abnormal schirmer's test with anesthesia value and 42 patients had abnormal TBUT results. These results signify, some degree of dry eye may be present in patient with healthy ocular surface as well.

There was no statistically significant difference found in dry eye status between males and female patient in both groups. As from the result, out of 149 males, 96 males had normal values and 53 had abnormal values for schirmer's test without anesthesia and whereas out of 130 female patients, 94 females had normal results and 36 females had abnormal results with p value of 0.159 and odds ratio was 1.442.

On the basis of schirmers test with anesthesia 78 males and 78 females had normal values and 71 males and 52 males had abnormal results with p value of 0.199 and odds ratio was 1.365.

And, on the basis of TBUT 87 males and 87 females had normal values and 62 males and 43 females had abnormal values with p value of 0.142 with odds ratio of 1.442.

Out of 188 indoor workers normal and abnormal schirmer's I test without anesthesia and with anesthesia and TBUT was 120 vs 68 patients, 104 vs 84 patients and 117 vs 71 patients respectively and out of 91 outdoor workers values were 70 vs 21 patients, 52 vs 39 patients and 57 vs 34 patients respectively. These values show that there was significant difference in the incidence of dry eye in outdoor workers as all the indices has P value  $> 0.05$  which are 0.774 for schirmers I test with anesthesia and 0.998 for TBUT, but as the p value for Schirmer's I test without anesthesia was 0.028 statistical difference was absent, which is in favor of the previous studies conducted in various parts of the world.<sup>23, 28</sup>

Odds ratio and Relative risk of having dry eye in patients with pterygium was calculated and it was observed that the risk of having dry eye in patients with pterygium was 2.27, 2.44 and 2.69 times higher on the basis of schirmer's test without and with anesthesia and TBUT respectively than those patient without pterygium which is quiet similar to the odds ratio of 3.83 between dry eye and

pterygium in study conducted by Kim *et al.*,<sup>14</sup> and odds ratio between pterygium and dry eye was 3.38 in another study conducted in Nepal.<sup>17</sup>

Regarding calculation of sample size as no population-based study was conducted in Nepal to assess the prevalence of pterygium or even dry eye in normal population or in population with pterygium neither the odds ratio was available. I, in this study took the prevalence rate of a study conducted in China, which was 6.5 %. I took it as a prevalence rate as it is an asian country and the study site had similar UVI as of our country taking in consideration that UV rays are one of the major risk factor for development of pterygium.

Our study has shown that dry eye was present in 60.21 % of pterygium patient and 36.02 % in the non-pterygium group and the odds ratio is 2.69 on the basis of schirmers I test with anesthesia. 45.16 % and 25.26 % of patients with and without pterygium had dry eye on the basis of schirmer's I test without anesthesia and the odds ratio was 2.44 while on the basis of TBUT, dry eye was present in 39.78% and 22.58% in pterygium and non-pterygium group respectively with odds ratio of 2.27. As for TBUT result, similar results were obtained in the study conducted at Andhra pradesh, India<sup>27</sup> in which 35.77% of patients with pterygium had dry eye.

## CONCLUSION

In our country, my study shows pterygium is common in males (M=48, F= 45), outdoor workers (outdoor = 51, indoor =42). The age group of patients of pterygium varies from 26 -71 years with mean age of 47.81 years with SD  $\pm$ 11.09 years. The largest number of pterygia is found in 40-50 years in both sexes which was 15 males and 17 females with 32 out of 93 cases. There was no relationship between dry eye with sex, but on the basis of occupation dry eye was more common in outdoor workers with P value > 0.05. Regarding education and socioeconomic status, dry eye was more common in patients who were illiterate or patients who had only gone for school level education and dry eye was more prevalent in lower middle class and upper lower class patients. Fleasy mass was most common complaint of patients with pterygium which 51 out of 93 patients complained of, redness, blurring of vision and watering was other main complaints present in 36, 32 and 32 patients respectively. 30 patients complained of foreign body sensation, 27 complained of itching and burning .Ocular fatigue and head ache was presenting complaint of 22 and 18 patients respectively.

Slightly more number of the patients in my study presented in late stage of pterygium (grade II = 45.2 %, grade III = 7.5 %) remaining 47.3% had grade I pterygium.

There is statistically significant difference in dry eye results i.e TBUT, Schirmer's I test without and with anesthesia between pterygium patients and non-pterygium group ( p value < 0.05). The odds ratio between pterygium and dry eye was 2.69, 2.44 and 2.27dry on the basis of schirmer's I without anesthesia and with anesthesia and TBUT respectively. Dry eye was present in 25.26 % and 45.16%, 36.02 % and 60.21 % and 22.58% and 39.78 % on the basis of SCH I without anesthesia , SCH I with anesthesia and TBUT in normal patients and patients with pterygium respectively.

This study has demonstrated that there is a strong relationship between dry eye and pterygium.

## REFERENCES

1. Holly FJ, Patten JT, Dohlman CH. Surface activity determination of aqueous tear components in dry eye patients and normals. *Experimental eye research*. 1977 May 1;24(5):479-91.
2. Ohashi Y, Dogru M, Tsubota K. Laboratory findings in tear fluid analysis. *Clinica chimica acta*. 2006 Jul 15;369(1):17-28.
3. Montés-Micó R. Role of the tear film in the optical quality of the human eye. *Journal of Cataract & Refractive Surgery*. 2007 Sep 1;33(9):1631-5.
4. Klenkler B, Sheardown H. Growth factors in the anterior segment: role in tissue maintenance, wound healing and ocular pathology. *Experimental eye research*. 2004 Nov 1;79(5):677-88.
5. Holly FJ. Tear film physiology. *American journal of optometry and physiological optics*. 1980 Apr;57(4):252-7.
6. Gilbard JP. The diagnosis and management of dry eyes. *Otolaryngologic clinics of North America*. 2005 Oct 1;38(5):871-85.

7. Foulks GN. The correlation between the tear film lipid layer and dry eye disease. *Survey of ophthalmology*. 2007 Jul 1;52(4):369-74.
8. Bron AJ, Tiffany JM, Gouveia SM, Yokoi N, Voon LW. Functional aspects of the tear film lipid layer. *Experimental eye research*. 2004 Mar 1;78(3):347-60.
9. Geerling G, Hartwig D. Autologous serum eyedrops for ocular surface disorders. In *Cornea and external eye disease 2006* (pp. 1-20). Springer, Berlin, Heidelberg.
10. Dartt DA. Control of mucin production by ocular surface epithelial cells. *Experimental eye research*. 2004 Feb 1;78(2):173-85.
11. Luthra R, Nemesure BB, Wu SY, Xie SH, Leske MC. Frequency and risk factors for pterygium in the Barbados Eye Study. *Archives of ophthalmology*. 2001 Dec 1;119(12):1827-32.
12. Dolezalova V. Is the occurrence of a temporal pterygium really so rare?. *Ophthalmologica. Journal international d'ophtalmologie. International journal of ophthalmology. Zeitschrift fur Augenheilkunde*. 1977;174(2):88-91.
13. Holland EJ, Mannis MJ, Lee WB. *Ocular surface disease: cornea, conjunctiva and tear film: expert consult-online and print*. Elsevier Health Sciences; 2013 May 17.
14. Kim HH, Mun HJ, Park YJ, Lee KW, Shin JP. Conjunctivolimbal autograft using a fibrin adhesive in pterygium surgery. *Korean Journal of Ophthalmology*. 2008 Sep 1;22(3):147-54.
15. Maheshwari S. Pterygium-induced corneal refractive changes. *Indian journal of ophthalmology*. 2007;55(5):383.
16. Fotouhi A, Hashemi H, Khabazkhoob M, Mohammad K. Prevalence and risk factors of pterygium and pinguecula: the Tehran Eye Study. *Eye*. 2009 May;23(5):1125.
17. Shrestha S, Shrestha SM. Comparative study of prevalence of pterygium at high altitude and Kathmandu Valley. *Journal of Nepal Health Research Council*. 2014;12(28):187-90
18. Anbesse DH, Kassa T, Kefyalew B, Tasew A, Atnie A, Desta B. Prevalence and associated factors of pterygium among adults living in Gondar city, Northwest Ethiopia. *PloS one*. 2017 Mar 30;12(3):e0174450.
19. Ganeshpuri AS, Kamble BS, Patil P et. al. A comparative study of tear film stability & secretion in pterygium patients - diabetic vs. non-diabetic. *Int J Health Sci Res*. 2014;4(4):86-97.
20. Cajucom-Uy H, Tong L, Wong TY, Tay WT, Saw SM. The prevalence of and risk factors for pterygium in an urban Malay population: the Singapore Malay Eye Study (SiMES). *British journal of ophthalmology*. 2010 Aug 1;94(8):977-81.
21. Chen T, Ding L, Shan G, Ke L, Ma J, Zhong Y. Prevalence and racial differences in pterygium: a cross-sectional study in Han and Uyur adults in Xinjiang, China. *Investigative ophthalmology & visual science*. 2015 Feb 1;56(2):1109-17.
22. Hashemi H, Khabazkhoob M, Yekta A, Jafarzadehpour E, Ostadimoghaddam H, Kangari H. The prevalence and determinants of pterygium in rural areas. *Journal of current ophthalmology*. 2017 Sep 1;29(3):194-8.
23. Khoo J, Saw SM, Banerjee K, Chia SE, Tan D. Outdoor work and the risk of pterygia: a case-control study. *International ophthalmology*. 1998 Sep 1;22(5):293-8.
24. Liu L, Wu J, Geng J, Yuan Z, Huang D. Geographical prevalence and risk factors for pterygium: a systematic review and meta-analysis. *BMJ open*. 2013 Nov 1;3(11):e003787.
25. Maharjan IM, Shreshth E, Gurung B, Karmacharya S. Prevalence of and associated risk factors for pterygium in the high altitude communities of Upper Mustang, Nepal. *Nepalese Journal of Ophthalmology*. 2014 Jul 22;6(1):65-70.
26. Manandhar LD, Rai SK, Gurung S, Shrestha K, Godar M, Hirachan A, Shrestha R. Prevalence of pterygium and outcome of pterygium surgery in hilly western Nepal. *Journal of Lumbini Medical College*. 2017 Jun 3;5(1):18-22.
27. Marmamula S, Khanna RC, Rao GN. Population-based assessment of prevalence and risk factors for pterygium in the South Indian state of Andhra Pradesh: the Andhra Pradesh Eye Disease Study. *Investigative ophthalmology & visual science*. 2013 Aug 1;54(8):5359-66.
28. Modenese A, Gobba F. Occupational exposure to solar radiation at different latitudes and pterygium: a systematic review of the last 10 years of scientific literature. *International journal of environmental research and public health*. 2018 Jan;15(1):37.
29. Song P, Chang X, Wang M, An L. Variations of pterygium prevalence by age, gender and geographic characteristics in China: A systematic review and meta-analysis. *PloS one*. 2017 Mar 29;12(3):e0174587.
30. Sun LP, Lv W, Liang YB, Friedman DS, Yang XH, Guo LX et al. The prevalence of and risk factors associated with pterygium in a rural adult Chinese population: the Handan Eye Study. *Ophthalmic epidemiology*. 2013 Jun 1;20(3):148-54.