ABSTRACT

Background: There are various factors associated with ocular injury such as age, gender, nationality, ethnicity, work related factor and alcohol intake. The aim of this study is to determine the proportion of ocular injury and its associated factors among patients admitted to a hospital in Selangor.

Materials and Methods: A hospital-based cross-sectional study design and universal sampling method were used. Data collection was conducted in a hospital in Selangor by retrospective review of secondary data for last six months from data collection period. The data were transferred into a proforma. The data analysis was done using Statistical Package for Social Sciences (SPSS) version 20. Chi square test was done to determine the relationship between the associated factors of ocular injury.

Result: There were 118 proforma collected. There were higher proportion of ocular injury in age group of 20-39 (59.3%), male (92.4%), Malay (47.5%) and Malaysian (65.3%). Cases of unilateral eye involvement were highest (88.1%) and occurred unintentionally (94.9%). Mostly (80.5%), patients sought immediate treatment after ocular injury. The commonest place of incident and source of ocular injury were industrial premises (33.1%) and blunt object (28.0%) respectively. 52.5% of ocular injury were of non penetrating diagnosis. There was high proportion of ocular injury due to work related factor (44.9%). Besides, there were significant relationship between types of nationality with work related factor (p=0.001) and types with sources of injury (p=0.001). There was no relationship between period of time taken before treatment with types of injury (p=0.118).

Conclusion: In short, ocular injury is more common in age group of 20-39 years old, male, Malaysian and Malay. There is high proportion of ocular injury due to work related factor. There are also significant relationship between types of nationality with work related factor and types of ocular injury with sources of injury among patients with ocular injury.

Keywords: Ocular injury, work related
1.0 Introduction

Ocular injury is a common hospital casualty referral. Ocular injury can be ranged from minor bruises and scratches to serious laceration, fractures and burns to the eye (Gabriella et al., 2009). Basically, ocular injury can be divided into two main groups, mechanical and non-mechanical injuries.

Mechanical trauma to the eye is subdivided into opened and closed globe injuries. It is further categorized by four parameters which are type, grade, presence or absence of a relative afferent papillary defect (APD), and extent (zone) of the injury (Kuhn et al., 2002).

In opened globe injury, the types of the injury are classified into rupture, penetrating, intraocular foreign body (IOFB), perforating and mixed. The grading of visual acuity can be divided into ≥20/40, 20/50 to 20/100, 19/100 to 5/200, 4/200 to light perception and no light perception (NLP). Classification of pupil is categorized into positive, relative APD in injured eye and negative, relative APD in injured eye. Extension of eye injury is divided into:

- Zone I (cornea and limbus)
- Zone II (limbus to 5mm posterior into sclera)
- Zone III (posterior to 5mm from the limbus).

In closed globe injury, the types of ocular trauma are contusion, lamellar laceration, superficial foreign body, or mixed. The grading and pupil classification for closed globe injury are the same as opened globe injury. Zone for closed globe injury is divided into three:

- Zone I is external (limited to bulbar conjunctiva, sclera, and cornea)
- Zone II is anterior segment (includes structures of the anterior segment and the pars plicata)
- Zone III is the posterior segment (all internal structures posterior to the posterior lens capsule).

The non-mechanical injury falls into three main categories which is chemical, thermal, and radiation. Chemical injuries can harm the eye by direct contact with external ocular tissues like getting unexpectedly splashed or sprayed in the eye by substances that can cause damage to the eye. For thermal injuries, we can subdivide it into flame burn and contact burn. Radiation injury is referred as damage to tissues caused by exposure to radiation. In general, radiation has two major divisions - non-ionizing radiation and ionizing radiation.

Generally, the victims with ocular injury will present with symptoms such as reduced visual acuity, redness, pain double vision and other unusual ocular discomforts. Eye with an opened wound need urgent can lead to sight-threatening infection, for example corneal infection. Some ocular injuries can result in cataract, glaucoma and retinal detachment. Delay in treatment may lead to visual impairment or blindness.

In 1988, the number of people who were blind was estimated to be 37 million worldwide. By 2002 till 2004, it was estimated to be 45 million: 8 million blind due to uncorrected refractive error and 37 million blind due to other causes (Allen et al., 2008). More than 90% of the worlds visually impaired live in developing countries. Blindness has been divisive because
the costs of lost productivity and of rehabilitation and education of the blind constitute a significant economic burden for the individual, the family and society.

Many people think that blindness is due to diseases only. They are not aware that unintentional ocular injury is also one of many causes of blindness. People have failed to notice, however, there are an increasing number of people with visual impairment due to work-related injuries, motor vehicle accident and other non-diseases factors.

This study is to find out the relationship between ocular injury and its associated factors. The factors that were focused were socio-demographic, work-related and trauma. With known associated factors, the relative authorities can give more attention to the groups at risk by taking preventive measures and introducing more protective ways.

The most commonly used statistic regarding eye injuries and disorder is the national blind registry. However, the major limitation with the use of this registry data is its incompleteness. Hence, the figure obtain is not a true figure of prevalence or incidence. In the National Eye Survey Malaysia conducted in 1996, the prevalence of visual impairment in Malaysia was found to be 2.7% which was higher in rural areas (2.9%) than in urban areas (2.5%). Nevertheless, this figure is not representative as there are under reporting of cases, especially in rural area.

As the numbers projected is only tip of the iceberg, the magnitude of the problem is fairly underestimated. Subsequently, the allocation for special care of the patient and other needs, would present a huge burden to the country (Zainal et al., 2002). Ocular injury in general, can occur in a variety of situations. Time lapse between injury and reporting to the hospital ranged from within one hour to seventh day of injury. This delayed presentation mainly due to accessibility of a particular area, lack of awareness and education (Zainal et al., 2002). Visual loss in young population has a great physical, psychological and social impact on the individual in particular and society in general. In essence, by having a better understanding of the course and epidemiology of the problem, this will help us in redefining the strategy for prevention and control effort.

The aims of this study are to determine the prevalence of penetrating ocular injury and its associated factors among ophthalmology patients admitted to a hospital and to determine the association between the penetrating ocular injury and its associated factors (socio-demographic, occupational, trauma and substance influence).

2.0 Materials and Methods

A hospital based cross-sectional study using data collection conducted in a hospital in Selangor by retrospective review of secondary data for last six months from data collection period. It was conducted in a hospital in Selangor from patients with ocular injury admitted to the Ophthalmology Ward. Inclusion criterion is all patients with ocular injury aged 70 years and below and the exclusion criterion is follow-up cases of ocular injury. The study frame is list of medical records of patients. The sampling unit is a patient. All samples taken and the sample size were 118 medical records. Prior to data collection, a proforma is prepared based on the objectives of this study. Case notes of respondents will be retrieved and data transferred into the proforma for analysis. The data will be keyed into the computer and analyzed by using Statistical Package for Social Sciences (SPSS) version 20.0. To test the
association between categorical data, Chi square test will be used. The association is significant if p value is less than 0.05. Dependent variable was penetrating ocular injury and independent variables were the associated factors of penetrating ocular injury. The associated factors in this study were socio-demographic, work-related and trauma.

3.0 Results

3.1 Patients’ characteristics

There were 1,325 patients admitted to hospital in the period of 6 months and 118 patients were due to ocular injury. Hence the proportion of ocular injury with ocular problems among patients admitted to hospital was 8.9%. Patients with non penetrating ocular injury were 62 (52.5%) from the total ocular injury. Cases of unilateral eye involvement accounts 88.1% and 80.5% of the patients sought immediate treatment after ocular injury.

Table 1: Socio-demographic Factors of Respondents (N=118)

<table>
<thead>
<tr>
<th>Socio-demographic</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age groups (year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 19</td>
<td>17</td>
<td>14.4%</td>
</tr>
<tr>
<td>20 - 39</td>
<td>70</td>
<td>59.3%</td>
</tr>
<tr>
<td>40 - 59</td>
<td>23</td>
<td>19.5%</td>
</tr>
<tr>
<td>60 ≤</td>
<td>8</td>
<td>6.8%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>109</td>
<td>92.4%</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>7.6%</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>56</td>
<td>47.5%</td>
</tr>
<tr>
<td>Chinese</td>
<td>14</td>
<td>11.9%</td>
</tr>
<tr>
<td>Indians</td>
<td>6</td>
<td>5.1%</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>1.7%</td>
</tr>
<tr>
<td>Foreigners</td>
<td>40</td>
<td>33.9%</td>
</tr>
<tr>
<td>Nationality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaysian</td>
<td>41</td>
<td>65.3%</td>
</tr>
<tr>
<td>Non-Malaysian</td>
<td>77</td>
<td>34.7%</td>
</tr>
</tbody>
</table>

In the Table 1 showed the socio-demographic of the respondents. The age group of 20-39 was the most susceptible to ocular injury which accounts for 70 (59.3%), 109 (92.4%) were male, 77 (65.3%) were Malaysian and majority was Malay (47.5%).

The incidence of ocular injury is more in developing countries than in developed countries. A study by Desai, et al. (1996) illustrated that the incident rate of ocular injury recorded in Scotland was 8.14 per 100,000. A study done in Singapore National Eye Centre revealed that subjects diagnosed with ocular injury falls in the mean age of 32.5 years and 92% of the subjects occurred in males (Ho CK et al., 2007, 2008). Ocular injuries presented at Kasr El Aini Hospital, Cairo University were 80% of them male (Soliman et al., 2008). A study done
in Sarawak illustrates that male were six times higher rates of ocular injury (Mallika et al., 2008).

Irrespective of gender, ocular emergencies incidence peaked in the third decade of life (Oum et al., 2004). In Singapore, the severity of ocular trauma varied with age, gender, and race (Wong et al., 1999). These suggest that socio-demographic had effects to high-risk injury especially those of the middle age and male.

3.2 Work-related and trauma

The commonest place of incident and source of ocular injury were industrial premises (33.1%), 33 (28.0%) patients involved with blunt object and 112 (94.9%) of the cases occurred unintentionally. There were high proportions of ocular injury due to work related factor (44.9%). Among patients admitted, 104 (88.1%) of the cases was unilateral eye involvement, 112 (94.9%) of the cases occurred unintentionally and 95 (80.5%) of the patients sought immediate treatment after ocular injury. The commonest place of incident of ocular injury was industrial premises (33.1%) and source of ocular injury mostly due to blunt object (28.0%). Ocular injuries related to work were seen in 36.9% of patients, and noted that there was a gross negligence of the personal protective devices use among them (Mallika et al., 2008). Work related injuries usually were due to negligence and unintentionally made.

Majority of patients (81.6%) came for treatment within 24 hours of their injuries. Most of ocular injuries were due to sharp instruments (38%) and blunt objects (35%) (Soliman et al., 2008). These factors are in line with our study. Meaning to show that, most of patients were brought in with not much delayed in cases of ocular injuries. The main place of incident and source of ocular injuries was work followed by assaults, play in, traffic accidents and sports (Oum et al, 2004). Commonest place of incidence of ocular injuries included home and followed by industrial premises (Mallika et al., 2008). The current study showed same setting of incident commonly happens in work premises. These are due to hazards that available at workplace are more and need to be handled with care.

3.3 Association of socio-demographic factors between patients with and without work related factors

There were cases of work related ocular injury among patients admitted in the hospital as can be explained in table 2.

**Table 2: Association of Socio-Demographic Factors between Patients with and without Work Related Factors (N=118)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Patients with Work Related Factors N (%)</th>
<th>Patients without Work Related Factors N (%)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Socio-demographic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaysian</td>
<td>16 (21.3%)</td>
<td>59 (78.7%)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Non Malaysian</td>
<td>37 (86.0%)</td>
<td>6 (14.0%)</td>
<td></td>
</tr>
</tbody>
</table>

*Significant P<0.05
From table 2 showed that there was an association between work related ocular injury and nationality of the patients and the analytical test done was significant (P<0.05).

Most injuries occurred in male (84.6%) with an average age of 33 years old and the most frequent causes among them were outdoor activities related injuries followed by work-related. In urban areas, road accidents were more frequent, whereas in rural areas, work-related injuries more frequent and in greater rate of than in urban areas (Cillino et al., 2008). Main source of ocular injuries was working related (Oum et al, 2004). A study done by Fong et al. (1995) found that 42% of total ocular injury occurred at work. Male are the main workforces especially dealing with manual work and they are subjected to physical hazards such as the ocular injury at work.

Different nationality had varied on main causes of ocular injuries but the work related is always among the common causes. Of all occupational injuries, ocular injuries account for 3.3%, resulting in lost workdays in private industry in the United States (Xiang et al., 2005). Ocular injuries accounted for 25% of all claims for welders (Lombardi et al., 2005).

It is essential to have a primary prevention and patient counselling on proper eye protection because with the use of eye protection, over 90 percent of injuries can be avoided. Adequate personal protection equipment is needed to prevent cataracts, as laser use increases in medical settings and industry. Sun protection needed for outdoor workers since they are exposed to significant ultraviolet rays and safety counselling to prevent age-related macular degeneration.

### 3.4 Association between types of injury and sources of injury among patients with ocular injury

**Table 3: Association between Types of Injury and Sources of Injury among Patients with Ocular Injury (N=118)**

<table>
<thead>
<tr>
<th>Types of Injury</th>
<th>Sources of Injury N (%)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sharp Object</td>
<td>MVA</td>
<td>Blunt Object</td>
<td>Others</td>
</tr>
<tr>
<td>Ocular Injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penetrating</td>
<td>31 (55.4%)</td>
<td>9 (16.1%)</td>
<td>10 (17.9%)</td>
<td>6 (10.7%)</td>
</tr>
<tr>
<td>Non-Penetrating</td>
<td>1 (1.6%)</td>
<td>17 (27.9%)</td>
<td>23 (37.7%)</td>
<td>20 (32.8%)</td>
</tr>
</tbody>
</table>

*Significant P<0.05

In the table 3, there was an association between types of injury and sources of injury and the analytical test done was significant (P<0.05).

The commonest cause of severe ocular injury was penetrating ocular injury, and less severe injury was corneal injury (Oum et al., 2004). In our study, it is noted that penetrating ocular injury more common than the non-penetrating, same as some other studies internationally. A study done by Fong et al. (1995) found that 29% of penetrating ocular injuries occurred at work. Commonest causes of penetrating ocular injury among children were sharp tools poked by the child into his/her own eye (17%) and objects thrown at the child (17%) (Thompson et al., 2002).
3.5 Association between types of injury and sources of injury among patients with ocular injury

Table 4: Association between Period Taken Before Treatment and Types of Injury among Patients with Ocular Injury (N=118)

<table>
<thead>
<tr>
<th>Period Taken Before Treatment</th>
<th>Diagnosis of Ocular Injury</th>
<th>N (%)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Penetrating</td>
<td>Non-Penetrating</td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>48 (50.5%)</td>
<td>47 (49.5%)</td>
<td>0.175*</td>
</tr>
<tr>
<td>Delayed</td>
<td>8 (34.8%)</td>
<td>15 (65.2%)</td>
<td></td>
</tr>
</tbody>
</table>

*Significant P<0.05

The table 4 showed no association between period taken before treatment and types of injury and the analytical test done was not significant (P>0.05).

Majority of patients came for treatment immediately after their ocular injuries (Soliman et al., 2008). In our study also most of the patients were brought are came almost immediately after they contract the ocular injury. Most the patients were in pain due to ocular injury and sudden decrease or loss of vision made them to come for early treatment.

4.0 Conclusion and recommendation

In order to reduce the incidence of ocular injury especially penetrative ocular injury at workplaces, preventive educational measures should be instigated. Negligence of the personal protective devices use among workers need to be monitored closely to reduce ocular injuries.

There are some issues on data protection and medical confidentiality that have been lessened. By using secondary data, we might encounter some problems in collecting the data such as data loss, incomplete data, and even information bias.

Observation bias such as information bias and recall bias also might occur in this study. The information provided might not be 100% correct and reliable. There might be a recall bias while the data is being collected. Misclassification bias is a systematic distortion of estimates that might be due to incomplete or inaccurate record data. Some data might be confidential. Data handling bias is another possible bias that might occur in this study. As using secondary data, data capture error or data entry bias might happen during data collection. Alertness and systematic data collection is crucial during data collection in order to reduce the bias.

Acknowledgement

We would also like to thank to all the staffs of Department of Ophthalmology of the hospital generally and the doctors specifically who have spent their precious time. Without the help of these selfless people, this project would have never gotten off the ground.
Declaration

The authors declare that:

i. The article mentioned above has not been published or submitted for publication in any other journal.

ii. We also declare that the authorship of this article will not be contested by anyone whose name is not listed here.

iii. We declare that we contributed significantly towards the research study ie, conception, design, analysis and interpretation of data and to drafting of the article or revising it critically for important intellectual content.

iv. There is no conflict of interest on this article

Authors’ contribution

The 1st, 2nd, 3rd and 4th author carried out the research and analysed the data, while the 5th, 6th and 7th author supervised the research and data analysis. The 7th author edited manuscript.

References


Ho CK, Yen YL, Chang CH, Chiang HC, Shen YY, Chang PY. (2007). Epidemiologic study on work-related eye injuries in Kaohsiung, Taiwan. The Kaohsiung Journal of Medical Sciences, 23(9):463-469.


