



Prevalence of Ocular surface disorders in Intensive Care Unit patients: A Cross-Sectional study

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ABSTRACT: Objective: Intensive care unit (ICU) patients are exposed to several surface eye disorders ranged from minor complications like corneal dryness to more serious ones such as corneal perforation and blindness. This study is done to assess the incidence of the ocular complications and related factors.

Materials and methods: During a prospective cross-sectional study in a general adult ICU at a tertiary care hospital, ocular complications of the patients were assessed. Data were analysed using descriptive analysis.

Results: 130 cases (260 eyes) were included in the study period. The most common complications among the patients included dry eye and corneal abrasion (25.8%) followed by conjunctivitis (25%). The mean time of occurrence for dryness and corneal abrasion was 4 ± 2.93 days after admission to the ICU. Lower Glasgow coma scale (GCS) and longer hospital stay were significantly associated with ocular complications in the ICU ($P < 0.05$).

Conclusion: Ocular surface complications are common in critically ill patients admitted in the ICU. Dry eye, corneal abrasion, and conjunctivitis are the most prevalent complications in this study. Efficient eye care protocol and training the ICU staff are both recommended to reduce complication rates as such.

I. INTRODUCTION:

Intensive care unit (ICU) patients are exposed to several eye disorders due to the extensive problems in the vital organs that may be life-threatening. These complications ranged from corneal dryness and keratopathy to the corneal perforation and blindness. In addition to changing the mechanisms protecting the eyes such as eye closure, tear formation, blinking, and corneal reflex, some other iatrogenic causes such as mechanical ventilation, sedation and muscle relaxants should not be neglected as well. The most prevalent eye complications which have been reported in the ICU patients include exposure keratopathy, chemosis and microbial keratitis.

II. MATERIALS AND METHODS:

This prospective descriptive study was conducted in a tertiary care hospital in eastern India from January 2023 to November 2024. The study included 130 ICU patients hospitalised in the surgical and neurological ICU wards. Written consent was obtained from each patient or patient's family in this study. The inclusion criteria included hospitalisation in the ICU due to trauma, staying hospitalised for more than 48 hrs in the ICU, and consent to participate in the study. Exclusion criteria included occurrence of dry eye and corneal ulcer before admission to the ICU.

Patients' information including age, gender, duration of hospitalisation in the ICU, type of trauma leading to hospitalisation (penetrating or non-penetrating), facial injury (if existed), Glasgow coma scale, type of eye complication, and type of treatment both for the existing injury or for the eye protection (if performed) were all recorded. Examination of all the eligible patients at the time of admission to the intensive care unit while the presence of dry eyes and corneal ulcers was done. Schirmer's test was performed using standard filter paper strip (Whatman-41) to check the dryness of the eye, wetting of paper up to 15 mm was considered as no corneal dryness. The presence of corneal ulcers was assessed by fluorescein staining and portable slit lamp. If there were dry eye and corneal ulcer at the admission, the patients were excluded from the study. Patients were examined every other day to check for ocular complications.

III. STATISTICAL ANALYSIS:

Data were presented as percentages and mean and standard deviation. For categorical variables, the Chi-Square test was used to show differences between the patients. The P-value of ≤ 0.05 was considered significant. Also, the SPSS version 22 was used for the statistical analysis.



IV. RESULT:

Table 1. Frequency distribution of the Ocular and facial injuries in the patients with ocular trauma admitted to the tertiary care hospital during the study period

Type of injury	No. (%)
Rupture of the globe of the eye	0 (0)
Periorbital and eyelid hematoma	65 (56.5)
Conjunctival hemorrhage	39 (33.9)
Facial tearing (except eyelid)	29 (25.2)
Eyelid tearing	23 (20)
Orbital bone fracture	4 (3.5)
Total damaged items	115 (44.2)
Sum	260 (100)

Table 2. Frequency distribution of the ocular complications by age in the patients with ocular trauma admitted to the tertiary care hospital during the study period

Type of complication	Age				Sum	P value*
	<19	20-39	40-59	>60		
Without eye complication	32 (32)	21 (21)	18 (18)	29 (29)	100	-
Dry eyes and corneal abrasions	5 (7.5)	27 (40.3)	30 (44.8)	5 (7.5)	67	<0.001
Conjunctivitis	30 (46.2)	15 (23.1)	14 (21.5)	6 (9.2)	65	0.021
Chemosis	16 (42.1)	8 (21.1)	11 (28.9)	3 (7.9)	38	0.036
Keratitis	3 (16.7)	4 (22.2)	6 (33.3)	5 (27.8)	18	0.39
Total eyes	79 (30.4)	68 (26.2)	72 (27.7)	41 (15.8)	260	-

Chi Square test (Compared to uncomplicated cases as base line).

Table 3. Frequency distribution of the ocular complications by gender in the patients with ocular trauma admitted to the tertiary care hospital during the study period

Gender	Male	Female	Sum	P Value*
Type of complication				
Without eye complication	66 (66)	34 (34)	100	-
Dry eyes and corneal abrasions	44 (65.7)	23 (34.3)	67	0.079
Conjunctivitis	34 (52.3)	31 (47.7)	65	0.965
Chemosis	22 (57.9)	16 (42.1)	38	0.376
Keratitis	11 (61.1)	7 (38.9)	18	0.688
Sum	160 (61.5)	100 (38.5)	260	-

*Chi Square test.



Table 4. Frequency distribution of the ocular complications based on Glasgow coma scale (GCS) in the patients with ocular trauma admitted to tertiary care hospital during the study period.

Type of complication	GCS			Total	P Value*
	≤8	9-12	13-15		
Without eye complication	30 (30)	32 (32)	38 (38)	100	-
Dry eyes and corneal abrasions	36 (53.7)	23 (34.3)	8 (11.9)	67	<0.018
Conjunctivitis	29 (44.6)	22 (33.8)	14 (21.5)	65	<0.001
Chemosis	25 (65.8)	11 (28.9)	2 (5.3)	38	<0.001
Keratitis	12 (66.7)	3 (16.7)	3 (16.7)	18	0.011
Sum	161 (61.9)	47 (18.1)	52 (20)	260	-

Chi Square test

Table 5. Frequency distribution of the ocular complications based on duration of hospitalisation in the patients with ocular trauma admitted to tertiary hospital during the study period

Type of complication	Duration of hospitalisation (day)			Total	P value*
	1-5	6-10	11-15		
Without eye complication	14 (14)	44 (44)	42 (42)	100	-
Dry eyes and corneal abrasions	3 (4.5)	13 (19.4)	51 (76.1)	67	<0.001
Conjunctivitis	10 (15.4)	16 (24.6)	39 (60)	65	0.035
Chemosis	2 (5.3)	7 (18.4)	29 (76.3)	38	<0.001
Keratitis	1 (5.6)	3 (16.7)	14 (77.8)	18	0.013
Sum	40 (15.4)	65 (25)	155 (59.6)	260	-

*Chi Square test.

V. DISCUSSION:

The results of this study showed that dry eye and corneal abrasion are the most common complications following hospitalisation in ICU. The mean time for the onset of these complications was 4 to 5 days after admission, respectively. The incidence of complications was inversely related to both the level of consciousness of the patients and the duration of hospitalisation in the ICU.

The healthiness of the surface of the eye, mainly the cornea, depends on the ability of

producing tears, blinking, and closing the eyes during sleep. These can be impaired on the ICU due to some varied reasons including diseases such as facial oedema, subconsciousness, neurological injury or treatments such as the drying effects of gas flows from non-invasive ventilation or oxygen masks. In addition, muscle relaxants can reduce the tonic contraction of the orbicularis muscle around the eye, resulting impaired eye closure. Sedation may cause blinking impairment and the blink reflex.



The current study produced results which are in line with the findings of a great deal of earlier works done in this field. Kousha O et al., during a two-phase study has reported the overall incidence of exposure keratopathy in their study as 21%. W Narmawala and HC Jani reported the incidence of exposure keratopathy 40% in a total of 146 patients during a prospected study in the ICU at a tertiary care hospital. The result of keratopathy in our study (25.8%) is almost closer to that in our former study. All the mentioned studies including our study lie in this range. In the present study, the incidence of conjunctivitis was 25%. As can be seen from the results, the frequency of conjunctivitis is slightly higher in our study. Chemosis (14.6%) and keratitis (6.9%) were other common complications identified in the patients in the current study. The range of chemosis in current study and those mentioned may be due to methodological differences such as sample size, inclusion/exclusion criteria, and definition of the complications and the outcomes. One of the important findings of this study was the high incidence of ocular complications in the patients with lower GCS and those patients with longer duration of ICU stay. In the present study, GCS less than 8 was significantly associated with the ocular complications. These results are consistent with those of other studies conducted in this field. Such patients are usually under mechanical ventilation in as much as several studies have shown the association between mechanical ventilation and ocular complications. These patients usually receive muscle relaxants and sedatives to tolerate the mechanical ventilation and have a low level of consciousness. Hence, their eyelids usually remain open and have no blinking too. This provides the conditions for superficial eye complications. The current study also proved that the longer the hospital stay in the ICU, the higher the risk of ocular complications as shown in other studies. The ocular complications in the ICU generally depend on the nursing care provided in the ward. However, many superficial corneal injuries are preventable by having a clear protocol for initial evaluation and timely treatment.

Despite the valuable insights, this study has limitations, including a relatively smaller sample size, time limitation for follow-up of patients to monitor the effects of eye care methods in the long term. This study was designed as a descriptive study, which should be conducted as a clinical trial to increase the strength and quality of the study. This study was conducted in a single center, which was better to be performed in multiple centers to increase the sample size.

VI. CONCLUSION:

In conclusion of this study, it was found that the ocular surface complications are common among the critically ill patients in the ICU. Dry eye, corneal abrasion and conjunctivitis have been among the most prevalent complications. Lower GCS and longer stay in the ICU predispose to these complications.

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