SUBMITTED 9 FEB 22
REVISIONS REQ. 9 MAY & 18 JUL 22; REVISIONS RECD. 23 JUN & 27 SEP 22
ACCEPTED 16 OCT 22
ONLINE-FIRST: DECEMBER 2022
DOI: https://doi.org/10.18295/squmj.12.2022.065

The Impact of the COVID-19 Pandemic on the Pattern of Trauma Presenting to a Tertiary Care Trauma Center in Oman

Rahma Al Harthi,[1] Maram Al Hinai,[1] Maather Al Abri,[2] Ashjan AlMaamari,[3] Edwin Stephen,[4] *Hani Al Qadhi[4]

[1]Department of General Surgery, Oman Medical Specialty Board, Muscat, Oman; [2]Department of General Surgery, [3]Sultan Qaboos University, Muscat, Oman; [4]Department of General Surgery, Sultan Qaboos University Hospital, Muscat, Oman.
**Corresponding Author's e-mail: halqadhi@squ.edu.om*

Abstract

Objective: We noticed a change in the pattern of presentation of trauma cases at SQUH, before the pandemic and during the two waves. Our study aimed at studying this observation. ***Methods:*** This retrospective study was from January 2019 to October 2021. Data of all trauma patients was collected from the hospital information system after ethics committee approval. The pattern of trauma was divided into pediatric, adult, and geriatric age groups. Location of trauma was described as outdoor, home and roads along with the details of mechanism of trauma was collected. Patients with incomplete data were excluded. ***Results:*** Based on the inclusion criteria 589 records were analyzed. The mean age of presentation was 29 years. Majority were male (71%). Adults were (54.2%), pediatrics (34%) and geriatric (11.9%). There was a gradual increase in percentage of pediatric trauma during pre-COVID, COVID wave 1 and COVID wave 2 (29%, 32%, 51%), respectively. A significant decline in the number of geriatric trauma by almost 50% between pre-covid and covid phase II. Increase in trauma at home during COVID phase II (65.9%) as was an increase in penetrating trauma during COVID phase II (16.5%). ICU

admissions increased during the first wave of the pandemic (10.5%). ***Conclusion:*** We noted a true change in the pattern of trauma cases before and during the COVID -19 pandemic. Observations made could lead to better safety guidelines for the pediatric age groups and take steps to reduce penetrating trauma.

Keywords: Trauma, coronavirus, COVID-19, Oman, Muscat, Epidemiology.

Advances in Knowledge

- The rate of pediatric trauma increased during the COVID19 pandemic.
- The rate of trauma has overall decreased during the pandemic.
- The rate of Motor Vehicle Crashes (MVC) was not affected by the restrictions implemented during the pandemic.

Application to Patient Care

- Public awareness should be raised to prevent trauma during pandemics with special focus on the most vulnerable demographic groups.
- With the overwhelming load of pandemic on the health systems and healthcare workers, understanding trauma patterns during a global pandemic will aid in preparing and planning strategies to deal with such an issue.

Introduction

The COVID-19 pandemic has had a significant impact on the social, economic, educational and health systems all over the world. Many adjustments and restrictions were implemented in an attempt to curb the spread of the virus and minimize the burden of the disease.

The Sultanate of Oman is located in the southeastern coast of the Arabian Peninsula and has a population size of 4.5 million people.[1] The first two cases of COVID-19 infection in Oman were registered in late February 2020.[2] The number of cases related to travel gradually increased and community transmission was noted by the end of March the same year. A “Supreme Committee” [SC] was formed to manage the pandemic and released several directives to control the outbreak at regular intervals, based on the case load, morbidity, and mortality within the nation.[3]

During the pandemic tertiary hospitals in the Sultanate announced a temporary suspension of all routine non-emergency services such as elective surgeries and procedures, outpatient appointments, etc.[4,5] and ours was one such center - The Sultan Qaboos University Hospital [SQUH], located in the capital city of Muscat, with a capacity of 600 beds.[6] It is considered one of two major trauma centers in Muscat that accepts cases from all across the Sultanate.

Several studies conducted around the world showed that the pandemic led to significant reductions in trauma case load and changed the pattern injurie.[7,8] However, no national level studies were conducted to evaluate this issue. We noticed a change in the pattern of presentation of trauma cases at SQUH, before the pandemic and during the two waves. The objective of this study is to study the overall trend (increase or decrease) in trauma cases presenting to a major trauma center in the Sultanate. Moreover, it looks at identifying the groups that are at higher risk of trauma and the most common mechanisms of injuries. This will help in raising public awareness to prevent trauma injuries in such overwhelming situations, as well as providing a baseline data for stakeholders to prepare healthcare services to deal with such problems.

Methods

This retrospective, cross-sectional study included all trauma cases that presented to SQUH from 1st of January 2019 until 30th October 2021 and was conducted after ethics committee approval.

To make the comparison between different time periods, we divided the dates of data collection into three phases: pre-COVID (01 Jan 2019 - 29 Feb 2020), COVID phase I (01 March 2020 - 28 Feb 2021) and COVID phase II (01 Mar 2021 – 31 Oct 2021). Age groups were divided as pediatrics (less than or equal to 13 years of age), Adults (14 to 64 years of age) and Geriatrics (more than or equal to 65 years of age).

Electronic medical records of patients' were reviewed. Data collected included demographics (age and gender), date of presentation to the emergency department (ED), location of trauma, type of trauma (penetrating or blunt), mechanism of trauma, list of injuries, outcomes including disposition from the trauma bay (admission (ICU/ward), discharge home, transfer to another hospital or death and length of hospital stay in days.

Statistical analysis was conducted using Statistical Package for Social Sciences (SPSS 21.0). Continuous variables were presented as mean, median, and standard deviation. Categorical variables were presented as frequency and percentage. Association/difference between two categorical variables were assessed by using a Chi-square test (Fisher's exact/Likelihood ratio). Appropriate graphs were used to show trends over time. A P-value less than 0.05 was considered statistically significant. All the analyses were carried out in IBM SPSS Statistics version 28.0.

Results

We reviewed 594 files and excluded 5 of them as the data was incomplete, leaving a total of 589 cases.

Demographic data of our study showed that (Table 1) - majority of the patients were males (421;71.5%); and median age was 29 years (age range 7 weeks to 96 years). More than half of the cases were adults (54%), a third of the cases were children (34%) and 12% were in the elderly age group.

Phase wise analysis revealed a falling trend in the total number of trauma cases presenting to ED (288; 49%, 210; 36%, 91; 15%) (Figure 1) across the adult and geriatric age groups; however, a rising trend was noted for the pediatric age group (29.5%, 32% and 51.6%) which was statistically significant ($p < 0.05$). The gender distribution between the three phases of time was not statistically significant (p 0.061).

Majority of trauma occurred at home (344; 58%), followed by outdoors (184; 31%) and roads (46; 8%). These differences were not statistically significant (p 0.43). Only 10 cases occurred at work/school, and these were equally divided between the pre-COVID and COVID phase I. Blunt trauma was significantly higher than penetrating trauma (81% vs 11%) with decreasing frequency during the three phases (87%, 79% and 71%). However, the percentage of penetrating trauma increased (7%, 15% and 17%). This change in trend was statistically significant ($p < 0.05$).

As for the mechanism of trauma (Table 2), falls accounted for 57% of the total number of cases, followed by Motor Vehicle Collision/Accidents [MVC] (11%), penetrating trauma and others (8.8% each). Lastly, sports related injuries, crush injuries, assault, drowning, and suicide attempts accounted for the remaining cases (4.4%, 3.7%, 3.6%, 1.5% and 0.7% respectively). We noted a decreasing trend in falls and sports related injuries through the three phases. Interestingly, penetrating injuries and drowning saw an increase. The rate of MVC remained stable throughout the three-time phases. No particular trend was noted for the remaining mechanism of trauma.

Injuries to the extremities were the most common (38%, Lower limbs 23% and Upper Limbs 15%), (table 3). These included bone fracture/dislocation, soft tissue injuries or neurovascular injuries. Secondly, Head and Neck injuries accounted for 26% of cases and included traumatic brain / ophthalmic / soft tissue injuries to the scalp, face and neck, and maxillofacial fractures. This was followed by polytrauma (10%), Spinal injuries (5%), thoracic injuries (3%), genitourinary injuries (2%), abdominal injuries (1%) and pelvic injuries (0.3%). In 14% of the cases, which included those with falls with late presentation to the ED and foreign body ingestions, we found no injury acquired.

Ninety five percent of our patients required admission (88% were admitted to the ward, 7% required admission to ICU). Four percent of the cases were discharged home while 0.3% were transferred to a different hospital. No cases were declared dead in the trauma bay. The admission duration varied between one day to 155 days (median duration - 2 days). There was no significant difference in trauma outcome during the three-time phases.

Discussion

The COVID19 pandemic shook the social and medical realms amongst others. This retrospective study looks at the impact of this pandemic on trauma patterns presenting to a major Trauma Center (SQUH) in Oman's Capital city of Muscat. This was done by comparing all trauma presentations to ED one-year pre-COVID, the first and second phase of COVID.

589 cases made it to the final analysis. We noted an overall decrease in the total number of trauma cases presenting to ED. When comparing the three-time phases, the total number of cases dropped by a third between the pre-COVID and COVID phase I (288; 49% versus 210; 36%) respectively. This trend continued in the second phase, where we observed a further drop of two-thirds (91; 15%). The latter could be an overestimation as data was collected until October 2021, which makes it a shorter period of time compared to the two other time phases. Several international studies have found a similar trend like a multicentre study by Berg et al which found a 32% decrease in the number of trauma cases during the pandemic.[7] Other studies showed a decrease ranging from 22% to 57%.[8,9] These observations can be attributed to the precautions that were implemented during the pandemic. This included closure of all international border for non-residents, restricting inter-governorate travel to absolute essential, a 70% reduction in the number of employees at workplaces [work from home policy], suspension of classes in schools and universities, banning all public gatherings, closing retail outlets, and recommending social distancing.

The first lockdown in the Muscat governorate was implemented on the 10th of April 2020, which was subsequently extended during the holy month of Ramadhan and finally lifted on May 29th.[10,11] Alongside this was a staged lockdown between governorates in June. Night curfew [NC] was implemented from March 28th till April 8th, 2021, between the hours of 8pm and 5am. The implementation of a lockdown/curfew led to a significant reduction in public and traffic movement. In our study, we found no significant drop in trauma cases during the first lockdown, in fact, the number of cases has remained stable. On the contrary, a drop was noted in the following year during the partial lockdown /NC.

As for demographics - males predominate with a male to female ratio of 3:1. This male predominance is consistent with trauma epidemiology overall[12] and no significant change in the sex distribution was observed during the COVID pandemic. This was true for our study and in other international studies.[7,13,14] When it comes to age, adults (13 to 64 years) formed the majority of our study population (54%), and this is expected as this age group was the most active. Although the number of trauma cases for both adult and geriatric age groups has significantly dropped during the pandemic, the number of pediatric trauma has risen significantly

and exceeded the percentage of adult trauma in COVID phase II (52% vs 41%). This finding was contrary to what was found in other studies which showed a drop in overall pediatrics trauma reaching up to one half.[15,16] We also expected the rate to decrease considering the shutdown of schools, parks, public playgrounds etc, but home related injuries can explain this rise. This might be due to the increase of stressors to families resulting from a number of new changes such as; working from home, supervising online teaching, lack of professional childcare services as well as restrictions in seeking extended family support. This in turn led to reduced direct and expert supervision and care of children.

More than a half of trauma occurred at home followed by a third occurring outdoors. There was no statistically significant difference in the distribution of trauma location between pre-COVID and the two phases of COVID. The proportion of blunt versus penetrating injury, however, changed during the pandemic. A significant decrease in blunt trauma was noted, versus a rise in penetrating trauma. This change was also demonstrated in studies conducted in the United States of America and the United Kingdom.[8,17,18] The increase in penetrating injuries has reached up to 21% in a multicenter retrospective study from South California, USA.[19] This was attributed to the socio-economic stress that resulted from the pandemic such as cutting down working staff and a rise in unemployment rate.[7,8,19] Others have attributed this to the rise in homicide, sales of firearms, self-harm, and domestic violence.[19,20] However, we cannot relate these findings to our studied population, as only three cases of penetrating injuries were attributed to assault and all of them were stabbing injuries. Another explanation is that more Do It Yourself (DIYs) were conducted at homes, which have resulted in those injuries. This rising trend should alert health care professionals to be prepared to deal with penetrating injuries as they are usually more severe. Moreover, such injuries are usually associated with more blood loss and often require blood transfusion. There was a shortage in blood supply during the pandemic due to reduction in donation[21], the health system should therefore be prepared to overcome such problems in the future.

Different mechanisms of injury were noted in our group, but the majority was due to falls (57%), followed by MVC (11%) and penetrating traumas (8.8%). During the different time periods, we noted a decreasing trend in falls and sports related injuries. Other studies have also found a

similar trend, which was statistically significant[19] and was attributed to social gatherings being banned, and sports centres being shut down during COVID Phase I and II. The trend of MVC remained unaffected during the pandemic while we expected it to drop given the implemented restrictions that reduced road travel in general. A no change trend in MVC was also noted in other studies[8], however, larger studies showed a significant reduction of MVC.[7] A possible explanation for our finding is that less severe MVC related injuries were dealt with in regional or non-trauma centers prior to the COVID pandemic. And although the overall trend reduced, the severity of injuries increased during the pandemic and such cases could only be managed in a major trauma center like SQUH. Drowning incidents increased in COVID Phase II. This is probably because private properties with swimming pools were more utilized during the pandemic in an attempt to entertain families and lift the pressure associated with the lockdown.

The distribution of injuries was classified by anatomical location. Cumulative upper and lower limbs injuries accounted for 38% of all acquired injuries. Head and neck injuries were the second most common and account for a quarter of our cases. These injuries are usually associated with blunt injury which was more common in our cohort.

We have studied the short-term outcome of our cases and found that 95% required admission and only 4% were safe to be sent home. There was no noted effect of the pandemic on the disposition of the patients from the trauma bay. We had a median length of hospital stay of two days which was also not affected by the pandemic. Our median seems to be shorter than that shown in other studies which varied between 4 days[17,19] and 5.5 days.[18] This might be due to less severe injuries seen in our study population.

This study aims to look at the trend of trauma patterns before and after the COVID pandemic and does not aim to compare particular blocks of time or absolute date. Being a retrospective study, there are a number of limitations associated with this type of studies such as recall bias, missed data and mis-documentation. Moreover, this is a single center study in the capital of the Sultanate which might not reflect the pattern of trauma in other areas of Oman before or during the pandemic. Also, a number of new implementations have been imposed by the SC to control

the pandemic, and the exact direct cause in changing the trauma pattern cannot be specifically identified.

Conclusion

The COVID-19 pandemic has influenced the frequency and pattern of trauma in Oman. There is an overall decrease in the total number of trauma cases presenting to SQUH, however, the proportion of pediatrics and penetrating injuries showed an increase. Despite the limitations of our study, the findings can be taken into consideration when formulating safety guidelines for the pediatric / geriatric age groups with special attention to penetrating trauma, lest there be another phase or pandemic.

Conflicts of Interest

The authors declare no conflict of interests.

Funding

No funding was received for this study.

Author Contributions

Rahma Al Harthti was involved in data collection, data analysis, literature review and manuscript writing. Maram Al Hinaei was involved in data collection and in drafting out the ethical approval application. Maather Al Abri was involved in data collection. Ashjan AlMaamari was involved in data collection. Edwin Stephen was involved in study design and supervising the research. Dr Hani Al Qadhi was involved in supervising the research. All authors approved the final version of the manuscript.

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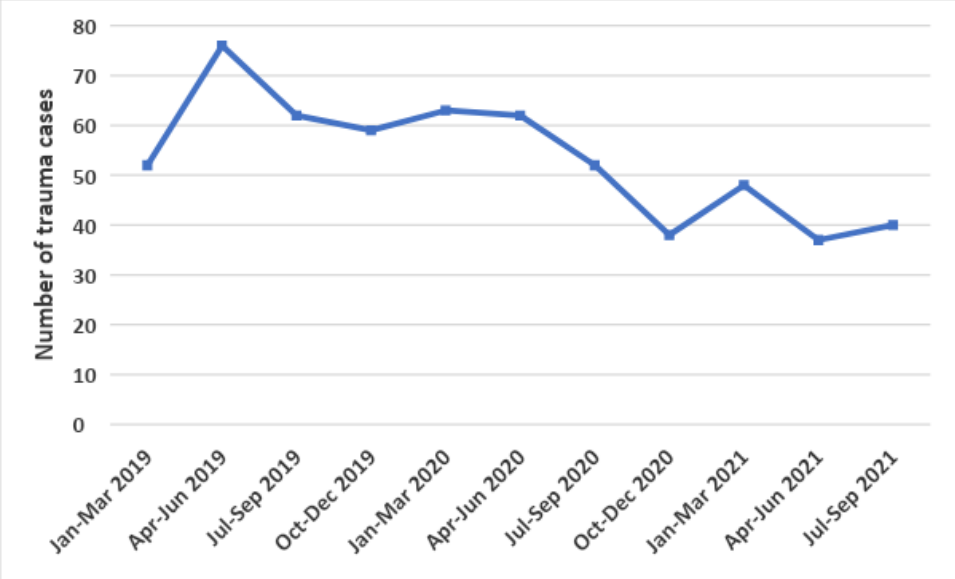

Figure 1: The number of trauma cases presenting to ED from January 2019 till September 2021

Table 1: The demographic data of our studied population.

	Pre-COVID (288)	COVID Phase I (210)	COVID Phase II (91)	Total number (589)
Sex				
Male	193 (67%)	160 (76%)	68 (75%)	421 (71.5%)
Female	95 (33%)	50 (24%)	23 (25%)	168 (28.5%)
Age groups				
Pediatric	85 (29.5%)	68 (32%)	47 (51.6%)	200 (34%)
Adult	161 (55.9%)	121 (58%)	37 (40.7%)	319 (54%)
Geriatric	42 (14.6%)	21 (10%)	7 (7.7%)	70 (12%)

Table 2: Mechanism of injury

	Pre-COVID (n 288)	COVID Phase I (n 210)	COVID Phase II (n 91)	Total (n 589)
Fall	175 (61%)	115 (55%)	48 (53%)	338 (57%)
MVC	32 (11%)	23 (11%)	10 (11%)	65 (11%)
Penetrating	14 (5%)	27 (13%)	11 (12%)	52 (8.8%)
Sports	19 (6.6%)	5 (2%)	2 (2%)	26 (4%)
Crush	11 (4%)	7 (3%)	4 (4%)	22 (3.7%)
Assault	10 (3.5%)	9 (4%)	2 (2%)	21 (3.6%)
Drowning	4 (1%)	1 (0.5%)	4 (4.4%)	9 (1.5%)
Suicide attempt	2 (0.7%)	1 (0.5%)	1 (1%)	4 (0.7%)
Others	21 (7%)	22 (10.5%)	9 (10%)	52 (9%)

Table 3: Anatomical location of the injuries

	Pre-COVID	COVID Phase I	COVID Phase II	Total
Head and Neck	62 (21.5%)	58 (28%)	34 (37%)	154 (26%)
Lower Limbs	80 (28%)	44 (21%)	13 (14%)	137 (23%)
Upper Limbs	49 (17%)	32 (15%)	9 (10%)	90 (15%)
Polytrauma	26 (9%)	26 (12%)	6 (7%)	58 (10%)
Spine	13 (4%)	10 (5%)	4 (4%)	27 (5%)
Thorax	9 (3%)	5 (2%)	2 (2%)	16 (3%)
Genitourinary	4 (1%)	4 (2%)	2 (2%)	10 (1.7%)
Abdomen	3 (1%)	3 (1%)	0 (0%)	6 (1%)
Pelvis	2 (0.7%)	0 (0%)	0 (0%)	2 (0.3%)
Others	4 (1%)	0 (0%)	0 (0%)	4 (0.7%)

Note: There are excluded data for patients who had no or minimal injury (36, 28 and 21 patients from the pre-COVID, COVID phase I and COVID phase II respectively.