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Original Article

Knowledge, Attitude, and Practices of Emergency Management of Ocular Chemical Injury Among Primary Responders

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Abstract

IIntroduction: C*hemical injuries are considered as one of the true ocular emergencies where timely management can save vision and years of visual rehabilitation. Thus, knowledge of the injury and its management is very important for medical professionals as well as the general population.*

Aim: T*his study aims to assess the knowledge, attitude, and practices of respondents from across the population about ocular chemical injuries.*

Settings and Design: *A cross-sectional, questionnaire-based study was conducted over 1 month in a tertiary care hospital in Northern Karnataka.*

Methods and Material: *60 respondents were divided into 2 groups. Respondents with various levels of medical training such as residents, casualty medical officers, and paramedical staff formed group 1, while group 2 constituted of site supervisors from workplace and family members of patients. Respondents were asked to answer a pre-formed multiple-choice questionnaire and the responses were noted and tabulated into an MS-Excel spreadsheet and were expressed in terms of percentage.*

Results: *Knowledge about the etiological agents was better in group 1, while both groups had a similar attitude towards the signs and symptoms of injury and the practice pattern of emergency management was better in group 1.*

Conclusions: *While better knowledge and practice of emergency management was shown by group 1, the attitude towards the signs and symptoms was similar in both groups. Variability among the group 1 respondents indicate a need for the formation of standard guidelines for the institutions dealing with ocular chemical injuries.*

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Keywords: *KAP, chemical Injury, ocular Burns, chemical Burns, chemical ocular Burns*

Introduction

An ocular chemical burn is an expression of the chemical ability of a xenobiotic molecule to react with a biochemical molecule that during chemical exposure that is of exceeding mass, contact time, chemical reactivity, and temperature overwhelming the protective mechanisms of the eye.[1] 7.5-27% of all burn patients have ocular involvement. 84% of those are due to a chemical etiology.[2] They are one of the true ocular emergencies which require emergency treatment, proper evaluation, and then further appropriate management.[3] Massive lid ecchymoses frequently associated with ocular chemical burns limits the ocular examination, delaying the treatment and thus leads to cicatricial sequelae.[4] The potential sequelae can be as trivial as dry eyes to severe conditions like ectropion, entropion, lagophthalmos, symblepharon, limbal stem cell deficiency, corneal opacity, non-healing corneal ulcer, intractable glaucoma, cataract, retinal detachment, and even phthisis bulbi, depending on the severity of the injury and when the treatment was initiated.[5] So, the knowledge about the emergency management of such injuries is a must for all working in the emergency department, or responding to accidents; and is desirable for the general population as it will reduce the ocular morbidity significantly, the sequelae and the need of ocular surface reconstruction can be prevented.

Aim

The current study aims to assess the Knowledge, Attitude, and Practices (KAP) of the primary responders to the chemical injuries as an emergency, which includes medical, paramedical personals, work-place supervisors, and the general population.

Subjects and Methods

A cross-sectional, questionnaire-based pilot study about the knowledge, attitude, and practices of emergency management of chemical injury among the primary responders was conducted in the emergency department of a tertiary care hospital in northern Karnataka for 1 month. 60 subjects participated in the study.

Inclusion criteria were individuals > 18 years of age, who can be present at the site of chemical injury or can be primary responders to a patient presenting to a casualty with chemical injury and were willing to participate in the study. The respondents with medical training formed group 1, consisting of ophthalmologists, casualty medical officers, and nursing staff. Group 2 comprised of workplace supervisors and family members of patients, who are the first person to witness the injury and can be potential primary responders. Exclusion criteria included individuals who refused to answer the questionnaire or are not the primary responders to the emergency.

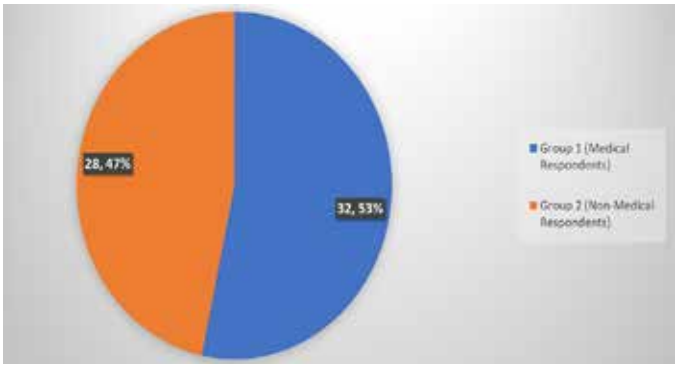

Figure 1: *Respondent's Groups*

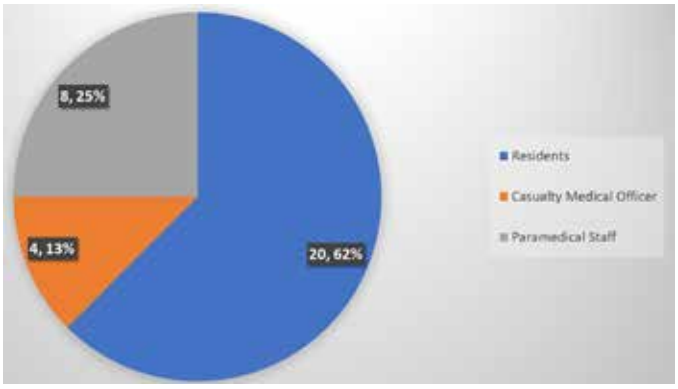

Figure 2: *Occupational demography among respondents related to the medical profession (Group 1)*

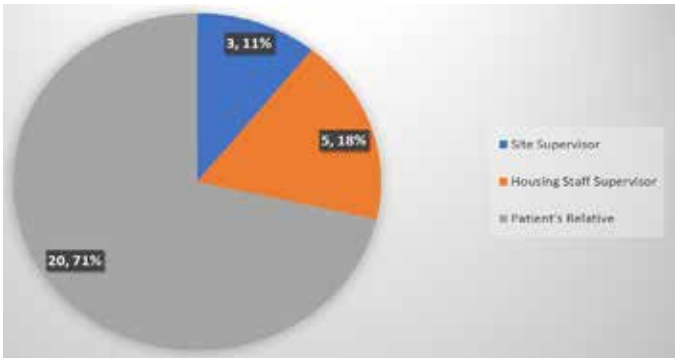

Figure 3: *Demography among respondents not related to medical professions (Group 2)*

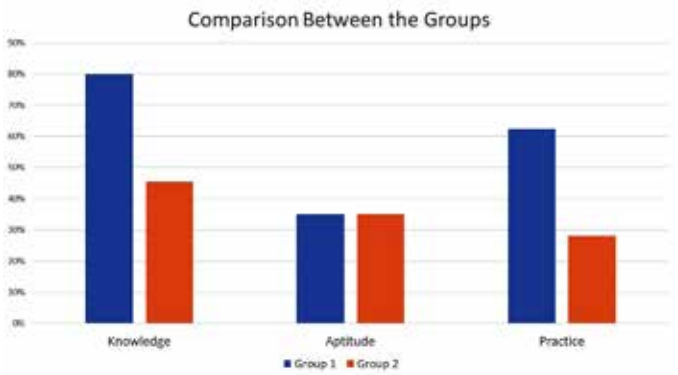

Figure 4: *Comparison of KAP among 2 groups. The percentage depicts the average number of correct responses provided by the respondents in a particular category.*

Data Collection

A 12 MCQ based questionnaire was devised which aimed to assess the knowledge about the etiology, the attitude about the signs indicative of emergency, and the practice of management of such an emergency. The questionnaire was devised in such a way that all the respondents could understand the options and respond to it. Each question had 3 options with probable answers and the 4th option was kept as not knowing about the correct response in all the questions. The data was then entered into an excel sheet and was processed to get the responses to each question expressed in percentage. The correct response was chosen from the established standard practice protocol, and the results were tabulated depending on what percentage of respondents chose the correct or incorrect options.

Post the submission of the questionnaire, the respondents from group 2 were given pamphlets of education material on emergency management of chemical injuries, and a seminar on ocular chemical injuries and its management was organized for the respondents from group 1.

Results

Among the 60 respondents, 20 were postgraduates from the department of ophthalmology and those posted in the emergency department from other specialties, 8 nursing staff, 4 casualty medical officers and 3 site supervisors of the construction work being conducted around the hospital area and 5 supervisors from housekeeping department, with 20 respondents were relatives of patients visiting the emergency department. Group 1 thus had 32 respondents while group 2 had 28 respondents. 34 respondents were male and 26 were female. (Figure 1,2,3) Knowledge about chemical injuries: Approximately 80% of the respondents from group 1 knew the aetiologies of chemical injuries while 45.5% from group 2 answered correctly about the same. Most common etiology in household chemical injury was thought to be detergent and shampoo by about 50% of the respondents from group 2. (Figure 4) (Table 1) Attitude about the signs indicating severity: 35% of the respondents from both the groups were having a correct attitude about recognizing the warning signs of a severe injury that was perilimbal ischemia. The majority thought that conjunctival congestion was the most indicative of severe damage. (Figure 4), (Table 2) The practice of emergency management: 93.5% of respondents from group 1 knew that starting emergency treatment precedes history taking and ocular examination, compared to 71.4% from group 2. Only 25% of respondents from group 2 knew that any non-toxic liquid can be used to irrigate the eye in case of emergency, compared to 81.25% from group 1. But only 62.5% of respondents from group 1 knew about the adequacy of emergency treatment, while 28.5% from group 2 responded correctly for the same (Figure 4), (Table 3).

Discussion

American chemical society (ACS) has 150 million registered chemical substances out of which 25,000 chemicals have been identified with the potential to cause burns.[6,7] Colby reported that the most common aetiological category causing chemical injury in the industrial setting is acid,

Table 1: Frequency distribution of respondent's Knowledge

Questions about the knowledge of etiology (Response frequency)		
Question	Group 1 (n=32)	Group 2 (n=28)
What is the most common etiological class of chemicals causing injury in the Iindustrial scenario?		
a. **Acid**	20	10
b. Alkali	7	8
c. Both	5	7
d. Don't Kknow	0	3
What is the most common chemical causing injury in the industrial scenario?		
a. **Sulphuric acid**	28	10
b. Hydrochloric acid	2	10
c. Depends on the industry	2	7
d. Don't know	0	1
What is the most common etiological class of chemicals causing injury in the Hhousehold scenario?		
a. Acid	4	5
b. **Alkali**	26	19
c. Both	2	2
d. Don't Kknow	0	2
What is the most common chemical causing injury in the Hhousehold scenario?		
a. Shampoo/Ddetergent	1	14
b. **Household Bbleach**	25	12
c. Chuna/Llime	6	2
d. Don't Kknow	0	0
The options marked in bold are the expected correct answers		

Table 2: Frequency distribution of respondent's Attitude

Attitude regarding signs of severe injury (Response Frequency)		
Question	Group 1	Group 2
What is the most common early symptom of chemical injury?		
a. **Redness of eye**	26	20
b. Burning sensation of the eye	4	4
c. Pain in the eye	2	4
d. Don't Kknow	0	0
What is the most important sign to indicate the urgency of treatment?		
a. Whitish Oopacity of Corneathe cornea	6	6
b. **Whitish Cconjunctiva**	12	10
c. Reddish Cconjunctiva	14	12
d. Don't Kknow	0	0
The options marked in bold are the expected correct answers		

most common being sulphuric acid.[8,10] The current study suggests that the general population lacks this knowledge, which might be due to the lack of knowledge about the industrial work environment. Wagoner et al and Colby have reported that household injuries occur mostly due to alkalis, of which group 2 had relatively better knowledge.[8,11] But about 58% of them responded that detergent or shampoo is

Table 3: Frequency distribution of respondent's Practice

The practice of emergency management (Response frequency)		
Question	Group 1	Group 2
What is the first step in the management of chemical Iinjuries?		
a. History Ttaking	1	4
b. Primary Ocular Surveyocular survey	1	0
c. **Start Emergenc Treatmentemergency treatment**	30	20
d. Don't Kknow	0	4
Does the emergency management differ in cases of different categories of etiological agents?		
a. Yes	19	7
b. **No**	10	8
c. Depends on Situationthe situation	3	10
d. Don't Kknow	1	3
How will you neutralize the chemical after the injury has occurred?		
a. Balance the pHph	1	10
b. **Dilute the chemical**	30	7
c. Depends on the situation	1	10
d. Don't Kknow	0	1
What is the irrigating liquid can be used to irrigate the eye post chemical exposure?		
a. Ringer lactate/BSS	4	10
b. Tap water	1	10
c. Any non-toxic liquid	25	8
d. Don't know	2	0
How much minimum fluid is needed to irrigate?		
a. 100ml	8	15
b. 500ml	20	8
c. **1000ml**	4	4
d. Don't Kknow	0	1
What is the minimum duration of irrigation?		
a. 5 mins	4	16
b. **15 mins**	20	8
c. 30 mins	7	4
d. Don't Know	1	1

the most common agent causing injury, which is irritant and doesn't cause injury. Ammonia, which is the most common alkali causing injury, as it is a component of most cleaning agents, was chosen by 42%.[8,10,11] There was a better correct response rate among group 1 about knowledge which can be attributed to their experience of witnessing a large number of such cases.The red-eye is always thought to be a sign of severe ophthalmic injury and so the conjunctival congestion was correctly answered by both the groups as the most common symptom of the injury. The severity of the injury though is not the amount of conjunctival congestion but is directly proportional to the amount of perilimbal ischemia, which manifests as whitish conjunctiva which is blanched of its normal pinkish hue due to the constrained and impaired blood flow.[3,8,12,13] There was a lack of attitude about the signs of the severity of such injury among both the groups.

Most of the potential injury is prevented by the common practice prevalent in the community, which is to wash the eye as soon as anything falls into it.[14] This was found consistent with our study where 83% of the respondents chose that starting emergency management comes first, history, and

examination after that. But there was a significant difference between both the groups about what that emergency management was, group 1 responding better which might be due to their experience of dealing with such situations more frequently. Only 31.25% in group 1 and 28.57% in group 2 responded that the emergency management didn't differ with the agent causing injury.[10,11,14,15] The group 2 lacked in the knowledge about how to neutralize the pH, which should be done by diluting the chemical by the copious amount of irrigation, rather than the chemical neutralization of pH, as it is an exothermic reaction which will cause additional thermal burns and worsen the condition.[11,14] About 2 liters of the irrigating solution is considered sufficient to dilute the chemical and neutralize its corrosive action, though the therapy should only be stopped once the litmus paper test starts showing pH in the physiological zone of 6.9-7.5.[1,4,11,12] There are reports of the use of as much as 20 liters of fluid to neutralize the pH.[16] Also, it should be ensured that there is no particulate matter at the end of rinsing as they can be a source of slow-release of chemicals prolonging the damage.[10,15] In absence of pH paper, the rinsing should be done with 500 ml of solution for 15 minutes, which is found to be effective in the majority of the injuries, though irrigation with 2 liters over 30 mins is considered ideal.[1] While most of the respondents from group 1 had adequate knowledge of this practice of dilution, they had no consensus about the adequacy of treatment. Group 2 generally lacked knowledge about the practice and its adequacy. This might be due to the common practice where more often than not; the rinsing is not adequate as the general population stop irrigation as soon as the eyes become red.

Though there have been epidemiological studies about the etiology, and studies to standardize the emergency management of chemical injury, literature search done on PubMed using multiple combinations of keywords related to the study didn't show any KAP study related to the ocular chemical injury to the best of our knowledge. This study can be considered as the first step towards a better understanding of such injury's knowledge and attitude in the general population. The authors do acknowledge that the current study is not without its limitations. The questionnaire of this pilot study was not validated. The study limited itself to the knowledge, attitude, and practice of emergency management and did not take into account the awareness about long-term complications such as glaucoma, corneal opacity, and phthisis, which have a significant effect on the quality of life. The study also did not evaluate the changes in KAP in the population once the awareness and education were completed. A long-term larger prospective study is underway to overcome these limitations.

Conclusion

The study has found that there is a lacuna among the general population about the knowledge of the chemical injury and there is no consensus among the professionals regarding the management protocol. We suggest that the emergency department should formulate a guideline for tackling such a situation, train the medical and paramedical staff of the emergency department about the same, and its guidelines should be prominently displayed on the walls of the emergency room which can also be used to educate the relatives of patients. The site supervisors can also be sensitized about the injuries and how to respond to the situation, as early initiation of rinsing at the site of the accident can dramatically improve the visual outcome. The authors also suggest a display of large banners at the workplace depicting the steps to provide first aid to victims of chemical injuries till medical help arrives.

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