

Eye Injury: A Public Health Burden Review

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ABSTRACT

Aims: Eye injury causes significant morbidity and is a leading cause of blindness worldwide. The current report assesses whether there has been any improvement (or, change in general) in respect of the burden of eye injury in Australia since it was first identified as a concern in the 1990s. The report focuses on the state of Victoria, Australia, but positions the information and findings within the context of broad global consideration.

Study design: The study design comprises an epidemiological assessment of experiential and observational evidence globally.

Place and Duration of Study: The research was conducted at Melbourne University (Rank of No. 1 in Australia and No. 33 in the world) during years 2007 – 2009 and as a private consultant, 2016.

Methodology: During 2007 – 2009, the VAED Dataset was surveyed for eye injury during the period spanning 2001-2005. Specific focus on a rural location, Mildura Rural City, was performed through review of patient medical files. Review of the global medical database ENTREZ PMD was also performed, spanning 1990 – 2016. Three separate sources were utilized as a means of data triangulation and validation.

Results: The key finding of the report is that no improvement appears to have been observed in respect of the burden represented by eye injury in approximately twenty five years despite significant public health funding including campaigns directed toward raising awareness.

Conclusion: Given the burden represented by eye injury appears to be irretractable, it may be worth considering re-direction of the finances previously directed toward eye injury prevention toward another area, by way of formal cost-benefit analysis (such as decision tree analysis), based on measures including estimated cost per quality-adjusted life year (QALY) gained.

Keywords: Burden; Eye Injury; Public Health; QALY; Review.

1. INTRODUCTION

Eye injury causes significant morbidity and is a leading cause of blindness worldwide [1-6]. The public health concern represented by eye injury in Victoria, Australia has been known for a period spanning now approximately 25 years. However, two reviews conducted by Raymond et. al. (2009, and 2010) identified there to have been no improvement observed in this public health concern since it was first identified in the 1990s and, in fact, the incidence of hospital treated eye injury had increased significantly from 15.2 per 100 000 person-years to 53.6 per 100 000 person-years [4-5]. The reviews by Raymond et. al. (2009, and 2010) found that for Victoria (Australia) overall the trend suggested the leading causes as falls, assault and transport related accidents and concluded that, given the predominant cause categories, the

design and implementation of an effective preventative strategy to reduce the rate of hospital-admitted eye injury in Victoria presents as a difficult task. That being said, in specific focus on rural areas of Victoria the most common causes of eye injury were identified as trade tools and machinery, followed by chemicals. The most common locations identified as residential homes and workplaces, and patients were more commonly male than female [5]. Based on the analysis, it was suggested that perhaps legislation restricting the use of trade tools and machinery to appropriately qualified persons (in addition to location of use restrictions) may be worth considering. The reports by Raymond et. al. (2009, and 2010) were consistent with the findings of other reports in respect of that period [7]. The trend in USA with respect to the burden represented by eye injury has demonstrated similarity with that observed in Australia. The current report assesses whether there has been any improvement (or, change in general) in respect of the burden of eye injury in Australia (focusing on Victoria) in the context of broad global consideration.

2. METHODOLOGY

During 2007 – 2009, the VAED Dataset was surveyed for eye injury (During the period spanning 2001-2005). Specific focus on a rural location, Mildura Rural City, was performed through review of patient medical files. Review of the global medical database ENTREZ PMD was also performed, spanning 1990 – 2016. Three separate sources were utilized as a means of data triangulation and validation.

3. RESULTS AND DISCUSSION

The burden represented by eye injury in Victoria, Australia was first identified as a concern by Fong (1995; RVEEH, Melbourne University) reinforced by Centre for Accident Research Victoria (1998) [8-10]. At that stage, the burden equated to an incidence of hospital admitted eye injury of 15.2 per 100 000 person-years (95% CI; 14.0 - 16.4 per 100 000 person-years). From an economic and financial perspective the burden was found to equate to \$39 million per annum for the state of Victoria and \$155 per annum for Australia in its entirety. Raymond et. al. (2009, and 2010) reviewed the public health concern at a period approximately twenty years subsequent to the initial findings and identified that, of particular concern, despite ongoing public health campaigns there had been no progress with respect to reducing the burden and in fact it had actually increased [4-5]. The rate of eye injury in Victoria (Australia) having increased steadily to 53.6 per 100 000 person-years [5]. In the reviews by Raymond et. al. it was identified that sixty-four per cent of patients were male and 36% were female and that this difference was statistically significant ($P < 0.001$) [4-5]. Male patients were most commonly middle-aged compared with female patients who were most commonly middle-aged to elderly and this difference in mean age between genders was significant ($P < 0.001$). Core patient groups included: elderly women sustaining eye injuries as a result of falls (particularly in residential homes); middle-aged men sustaining eye injuries as a result of assault and in transport-related accidents [5]. For rural areas the main causes were identified as: trade tools and machinery (47%) and chemicals (12%) [4]. The findings are consistent with other sources [7]. Review of the current evidence does not provide an optimistic outlook and there does not appear to be evidence of improvement. It has been commonly espoused that a high proportion (or, at least a reasonable proportion) of eye injuries sustained are preventable [125]. However, based on the experiential and observational evidence available this does not appear to be correct. The situation in respect of eye injuries for Victoria, and Australia broadly, would tend to indicate that the public health concern represented by eye injury in this area is irretractable at this stage. It has now been twenty five years and, despite the concerning burden having been identified on multiple occasions with successive public health campaigns implemented, there has been almost a total failure to gain traction on this public health burden. The strategies to date have revolved around public health campaigns and there is some small scope for further attempt through legislative measures as detailed by Raymond et. al. (2009) [4]. That being said, it would seem the most practical measure at this stage may be to devote public health financing to other health burdens given the evidence tends to indicate that, at least for Australia, the burden appears to be irretractable. The pattern around the world is not particularly inconsistent with that in Australia [4-5, 12-18].

The situation in USA is similar, with an incidence of eye injury requiring hospital admission of 13.2 per 100 000 person-years [19], and an incidence of emergency treated eye injury of 6.98 per 1,000 person-years [20]. There is some evidence of improvement observed in certain categories (or, age groups) of individuals with respect to the incidence of eye injury across time in recent years however there is also counter evidence to suggest that any improvement is of minimal significance. In fact, Seven & Cinal (2016) in line with the current report, put forward the view that, in respect of USA, public health campaigns have not achieved any significant success in reducing the public health burden represented by eye injury [21]. Given the burden represented by eye injury appears to be irretractable, it may be worth considering redirection of the finances (previously directed toward eye injury prevention) toward another area, by way of formal cost-benefit analysis (such as decision tree analysis), based on measures including cost per quality-adjusted life year (QALY) gained [22-23]. There are other areas of ophthalmology where definite tangible gains appear to be achievable based on

objective and subjective outcome measures including cataract surgery [22-24]. It may be worthy of consideration that finances be re-directed toward the provision of such services, revolving around cataract surgery, to disadvantaged (including third world) areas.

4. CONCLUSION

Strategies directed at reducing the public health burden represented by eye injury to date have revolved around public health campaigns and have failed to achieve any success in Australia. Similarly, there is minimal evidence to suggest any substantial improvement in the burden in USA. There is some small scope for further attempt through legislative measures as detailed by Raymond et. al. (2009) [4-5]. That being said, it would seem the most practical measure at this stage may be to devote public health financing to other health burdens given the evidence tends to indicate that, at least for Australia, the burden appears to be irretractable at this stage. It would seem appropriate that if funds are to be re-directed then this be based on formal decision analysis employing outcome measures such as cost per QALY [22-24] (Phillips, 2009; Favilla, 2005).

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