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**A SURVEY OF OCULAR TRAUMA AT GROOTE SCHUUR HOSPITAL IN CAPE TOWN,
SOUTH AFRICA**

A dissertation submitted in fulfillment of the

MSc Global Surgery Degree

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Declaration

I, Zahra Logday, declare that this work is my original work (except where acknowledgement indicate otherwise)

Signed by candidate

Date: 22 June 2023

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Acronyms

LMIC – Low, middle-income countries

WHO – World Health Organisation

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Abstract

Background

Ocular trauma is an important cause of unilateral blindness around the world. There have been a few studies around Southern Africa that demonstrate the causality and outcomes. However, there is a dearth of evidence on the contribution of ocular trauma to trauma, despite the high prevalence of trauma that exists.

Objectives

To investigate the prevalence of ocular trauma cases that present to Groote Schuur Hospital in Cape Town, South Africa from 1 December 2019 to 31 May 2020.

Methods

This was a retrospective cohort study of all ocular trauma cases seen at the Groote Schuur Hospital Trauma Unit over a 6-month period.

Results

There was a total of 1301 trauma cases and a total of 47 ocular trauma cases, representing 3.6% of total trauma cases. Assault was the most common manner of trauma. Most cases involved males and those aged 18-30. Most cases were referred from primary healthcare facilities and 47% of cases required medical management only. During COVID-19, there was a significant decline in the number of ocular trauma cases.

Conclusion

In this study, ocular trauma was found in 3.6% of cases that presented to the Emergency Unit. Ocular trauma predominantly occurred in males. Importantly, the majority of ocular trauma that occurred is as a result of assault; and a third of patients required a surgical intervention.

Key words: Ocular trauma, assault, blindness, low-middle income countries, COVID-19

INTRODUCTION

Trauma affects tens of millions of people every year worldwide.¹ Low- and middle- income countries (LMICs) have the highest prevalence of trauma, contributing 90% of trauma cases globally.^{2,3} Approximately 4.4 million people die from trauma every year⁴, deaths that could be largely preventable by implementing policies that enforce safety, for example reducing availability of illicit substances that contribute to interpersonal violence.⁴ Millions more suffer from non-fatal injuries, as well as temporary and permanent disabilities such as blindness.^{1,4}

In addition to the prevailing burden of trauma, the world was faced with a devastating lockdown as a result of the COVID-19 pandemic. During this time, it was documented that the number of trauma cases had reduced significantly around the world.^{5,6} Reasons for this reduction have been hypothesized, which include the alcohol sale restrictions and fear of contracting COVID-19, where people would avoid hospitals in fear of contracting the virus.⁷ South Africa's trauma-related mortality rate is 4.5 times the global average.⁸ Interpersonal violence is one of the top ten causes of death and a significant contributor to the prevalence of disability.⁹ Morbidity from trauma, in this case ocular trauma, generates a major impact on the individual, healthcare system, and the economy.¹⁰

Over 90% of trauma-related mortality and morbidity occurs in LMICs with road traffic injuries and interpersonal violence predominating as causes.³ Within a country, trauma is more prevalent in low socioeconomic settings than high socioeconomic settings, in part due to the people from low socioeconomic settings living and working in unsafe environments, having inequitable access to

healthcare, and that less preventative measures being implemented and enforced in poorer areas.⁴ Furthermore, the economic impact of trauma is two-fold; it may preclude individuals from working, resulting in loss of income and it contributes to increased expenditure of medical care and recovery.⁴

Ocular trauma is a global concern with 90% of vision loss due to ocular trauma being preventable.¹¹ Twenty years ago ocular trauma accounted for 1.6 million cases of blindness, 2.3 million cases of bilateral vision loss, and 19 million cases of unilateral blindness worldwide.¹² In 2021, with increasing rates of global trauma,^{2,4} it is possible that prevalence of ocular trauma has been on a steady rise, however there is no recent study to verify this. Most ocular trauma is accidental in high income countries; in contrast, in LMICs, interpersonal violence is a leading cause.¹²⁻¹⁴ In South Africa, interpersonal violence is the leading cause of ocular trauma.¹⁵ However, few studies in South Africa have reported on ocular trauma¹⁶ with one study in Cape Town¹⁵, two in Kwa-Zulu Natal province,^{16,17} and one in East London.¹⁸ The studies described similar risk factors related to increased incidence of ocular trauma in South Africa, such as young males, drug and alcohol consumption, recreational settings, and low socioeconomic settings.¹⁵⁻¹⁸ These results reflect those found in other countries.¹²⁻¹⁴

In 2013, a study at Groote Schuur Hospital in Cape Town focused on the causes and effects of open globe injuries and found that ocular trauma accounted for 12.6% of all ophthalmology admission with 66% being open globe injuries as a result of interpersonal violence.¹⁵ The study focused on open globe injuries, excluding closed globe injuries, which accounted for 34% of the ocular trauma admissions.¹⁵ This finding provides a solid foundation and rationale to investigate all ocular trauma cases, especially considering that 12 000 general trauma cases present to Groote Schuur Hospital emergency unit every year.⁸ In 2016, a study done in East London focusing on epidemiology of ocular trauma found that 41% of ocular trauma

admissions were closed globe injuries.^{15,18} Other studies have shown that open globe injuries are more severe, often requiring admission but closed globed injuries are more common, therefore important to include and investigate, and can require medical and / or surgical intervention.^{10,19}

During the COVID-19 pandemic, countries around the world continued to treat ocular trauma.^{7,20,21} In the United Kingdom, two studies investigated the impact of COVID-19 lockdown on eye emergencies, one found a 43% reduction in ocular trauma during March 2020 to April 2020 when compared to March 2019 to April 2019,²² and the other described a 3-fold increase in ocular trauma during the lockdown attributed to increase in falls and accidental domestic injuries.²³ Pellegrini *et al.* (2020) observed the changing trends of ocular trauma in the time of COVID-19 and found a 68.4% reduction in ocular trauma however, concerned that patients with serious ocular injury avoided care in fear of contracting COVID-19.²⁴ A study in India found that 88% of patients missed their follow-up appointment due to lockdown restrictions and fear of COVID-19.²⁵ Regular follow-up is necessary to delay ocular disease progression.²⁵ In South Africa, the impact of COVID-19 lockdown on ophthalmology follow-up for ocular trauma has not been investigated at the time of this study.

Overall, incidence of trauma and ocular trauma during immediate COVID-19 hard lockdown from March 2020 to April 2020 was reduced in countries around the world compared to March to April 2019, however the impact on ocular trauma before and during COVID-19 lockdown in South Africa has yet to be described.

Several studies have been conducted worldwide; however, research on ocular trauma is limited in South Africa.¹⁷ In Cape Town, no singular study that researches epidemiology of all ocular trauma cases that

present to emergency centres has been published to our knowledge despite the high prevalence of trauma that exists.⁸ The primary aim of this study was to investigate the epidemiology of ocular trauma that presented to Groote Schuur Hospital in Cape Town, South Africa from 1 December 2019 to 31 May 2020. The secondary aim is to determine whether COVID-19 had a major influence on the prevalence and incidence of ocular trauma. The objectives were to identify the demographics of all patients with ocular trauma, to determine the prevalence, causes and severity of ocular trauma cases, to identify the types of ocular trauma that was managed at Groote Schuur Hospital, whether it required medical or surgical management or specialist care and to investigate how many cases had isolated ocular trauma versus polytrauma. Additional objectives were to determine whether the COVID-19 pandemic affected prevalence of ocular trauma, ophthalmology services in terms of accessibility to care and outpatient follow up for ocular trauma.

METHOD

The objective of this study was to investigate the prevalence of ocular trauma cases at Groote Schuur Hospital in Cape Town, South Africa from 1 December 2019 to 31 May 2020. Furthermore the objectives of the study were to identify the demographics of all patients with ocular trauma, to determine the prevalence, causes and severity of ocular trauma cases, to identify the types of ocular trauma that was managed at Groote Schuur Hospital, whether it required medical or surgical management or specialist care and to investigate how many cases had isolated ocular trauma versus polytrauma. Additional objectives were to determine whether the COVID-19 pandemic affected prevalence of ocular trauma, ophthalmology services in terms of accessibility to care and outpatient follow up for ocular trauma.

This was a retrospective cohort study that was conducted using patient case records from the hospital's trauma unit. All patients with ocular trauma that present to the trauma unit were filtered based on the inclusion criteria during the six-month period. The inclusion criteria included all patients who presented to Groote Schuur Hospital with ocular trauma, including polytrauma cases with direct ocular trauma from 1 December 2019 to 31 May 2020. The exclusion criteria are participants under the age of 18 years, participants who sustained indirect ocular trauma i.e. ophthalmoplegia from a traumatic brain injury and patients who had a recurrent complications of a pre-existing ocular injury before 1 December 2019.

The case records were analysed extensively to acquire information on patient demographics, details of the injury, instruments and objects associated with the injury, victim-assailant relationship, timing of the injury, presentation to a healthcare facility and duration between presentation and initial consultation to assess response time, visual acuity at presentation and at follow-up, disposal from the trauma unit, documentation of other concurrent injuries and other specialist involved, management of each case (medical, surgical or both) and ultimately follow-up.

Groote Schuur hospital is a large tertiary level academic hospital in Cape Town, South Africa and funded by the government. It is located in a low to middle socioeconomic and urban area of Cape Town. The trauma unit at Groote Schuur triages over 12000 cases per year. It functions as a referral centre and drainage hospital for the western region of Cape Town as well as servicing the local area.

The study sample comprised of all ocular trauma cases that were seen in the trauma unit during the study period. It excluded patients younger than 18-years-old. The study observed all cases that were seen in the unit and who were subsequently discharged, asked to follow-up as an outpatient, admitted for in-patient care, deceased, or absconded. Privacy and confidentiality was maintained throughout the study. This chosen study period accounted for four months of cases prior to COVID-19 lockdown in South Africa, therefore allowing for data collection unaffected by restrictions, and a two-month period during the hard lockdown allowing for data collection that assessed the effect of COVID-19 on ocular trauma. The study used quantitative techniques. Data were analysed using R-Studio. Values were reported as mean \pm SD for normally distributed continuous data, median (range) for non-normally distributed continuous data, and number (percentage) for categorical data.

Approval was granted for the study from the University of Cape Town Surgical Department Research Committee and Human Research Ethics Committee (669.2021). Access to patient records was granted by Groote Schuur Hospital

Definitions

1. *Blindness*

Blindness is defined as a visual acuity less than 3/60, using the WHO definition.²⁶

2. *Community Assault*

Community assault is defined as extra-judicial violence whereby a group of people take the law into their own hands in order to injure or kill a person accused of wrongdoing and to serve as punishment upon the alleged perpetrator.

RESULTS

There were 1301 trauma cases in Grootte Schuur Hospital between December 2019 and May 2020. A total of 47 ocular trauma cases that met the inclusion criteria for this study during this time, which translates to approximately 3.6% of cases. The mean age was 33.9. The most common age range was 18-30, with 20/47 (42.6%) of cases followed by 31-40, which accounted for 14/47 (29.8%) of cases. The age range was 18-63. Males accounted for 46/47 (97.9%) of all cases. Patients in this study were predominantly unemployed, accounting for 28/47 (59.6%) of cases. Most of the patients were single, making up 34/47 (72.3%) of cases, followed by those married, which was 7/47 (14.9%) cases, 1/47 (2.1%) of cases were divorce then 5/47 (10.7%) cases were unknown marital status. Most patients were referred from a primary healthcare facility, accounting for 37/47 (78.7%) of cases. Most cases occurred in lower socioeconomic areas of Cape Town, most notably Mitchells Plain (31.9%) and Gugulethu (14.9%), this is also in keeping with the referral facilities that transferred patients from Mitchells Plain (32%) and Gugulethu (22%) to Grootte Schuur Trauma Unit.

Table 1. Age and sex of patients pre-COVID-19, during COVID-19 and overall

	Pre-COVID 19	COVID 19	Total Cases
Total Cases	N = 36	N = 11	N = 47
Age (Years)			
Mean (SD*)	33.9 (12.2)	33.8 (7.05)	33.9 (11.1)
Median (IQR**)	31.5 (25.8-44.0)	34.0 (28.5-40.5)	32.0 (26.0-41.5)
Range	18.0-63.0	23.0-43.0	18.0-63.0
Age Ranges***			
18 – 30	16 (44.4%)	4 (36.4%)	20 (42.6%)
31 – 40	10 (27.8%)	4 (36.4%)	14 (29.8%)
41 - 50	5 (13.9%)	3 (27.3%)	8 (17.0%)
51 – 60	4 (11.1%)	0 (0%)	4 (8.5%)
61 - 70	1 (2.8%)	0 (0%)	1 (2.1%)
Sex***			
Female	0 (0%)	1 (9.1%)	1 (2.1%)
Male	36 (100%)	10 (90.9%)	46 (97.9%)

*Standard deviation

**Interquartile range

***Table represents percentages of cases pre-COVID 19, during COVID 19 and the total, affecting different age ranges and sexes

Ocular injury was most commonly due to blunt trauma, accounting for 29/47 (61.7%) cases, followed by sharp/penetrating trauma with 14/47 (29.7%), then by chemical trauma with 2/47 (4.3%) and foreign body with 2/47 (4.3%).

The most common manner of trauma was assault, accounting for 36/47 (77%) of cases. A detailed list of the objects used in assault cases can be found in table 2. Of the total cases, only 11/47 cases (23%) accounted for accidental trauma, most commonly due to road traffic accidents in 5/11 (45%) of accidental cases. Of note, community assault accounted for 9/36 (25%) of assault cases alone.

Table 2. Causes of accidental trauma and objects used in assault cases

	Pre-COVID 19	COVID 19	Total Cases
Total Cases	N = 36	N = 11	N = 47
Accidental Causes (Years)*			
Home-related	1 (2.8%)	1 (9.1%)	2 (4.3%)
Work-related	1 (2.8%)	3 (27.3%)	4 (8.5%)
Road Traffic Accident	5 (13.9%)	0 (0%)	5 (10.6%)
Assault Objects*			
Baseball bat	0 (0%)	1 (9.1%)	1 (2.1%)
Fists	1 (2.8%)	2 (18.2%)	3 (6.4%)
Gun	5 (13.9%)	1 (9.1%)	6 (12.8%)
Knife	3 (8.3%)	1 (9.1%)	4 (8.5%)
Stick	2 (5.6%)	0 (0%)	2 (4.3%)
Unknown	8 (22.2%)	1 (9.1%)	9 (19.1%)
Bottle	4 (11.1%)	0 (0%)	4 (8.5%)
Brick	2 (5.6%)	0 (0%)	2 (4.3%)

*Table represents percentages of cases pre-COVID 19, during COVID 19 and the total regarding accidental causes and objects used in assault cases

The most common injury sustained was a ruptured globe in 13/47 cases (27%) followed by lid laceration in 9/47 cases (19%). A detailed list of all injuries can be found in table 3. Alcohol was implicated in 8/47 (17%) of cases, followed by 2/47 (4.3%) for illicit substances, 25/47 (53.2%) cases it was unknown cases whether alcohol/substances were used and 12/47 (25.5%) no alcohol/illicit substances were implicated. Unilateral injury was found in 40/47 (85%) of cases, with the left and right eye being equally affected. Most patients presented to a facility within 6 hours of injury, accounting for 33/47 (70%), 6/47 (12.8%) presented within 6-12 hours, 4/47 (8.5%) within 12-24 hours and 4/47 (8.5%) after 48 hours. Approximately 31/47 (66%) of patients received a consultation within 6 hours of presentation to a facility, 9/47 (19.1%) within 6-12 hours, 3/47 (6.4%) within 12-24 hours and 4/47 (8.5%) within 24-48 hours.

Isolated ocular injury account for 16/47 (34%) of total cases, the remaining 31/47 (66%) of cases sustained other injuries, most commonly facial fractures.

Table 3. Types of ocular injuries

	Pre-COVID 19	COVID 19	Total Cases
Total Cases	N = 36	N = 11	N = 47
Injuries *			
Lid laceration	7 (19.4%)	2 (18.2%)	9 (19.1%)
Pre-septal cellulitis	2 (5.6%)	1 (9.1%)	3 (6.4%)
Ruptured globe	11 (30.6%)	2 (18.2%)	13 (27.7%)
Hyphaema	3 (8.3%)	0 (0%)	3 (6.4%)
Closed globe injury	2 (5.6%)	0 (0%)	2 (4.3%)
Burns	0 (0%)	1 (9.1%)	1 (2.1%)
Corneal foreign body	0 (0%)	1 (9.1%)	1 (2.1%)
Epithelial erosion	0 (0%)	1 (9.1%)	1 (2.1%)
Foreign body	0 (0%)	1 (9.1%)	1 (2.1%)
Iritis	1 (2.8%)	1 (9.1%)	2 (4.3%)
Conjunctivitis	1 (2.8%)	0 (0%)	1 (2.1%)
Corneal abrasion	1 (2.8%)	0 (0%)	1 (2.1%)
Corneoscleral laceration	1 (2.8%)	0 (0%)	1 (2.1%)

*Table represents percentages of cases pre-COVID 19, during COVID 19 and the list of injuries sustained as a result of ocular trauma

Medical management alone was needed in 22/47 (47%) of cases, followed by surgical management in 13/47 (28%) of cases. Ophthalmology services were required in 38/47 (81%) of cases, with 25/47 (53%) of total cases also required additional care from other specialties, most commonly Neurosurgery and Maxillo-Facial. Most patients were discharged from the trauma unit (38%), followed by ophthalmology admissions to the ward in 14/47 (30%) of cases. Most patients required follow-up, accounting for 34/47 (72%), of which 22/34 (65%) attended the follow-up. **Of the 47 cases, 33 (70%) presented as unilateral**

blindness with a visual acuity of <3/60 (including counting fingers, hand movements, light perception and no light perception) and 6 (12%) cases as bilateral blindness with a visual acuity of <3/60 on the first presentation comparative to final presentation, with 23 (48%) cases of unilateral blindness with a visual acuity of <3/60 of which, 10 (21%) cases resulted in unilateral evisceration and 2 (4%) cases of bilateral blindness with a visual acuity of <3/60.

Table 4. Type of management and types of other specialities required

	Pre-COVID 19	COVID 19	Total Cases
Total Cases	N = 36	N = 11	N = 47
Management*			
Medical	15 (41.7%)	7 (63.6%)	22 (46.8%)
Medical and surgical	9 (25.0%)	3 (27.3%)	12 (25.5%)
Surgical	12 (33.3%)	1 (9.1%)	13 (27.7%)
Ophthalmologist required			
No	5 (13.9%)	4 (36.4%)	9 (19.1%)
Yes	31 (86.1%)	7 (63.6%)	38 (80.9%)
Other speciality required			
No	16 (44.4%)	6 (54.5%)	22 (46.8%)
Yes	20 (55.6%)	5 (45.5%)	25 (53.2%)
Other speciality**			
Maxillo-facial and Orthopaedics	1 (2.8%)	1 (9.1%)	2 (4.3%)
Maxillo-facial and Neurosurgery	6 (16.7%)	2 (18.2%)	8 (17.0%)
Maxillo-facial and Cardiothoracics	1 (2.8%)	0 (0%)	1 (2.1%)
Maxillo-facial, Neurosurgery and ENT*	2 (5.6%)	0 (0%)	2 (4.3%)
Maxillo-facial	7 (19.4%)	0 (0%)	7 (14.9%)
ENT	1 (2.8%)	0 (0%)	1 (2.1%)
Plastic surgery	0 (0%)	2 (18.2%)	2 (4.3%)
Neurosurgery	2 (5.6%)	0 (0%)	2 (4.3%)

*Table represents percentages of cases pre-COVID 19, during COVID 19 and the management required, as well as other surgical specialist services that were needed for ocular trauma

During the COVID-19 pandemic period, there were only 11/47 cases of ocular trauma, accounting for 23% of total cases. The mean age was 33.8. The most common age category was 18-30, with 36% of cases followed by 31-40, which also accounted for 36% of cases. The age range was 23-43, with demographics similar to the pre-COVID -19 cases. Mitchells Plain and Gugulethu remained the most common areas where injuries occurred. Assault remained the most common manner of trauma, accounting for 7/11 (63%) of cases and accidental trauma accounted for 4/11 (37%). Work-related injuries accounted for $\frac{3}{4}$ (75%) of total accidental trauma, with home-related accounting for $\frac{1}{4}$ (25%). Most common injuries remained as ruptured globe and lid laceration, account for almost 4/11 (37%) of all cases. Medical management was sufficient in 7/11 (63%) of cases, with the remaining needing surgical intervention, in keeping with the most common injuries. Ophthalmology services were required in 7/11 (63%) of cases. Of the total cases, 4/11 (36%) were discharged from the trauma unit and 4/11 (36%) needed outpatient management. Approximately, 5/11 (45%) of patients required follow-up, of which only 1/5 (20%) attended the follow-up.

DISCUSSION

The key findings in this study were that ocular trauma accounted for 3.6% of total trauma cases for the study period. This study showed that assault was the leading cause of ocular trauma with a much higher proportion of young males being affected. Most ocular trauma cases were polytrauma cases involving the head, neck and face, which required multidisciplinary management. These injuries were also more likely to result in worse visual outcomes requiring surgical intervention. A significant proportion of cases resulted in unilateral blindness despite presenting to a facility and being treated timeously. COVID-19 lockdown observed an overall reduction in trauma cases however those that occurred were most commonly due to assault and the outpatient follow-up during this period was worse.

According to our knowledge, no similar study has been conducted in recent years. This study revealed that roughly 36 per 1000 individuals that sustain injuries from trauma are likely to sustain ocular trauma. A study conducted in 1988 in the United States²⁷ by Wilson et al investigated ocular trauma over a two month period. According to the study which also included children under the age of 18-years old, ocular trauma accounted for 3% of cases.²⁷ According to the World Health Organisation (WHO), general trauma has been on a steady rise^{1,4}, and a possible inference could be made that ocular trauma rates would be on a steady increase too. The cause of the majority of ocular trauma was assault, accounting for 77% of cases and regarded as preventable.^{11,13} Some studies have documented that prevention strategies to reduce assault and interpersonal violence are difficult to develop.^{1,4} Some mention reducing drug and alcohol intake with stricter laws, prohibiting access to weapons and community education.¹ However in this study assault remained the leading cause of trauma even during lockdowns.

Many studies have shown that men have a greater tendency to suffer from injury compared to females.^{1,8,10-13,16,28} Ocular trauma is no different and it is well documented that men are more likely to sustain ocular injuries compared to females. A study in New Zealand quoted a ratio of 3:1, a study in Malaysia was 6:1, in India it was 2.7:1 and in the United States it was 3.5:1.^{10,27,29,30} Two studies in South Africa, quoted a ratio of approximately 4:1.^{16,18} In this study, ocular trauma was disproportionately higher in males compared to females with a ratio of 46: 1, with females accounting for only 2% (1/47) of total ocular trauma cases, South Africa has one of the highest rates of intimate partner violence in the world, it is therefore, unclear whether women are presenting at other facilities or not presenting at all. A study showed that women who are victims of intimate partner violence are likely to sustain facial injuries and ocular trauma, this is not reflected in this study.³¹ This could be masked by the low occurrence of ocular trauma in women.

Most ocular injuries do not occur in isolation, they are often associated with other injuries, most commonly affecting the head, neck and face. As a result, neurosurgery, maxillofacial surgery and ENT surgery are involved in the co-management of these patients.^{29,30} In this study, a larger proportion of patients needed multidisciplinary intervention, approximately 25/47 (53%) of cases sustained other injuries, most notably facial fractures and traumatic brain injury and needed other specialist services such as maxillofacial surgery and neurosurgery. The remaining 22/47 (47%) of cases sustained isolated ocular injuries. These polytrauma cases were accompanied by severe ocular injuries, most notably ruptured globe injuries, accounting for 8 out of 25 (32%) cases. Unilateral blindness resulted in 10/25 (40%) of the polytrauma cases and the only 2 bilateral blindness cases of the study were also as a result of polytrauma. A study in Malaysia documented 7% of cases having other injuries compared to India, which had 55% of cases

involving other injuries, which is in keeping with this study.^{29,30} The need for multidisciplinary services is key to improving trauma outcomes.

Most of the cases required surgical intervention accounting for 25/47 (53%) of cases. Surgery was either indicated for a ruptured globe or for a lid laceration. Unfortunately, surgery for the ruptured globes, 13/25 cases (52%) resulted in evisceration therefore not a vision-saving operation and consequently, resulted in the use of limited and valuable state resources without the reward of restoring vision.^{15,32} This is relevant as most of the polytrauma cases in this study resulted in other life-threatening injuries, such as a traumatic brain injury that required immediate attention and often the ocular injury is given less attention. However, this appropriate delay can result in worse visual outcomes as vision-threatening injury will not take preference over a life-threatening injury.³³ The impact of both bilateral and unilateral blindness on an individual's life is two-fold, there are personal implications as well as economic.^{12,26} It may affect quality of life and independence, less involvement in the workforce and has been associated with mental health disorders. Those with bilateral blindness experience more severe consequences of daily life compared to those with unilateral blindness.³⁴ There is also a macro - and micro - economic cost implication, as mentioned individuals are less likely to be involved in the workforce, which may lead to unemployment and poverty. It has also been shown to affect global productivity, with a loss of \$411 billion, according to WHO.²⁶

As previously mentioned, ocular trauma is a public health concern that can lead to vision loss.¹¹⁻¹³ It has been noted that 90% of ocular trauma is preventable with simple interventions, however this statement may be incomplete and should state that 90% of ocular trauma as a result of accidental injury is easily preventable. Accidental injuries in the workplace, sports field and due to road traffic accidents have clear

prevention strategies in places, such as use of protective eyewear. Most of the studies, which have quoted this proportion of preventable blindness have been conducted in high income countries where more ocular trauma is as a result of accidental injuries. In LMIC, ocular trauma is most commonly due to assault and interpersonal violence, which is evident in this study with 36/47 (77%) of cases being assault-related and 11/47 (23%) of cases due to accidents. The World Health Organisation has stated that assault is preventable and strategies such as identifying risk factors for assault are targeted in order to mitigate violence. This is challenging and easily implemented interventions for interpersonal violence are difficult to develop. The WHO specifically targets reducing access and availability of alcohol and illicit substances, reducing access to weapons, promoting gender equality and deconstructing ideas that support violent behaviour. The effect of these interventions is not immediate. .

Most cases were referred appropriately from primary healthcare facilities, as 81% of cases required ophthalmology services. Most patients presented and were treated timeously by a healthcare facility, which has been found to result in improved outcomes.^{15,18} This may indicate that there is a functional tertiary level service and efficient referral systems that exist. A study in Tanzania found that most patients presented after 24 hours, but in developed countries the timeous presentation and treatment reflects what was found in this study.^{14,15,19,33} Other parts of the African continent may not be as well-equipped or have enough resources and it may result in delayed care and worse outcomes.

During COVID-19, there was an overall reduction in the number of ocular trauma cases, resulting in only 11/47 (23%) during COVID-19 compared to 36/47 (77%) pre-COVID-19, roughly translates to 5.5 cases per month vs 9 cases per month, respectively; however, there were more assault cases (7 out of 11) compared to accidental cases (4 out of 11), which is a conflicting finding to most studies but supported by

Navsaria, demonstrating that there was an overall reduction of trauma however, assault cases predominated over accidental ones.³⁵⁻³⁹ The characteristics of individuals affected remained consistent between pre-COVID-19 and COVID-19 periods, such as young males, who are unemployed and live in LMIC areas. These factors are the social determinants of trauma and ocular trauma. It has been theorised that young males are more likely to participate in risky behaviour that result in unintentional injuries.⁴⁰ This could explain why these cases continued to occur during COVID-19 as these factors remain unchanged in a densely populated area. Another reason for the relative disproportion is that accidental injuries due to road traffic accidents were unlikely to occur as there were strict enforcements made on freedom of movement of people thereby restricting use of vehicles. The healthcare system continued to treat vision-threatening pathology throughout the pandemic, although access to follow-up was adversely affected. Patients were not seen due to COVID-19 and patients did not follow up, possibly due to fear of contracting COVID-19. The effect of the pandemic was detrimental to ocular health and trauma as loss to follow-up resulted in worse outcomes that may have been preventable.²⁵ As this was a retrospective study, it is difficult to determine the reason for the lack of attendance, however inference may be made that there was 2-fold reasons: there may have been difficulty in accessing transport to attend the follow-up and during this time people were afraid of contracting COVID-19 and avoided hospitals.^{7,25} This behaviour may be mimicked in future pandemics and likely to have negative outcomes on ocular health.

There were outlying findings in this study that have not been documented in other studies, such as the consequence of community assault. Community assault resulted in 25% of ocular trauma cases, of which 30% resulted in severe injury and unilateral blindness. It is described as a form of vigilante justice in South Africa that is commonly seen in low-income areas and is a result of community retribution for criminals not tried or convicted by law enforcement.⁴¹ In order to correct and solve this societal disruption in the

community requires improved law enforcement possibly with patrol units, community outreach centres that focus on holistic betterment of the community or the involvement of community health forums or street committees.

The strengths of this study

The strength of this study is that it involved a large cohort of cases with adequate documentation that could be reviewed to reveal incidence of ocular trauma in a general trauma unit. It was relatively easy to conduct and cost efficient. This study provides novel data regarding contribution of ocular trauma to the general trauma burden, which has not been recently described in any other study according to our knowledge.

The limitations of this study

This was a retrospective cohort study and by its nature occasionally resulted in missing data. It was also difficult to establish cause and effect of ocular trauma, given it was retrospective.

Recommendations

A recommendation would be to conduct more clinically relevant studies in order to single out modifiable risk factors for ocular trauma, which can be targeted for prevention strategies. A further recommendation would be to reinforce and support current surgical services to improve the current standard of care for ocular trauma. The current service may benefit from an outreach program that will upskill healthcare workers in the primary healthcare facilities to manage ocular trauma that is appropriate for their level of care prior to referring to a tertiary level of service. In order to reduce the level of ocular trauma, assault and interpersonal violence needs to be addressed and intervention needs to be implemented accordingly, such

as reducing access and availability of alcohol and illicit substances, reducing access to weapons, promoting gender equality and deconstructing ideas that support violent behaviour.

CONCLUSION

The study revealed demographic findings in keeping with current literature. It also provided incidence of ocular trauma and its burden on a trauma centre. Ocular trauma is more likely to occur in poly-trauma and as a result of assault, which are both associated with worse visual outcomes and require multidisciplinary teams. Trauma due to assault is difficult to prevent compared to accidental injuries and developing prevention strategies may be challenging. COVID-19 lockdown resulted in less ocular trauma cases overall however assault continued to predominate. It was found that follow-up was worse possibly due to fear of contracting COVID-19 and difficulty in accessing transport. It will be important to maintain and improve current allocation of resources that treat ocular trauma in the context of polytrauma to preserve the current response level. Public health interventions are required to prevent trauma and the long-term consequences of ocular trauma.

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ADDENDUMS

1. Data Collection Form

THE EPIDEMIOLOGY AND OUTCOMES OF OCULAR TRAUMA PRE- AND DURING COVID-19 LOCKDOWN IN CAPE TOWN, SOUTH AFRICA

PRINCIPAL INVESTIGATOR: A/PROF SALOME MASWIME

SUB – INVESTIGATOR: DR ZAHRA LOGDAY

CLINICAL SITE: GROOTE SCHUUR HOSPITAL

I am confident that the information supplied in this case record form is complete and accurate data. I confirm that the study was conducted in accordance with the protocol and any protocol amendments and that PERMISSION to access case records was obtained prior to the study.

Investigator's Signature:

Date of signature:

D	d	m	m	m	y	y	y	y

INCLUSION CRITERIA

	<i>YES</i>	<i>NO</i>
1. Did the patient experience any direct ocular trauma?		
2. Did ocular trauma occur between 1 December 2019 - 31 May 2020?		

IDENTIFYING DATA

Study Number	
Hospital Number	
Surname	
Name	

DEMOGRAPHICS

Tick an option for each

If select OTHER, please specify

Date of Birth (dd/mm/yyyy)	Day	Month	Year	
Sex	Male	Female	Other	
Education	Primary	Secondary	Tertiary	Unknown
Employment	Employed	Unemployed	Unknown	
Marital Status	Single	Married	Divorced	Unknown

DETAILS OF INJURY

Tick an option for each

If select OTHER, please specify

Date of Injury	Date (dd/mm/yyyy)					
Geographical Location (i.e., Mowbray)	Khayelitsha	Salt River	Lansdowne	Mitchells Plain	Other	
Place of Injury	Home	Work	Street	Unknown	Other	
Referral	Self	Facility, please specify Heideveld CHC Other				
Duration passed until presentation	0 – 6 hours	6 – 12 hours	12 – 24 hours	24 – 48 hours	>48 hours	
Classify Ocular Trauma	Blunt Force Trauma		Sharp Force/Penetrating Trauma		Chemical Trauma	
Manner of Trauma	Accidental			Assault		
If accidental, cause of trauma	Road traffic accident	Work-related	Fall	Other		
If assault, Object Used	Bottle	Knife	Unknown	Other		
Use of Substances by Patient	Alcohol	Illicit Substances	Unknown	Other		
Relationship to Assailant	Partner/Spouse	Family	Friend	Unknown	Other	None

Diagnosis						
Time between presentation and consultation	0 – 6 hours	6 – 12 hours	12 – 24 hours	24 – 48 hours	>48 hours	
Eye affected	Left		Right		Both	
Visual Acuity at Presentation (Left Eye)	>6/12	<6/12-6/18	<6/18-6/60	<6/60-3/60	<3/60	Other
Visual Acuity at Presentation (Right Eye)	>6/12	<6/12-6/18	<6/18-6/60	<6/60-3/60	<3/60	Other
Management Required?	Medical Only		Surgical Only		Medical and Surgical	
Required Specialist Ophthalmology Care?	Yes			No		
Required Other Specialist Care? Specify	Yes		No		Specify	
Disposal from Trauma Centre	Ophthalmology Admission	Ophthalmology Outpatient	Discharge from Trauma Centre	Abscond	Death	
Required Follow-Up?	Yes		No		Unknown	
Attended Follow-Up?	Yes		No		Not applicable	
Visual Acuity at Presentation (Left Eye)	>6/12	<6/12-6/18	<6/18-6/60	<6/60-3/60	<3/60	Other
Final Visual Acuity (Right Eye)	>6/12	<6/12-6/18	<6/18-6/60	<6/60-3/60	<3/60	Other
Other Injuries Present? If yes, list below	Yes			No		
List Injuries and outcomes						