

Comparative Study of Prevalence of Pterygium at High Altitude and Kathmandu Valley

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ABSTRACT

Background: Pterygium is a fleshy fibrovascular growth of conjunctiva encroaching upon the superficial cornea towards the visual axis in the interpalpebral fissure. The study aims to compare the prevalence of pterygium at high altitude and Kathmandu.

Methods: A cross sectional quantitative study organized by Professional Support Service Nepal was conducted at Mustang and Kathmandu Valley in the Tibetan and Thakali population. The sample size at Mustang is 222 and Kathmandu Valley is 186.

Results: At Mustang, pterygium was present in 40 males (38.5%) and 48 females (40.7%) while at Kathmandu, pterygium was present in 6 males (8.8%) and 17 females (14.4%). Pterygium was present in 20.7% (n=12) at the altitude of 2710 meters, 28.8% (n=21) at an altitude of 2900 meters, 56.6% (n=30) at 3500 meters and 65.8% (n=25) at 3800 meters. The prevalence of Pterygium was significantly high with the rise in altitude (p value=0.000). Pterygium was present in 12.4% (n=23) at Kathmandu. The prevalence of pterygium at high altitude as compared with Kathmandu was also statistically significant (p value = 0.000). Pterygium was present in <40years in 40% and =/>40years in 39.5% at high altitude. At Kathmandu, pterygium was present in <40years in 8.2% and =/> 40years in 13.9%. At Mustang, among participants with the duration of stay at high altitude up to 20 years, pterygium was present in 36.1% (n=13) and those with >20years, pterygium was present in 40.3%(n=75).

Conclusions: Pterygium has significantly higher prevalence at high altitude as compared to lower altitude.

Keywords: high altitude; prevalence; pterygium; Kathmandu.

INTRODUCTION

Pterygium has been recognized and written about for the past 3000 years. Much has been speculated, believed and written about it but definitive etiology and mode of development continues to elude the best of researchers¹. Numerous different theories have been put forth to explain the pathogenesis of pterygium like chronic conjunctivitis, ultraviolet radiation, tear film abnormalities, heat, dust, angiogenic factor, heredity, limbal stem cell deficiency etc. The ultra violet theory of pterygium is supported by studies on rural Australian aborigines, Japanese welders, fishermen, surfers and sailors who are exposed to high levels of UV albedo (reflected, scattered light) of broad band (290 -400nm)^{2,3}.

Mustang is a district with dry, dusty and windy climate lying at a latitude of 28° N 83° E. The district of Mustang consist of 2/3rd population of Tibetans and 1/3rd population of Thakalis.

METHODS

A cross sectional comparative and quantitative study was conducted in the similar ethnic group at Mustang and Kathmandu district of Nepal organized by Professional Support Service Nepal. The study was conducted from 2010 to 2011. The prevalence of pterygium was studied among the natives at Mustang and Kathmandu that is Tibetan and Thakali population. The altitude of Mustang where the study was conducted is 2710 -3800 meters

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above the sea level and the altitude of Kathmandu valley is 1400 meters above the sea level. There were 222 participant at Mustang and 186 participants at Kathmandu. Camps were organized at Jomsom, Kagbeni, Jharkot and Muktinath of Mustang district in the year 2009. Similarly, in Kathmandu camps were organized at Tibetan Camp at Jawalakhel and Thakali Sewa Samiti, Balaju in the year 20... The prevalence of pterygium was studied at Jomsom (2710 meters), Kagbeni (2900 meters), Jharkot (3500 meters) and Muktinath (3800 meters). Similarly, in Kathmandu valley, the prevalence of pterygium was studied at Tibetan camp in Jawalakhel and Thakali Sewa Samiti in Balaju. Patient demographics, duration of stay at high altitude and the clinical examination findings were entered in especially designed proforma. Statistical analysis was done using SPSS Program (Version 15). Ethical clearance was taken from Nepal Health Research Council for conducting the study.

RESULTS

At Mustang, pterygium was present in 40 males (38.5%) and 48 females (40.7%) while at Kathmandu, pterygium was present in 6 males (8.8%) and 17 females (14.4%).

Figure I

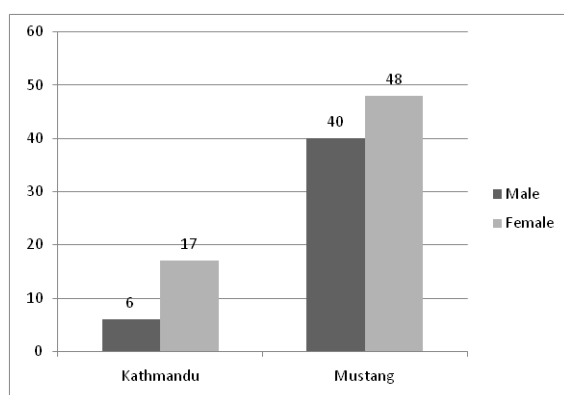


Figure I: Distribution of Pterygium According to Gender

Pterygium was present in 20.7% (n=12) at the altitude of 2710 meters, 28.8% (n=21) at an altitude of 2900 meters, 56.6% (n=30) at 3500 meters and 65.8% (n=25) at 3800 meters. The prevalence of Pterygium was significantly high with the rise in altitude (p value=0.000 using Chi-Square Test). Pterygium was present in 12.4% (n=23) at Kathmandu. The prevalence of pterygium at high altitude as compared with Kathmandu was also statistically significant (p value = 0.000 using Chi-Square Test). Figure II

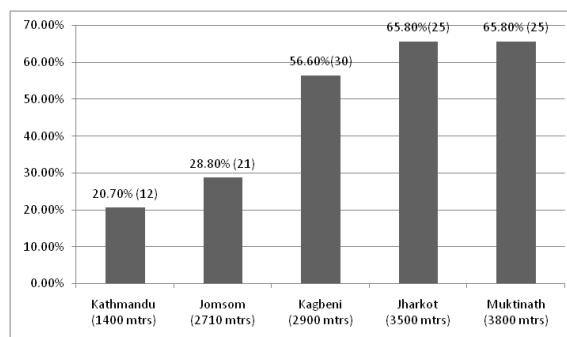


Figure II: Distribution of Pterygium according to altitude

Pterygium was present in <40years in 40% and =/>40years in 39.5% at Mustang. At Kathmandu, pterygium was present in <40years in 8.2% and =/> 40years in 13.9%. At Mustang, among participants with the duration of stay at high altitude up to 20 years, pterygium was present in 36.1% (n=13) and those with >20years, pterygium was present in 40.3% (n=75). At Kathmandu, among participants with duration of stay at that altitude upto 20 years, pterygium was present in 8.3% (n=1) and >20 years, pterygium was present in 12.6% (n=22).

The mean age of participants at Mustang was 54.08 years with the mean standard deviation ± 16.64. Similarly, the mean age of participants at Kathmandu valley was 53.63 years with the mean standard deviation ± 18.84.

At Mustang, prevalence of pterygium is not increased with the increase in age. However at Kathmandu, pterygium is more common in the age group 60-69 years (21.6%) and 70-79 years (23.1%). Table I

Table I : Distribution of pterygium according to age group

Age group in years	Presence of Pterygium	
	Kathmandu	Mustang
20-29	1	4
30-39	3	16
40-49	1	22
50-59	1	19
60-69	8	15
70-79	9	9
≥80	0	3
Total	23	88

DISCUSSION

Mackenzie et al documented a 40% increase in the occurrence of pterygium in people who lived the first

five years of life in latitudes between the N and S 30 degree. However, reports of high pterygium prevalence at high latitudes (Eskimos) provided exceptions to the general rule. UV radiation exposures may be similar if the terrain reflectivity is taken into account².

It was proved that drying up of the tear film by wind devitalizes tissues of the medial third of the palpebral aperture allowing actinic radiation to damage cornea, conjunctiva and Bowman's membrane³

Several physiological and pathological changes occur in eyes with the rise in altitude. The risk of exposure to ultra-violet rays increases with the rise in altitude. Exposure to ultra- violet rays is one of the risk factor for the development of pterygium. This study concerns itself with the prevalence of pterygium at high altitude and in Kathmandu valley.

The epidemiological studies around the world have shown that the prevalence rates range from 0.3% to 37.46%^{4,5}. The highest prevalence rate of pterygium was in Aravak and Tukano in indigenous population of the Brazilian Amazon rain forest⁶, 36.6% (97/265) in a survey of prevalence of pterygium and cataract study and in the rural area of Doumen county, China, 67.46%⁴. Lu et al found an overall prevalence of 14.49% in 2229 native Tibetans at high altitude area in China⁷. In a study by Maharjan et al, the overall prevalence of pterygium was 10.08% in the high altitude communities of upper Mustang⁸. Similarly, the overall prevalence of pterygium was 14.49% in native Tibetans at high altitude area in China⁷. In the present study the prevalence of pterygium shows an increasing trend with the rise in altitude. At Kathmandu the prevalence of pterygium is 12.4% while at Mustang, the prevalence is 39.6%.

In a case controlled comparative study by Gupta et al, the prevalence of dry eye was significantly higher amongst the native population residing at high altitude as compared to low altitude⁹. However, dry eye which is one of the risk factor for the development of pterygium was not evaluated in the present study.

The prevalence of pterygium was 33.01% in subjects aged 50 years or above. There was a significantly higher prevalence in female (35.70%) than in male (29.70%, $p=0.025$)⁴. In an aged Mongolian population at high altitude, the overall prevalence of pterygium is 17.9%¹⁰. Similarly, pterygium prevalence in rural central India is 13% among adult Indians aged 30+ years¹¹. Pterygium was independently associated with increasing age for persons aged 70-79 years compared with those aged 40-49 years, female gender, dry eye symptoms, seldom

use of sunglasses or hats, lower education level and low socioeconomic status⁷. Cameron believed the overall tendency of the prevalence of pterygium increased with older age, and reached the peak at 70 -80¹². In our study females had pterygium more than males. At Mustang, prevalence of pterygium is not increased with the increase in age. However at Kathmandu, pterygium is more common in the age group 60-69 years (21.6%) and 70-79 years (23.1%).

UV radiation can cause mutations in genes such as P 53 tumour suppressor gene, resulting in its abnormal expression in pterygial epithelium suggesting uncontrolled cell proliferation^{13, 14, 15}. This may be the reason for increase in pterygium at high altitude at Mustang.

CONCLUSIONS

The prevalence of pterygium showed an increasing trend with the rise in altitude. Pterygium had significantly higher prevalence at high altitude as compared to low altitude.

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REFERENCES

1. Cameron ME. Pterygium throughout the world, Springfield, IL 1965, Charles C Thomas.
2. Mackenzie FD, Hirst LW, Battistutta D, Green A. Risk analysis in the development of pterygia. *Ophthalmology*. 1992 Jul;99(7):1056–1061.
3. Coroneo Mt. Pterygium as an early indicator of ultraviolet insolation: a hypothesis. *Br J Ophthalmol* 77:734, 1993.
4. Wu KL, He MG, Xu JJ, Li SZ. The epidemiological characteristic of Pterygium in middle-aged and the elderly in Doumen County. *J Clin Ophthalmol* 1999; 7(1):17-18.
5. Moran DJ, Hollows FC. Pterygium and ultraviolet radiation: a positive correlation. *Br J Ophthalmol* 1984;68:343-346.
6. Paula JS, Thorn F, Cruz AA. Prevalence of pterygium and cataract in indigenous populations of the Brazilian Amazon rain forest.

- Eye 2006; 20:533-536.
7. Lu P, Chen X, Kang Y, Ke L, Wei X, Zhang W. Pterygium in Tibetans: a population based study in China. *Clin Experiment Ophthalmol*. 2007 Dec; 35(9):823-33.
 8. Maharjan IM, Shrestha E, Gurung B, Karmacharya S. Prevalence of and associated risk factors for pterygium in the high altitude communities of Upper Mustang, Nepal. *Nepal J Ophthalmol* 2014; 6(2):65-70.
 9. Gupta N, Prasad I, G, D'Souza P. Prevalence of dry eye at high altitude: a case controlled comparative study: *High Alt Med Biol*. 2008 Winter; 9(4):327-34.
 10. Lu J, Wang Z, Lu P, Chen X, Zhang W, Shi K, Kang Y, Ke L, Chen R. Pterygium in an aged Mongolian population: a population based study in China.
 11. Singh MM, Murthy GV, Venkatraman R, Rao SP, Nayar S. A study of ocular morbidity among elderly population in a rural area of central India. *Indian J Ophthalmol* 1997; 45:61-65.
 12. Cameron M. Geographic distribution of pterygia. *Am J Ophthalmol* 1964; 57:880-883.
 13. Reisman D, McFadden JW, Lu G. Loss of heterozygosity and p53 expression in pterygium. *Cancer Lett* 2004; 206:77-83
 14. Zhang LW, Xi XH. Advances in microbiological researches on the mechanism of pterygium. *Int J Ophthalmol (Guoji Yanke Zazhi)* 2006;6(6):1404-1406
 15. Tan DT, Tang WY, Liu YP, Goh HS, Smith DR. Apoptosis and apoptosis related gene expression in normal conjunctiva and pterygium. *Br J Ophthalmol* 2000; 84:212-216