



Ocular Trauma during the COVID-19 Pandemic in Sanglah Hospital, Denpasar, Bali From March 2020 to March 2021

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Abstract

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BACKGROUND: The coronavirus disease 2019 (COVID-19) is an infectious disease characterized by severe acute respiratory syndrome caused by the coronavirus 2. The implementation of lockdown and social distancing is the efforts made by the government to prevent the spread of this virus. The COVID-19 pandemic has affected the incidence rate of ocular trauma in several means.

AIM: This study aimed to evaluate the factors that can cause ocular trauma, from the patient's characteristics, clinical presentation, etiology, and mechanism of ocular trauma of patients who came to the emergency unit of Sanglah Central General Hospital (RSUP) during the COVID-19 pandemic.

METHODS: This study is an observational analytic study with simple random sampling method to evaluate the characteristics of patients with ocular trauma from March 2020 to March 2021. The secondary data were obtained from the medical records including age, gender, address, examination data (visual acuity, duration between trauma and time of seeking medical care, diagnosis, trauma etiology, trauma mechanism, and surgery performed on the patient).

RESULTS: In this study the most common was the presence of corpus alienum/foreign body in the cornea, chemical trauma, corneal erosion, canaliculi rupture, and keratitis which are usually caused by photoelectric injury. During the COVID-19 pandemic, new regulations were implemented including patient screening, COVID-19 test before undergoing surgery, patient treatment, and also the use of personal protective equipment for the examiners. Moreover, there were behavioral changes of the people caused by the enforcement of lockdown system and also people's fear of going to the hospital, especially to a COVID-19 referral hospital such as Sanglah General Hospital; therefore, some patients delayed seeking medical treatment and refused to have surgery at Sanglah General Hospital.

CONCLUSION: Our study concluded that the trend of ocular trauma in the COVID-19 era tends to occur in the male population and involves trauma to the cornea, with the most common etiology is caused by the presence of foreign bodies such as gram, wood, or metal. Our finding also showed that despite the implementation of social distancing policies in the COVID-19 pandemic situation, ocular trauma can still be found related to the implementation of the lockdown that has been relaxed during this research.

Introduction

The eyes are the third most vulnerable organ in the human body to experience trauma following the hands and feet. Globally, ocular trauma frequently becomes a preventable cause of visual morbidity and monocular blindness; however, a higher incidence occurs in developing countries, where the treatment is inadequately carried out so that it often leads to permanent visual disorder. In addition, ocular trauma occurs in people of all ages and genders, although the previous studies have reported a predominance in the male population (Jawade *et al.*, 2020; Alem *et al.*, 2019; and Tuladhar *et al.*, 2017) [1], [2], [3].

According to the World Health Organization, ocular trauma affects around 55 million people globally, with 750,000 of which are reported to require further hospital admission. The global blindness rate related to ocular trauma is approximately 1.6 million, and more than a half-million injuries, leading to blindness

are reported annually. The majority of ocular trauma can be prevented with proper eye protection and sufficient health education. Nevertheless, limited health infrastructure, poor healthcare-seeking behavior, and a low rate of adequate trauma management contribute to a poorer prognosis for those experiencing ocular trauma in developing countries. As a result, it leads to a more significant socioeconomic burden as most of the patients are faced with the loss of career opportunities and lifestyle changes due to disability caused by permanent damage of the ocular function (Jawade *et al.*, 2020; Alem *et al.*, 2019; and Yadav *et al.*, 2014) [1], [2], [4].

The common cause of ocular trauma is related to chemical, thermal, radiation, and mechanical injuries. Several pathological conditions may result from the trauma, with the most common findings include the tearing of the cornea, sclera, and lens disruption. Besides, other common findings are palpebral and canaliculi laceration, uveal prolapse, anterior ocular chamber disorders, retinal ablation, and optic nerve ablation. The previous studies suggest that the majority of patients are brought

to an ophthalmologic care facility after 24-h post-trauma (Alem *et al.*, 2019 and Khan *et al.*, 2017) [2], [5].

The coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2. The government began to initiate lockdown and social distancing policies to prevent the spreading of the virus. Implementing these policies significantly impact the eye care service and the incidence of ocular trauma (Shah *et al.*, 2020 and Sundaram *et al.*, 2020) [6], [7]. This study aimed to evaluate the incidence of ocular trauma, including the patient's characteristics, clinical presentation, etiology, and trauma mechanism among emergency unit patients at Sanglah Central General Hospital during the COVID-19 pandemic.

Study Methods

Subject and study design

An observational analytic study was conducted to evaluate patients with ocular trauma characteristics within 1 year from March 2020 to March 2021. The study population involved all patients with ocular trauma who came to seek medical care to the emergency unit at Sanglah General Hospital, Denpasar, Bali, Indonesia. In addition, we obtained secondary data using the medical records, including age, gender, address, and examination data (visual acuity, duration between trauma and time of seeking medical care, diagnosis, trauma etiology, trauma mechanism, and surgery performed on the patient). Subjects with incomplete medical records data were excluded from this study. All data collection was then classified using the Birmingham eye trauma terminology system (BETTS).

Data analysis

All data, including age, gender, address, and examination data (visual acuity, duration between trauma and time of seeking medical care, diagnosis, trauma etiology, trauma mechanism, and surgery performed on the patient) were arranged into a work table and were analyzed using IBM SPSS statistics Version 23.0. Data regarding subject characteristics were analyzed descriptively. All categorical data were described as frequency and percentage, while numerical data were expressed as mean and standard deviation.

Results

Characteristics of study subjects

This study population included 266 patients with ocular trauma who came seeking medical care

Table 1: Characteristics of patients with ocular trauma seeking for medical care in the emergency unit of Sanglah General Hospital, Denpasar

Characteristics of study subjects	n (%)
Gender	
Male	224 (84.2)
Female	42 (15.8)
Age (years) mean ± SD	34.233 ± 16.5161
0 – 10	22 (8.3)
11 – 20	21 (7.9)
21 – 30	68 (25.6)
31 – 40	72 (27.1)
41 – 50	41 (15.4)
51 – 60	27 (10.2)
> 60	15 (5.7)
Visual acuity	
≥ 20/40	166 (61.7)
20/50 – 20/100	35 (13)
19/100 – 5/200	29 (10.8)
4/200 – Light perception	24 (8.9)
No light perception	5 (1.9)
Hard to evaluate	7 (2.6)
Residence	
Urban area	144 (54.13)
Rural area	122 (45.86)
Duration to seeking medical care (hours) mean ± SD	17.3526 ± 33.50959
< 6 h	150 (56.4)
6 – 24 h	82 (30.8)
1 – 3 days	26 (9.8)
> 3 days	8 (3)
Need Surgery	71 (26.7)

to the emergency room of Sanglah General Hospital Denpasar. Comprehensive data regarding study population characteristics are presented in Table 1.

The table above described the distribution of patients with ocular trauma who came to seek medical care to the emergency unit of Sanglah General Hospital, Denpasar. Based on gender, it was found that the mean age of the study population was 34.233 ± 16.5161 years, which mainly consists of men compared to women (84.2% vs. 15.8%, respectively). The most common age group with ocular trauma was those aged between 31 and 40 years old. Most ocular trauma patients who came to seek medical care in our institution showed visual acuity result of $\geq 20/40$; however, 35.7% subjects came with poor eyesight, and seven subjects (2.6%) was not completely evaluated, because they were unconscious or being uncooperative during the examination. Patients who lived in the urban area were higher than those who lived in the rural area. The mean duration of time between trauma occurrence and seeking medical care and were 17.3526 ± 33.50959 h. We documented the duration of patients seeking medical care and found that more than half of the study population sought medical care in <6 h (56.4%). A total of 26.7% of patients had trauma that required surgery, but 14 patients refused surgery and four patients had a delay of surgery due to the reactive IgM test for COVID-19.

Table 2 describes the distribution of ocular trauma etiologies in our study population. We found that the most common ocular trauma etiology was gram, followed by wood, metal, chemical, and photoelectric trauma.

Table 3 describes the clinical manifestation of ocular trauma in our study population. The incidence of trauma involved the palpebra in 18.42% of subjects,

Table 2: Distribution of ocular trauma etiologies in patients seeking for medical care in the emergency unit of Sanglah General Hospital, Denpasar

Ocular trauma etiology	n (%)
Gram	78 (29)
Wood	33 (12.3)
Metal	27 (10)
Chemical trauma	27 (10)
Photoelectric trauma	18 (6.7)
Traffic accident	13 (4.8)
Animals (insects and dog bites)	11 (4.1)
Battle	10 (3.7)
Thermal trauma	9 (3.3)
Dust	9 (3.3)
Falls	9 (3.3)
Other causes	22 (8.1)

conjunctiva in 9.40% of subjects, and scleral rupture in 1.88% of subjects. Most of the study population presented with corneal trauma (66.17%). In addition, a small number of subjects also experienced other trauma, including corneoscleral trauma (1.88%), hyphema (1.88%), recti muscles rupture (0.38%), IOFB (1.50%), and ophthalmoplegia (0.38%).

Table 3: Clinical manifestation in patients seeking for medical care in the emergency unit Of Sanglah General Hospital, Denpasar

Clinical manifestation	n (%)
Palpebra	
Excoriation	14 (5.3)
Full-thickness rupture	10 (3.8)
Partial-thickness rupture	6 (2.3)
Canaliculi rupture	19 (7.1)
Conjunctiva	
Full-thickness rupture	4 (1.5)
Partial-thickness rupture	11 (4.3)
Corpus Alienum (Foreign Object)	5 (1.9)
Sclera rupture	5 (1.9)
Cornea	
Chemical trauma	27 (10.2)
Thermal trauma	9 (3.4)
Erosion	24 (9)
Full-thickness rupture	11 (4.1)
Partial-thickness rupture	5 (1.9)
Corpus alienum (foreign object)	82 (30.8)
Keratitis	18 (6.8)
Corneosclera rupture	5 (1.9)
Hyphema	5 (1.9)
Recti muscles rupture	1 (0.4)
IOFB	4 (1.5)
Ophthalmoplegia	1 (0.4)

Table 4 describes the distribution of ocular trauma patients who seek medical care to the emergency unit in our institution according to BETTS criteria. Open globe injury consists of 26 subjects (12.27%) classified into Type A 21 subjects, Type B 1 subject, and Type C were four people. According to the zone, those included in Zone I were 18 subjects, Zone II was seven subjects,

Table 4: Case distribution of ocular trauma patients seeking for medical care in the emergency unit of Sanglah General Hospital, Denpasar, according to Betts criteria

Mechanism of trauma	n (%)
Open globe injury	
Type A	21
Type B	1
Type C	4
Type D	0
Zone I	18
Zone II	7
Zone III	1
Closed globe injury	
Type A	9
Type B	54
Type C	104
Type D	19
Zone I	179
Zone II	6
Zone III	1

and Zone III was one subject. On the other hand, patients with closed globe injury were 186 subjects (87.74%) classified into Type A nine subjects, Type B 54 subjects, and Type C 104 subjects. According to the zone, those included in Zone I were 179 subjects, Zone II was six subjects, and Zone III was one subject.

Discussion

Ocular trauma can occur at any age and to all gender; however, the previous studies mentioned that it is more common in the male population. A study by Alem *et al.* stated that the age distribution of patients was between 2 months and 92 years old, with the largest age group ranging from 0 to 16 years old and 58.34% of subjects lived in the rural area. Jawade *et al.* showed that the most common age group with ocular trauma was 31–40 years old. A study by Wu *et al.* during the COVID-19 pandemic showed that the mean age of patients with ocular trauma was 41.1 years old, and 69% of them were male. Our study presented 266 subjects, with the age distribution ranging from 1 month to 85 years old. The largest age group with ocular trauma was between 21 and 30 years which consisted of 68 subjects (25.6%) and the mean age of 34.233 ± 16.5161 years old. A larger number of male patients with ocular trauma presented with a total of 224 subjects (84.2%). The male population tends to do rough housework that is at risk of causing trauma, which may explain why there is a predominance of males who experience ocular trauma over females during a lockdown situation (Wu *et al.*, 2020; Jawade *et al.*, 2020; and Alem *et al.*, 2019) [1], [2], [8].

A study conducted by Alem *et al.* showed that 74.51% of patients with ocular trauma came to tertiary ophthalmologic center within 3 days post-trauma. Only 1.29% of the total study subjects were treated at under 6 h. The result of a study by Karve *et al.* showed that 35% of patients came to seek medical care in <24 h, and 28% came to seek medical care at 1–3 days post-trauma. On the other hand, Shashikala *et al.* showed that 41.3% came to seek medical care at <6 h, 36.8% at 11–3 days, 20% at 6–24 h, and 1.9% at >3 days. Wu *et al.* showed that the mean time between the incidence of trauma and the time patient came to seek medical care was 36 h. In our study, the mean duration between the onset of trauma and medical care was 17.3526 ± 33.50959 h. Most of subjects (56.4%) came in <6 h; 30.8% at 6 – 24 h, 9.8% at 1–3 days, and 3% at >3 days. The delay in seeking medical care to Sanglah General Hospital might be caused by the fear of coming to a hospital due to the COVID-19 pandemic. However, compared to other preceding studies, most of the subjects in our population sought treatment in a shorter time than the previous study (Wu *et al.*, 2020;

Alem *et al.*, 2019; Karve *et al.*, 2017; and Shashikala *et al.*, 2013) [2], [8], [9], [10].

The result from Jawade *et al.* showed that the most common ocular trauma manifestations were ecchymosis and palpebral and sub-conjunctival edema, hyphema, palpebral laceration, and corneal abrasion. In contrast, the study by Karve *et al.* described that most of the ocular trauma occurred as the injury of the cornea (54%), conjunctiva (24.25%), lens (13.25%), palpebral (8%), and retina (7.5%). In addition, Wu *et al.* presented the common ocular trauma during pandemic were hyphema (35%), chemical trauma (20%), periocular laceration (18%), rupture/IOFB (9%), and commotion of the retina (9%). In this study, the most common ocular traumas were corpus alienum/foreign body in the cornea (30.8%), chemical trauma (10.2%), globe rupture/IOFB (9.4%), and canaliculi rupture (7.1%) (Wu *et al.*, 2020; Jawade *et al.*, 2020; and Karve *et al.*, 2017) [1], [8], [9].

A comparative study by Pellegrini *et al.* [11] regarding the trend of ocular trauma during the pandemic era in Italia identified a decreased incidence rate of ocular trauma compared to the same period in the previous year. The study explained that COVID-19 lockdown leads to a significant change in people's behavior during quarantine which can be related to less risk of trauma. The decreased incidence rate of sports injuries and pediatric injuries during school closure appeared to support this hypothesis. Another report from the United Kingdom showed an increase in domestic ocular trauma cases compared to the previous year. In addition, Wu *et al.* found that 84% of ocular trauma occurred at home and was related to several activities, such as gardening and self-repairing projects done unprofessionally and without using protective equipment. Our study showed that ocular trauma most commonly occurred while doing activities at the workplace and home. Ocular trauma in children occurred at home while playing but was not found at school. The difference in this study could be due to the different period since the previous studies were conducted from March to April 2021, while this study was conducted from March 2020 to March 2021 when lockdown had been moved out and some workers had already back to work (Pellegrini *et al.*, 2020; Sundaram *et al.*, 2020; and Wu *et al.*, 2020) [7], [8], [11].

Ocular trauma in any form is considered an emergency. The treatment of ocular trauma or surgical procedure should not be delayed; thus, several changes need to be implemented during this pandemic era, particularly when treating an ocular trauma. Maximum personal protection should be implemented to minimize the spreading of COVID-19. Ophthalmologists are at very high risk of a direct contact against COVID-19 from patients, due to the close examination distance and the exposure of mucosal surface of the eye. Therefore, all prevention strategies must be implemented when evaluating an ocular trauma case, assuming all patients are a COVID-19 case. This includes using

basic protective equipment, such as face masks, face protectors, and gloves. Besides the ophthalmologic history, general health history should also be explored. If patients have symptoms that are suggestive of COVID-19, they have to be screened for COVID-19. Therefore, the ophthalmologist should promptly consult patients with ocular trauma who have symptoms suggestive of COVID-19 and, if necessary, perform further imaging to rule out COVID-19.

Surgical intervention in case of trauma during the pandemic era could be performed immediately or delayed while waiting for COVID-19 screening test result. Therefore, all practitioner should ensure that the appropriate personal protective equipment have been prepared, assuming the patient is seropositive for COVID-19. In the presence of ocular trauma and pan-facial trauma involvement, the examination of ocular injuries often includes the mucosal surface of the head/face, nose, and pharynx, which are considered an aerosol risk. Therefore, a strict personal protective equipment guidelines must be followed. It is recommended to use an N95 mask, eye protector, protective gown, and gloves. Surgical procedure for a previously diagnosed COVID-19 case is also recommended to be performed at a hospital with specific COVID-19 treatment facilities, including the inpatient ward, operating room, and intensive care unit for COVID-19 patients. When surgical intervention is required, it needs to be performed as early as possible. Some efforts should also be made to limit the number of health care providers involved in patient care. There is no observer and non-essential staff involved in the whole process. This effort is aimed to reduce the period of patient stay in the hospital, reduce the number of health care providers exposed to the patient, and reduce the use of crucial operating room resources (Ali *et al.*, 2020; and Sundaram *et al.*, 2020) [7], [12].

All of these efforts have been implemented in our institution at Sanglah General Hospital. Each patient is screened for COVID-19 and the health-care personal must always use basic personal protective equipment. All patients needing surgical procedures were constantly tested for COVID-19, and if the result showed a positive result, surgery will be delayed, and the patient will be consulted to a pulmonologist. The result of this study showed that there were 71 patients (26.7%) required surgery. However, 14 patients refused to undergo surgery due to fear of having surgery at Sanglah General Hospital, as our institution is one of the COVID-19 referral hospital. Four patients had a surgery delay for 48 h due to reactive result using rapid immunoglobulin-M test for COVID-19. Therefore, the patient had to be firstly consulted to a pulmonologist and had to wait for the PCR COVID-19 result. Patients who had delayed surgery were given systemic and local antibiotics to prevent infection of the ocular trauma.

Conclusion

Our study concluded that the trend of ocular trauma in the COVID-19 era tends to occur in the male population and involves trauma to the cornea, with the most common etiology is caused by the presence of foreign bodies such as gram, wood, or metal. Our finding also showed that despite the implementation of social distancing policies in the COVID-19 pandemic situation, ocular trauma can still be found related to the implementation of the lockdown that has been relaxed during this research.

In our study population, it was found that most of the patients sought for medical care in <6 h, which is a shorter duration of time compared to the comparison study. This might be related to anxiety about complaints caused by trauma despite the limitations imposed during the pandemic. Nevertheless, medical conditions related to ocular trauma should be treated as an emergency and the treatment should not be delayed. Ophthalmologists and health-care practitioners should implement careful prevention strategies regarding COVID-19 in managing any trauma oculi cases. New regulations were implemented including initial patient screening for COVID-19 before surgery and a strict regulation regarding the use of personal protective equipment for all health-care providers.

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