Risk factors for pterygium in an adult Jordanian population

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ABSTRACT.

Purpose: To evaluate the risk factors for the development of pterygium in a Middle Eastern country (Jordan) and to compare our findings with those from other countries.

Methods: This study was conducted in Irbid District, in northern Jordan, a region located 31 degrees north of the equator, with a stable, subtropical climate. In this case control study, 96 adult subjects presenting with pterygium were interviewed and compared to 192 control subjects who were group-matched for age and sex. A standard questionnaire and eye examination were completed for both groups.

Results: There was a strong positive association between pterygium and environmental factors. The most striking increase in the risk of pterygium occurred in subjects who worked outdoors compared to those who worked indoors, with an odds ratio of 5.47. Current and previous sunlight exposures were associated with a higher risk of developing pterygium, with odds ratios of 3.54 and 4.52, respectively. Previous use of sunglasses represented a protective element, but the protective role of recent use of sunglasses was not statistically significant.

Conclusion: There is a statistically significant association between outdoor work, sunlight exposure and pterygium formation. Efforts should be made to educate outdoor workers to wear sunglasses and brimmed hats. Public education should focus on avoidance of unnecessary sunlight exposure.

Key words: Jordan – pterygium – sunlight exposure – sunglasses

Material and Methods

The study was conducted at the Princess Basma Teaching Hospital, which is affiliated to the Jordan University of Science and Technology, from July 1999 to April 2002. This hospital serves the district of Irbid in the north of Jordan, which is located 31 degrees north of the equator and has a stable, subtropical climate. A total of 96 adult patients presenting with problems related to pterygia were included in

process associated with cellular proliferation, connective tissue remodelling and angiogenesis leading to fibrovascular proliferation (Kwok & Coroneo 1994; Coroneo et al. 1999).

Pterygia are usually small and relatively benign, but they are common (Luthra et al. 2001; Wong et al. 2001). They cause considerable discomfort and tearing, and may progress to involve the central part of the cornea.
the study. The next two consecutive patients to present after each pterygium patient in the same outpatient clinic were selected as controls. All subjects were group-matched for age and sex.

All subjects agreed to be included in the study after the nature of the study had been explained and they had been interviewed by the ophthalmologist. The same questionnaire was given to all subjects in both groups. Each subject’s main occupation during the previous 7 years was classified as either predominantly ‘indoor’ (such as office workers, clerks, teachers, etc.) or ‘outdoor’ (such as taxi drivers, construction workers, etc.) based on the nature, location and circumstances of their work. Each subject was questioned about their current level of sunlight exposure in average hours per day and their exposure level 7 years previously. In addition, their use of protective sunglasses at the time of the study and 7 years previously was recorded. Data including age, gender, smoking and previous surgical treatment were collected. All subjects were examined using slit-lamp biomicroscopy. When present, the size of the pterygium was measured in millimetres from its apex to limbus, using the slit-lamp beam.

Odds ratios (ORs) and 95% confidence intervals (95% CI) were calculated to obtain the relative risk of developing pterygium for each risk factor.

**Results**

A total of 96 pterygium subjects and 192 control subjects were included in the study. The mean age of the pterygium subjects at interview was 49.1 years (range 22–72 years), while that of the control subjects was 48.2 years (range 25–70 years). In all, 83% of pterygium subjects were male, as were 77.6% of control subjects. As shown in Fig. 1, 54 pterygium subjects (56%) had unilateral disease almost equally distributed between the two eyes, while 42 (44%) had bilateral disease. The average size of pterygium was 2.1 mm in the right eye and 1.9 mm in the left eye. Twelve patients out of 96 had had previous surgical treatment for pterygium.

The results shown in Table 1 demonstrate that those who worked predominantly outdoors were 5.74 times more at risk of developing pterygium than those who worked indoors. Current and previous sunlight exposures (on an average of 1 hour or more daily) were strongly associated with a higher risk of developing pterygium, with ORs of 3.54 and 4.52, respectively. Previous use of sunglasses was shown to be protective against pterygium formation. However, the protective role of current use of sunglasses was not statistically significant. In addition, smoking did not represent a statistically significant risk factor for pterygium formation. Bilaterality of the disease was independent of the studied risk factors, in that the studied risk factors were not found to increase the risk of bilateral involvement.

**Discussion**

The most striking increase in the risk of developing pterygium occurred in subjects who worked in an outdoor environment compared with those who worked indoors. This finding is comparable to that of similar studies evaluating the relationship between outdoor work and pterygium conducted in different parts of the world (Rosenthal et al. 1988; Mackenzie et al. 1992; Nakaishi et al. 1997; Wong et al. 2001). In a study conducted in Japan, the OR for the prevalence of pterygium among outdoor workers as compared to indoor workers was 2.1 (95% CI 1.68–2.45) (Nakaishi et al. 1997). This

<table>
<thead>
<tr>
<th>No. of subjects</th>
<th>96 (100)</th>
<th>192 (100)</th>
<th>288</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>80 (83)</td>
<td>149 (77.6)</td>
<td>229</td>
</tr>
<tr>
<td>Females</td>
<td>16 (17)</td>
<td>43 (22.4)</td>
<td>59</td>
</tr>
<tr>
<td><strong>Work</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoors</td>
<td>62 (64.6)</td>
<td>48 (25)</td>
<td>110</td>
</tr>
<tr>
<td>Indoors</td>
<td>34 (35.4)</td>
<td>144 (75)</td>
<td>178</td>
</tr>
<tr>
<td><strong>Sun exposure 7 years previously</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 1 hour/day</td>
<td>78 (81)</td>
<td>94 (49)</td>
<td>172</td>
</tr>
<tr>
<td>&lt; 1 hour/day</td>
<td>18 (19)</td>
<td>98 (51)</td>
<td>116</td>
</tr>
<tr>
<td><strong>Sunglasses 7 years previously</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>76 (79)</td>
<td>87 (45)</td>
<td>163</td>
</tr>
<tr>
<td>Present</td>
<td>20 (21)</td>
<td>105 (55)</td>
<td>125</td>
</tr>
<tr>
<td><strong>Current sun exposure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 1 hour/day</td>
<td>70 (73)</td>
<td>83 (43)</td>
<td>153</td>
</tr>
<tr>
<td>&lt; 1 hour/day</td>
<td>26 (27)</td>
<td>109 (57)</td>
<td>135</td>
</tr>
<tr>
<td><strong>Current sunglasses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>56 (58)</td>
<td>90 (47)</td>
<td>146</td>
</tr>
<tr>
<td>Present</td>
<td>40 (42)</td>
<td>102 (53)</td>
<td>142</td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoker</td>
<td>44 (46)</td>
<td>102 (53)</td>
<td>146</td>
</tr>
<tr>
<td>Non-smoker</td>
<td>52 (54)</td>
<td>90 (47)</td>
<td>142</td>
</tr>
</tbody>
</table>

OR = odds ratio; 95% CI = 95% confidence interval; NS = not significant.
association may be related to a higher level of exposure to sunlight (Rojas & Malaga 1986; Mackenzie et al. 1992; Nakaiishi et al. 1997; Threlfall & English 1999) and possibly to a higher level of exposure to dust (Dimitry 1937; Mackenzie et al. 1992; Nakaiishi et al. 1997) in outdoor workers. In our study, outdoor workers were more likely to be male, because outdoor occupations are predominantly male vocations in Jordan. This explains why the majority of pterygium subjects were male.

Current and previous sunlight exposures were associated with a higher risk of developing pterygium. The association was stronger for previous exposure than for current exposure. This might reflect the cumulative effect of exposure, whereby solar radiation may initiate ocular tissue changes that later promote the development of pterygium so that sunlight exposure is reflected in later years of life by development of pterygium. Our finding is consistent with other findings in Singapore (Khoo et al. 1998) and Australia (Threlfall & English 1999). Several surveys have consistently shown that countries near the equator have higher rates of pterygia (Taylor 1981; Moran & Hollows 1984; Saw & Tan 1999). The theory that chronic exposure to sunlight causes pterygium seems to be beyond any debate.

The effect of solar radiation on the eye was studied thoroughly by Taylor et al. (1992). The effects of visible radiation as well as ultraviolet-A and ultraviolet-B were evaluated. A positive association was found between ocular exposure to each band of radiation (bands of visible radiation, UV-A, UV-B) and the development of pterygium. Most plastic lenses in sunglasses block substantial amounts of UV-A and UV-B radiation (Rosenthal et al. 1988). Glass is slightly less effective in blocking UV-B radiation (Rosenthal et al. 1986). In our study, previous use of sunglasses was shown to be protective against pterygium formation while current use was not. In a study by Khoo et al. (1998), neither previous nor current use of sunglasses were shown to have a protective role. Most other studies have demonstrated that the use of sunglasses has a protective role to varying extents (Rosenthal et al. 1986, 1988; Mackenzie et al. 1992; Threlfall & English 1999). One possible explanation for the variation in the protective role of sunglasses may be that different types of sunglasses have been used by both case subjects and control subjects. Genetic attributes (Tan et al. 1997) and variable lifestyle behaviour may also contribute to this variation. A possible explanation for the nontechnical effect of recent use of sunglasses is that subjects start wearing sunglasses once the pterygium has already formed.

Although some previous studies found a positive correlation between smoking and pterygium formation (Khoo et al. 1998), smoking was not found to be a statistically significant risk factor in our study.

As a method of recruiting subjects with pterygium, the hospital-based study design represents a practical alternative to a large scale, community-based survey. We incorporated several features into our study design to reduce bias. For instance, both pterygium and control subjects were selected from the same clinic population and interviewed using a standard questionnaire. Diagnosis was made by an ophthalmologist using a slit-lamp. The subjects were group-matched for age and sex. Although the possibility of investigator bias was minimized by the similarity of the study procedure for both groups, it could not be completely eliminated because it was impossible to mask the interviewer to a patient with grossly visible pterygium during a face-to-face interview. Another limitation in our study is that data on the average daily ocular radiation dose were not available, and therefore a dose-response relationship between sunlight exposure and development of pterygium could not be described. In addition, the relatively small sample size might have made some factors, such as smoking, insignificant, in contrast to some previous studies.

Conclusion

This study shows that outdoor work and sunlight exposure are positively associated with the development of pterygium. Public education should focus on encouraging people to take appropriate protective measures, such as wearing sunglasses and brimmed hats when outdoors, and to avoid unnecessary sunlight exposure. Meanwhile, further research is required to enable us to better understand the relative contributions of different risk factors.

References


Received on December 27th, 2002. Accepted on October 18th, 2003.

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