

Visual Outcomes & Associated Factors in Patients with Chemical Injury in a Tertiary Eye Care Hospital in Bangladesh

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Abstract

Purpose: To study the clinical profile & visual outcome of ocular chemical injuries. **Methods:** This observational retrospective study was performed on 50 patients with chemical injuries attending in cornea clinic from January 2022 to December 2022 in a tertiary Eye Institute & Hospital in Bangladesh. A detailed history of the patients and history of presenting complaints was taken. An ocular examination was performed. Visual acuity was recorded by using Snellen's test-type Chart. A thorough examination was carried out on slit-lamp, direct & indirect ophthalmoscopes. Clinical grading was done by Roper Hall Classification. Other's ocular investigations were done when required. **Results:** In the present study, 50 patients were included of which 60% (30) were male and 40% (20) were females. In the present study, 11-20 years of age patients are 18(36%) & 0-10 years of age are 12(24%). Most of the cases were day labor 16(32%), followed by students 12(24%), housewife 4(8%) & others are 18(36%). As per the Roper Hall Classification, most of the eyes sustained grade II chemical injury at 36% (30 eyes); followed by grade IV at 26%; grade III was 20%, and grade I was 18%. The visual acuity at presentation, 17(34%) patients had visual acuity 6/12- 6/24. On the other hand, 14(28%) have a counting finger. Visual acuity at the final follow-up, 19(38%) patients had visual acuity 6/12- 6/24. On the other hand, 16(32%) had a counting finger. The management of chemical injury, AMG + BCL was done on 54% of patients & conservative management was done on 32% of patients. **Conclusion:** The incidence was more in the younger working population, with a majority of injuries occurring in less than 30 years of age. The severity of chemical burn belonging to grade II and grade IV injuries. Henceforth the visual outcome was better and complications were much less after immediate management. Saline wash & Amniotic membrane Grafting(AMG) with fresh amniotic membrane increases patient comfort and reduces inflammation. Public health initiatives are critical to prevent chemical injuries in mitigating the poor visual prognosis.

Keywords: Chemical injury, Visual Outcome, Amniotic membrane Grafting(AMG).

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Introduction

Nowadays, more ocular chemical injuries are occurring as a result of the developing world's growing industrialization. Various studies around the world have reported a wide range of results regarding the incidence of ocular chemical injury. Also, this is one of the major causes of severe ocular morbidities including blindness, particularly in the younger working population.^[1] Chemical injuries of the anterior segment of the eye are a common problem in ophthalmology practice and can range from mild irritation to complete damage to the anterior segment. Delay in seeking proper management can result in severe vision-threatening co-morbidities. It is well known that both strong acids and strong alkalis can cause severe eye injuries, and vision-threatening complications can occur depending on the extent to which the eye surface is involved.^[2,3] The severity depends upon the

nature, properties, and concentration of the chemical, the area of the affected surface, the length of exposure, and the presence of associated damage. The degree of intraocular penetration, the concentration, and the kind of substance involved are all factors that affect the prognosis of chemical burns. Acidic or alkaline substances can both result in chemical burns. Chemical burns to the eye can result in a variety of injuries, from minor conjunctival or corneal epithelial damage to total blindness. Very little data exists about chemical injury in our country.^[1,2,3] Keeping this in mind, we want to conduct this study. This study aims to find out the associated ocular injuries and visual outcomes of patients with chemical injuries along with their demographic features and modes of injury.

Materials & Methods

This observational retrospective study was performed on 50 patients with chemical injuries attending in cornea clinic from January 2022 to December 2022 in a tertiary Eye Institute & Hospital in Bangladesh. Institutional permission to collect data has obtained before conducting the study. As soon as a case of ocular chemical injury presented to the casualty first aid was given in the form of thorough irrigation with ringer lactate or normal saline for a minimum of 15 minutes, pH was measured, and superior and inferior fornix was examined for the presence of any retained or embedded particulate matter and was removed carefully. A detailed history of the patients and history of presenting complaints was taken. Roper Hall Classification for grading of limbal ischemia in the chemical burn was used. An ocular examination was performed. visual acuity was recorded by using Snellen's test-type Chart. A thorough examination was carried out on slit-lamp, direct & indirect ophthalmoscopes. Clinical grading was done by Roper Hall

Classification. Other ocular investigations were done when required. The patient has managed medically and/or surgically accordingly. The final visual outcome was noted at 2 months after injury.

Data was collected in a pre-designed data collection sheet and then compiled accordingly. Appropriated descriptive statistical analysis was done using the computer-based software SPSS program. (Statistical Package for Social Sciences, version 22, SPSS Inc, Chicago, IL, USA).

Results

In the present study, 50 patients were included of which 60% (30) were male and 40% (20) were females. In the present study, Table I shows 11-20 years of age patients are 18(36%) & 0-10 years of age are 12(24%), 31-40 years of age patients are 7(14%), 21-30 years of age patients are 6(12%). Most of the cases were day labor 16(32%), followed by students 12 (24%), housewife 4(8%) & others are 18 (36%) (Table II). As per the Roper Hall Classification, most of the eyes sustained grade II chemical injury at 36% (30 eyes); followed by grade IV at 26%: grade III was 20%, and grade I was 18% (Table III). Table IV shows the visual acuity at the presentation. 17(34%) patients had visual acuity 6/12- 6/24. On the other hand, 14(28%) have a counting finger. 6/36 to 6/60 visual acuity had 8 (16%) patients & hand movement had 5(10%) patients. Table V depicted the visual acuity at the final follow-up. 19(38%) patients had visual acuity 6/12- 6/24. On the other hand, 16(32%) had a counting finger. 6/36 to 6/60 visual acuity had 8 (16%) patients & hand movement had 1(2%) patients. Table VI shows the management of chemical injury. AMG + BCL was done on 54% of patients & conservative management was done on 32% of patients.

Table I: Table showing Age & Sex distribution in chemical injury of eye (n =50)

Age group (in years)	Male (%)	Female (%)
0- 10	6 (19.4)	6 (30.0)
11-20	12 (38.7)	6 (30.0)
21-30	4 (12.9)	2 (10.0)
31-40	3 (9.7)	4 (20.0)
41-50	4 (12.9)	1 (5.0)
51-60	1 (3.2)	0 (0.0)
>60	0 (0.0)	1 (5.0)

Table II: Table showing Occupation distribution in the chemical injury of the eye (n=50)

Occupation	Male (n= 30)	Female (n=20)	Total (n=50)
Student	9 (30.0%)	3 (15.0%)	12 (24%)
Day labor	10 (33.3%)	6 (30.0%)	16 (32%)
Housewife	-	4 (20.0%)	4 (8%)
Others	11 (36.7%)	7 (35.0%)	18 (36%)

Table III: Table showing Grading in the chemical injury of the eye (n =50) (Roper Hall Classification for grading of limbal ischemia in the chemical burn was used.)

Severity	Male (n= 30)	Female (n=20)	Total (n=50)
Grade I	6 (20.0%)	3 (15.0%)	9 (18%)
Grade II	10 (33.3%)	8 (40.0%)	18 (36%)
Grade III	9 (30.0%)	1 (5.0%)	10 (20%)
Grade IV	5 (16.7%)	8 (40.0%)	13 (26%)

Table IV: Table showing Visual Acuity at presentation in the chemical injury of the eye (n =50)

Visual Acuity	Male (n= 30)	Female (n=20)	Total (n=50)
6/9 or better	1 (3.3%)	1 (5.0%)	2(4.0%)
6/12- 6/24	9 (30.0%)	8 (40.0%)	17(34.0%)
6/36 -6/60	7 (23.3%)	1 (5.0%)	8(16.0%)
5/60 -1/60	3 (10.0%)	0 (0.0%)	3(6.0%)
CF	9 (30.0%)	5 (25.0%)	14(28.0%)
HM	2 (6.7%)	3 (15.0%)	5(10.0%)
PL2 (6.7%)	2 (10.0%)	4(8.0%)	
NPL	0 (0.0%)	0 (0.0%)	0 (0.0%)

Table V: Table showing Visual Acuity after treatment in the chemical injury of the eye (n =50)

Visual Acuity	Male (n= 30)	Female (n=20)	Total (n=50)
6/9 or better	6 (20.0%)	0 (0.0%)	6(12.0%)
6/12- 6/24	10 (33.3%)	9 (45.0%)	19(38.0%)
6/36 -6/60	5 (16.7%)	3 (15.0%)	8(16.0%)
5/60 -1/60	10 (3.3%)	0 (0.0%)	1(2.0%)
CF	11 (36.7%)	5 (25.0%)	16(32.0%)
HM	0 (0.0%)	1 (5.0%)	1(2.0%)
PL0 (0.0%)	2 (10.0%)	2(4.0%)	
NPL	0 (0.0%)	0 (0.0%)	0 (0.0%)

Table VI: Table showing management in the chemical injury of the eye (n =50 cases)

Management	Frequency	Percentage (%)
Saline wash+ AMG+BCL	3	6.0
AMG+ BCL	27	54.0
BCL	4	8.0
Conservative	16	32.0

Discussion

The mean age of presentation in the current study was under 30 years, which highlights the vulnerability of young people and school-age children of which 60% (30) were male and 40% (20) were females. In a retrospective investigation on the frequency and prevalence of ocular chemical injury, Kuckelhorn et al^[4] also noted that patients were split about evenly between adult males (70%) and adult females (23%), and children (7%). According to Singh et al's research,^[5] people between the ages of 20 and 40 are most likely to suffer chemical eye damage. In their study carried out in the United States with a sample of 900 patients, Haring et al^[6] reported a median age of 22 years.

Adult males were most frequently harmed because they are exposed to chemicals in the workplace more than females. School-aged children who were unintentionally exposed to chemicals while playing make up the second most prevalent category. In earlier research, the incidence of chemical eye injury in men was higher than in women. Males were more likely to sustain chemical injuries than females were, with a ratio of 3.90:1 found both in our study and by other investigators.^[7,8,9]

In the current study, As per the Roper Hall Classification, most of the eyes sustained grade II chemical injury at 36% (30 eyes); followed by grade IV at 26%: grade III was 20%, and grade I was 18%. In their study, Kuckelkorn et al [4] found that 42% of the cases were Grade I while Midelfart et al [10] found that 49% of chemical injuries were Grade I and 28% Grade II. In our study, the visual acuity at presentation. 17(34%) patients had visual acuity 6/12- 6/24. On the other hand, 14(28%) have a counting finger.6/36 to 6/60 visual acuity had 8 (16%) patients & hand movement had 5(10%) patients 30 eyes' best corrected visual acuity had increased to 6/6 - 6/18 (88.2%) at the review point after two months. Nevertheless, 3 eyes (8.8%) had visual acuities between 6/24 and 3/60, and one eye had visual acuity above this range <3/60. This was in agreement with the study of Subrata Das et al.^[7] At 3 months follow-up, Subrata Das et al.^[7] found that the majority of patients had best corrected visual

acuity in the range of 6/12 - 6/24 (56%). Most of the injuries were minor and so 20% of patients had visual acuity better than 6/9.

The severity of chemical injuries affects how they will appear visually. Visual acuity will be impaired when the injury becomes more serious. The majority of the injuries were modest, resulting in visual acuities of 6/12 to 6/24 (56%) and 6/9 or better being roughly 20%. A small number of patients experienced a severe decline in visual acuity as a result of phthisis bulbi, corneal vascularization with opacity, etc.^[10,11,12,13]

In our study, the management of chemical injury. AMG + BCL was done on 54% of patients & conservative management was done on 32% of patients. This was in agreement with the result of Rasik B. Vajpayee et al^[12]. In severe burns, however, AMG restores the conjunctival ocular surface without debilitating symblepharon and reduces limbal stromal inflammation, but does not prevent limbal stem cell deficiency, which requires further limbal stem cell transplantation. These results underscore the importance of immediate intervention of AMG in the acute stage of eyes with severely damaged ocular surfaces.^[11,12] Further prospective randomized studies including a control group are required to determine the effectiveness of AMG in acute chemical and thermal burns of the eye.

This study has a few limitations as the sample size was small. It was a single-centered based study. It would be fruitful if a multicentred study was done.

Conclusion

In our study, the incidence was more in the younger working population, with a majority of injuries occurring in less than 30 years of age. Considering the younger age group of patients affected, the injury can adversely affect their quality of life. But the severity of injuries was less with most of them belonging to grade II and grade IV injuries. Henceforth the visual outcome was better and complications were much less at 2 months of follow-up. AMG is an effective adjunctive treatment in the management of acute ocular chemical burns to support epithelial

healing and restore ocular surface integrity with the potential to improve vision. We conclude that For patients presenting with chemical ocular injuries, whether they occur in the workplace or at home, early recognition and prompt treatment by the treating physician remain the standards for maximal preservation of ocular tissue and provide hope for the preservation of vision. We recommend and encourage other researchers to conduct more studies about management options after chemical injury.

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Conflicts of interest

There are no conflicts of interest.

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