VOLUME-9, ISSUE-2, FEBRUARY-2020 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Ophthalmology

OCULAR CHEMICAL INJURY: A PROSPECTIVE STUDY

Dr Sharmistha Behera	Associate Professor Department Of Ophthalmology, Vssimsar Burla
Dr Kshyanaprava Priyadarshini*	3rd Year Pg Resident Department Of Ophthalmology, Vssimsar Burla *Corresponding Author
Dr Jayashree Dora	Professor & Hod Department Of Ophthalmology, Vssimsar Burla
Dr Satya Sundar Biswal	3rd Year Pg Resident Department Of Ophthalmology, Vssimsar Burla
Dr Jyotirmayee Swain	3rd Year Pg Resident Department Of Ophthalmology, Vssimsar Burla

ABSTRACT

AIM : To describe the epidemiologic trends and risk factors for chemical injuries of the eye.

METHODS: This cross-sectional observational study was done among 84 patients of chemical ocular injury by different substances between June 2018 - June 2019. Clinical history was taken and clinical examination was done to elicit findings related to eye injury and its complication After initial evaluation patients were also followed up for next 3 months to evaluate the visual outcome

RESULTS: Male : female ratio affected with chemical ocular injury was found to be 2.3:1. Most common age group to be affected was 26-40 years. Males between 26-35years and 46-55 years and females of 36-45 were affected most. 60 (72%) cases had ocular burn due to alkali and remainder was acid burn. Among alkali, hydrated lime Ca (OH)2 had highest percentage 84.6%. The whole eyeball was affected in 3 patients. Only corneal involvement was seen in 42 patients. Patients presenting with only chemical conjunctivitis was 12. Corneoscleral involvement was seen rest of the cases. 47.6 % of the study population had grade I severity with 28.5% having grade 2 severity.

CONCLUSION : Ocular chemical burns is a major ocular problem at workplaces and the risk to young adults is substantially higher. Protective glasses at workplace can aid in reducing the hazards leading to ocular injury. Early institution of management is essential to prevent sight threatening visual complications.

KEYWORDS : Ocular, Chemical, Burn

INTRODUCTION :

Ocular chemical injury is a true ocular emergency and requires immediate intervention.[1] It can lead to other associated anterior segment involvement producing extensive damage to the ocular surface with visual impairment and disfigurement. They represent 11.5%–22.1% of all ocular traumas and require immediate and intensive evaluation and care.[2] The victims of such injuries are usually young men aged 20–30 years, and therefore, vision loss could dramatically affect their remaining lifetime with more number of disability years.[3]

The clinical course of the disease is divided into immediate, acute, early, and late reparative phases. After chemical injury, the goal of therapy is to restore a normal ocular surface and corneal clarity. Treatment starts with simple vision-saving steps and is continued with complicated surgical procedures such as limbal stem cell transplantation, amniotic membrane transplantation, and ultimately keratoprosthesis depending on the patient's needs.[4]

Ocular chemical injuries can occur under diverse circums tances and in such varied locations as the home, the workplace, and school. Automotive battery acid burns have become increasingly more common. During recharging of a lead acid storage battery, which contains up to 25% sulfuric acid, hydrogen and oxygen produced by electrolysis form a highly explosive gaseous mixture. [5] Chemical agents commonly causing it are hydrochloric acid, sulfuric acid, nitric acid, oxalic acid, acetic acid, ammonium hydroxide, sodium hydroxide, and calcium hydroxide.[6]

COMMON WORKPLACE FOR CHEMICAL INJURY :

Industrial chemical laboratories
Machine factories
Agriculture
Laborers and construction workers
Fabric mills
Automotive repair facilities
Cleaning and sanitizing crews

The aim of this study was to find out the pattern of ocular injury, nature of causative chemicals, the disabilities incurred and the outcome of treatment.

METHODS :

84 patients (58 males & 26 females) presenting with history of exposure to a varied range of chemicals were analyzed over a period of 1 year (June 2018- June 2019) This is a hospital-based cross sectional observational study of patients with clinical diagnosis of ocular chemical injury . Incidence of ocular chemical burns by injury-level characteristics, such as the mode of injury, demographic factors such as age, sex, and income quartile were also examined. Injury-setting descri ptions were combined into 4 categories:

1. *Residential, including home and other residential facilities*
2. *Commercial, including industrial sites, mines, and farms*
3. *Public, including schools and other public buildings, streets and highways, and sports and recreational facilities*
4. *Other locations, or were classified as missing.*

After initial evaluation patients were also followed up for next 3 months to evaluate the visual outcome

INCLUSION CRITERIA:

1. *Patients with chemical injury to the eyes*
2. *Age 15–60 years*

EXCLUSION CRITERIA :

1. *Associated injury to other parts of the body*
2. *Preexisting ocular pathology*
3. *Age > 60 years*

Clinical history was taken and clinical examination was done to elicit findings related to eye injury and its complication. Slit lamp examination, visual acuity test and ophthalmoscopy was also done. Conjunctival swab was taken to find out any eye infection. Acidity or alkalinity was confirmed by litmus paper test.

Statistical analysis was performed by using SPSS (Statistical Package for Social Sciences) for windows version 22.

RESULTS :

Male : female ratio affected with chemical ocular injury was found to be 2.3:1. Most common age group to be affected was 26-40 years. Males between 26-35years and 46-55 years were mostly affected whereas females of 36-45 were affected most.62 % had unilateral eye involvement whereas the rest had both eyes affected.

TABLE 1 :
DISTRIBUTION OF AFFECTED POPULATION BASED ON AGE GROUP & GENDER

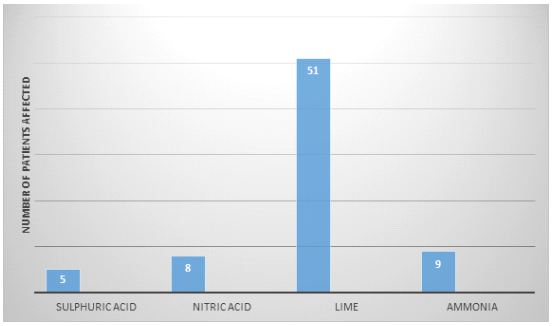
AGE GROUP (YEARS)	MALE	FEMALE
15-25	5 (8.62%)	3 (11.5%)
26-35	18 (31.03%)	6 (23.07%)
36-45	9 (15.5%)	14 (53.8%)
46-55	16 (27.5%)	2 (7.69 %)
56-60	9 (15.5%)	1 (3.84%)
Total	58	26

60 (72%) cases had ocular burn due to alkali and remainder was acid burn. Among alkali, hydrated lime Ca (OH)2 had highest percentage 84.6%. 4 patients had chemical conjunctivitis due to kohl. 5 patients had hair dye induced chemical conjunctivitis. 2 patients presented with feviquik induced chemical ocular injury. Affected males were predominantly service holders whereas females were predominantly housewives.

TABLE 2 : PREVALENCE OF AFFECTION BY DIFFERENT TYPES OF CHEMICALS :

Nature of chemicals		Patients Affected
Acids	Sulfuric Acid	5
	Nitric Acid	8
Alkali	Lime	51
	Ammonia	9

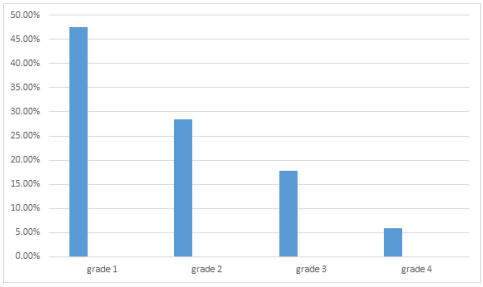
GRAPH SHOWING THE AFFECTION OF PATIENTS BY VARIOUS CHEMICALS



The whole eyeball was affected in 3 patients. Only corneal involvement was seen in 42 patients. Patients presenting with only chemical conjunctivitis was 12. Corneoscleral involvement was seen rest of the cases. 47.6% of the study population had grade I severity with 28.5% having grade 2 severity.

TABLE 3 : SEVERITY OF INJURY BASED ON GRADE (ACCORDING TO ROPER HALL CLASSIFICATION) :

Grading	Total
Grade 1	40(47.6%)
Grade2	24(28.5%)
Grade3	15(17.8%)
Grade4	5(5.9%)



38% of the patients had bilateral involvement. Stromal edema was found to be the most common complication.

TABLE 4 : COMPLICATIONS FOLLOWING CHEMICAL INJURIES

COMPLICATIONS	TOTAL
STROMAL EDEMA	60(72%)
CORNEAL ULCER	2(2.3%)
CORNEAL OPACITY WITH OR WITHOUT VASCULARIZATION	12(10.08%)
ECTROPION	2(2.3%)
ENTROPION	5(5.9%)
SYMBLEPHARON	8(9.5%)

GRAPH SHOWING THE VARIOUS COMPLICATIONS DUE TO CHEMICAL INJURIES

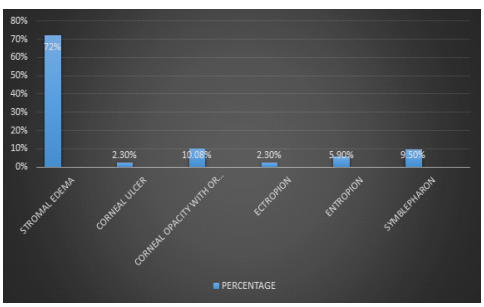
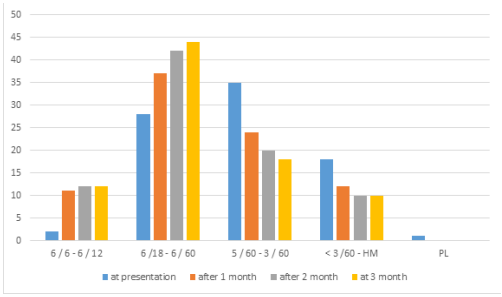


TABLE 5 : MONITORING OF VISUAL ACUITY AT VARIOUS INTERVALS

Visual Acuity	At Presentation	After 1 Month	After 2 Months	At 3 Months
6/6 - 6/12	2	11	12	12
6/18 - 6/60	28	37	42	44
5/60 - 3/60	35	24	20	18
< 3-60 – HM	18	12	10	10
PL	1	0	0	0

GRAPH DENOTING THE VISUAL OUTCOME



DISCUSSION :

As such distribution of the chemical ocular injuries has shown considerable variations. Majority of the patient with ocular affection was young adult. It was found to be almost similar to findings of Saini-Sharma[6] . They stated that young people works in laboratories and factories constitute two-thirds of the patients of chemical injury. 42 % of the affected population were service holders. They were accidentally injured by the chemical substance at their work place. A study by McCarty *et al*. [8] found factory workers and manual daily laborers to be a high-risk population for ocular trauma similar to the present study, which could be explained by involvement of unskilled and semiskilled workers and lack of any eye protection. This is the target population for emphasizing recommendations for safety measures as most of the injuries can be prevented by appropriate use of ocular protection. Also accidental injury to housewives and children by hydrated lime was common. Accidental entry of feviquik, kohl application was also noted.

Our study showed 38 % bilateral involvement whereas Saini-Sharma[6] shows 42.1% of bilateral injury. Severity of injury depends upon several factors like nature of the chemical, amount of chemical substance, duration of contact with tissue, pattern of management i.e. early or late.

Most common age group to be affected was 26-40 years in our study. The mean age for ocular injury in a study by Syal E et al was 29.87±12.46 years, which is in accordance with most other studies in which a mean age of 30 years has been reported [7,8,9]. This is likely due to work-related injuries that contributed to the largest portion of injuries.

Consistent with other studies[10,11] , the current study observed male dominance of ocular trauma with a male : female ratio of about 2.3 : 1. This male preponderance is thought to be related to occupational exposure, participation in dangerous sports and hobbies, alcohol use, and risk-taking behavior.In a study by Syed E et al [7] observed a male preponderance at workplace trauma and road traffic accidents and women at domestic trauma showing a significant correlation which is similar to the results found in the study by Oum et al [12]

In this study the percentage of minor injuries is 80 % that is similar to Monestame's study[7] Our study showed people are commonly injured by alkali than as it is widely used at home and industries. These findings are consistent with the previous study. Our study showed the different complications caused by chemical injuries. In the present study corneal stromal edema (72%) was found to be the most common complication. This was similar to the study by Das et al.[14]

CONCLUSION :

Ocular chemical burns is a major ocular problem at workplaces & the risk to young adults is substantially higher. Alkali is the most common agent for chemical ocular injuries. Protective glasses at workplace can aid in reducing the hazards leading to ocular injury. Early institution of management is essential to prevent sight threatening visual complications.

REFERENCES :

1. https://eyewiki.aao.org/Chemical_(Alkali_and_Acid)_Injury_of_the_Conjunctiva_and_Cornea
2. Clare G, Suleman H, Bunce C, Dua H. Amniotic membrane transplantation for acute ocular burns. Cochrane Database Syst Rev 2012;9:CD009379.
3. Singh P, Tyagi M, Kumar Y, Gupta KK, Sharma PD. Ocular chemical injuries and their management. Oman J Ophthalmol 2013;6:83-6.
4. Eslani M, Baradaran-Rafii A, Movahedan A, Djalilian AR. The ocular surface chemical burns. J Ophthalmol. 2014;2014:196827
5. Holekamp TL. Ocular injuries from automobile batteries. Trans Sect Ophthalmol Am Acad Ophthalmol Otolaryngol 1977;83:805-10.
6. Saini JS, Sharma A. Ocular chemical burns—clinical and demographic profile. Burns 1993;19:67-9
7. Syal E, Dhawan M, Singh SP. To study the epidemiological and clinical profile of ocular trauma at a tertiary health-care facility. Delta J Ophthalmol 2018;19:259-67
8. McCarty CA, Fu CL, Taylor HR. Epidemiology of ocular trauma in Australia. Ophthalmology 1999; 106:1847–1852
9. Smith AR, O'Hagan SB, Gole GA. Epidemiology of open and closed-globe trauma presenting to Cairns Base Hospital, Queensland. Clin Exp Ophthalmol 2006; 34:252–259
10. Saxena R, Sinha R, Purohit A, Dada T, Vajpayee RB, Azad RV. Pattern of pediatric ocular trauma in India. Indian J Pediatr 2002; 69:863–867
11. Nirmalan PK, Katz J, Tielsch JM, Robin AL, Thulasiraj RD, Krishnadas R, Ramakrishnan R. Ocular trauma in a rural south Indian population: The Aravind Comprehensive Eye Survey. Ophthalmology 2004; 111:1778–1781.
12. Oum BS, Lee JS, Han YS. Clinical features of ocular trauma in emergency department Korean J Ophthalmol 2004; 18:70–78
13. Monestam, Bjornstig. Eye injuries in Northern Sweden, Department of Ophthalmology, University of Umea, Sweden. 1991;69(1):1-5
14. Das S, Kabir F, Das J et al , Pattern of Chemical Ocular Injury: A Clinical Study Chattagram Maa-O-Shishu Hospital Medical College Journal Volume 13, Issue 1, January 2014