CHAPTER II

LITERATURE REVIEW

2.1 FACTS ABOUT EYE INJURY

2.1.1 Definition of eye injury

According to Gibson, (Negrel *et al.*, 1997) an injury is damage to a person or to a tissue/organ, e.g. the eye caused by a transfer of energy, namely one of the five forms of physical energy: mechanical, thermal, chemical, electrical and radiant. Consequently, eye injuries include all damage caused to the eye and its adnexa, orbital and periorbital tissues due to direct contact with fixed or mobile, blunt or sharp objects (mechanical energy transferred for example by rapid deceleration), hot objects (thermal), chemical substances, sources of electrical power, different types of radiation (UV, X-ray, microwave

2.1.2 Classification of eye injury

(A) Closed or Open globe injuries

Ocular Trauma Classification Group (OTCG) has classified the mechanical eye injuries. This classification is based on anatomic and physiologic variables that have prognostic value for visual outcome in ocular injuries. It includes visual acuity at the time of presentation, pupillary reaction in the affected eye, and zone and type of injury (Pieramici *et al.*, 1997).

Birmingham Eye Trauma Terminology (BETT) is a comprehensive standardized system of eye trauma terms. A standardized terminology for eye injury has been developed based on the extensive experiences. The type of injury is classified as closed globe injury (contusion and lamellar laceration) or open globe injury (rupture and penetrating, intraocular foreign body or perforating laceration). By always using the entire globe as the tissue of reference, classification is unambiguous, consistent and simple (Kuhn *et al.*, 2002).

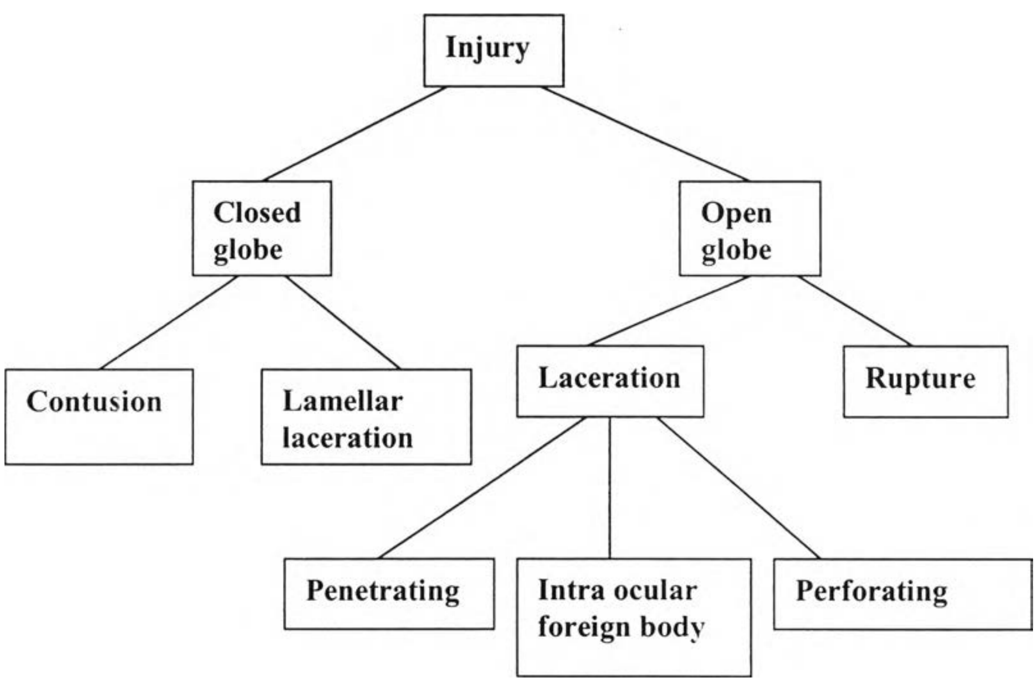

Figure 2.1 Birmingham Eye Trauma Terminology: Closed or Open globe injury

(B) Ocular burns

Ocular burns constitute the ocular emergencies and both thermal and chemical burns represent potentially blinding ocular injuries. Thermal burns result from accidents associated with fireworks explosives, steam, boiling water, or molten metal (commonly aluminum). Either alkaline or acidic agents may cause chemical burns. Acid tends to cause less damage then alkaline burns (Harminder *et al.*, 2001). Historically, it has been recognized that the extent of tissue damage is a prognostic indicator of recovery following ocular surface injury. Recovery of ocular surface burns depends upon the causative agents and the extent of damage to corneal, limbal, and conjunctival tissues at the time of injury. Damage to the intraocular structure influences the final clinical outcome. Ballen first suggested a classification, which was later, modified by Rooper-Hall to provide prognostic guidelines based on the corneal appearance and the extent of limbal ischaemia. This classification has become the commonly used benchmark since its introduction in 1965 (Harminder *et al.*, 2001).

Table 2.1: Classification of severity of ocular surface burns by Rooper-Hall

Grade	Prognosis	Cornea	Conjunctiva/limbus
I	Good	Corneal epithelial damage	No limbal ischaemia
II	Good	Corneal haze, iris details visible	< 1/3 limbal ischaemia
III	Guarded	Total epithelial loss, stromal haze, Iris details obscured	1/3-1/2 limbal ischaemia
IV	Poor	Cornea opaque, iris and pupil obscured	> 1/2 limbal ischaemia

2.1.3 Magnitude of eye injuries

Using the definitions of the International Classification of Diseases for low vision and blindness, the following current global estimates were arrived at in this way (Negrel *et al.*, 1997)

- A total of 1.6 million cases of blindness are caused by eye injuries
- Some 2.3 million cases with low vision are due to eye injuries
- Some 19 million cases of monocular blindness are due to eye injuries

Table 2.2: Prevalence (per 100 000) of Blindness/Low vision due to eye trauma. Review of 10 Cross-Sectional Random Sample Studies (Source WHO/PBL/94.40: Available Data on Blindness- An update-unpublished data)

Country	Year	Population examined	Blindness due to eye injury	Low vision due to eye injury	Monocular loss of vision
Congo	1982	7041	-	-	216
The Gambia	1986	8174	14	-	-
Mali	1985	3538	78	137	490
Morocco	1992	8878	10.5	90	392
Nepal	1980	39887	19.2	-	228
Pakistan	1990	5732	75	-	432
Saudi Arabia	1990	4340	46.5	-	407
Togo	1984	2758	39	37	448
Tunisia	1993	8548	17	-	285
Turkey	1993	7497	-	75	315

- Blindness is defined as vision <3/60. Low vision is defined as vision <6/18-3/60
- Includes monocular blindness and monocular low vision

2.2 THEORY RELATED TO EYE INJURY

2.2.1. Promoting treatment-seeking behavior: the Common Sense Model

Leventhal and colleagues (Brownlee, Leventhal, and Leventhal, 2000) developed the concept of risk perception from the perspective of the Common Sense Model (CSM), which is a self-regulation model of health threat cognition and behavior. This model suggests a number of important cognitive and affective facets of risk perceptions. The self-regulatory model proposes that 3 stages regulate the behavior seen in response to a health threat. Each stage has a perceptual level and a cognitive level. The first stage, cognitive representation of the health threat, includes identifying the symptoms and labeling the threat, potential cause(s), and possible consequences of the threat. The second stage is the action plan or coping stage in which a plan of action is formulated and initiated. The motivation to engage in coping actions is self-generated in response to the individual's representation of the health threat, the possibilities for coping, and the relationship between coping and threat. In the third stage the individual appraises the success of his or her coping actions, and if it is perceived that there is not enough progress, the representation of the problem (objective and perceptual) and the plans to cope with it are reassessed and may be changed.

Coping plan are also generated to control the emotional experiences provoked at any stage of the response to the health threat. Thus there is a "danger control process for the objectively represented health threat and an "emotion control process" for the subjectively represented emotional response to the health threat. Leventhal and colleagues have shown that the processes of coping with emotional reactions may be parallel to, but partially independent of the cognitive processes of coping with the health threat. At the cognitive level, the representation of health threat relies on objective knowledge, such as labels for illnesses, and the coping action is primarily one that is controlled. Perception of the health threat relies on subjective knowledge acquired through past personal experiences, such as prior illnesses, and the coping response is primarily automatic. The controlled and automatic coping processes may interact in ways that are mutually facilitating or mutually interfering (McKinley *et al.*, 2000).

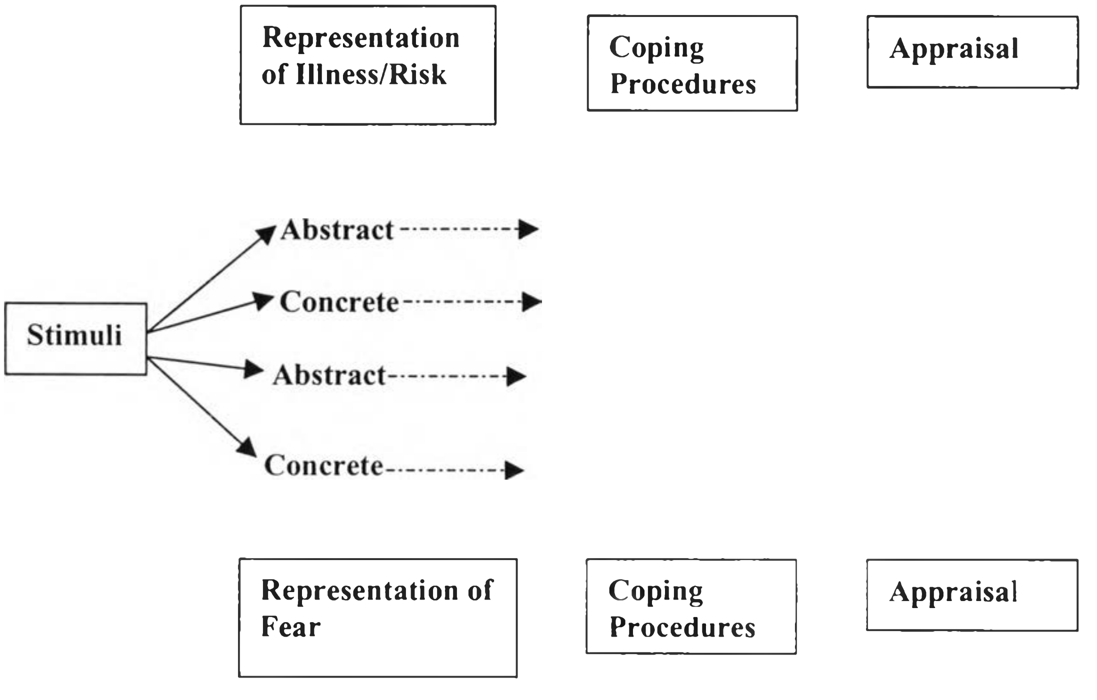

Figure 2.2 The Common Sense Model of the self-regulation of health threats. Adapted from Conceptualizing and Assessing Risk perception: (Cameron L D *et al.*, 2003).

2.2.2 A closer look at illness risk representation

According to Common Sense Model, health threat stimuli elicit the activation and development of a representation of illness risk. Considerable research has established that this representation has five key domains: identity, cause, timeline, consequences, and control/cure (Leventhal, 2001). The representation guides the identification and uses the procedures for controlling the health threat. The outcomes are then appraised in terms of their success in controlling the threat, and these appraisals feed back to update the illness representation. Generally, three of the domains may serve primarily as the basis for the generation of likelihood estimates: identity, cause, and timeline. Identity includes beliefs about whether or not one is at risk or in early stages of illness progression. Casual beliefs concern personal and environmental factors that place one at risk. Timeline beliefs that are potential importance for understanding responses to future health risks are perceived timelines of when illness strikes, and the speed and nature of the development and progression of illness. The remaining two domains, consequences and controllability, are likely to serve as the basis for severity estimates. Consequence beliefs include abstract-conceptual knowledge and concrete-perceptual images regarding the disabilities, social consequences, and other outcomes of the illness or condition. Controllability beliefs involving whether the illness condition can be cured or controlled through medication, surgery, or other sorts of treatment should directly influence severity appraisals as well. Likelihood and severity estimates are the most commonly assessed facets of risk judgments, and expect that the five contents domains of illness representations underpin these basic components of risk judgments. A potential advantage to considering likelihood estimates and severity estimates in terms of these illness representation domains directly represent the mental contents driving emotional response and behavior.

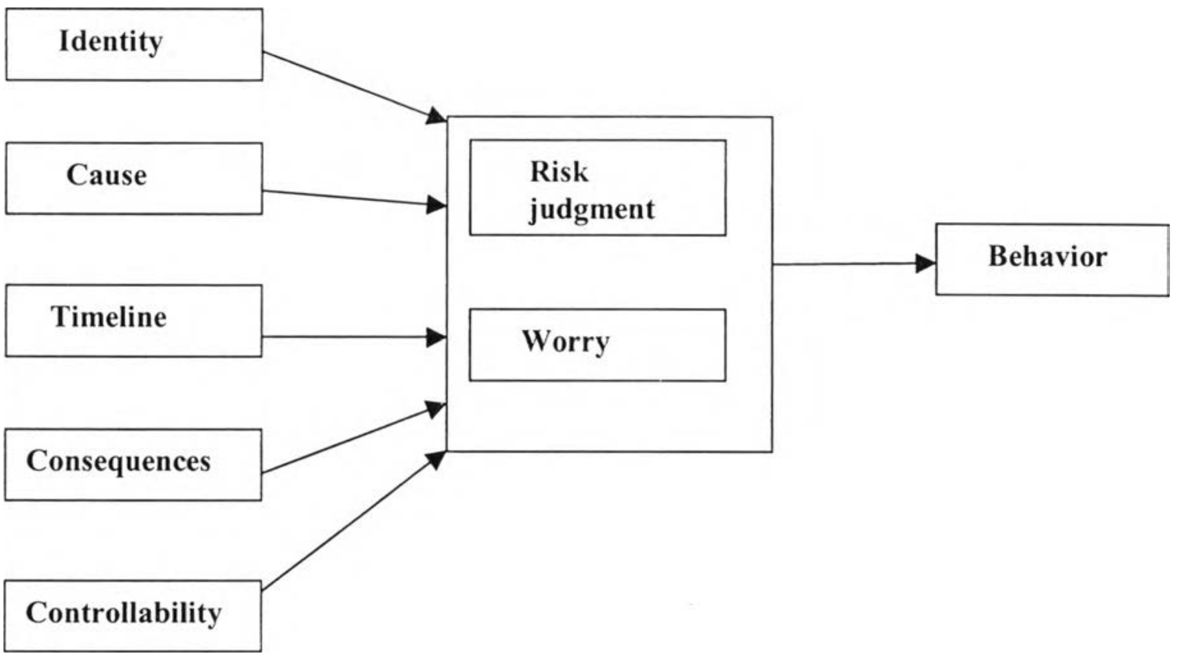

Figure 2.3 A proposed model of the relationship between illness representation contents, risk perceptions and worry, and protective behavior. Adapted from conceptualizing and assessing risk perceptions (Cameron L D *et al.*, 2003).

2.3 RESEARCH RELATED TO EYE INJURY

2.3.1. Ocular trauma: a major problem

A study was done to determine the rate of ocular trauma in a rural population of southern India and its impact on vision impairment and blindness (Nirmalan *et al.*, 2004). A population based cross sectional study of 5150 persons 40 years older in a randomly chosen rural population of 3 districts of southern India was carried out. Prospective information on trauma, type and agent of injury, setting of injury, and details of treatment sought for the last episode was recorded with questionnaires after face-to-face interviews. All interviewed subjects underwent a comprehensive ocular examination, including vision estimations, slit-lamp biomicroscopy examinations, and dilated posterior segment examinations. The author found a history of ocular trauma in either eye from 229 (4.5%) persons, including 21 (0.4%) with bilateral ocular trauma. Blunt injuries were the major cause of trauma reported in this population. The most common setting where the ocular trauma occurred was during agricultural labor and domestic works. Nearly three quarters of those reporting ocular trauma sought treatment from an eye specialist and one-fifth from a traditional healer. Education, occupation, or type of injury was not associated with seeking treatment from a traditional healer. Seeking treatment from a traditional eye healer was not associated with vision impairment or with blindness.

A study was carried out to estimate the incidence of ocular injury in rural Nepal and to identify details about these injuries that predict poor visual outcomes (Khatry *et al.*, 2004). The study collected prospective case series data from all patients presenting with ocular trauma from November 1995 through May 2000 to the primary eye care center in Sarlahi district, Nepal. 525 cases of incident ocular injury were reported during this period. The most common types of injury were lacerating and blunt, with the majority occurring at home or in the fields. Agriculture and domestic works were the most common settings for eye injury. A poor visual outcome was associated with increased age; care sought at a site other than the eye clinic, and severe injury. The lag between injury occurrence and care seeking was associated with a worse visual outcome, and may reflect not only to the type of injury, but also economic constraints beyond lack of awareness and treatment.

A one-year study was performed on 257 consecutive patients with eye injury admitted in Muhimbili Medical Centre, Tanzania from January 1993 to January 1994

(Mselle *et al.*, 1998). It describes the causes, presenting visual acuity and associated ocular complications, use of traditional eye medicine on the injured eye and lastly the visual outcome. Stones, sticks and metallic objects were the major causes of ocular trauma. The main types of traditional medicines used were plant juices; milk mixed with black powder and pounded roots. Traditional eye medicines were used by 49%of all patients. The main ocular complications presented keratitis, endophthalmitis, and panophthalmitis were seen more in patients with a positive history of using traditional eye medicine than those with a negative history. Poor visual outcome was also seen more in patients who used traditional eye medicines than in those who did not use them.

A study was conducted in Split-Dalmation County, Croatia to determine the incidence of eye injuries, population group at risk, circumstances and activities at the time of accident, causes, mechanism, type and severity of injury, therapeutic procedures, final outcome, and the incidence of blindness in patients over 18 years of age (Karaman *et al.*, 2004). The author retrospectively analyzed data on 383 patients with eye injuries hospitalized at Split University Hospital between January 1998 and December 2002. The annual incidence of adult patients requiring hospitalization because of ocular trauma was 23.9 per 100 000 inhabitants. Most eye injuries occurred at home during domestic activities and leisure time, at workplace, and in agriculture. The most frequent eye injuries were mechanical, whereas chemical burn was the most frequent cause of bilateral trauma. The final visual outcome was directly related to the severity of eye injury. The median time from injury to hospital admission was 3 hours. This is important because immediate and appropriate intervention with modern microsurgical techniques in vision threatening emergencies can reduce long-term loss of visual acuity, and functional vision salvage rate can be as high as 60-70%.

A study was conducted in Bhaktapur district of Kathmandu valley, Nepal to determine the incidence of ocular trauma and corneal ulceration and to determine whether or not topical antibiotic prophylaxis can prevent the development of ulceration after corneal abrasion (Upadhyay *et al.*, 2001). A defined population of 34 902 individuals was closely followed prospectively for two years by 81 primary eye care workers who referred all cases of ocular trauma and/or infection to one of the three local secondary eye study centers in Bhaktapur for examination, treatment, and follow up by ophthalmologist. Over the two-year period of this study there were 1248 cases of reported ocular trauma, 979 (78%) of which were confirmed by clinical examination. This total number can be expressed as an annual incidence of 1788 cases of ocular trauma per 100 000 population, or 1.8% of the inhabitants of Bhaktapur sustaining some degree of ocular trauma every year. The most common ocular injury documented was corneal abrasion. This study shows that post-traumatic corneal ulceration can be prevented by topical application of 1% chloramphenicol ophthalmic ointment in a timely fashion to the eyes of individuals who have suffered a corneal abrasion in rural setting.

A study was conducted in an urban population in southern India to assess the level of awareness and knowledge of eye diseases (Dandona *et al.*, 2001). A total of 2522 subjects of all ages participated in the population based Andhra Pradesh Eye Disease Study. Of these, 1859 aged above 15 years responded to a structured questionnaire on cataract, glaucoma, night blindness and diabetic retinopathy to trained field investigator. Having heard of the eye disease in question was defined as "awareness" and having some understanding of the eye disease was defined as "knowledge". Awareness of cataract was higher among subjects with an education level above class six. Even though the level of awareness of cataract was reasonable, knowledge of cataract was poor. Awareness and knowledge of glaucoma among the study population was very poor. Awareness of night blindness was reasonable in the study population but knowledge was poor. Awareness of the possibility of diabetes causing impaired vision was low but knowledge was poor in this population. Education played a significant role in increasing the awareness of these eye diseases. The major source of awareness of all the diseases was a family member/friend/relative suffering from that eye disease. This data suggest that there is an urgent need for health education in the study population in order to increase their level of awareness and knowledge about common eye diseases.