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*Research Article*

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# A Descriptive Study of Trauma During the COVID-19 Pandemic in a Major Trauma Centre in the United Kingdom

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**Abstract**

**Background:** The coronavirus disease 2019 pandemic has caused a major health crisis. A significant reconfiguration of services occurred to help deal with this pandemic. This study aims to describe the change in trauma and orthopaedics services during this period of major lockdown rules.

**Methods:** A retrospective data analysis was performed using the trauma and orthopaedics electronic trauma database, between the 23rd of March to the 23rd of April 2020. A 30 day period was used to identify outcomes.

**Results:** There were 257 patients identified, with a mean age of 59 years old (2-100 years old) and a M:F ratio was 108:149. The biggest group of patients was 53 (20.6%) in the 80-89 year old. The majority of fractures were proximal femur fractures (25.7%) and the majority of injuries were indoors (74.3%) with fall from standing height (46.6%) being the main mechanism of injuries. There were 15 (5.8%) patients with a positive COVID-19 test and there were 15 (5.8%) dead patients at 30 days follow up. Significance was identified between an older decade and mortality ($p=0.002$), ASA and COVID-19 ($p=0.003$), ASA and mortality ($p<0.001$), residence and mortality ($p=0.013$), place of origin and COVID-19 ($p=0.044$) and place of origin and mortality ($p=0.044$).

**Conclusion:** Good management of basic common conditions is required during any reduced activity environment for the public. General public advice and warnings can help reduce the workload of trauma and should be considered by the healthcare professionals.

**Keywords:** COVID-19; Trauma; Major trauma centre; Epidemiology.

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## Introduction

In January 2020, countries across the globe encountered a major health crisis. The coronavirus outbreak was declared a public health emergency of international concern on the 3rd of January 2020. The World Health Organisation (WHO), named it, the coronavirus disease 2019 (COVID-19) [1]. On the 11th of March 2020, the WHO declared this disease as a pandemic [2]. In early March 2020, COVID-19 cases started to rise steadily in the United Kingdom [3]. In an attempt to reduce the number of cases, the United Kingdom government introduced social distancing measures and a lockdown procedure in the country on the 23rd of March 2020 [4]. Despite these measures, the pandemic continued to spread which put the National Health Service (NHS) under pressure [1, 3]. However, the health sector in the United Kingdom responded rapidly, by focusing its resources and undergoing major reconfiguration of services to saving the lives of those infected with COVID-19 [5]. Across the country, strategic planning and service reconfiguration in medical and surgical specialities was carried out. The British Orthopaedic Association (BOA), promptly recognized the effect of the pandemic on trauma and orthopaedic treatment and services. Hence, emergency BOAST guidelines in response to the pandemic were published to aid clinicians in optimising treatment. The aim was to balance treatment, with patient safety and resource availability [6]. Our institution is a Major Trauma Centre (MTC) that provides a full range of acute hospital services for approximately 1.1 million people living in and around the North Midlands area [7]. Moreover, the hospital is a tertiary referral hospital for trauma and orthopaedics, spinal surgery, neurosurgery, cardiothoracic, and plastic surgery. This increases the impact of our services, as our MTC provides service to almost 3 million people in a wider area, including North Wales [8].

As a response to the pandemic, continued services were provided for urgent and essential surgery during the crisis. However, some modifications to treatment pathways were introduced, in line with the BOAST national guidelines [6]. This was to reduce patient exposure to disease and minimise pressure on the NHS. It was recognised early, that the pandemic placed huge demands on the entire service and changed the way our trauma centre worked. This study aims to describe the change in trauma and orthopaedics during the lockdown period of COVID-19 pandemic in a MTC, evaluate the effect of the lockdown measures on the case load and type, and finally compare our findings with international studies [9].

## Methods

The trauma and orthopaedics electronic daily admission trauma list was used to form this study's database. Anonymised data were collected between the 23rd of March to the 23rd of April 2020, which marked one month activity at our institution, since the COVID-19 major lockdown measures were introduced in the United Kingdom. Those included only shopping for basic necessities, one form of exercise a day, any medical need or care, travelling from and to work, but only if absolutely necessary and cannot be done from home, closing all shops selling non-essential goods, stopping gatherings of more than two people in public excluding the ones you live with and stopping all social events [4]. Data categorised into Demographics, laterality, type of injury, surgical intervention, American Society of Anaesthesiologists (ASA) grade [10], mechanism of injury, polytrauma, open injuries, current residence, place of origin, COVID-19 status and 30 day mortality. The age was divided per decade, 0-9 years old, 10-19 years old, 20-29 years old, 30-39 years old, 40-49 years old, 50-59 years old, 60-69 years old, 70-79 years old, 80-89 years old and over 90 years old. The laterality was expressed as left, right, bilateral and not applicable for spine cases. Injuries were divided as wound (lacerations, bites), infection (cellulitis, abscess, flexor sheath infection, infected metalwork), any septic joint review, joint dislocation (native and prosthetic), hand injury (hand fractures, tendons injuries), distal radius fracture, forearm fracture, elbow fracture, upper arm fracture (humerus, shoulder, clavicle, scapula), pelvic and acetabular fracture, proximal femur fracture (Intracapsular, extracapsular and subtrochanteric), femoral fracture, knee fracture (tibial plateau, patella), tibia and fibula fracture, ankle and foot fracture, periprosthetic fracture, spinal fracture, metastatic spinal cord compression (MSSC), spinal cord compromise (spinal stenosis, compression, cauda equina syndrome) and paediatric painful hip review.

The surgical intervention was divided to wound management, open reduction and internal fixation (ORIF), total hip arthroplasty (THA), Hemiarthroplasty, Dynamic Hip Screw (DHS), Intramedullary Nail (IM Nail), External Fixation (Ex Fix), Incision and Drainage (I&D) (metalwork removal cases included), Manipulation Under Anaesthesia (MUA) with or without k-wire fixation, Tendon Repair, Revision Arthroplasty, Spinal fixation (only trauma) and Spinal Decompression. The mechanism of injury was divided, motor vehicle collisions, farming injuries, bicycle injuries. The current residence was divided to own residence or sheltered accommodation (care or nursing homes). The place of origin refers to the presentation area and is divided to inside the house, outside the house and ward referrals. Finally, in the polytrauma patient, the most severe injury was used for classification purposes. Categorical data were evaluated with the chi square test. Fisher's exact test was used for low number cases. A p value of less than 0.05 was considered significant. The SPSS v23 was used for data analysis.

## Results

During the study period, 257 patients were identified requiring an inpatient hospital treatment at our MTC.

### Age, sex and laterality

(Figure 1), divides age groups by decade. The mean age was 59 years old (2-100 years old) and the median age was 65 years old. Majority of patients were older, with 53 patients (20.6%) being the largest group, in the 80-89 years old. There were 108 (42.0%) males and 149 (58.0%) females. In terms of laterality, 111 (43.2%) were left sided, 99 (38.5%) were right sided, 4 (1.6%) were bilateral and 43 (16.7%) were spinal injuries.

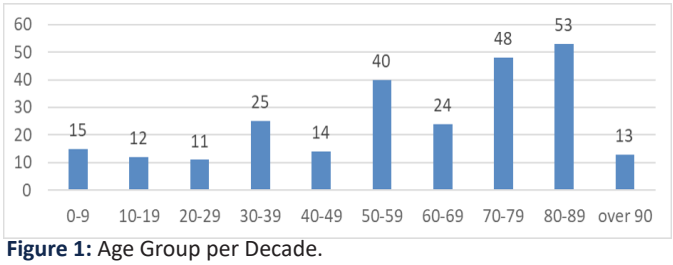


**Figure 1:** Age Group per Decade.

### Injury classification

(Figure 2), divides each type of presentation by number presented in our MTC. The classification of injuries showed 23 wounds (8.9%), 24 infections (9.3%), 9 suspected septic joint reviews (3.5%), 12 joint dislocations (4.7%), 8 hand injuries (3.1%),16 distal radius fractures (6.2%), 1 forearm fracture (0.4%), 5 elbow fractures (1.9%), 5 upper arm fractures (1.9%), 6 pelvic and acetabular fractures (2.3%), 66 proximal femur fractures (25.7%), 5 femoral fractures (1.9%), 6 knee fractures (2.3%), 5 tibia and fibula fractures (1.9%), 13 ankle and foot fractures (5.1%), 7 periprosthetic fractures (2.7%), 22 spinal fractures (8.6%), 4 metastatic spinal cord compression (1.6%), 18 spinal cord compromise (7.0%) and 2 paediatric painful hip reviews (0.8%).

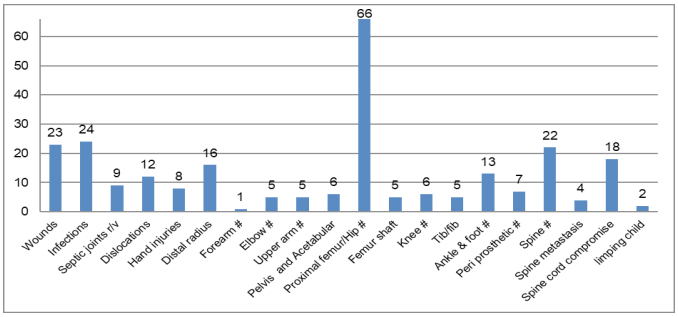


**Figure 2:** Number of cases by type of injury.

### Surgical intervention

(Figure 3), separates patients by type of surgical intervention required. Out of 257 patients, 169 (65.8%) required a form of surgical intervention. This was divided to 21 wound managements (8.2%), 27 open reduction and internal fixations (10.5%), 3 total hip arthroplasties (1.2%), 23 hemiarthroplasties (8.9%), 27 dynamic hip screws (10.5%), 15 intramedullary nails (5.8%), 1 external fixation (0.4%), 14 incision and drainages (5.4%), 9 manipulations under anaesthesia with or without k-wire fixation (3.5%), 5 tendon repairs (1.9%), 2 revision arthroplasties (0.8%), 4 spinal fixations (1.6%) and 3 spinal decompressions (1.2%).

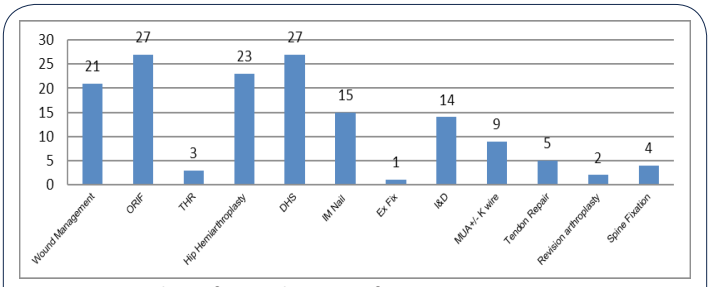


**Figure 3:** Number of cases by type of surgery.

### ASA

(Table 1), shows the amount and percentage of patients per ASA grade. The ASA grade showed 95 (37%) patients having a grade 1, 58 (22.6%) patients having a grade 2, 62 (24.1%) patients having a grade 3 and 42 (16.3%) having a grade 4.

**Table 1:** Percentage & Number of Cases by ASA grade.

| ASA | Number | Percentage |
|---|---|---|
| I | 95 | 37.0% |
| II | 58 | 22.6% |
| III | 62 | 24.1% |
| IV | 42 | 16.3% |

### Mechanism of Injury, Place of Residence and Severity of Injury

(Table 2), divides the mechanism of injury into different variables. The two main causes of the T&O case load was fall from standing height 46.6% and infection 8.9%. Almost three quarters of the cases 191 (74.3%) had an injury indoors, 54 (21.0%) were injuries outdoors and 12 (4.7%) were inpatient referrals. In terms of residence, 234 (91.1%) lived in their own house and 23 (8.9%) lived in a sheltered accommodation. Out of 257 patients, only 10 (3.9%) were polytrauma patients and only 10 (3.9%) patients were classified as open fractures.

**Table 2:** Number and Percentage of Case for Mechanism of Injury.

| Mechanism | Number | Percentage |
|---|---|---|
| Alcohol | 2 | 0.7% |
| Bite | 5 | 1.9% |
| Burn | 2 | 0.7% |
| Cooking | 3 | 1.2% |
| Degenerative | 14 | 5.4% |
| DIY | 12 | 4.6% |
| Exercise | 9 | 3.5% |
| Fall from standing | 120 | 46.6% |
| Fight | 8 | 3.1% |
| Fall from Height (>1m) | 15 | 5.8% |
| Infection | 23 | 8.9% |
| Motor Vehicle Accident | 4 | 1.5% |
| Play | 11 | 4.2% |
| Self Harm | 3 | 1.2% |
| Seizure | 3 | 1.2% |
| Shooting | 1 | 0.3# |
| Spontaneous | 13 | 5.0% |
| Tumour | 7 | 2.7% |
| Work Related | 2 | 0.7% |

### COVID-19 and mortality

There were 15 (5.8%) patients with a positive COVID-19 test and there were 15 (5.8%) deceased patients. The data collection was conducted 30 days after the last patient was admitted. Different categorical variables were assessed to identify a significant

correlation with mortality and a positive COVID-19 status (Table 3). Significance was identified between age group and mortality (p=0.002), ASA and COVID-19 (p=0.003), ASA and mortality (p<0.001), residence and mortality (p=0.013), place of origin and COVID-19 (p=0.044) and place of origin and mortality (p=0.044). More specifically, a higher ASA was associated with more likelihood of being positive for COVID-19 and also dying. Patients living in a sheltered accommodation prior to injury were more likely to die and individuals that were already hospitalised at the time of referral were more likely to have COVID-19 and die. Finally, 8 out of the 15 (53.3%) COVID-19 positive patients were dead at 30 days. Out of 15 COVID-19 positive patients, 7 (46.7%) required a surgical intervention. Out of those 8 COVID-19 positive patients that died, 5 (62.5%) were operated. Analysis between a positive COVID-19 status and mortality showed a significant association (p<0.001). Patients with COVID-19 positive status were nursed in a COVID-19 specific ward. The injury classifications for those 8 dead patients were 3 proximal femur fractures, 1 femur fracture, 2 periprosthetic fractures, 1 spinal fracture and 1 spinal compression.

**Table 3:** Correlation Between Categorical Factors with COVID-19 Status and Mortality.

| | COVID-19 | Mortality |
|---|---|---|
| Age Group (decade) | 0.080 | **0.002** |
| Sex | 0.360 | 0.482 |
| Laterality | 0.612 | 0.880 |
| Injury Classification | 0.438 | 0.620 |
| ASA | **0.003** | **<0.001** |
| Polytrauma | 0.542 (Fishers) | 0.542 (Fishers) |
| Open Fracture | 0.542 (Fishers) | 0.542 (Fishers) |
| Residence | 0.122 | **0.013** |
| Mechanism of Injury | 0.399 | 0.399 |
| Type of Surgery | 0.391 | 0.813 |
| Place of Origin | **0.044** | **0.044** |

## Discussion

COVID-19 and the restrictions that were put in place upon the public to both curb the spread and reduce the pressure on the health service has had a marked impact on all aspects of life in the United Kingdom. This has had an influence on the trauma that is presenting to our department. We have never before been in a situation where so much of the population has been confined to their own homes for such an extended period of time [4]. Zhu et al, identified prevalence in low energy trauma and an increase in the frequency of fragility hip fractures in their epidemiological study of trauma during COVID-19 [9]. This study demonstrates the pattern and mechanism of injury seen in a major trauma centre for the first month of full lockdown measures in the United Kingdom. In 2019 and 2018, our centre saw 890 and 1506 total case of major trauma brought in through the trauma network, respectively. This number would equate to an average almost 100 cases a month with the majority, if not all being attended by the orthopaedic team [11]. In the one month study period, only 10 (3.9%) cases were polytrauma, showing a tenfold decrease in polytraumas. Instead the majority of injuries, were proximal femur fractures, accounting for 25.7%. In our data gathering period (23rd March 2020 to 23rd April 2020), we had 66 hip fractures. In comparison, in March 2019 there we had 63 hip fractures in our MTC [12].

We had perceived an increase in the frequency of do-it-yourself (DIY) related injuries and in this one month period we saw 12 (4.6%) cases of DIY related injury requiring intervention. The majority of these related to falls from height whilst undertaking maintenance or repairs or are related to hand or finger injuries whilst using machinery or a saw. By far the most frequent mechanism of injury was low energy fall from standing height (46.6%). This was expected with the daily occupation of the majority of people having changed to being all but house bound. This is similar to previous literature and necessitates the introduction of a primary prevention measures to help reduce the above observations in cases of any further national lockdown [9]. The other precipitants of presentation remained broadly unaltered. The usual reasons for presentation such as infective, degenerative and neoplastic remained present (Table 2). There is a subjective perception that in the early part of lockdown the rates were much fewer than is typically seen, due to the lockdown measures [4]. This however raises more questions than it answers.

In the month studied, there were 15 cases presenting to the department of trauma and orthopaedics who were diagnosed with COVID-19. This represents approximately 5.8% of all cases presenting to the department. Of these cases, operative intervention was considered necessary despite the risks of surgery in 7 (46.7%) cases. The mortality rate amongst cases with COVID-19 was 53.3% in this month of study. This does appear to be a high rate compared to the previous published data suggesting a mortality of 21.9% and 26.4%, depending on a positive COVID-19 diagnosis preoperatively and postoperatively, respectively [13]. Our case mix is not however well spread. All patients with COVID-19 who required and were considered suitable and fit an operation were patients advanced in years, who had sustained a hip fracture, periprosthetic femoral fracture or distal femoral fracture. The number of patients with COVID-19 who underwent surgery is too few to draw any conclusions regarding mortality rate, other than it does appear to be higher than the usual hip fracture rate for our hospital. In 2019, our centre treated 725 hip fractures with an average mortality rate of 5.5% [12].

Furthermore, test inaccuracy and infected patients not exhibiting significant symptoms, can lead to an underestimation of the correct number of COVID-19 positive patients [14]. In the United Kingdom, London had the highest amount of deaths due to COVID-19, showing that there was an increase in COVID-19 prevalence there [3]. Further studies are required to better understand the impact of this disease, in areas of higher COVID-19 prevalence.

There have been changes to the way the profession as a whole has addressed musculoskeletal trauma. The BOA have provided updated guidance in safely dealing with trauma, whilst the pandemic is underway [6]. A lot of injuries are being addressed without operative intervention, where there is near equivalence in outcomes. This reduces patient exposure to an environment where the prevalence of SARS-Cov2 is higher than in the general population and reduces the footfall in the hospital. In addition, in our institution decreasing patient contact strategies were

implemented, such as absorbable sutures, removable splints or soft casts and telephone consultations. This is a single centre retrospective assessment of our patient admission database and consequently data is not always complete. Not all of the patients referred to the department will be included as we have confined the series to cases referred for inpatient assessment. There are cases seen in the clinic or in the community which will not be reflected in this series. Spinal referrals from outside hospitals are via an online system which was not included in this series other than patients transferred for inpatient management or intervention.

## Conclusion

In conclusion, during the lockdown a decrease in polytrauma patients was noticed, whilst fragility hip fractures remained stable. A low energy fall from standing height (46.6%) accounted for the mechanism of most patients presenting in our centre. A high mortality rate is associated with a positive COVID-19 test (53.3%), although only 5.8% were found to be affected by the disease in our cohort of patients. Further studies are required to identify the impact of this pandemic in current trauma practice. Good management of basic trauma conditions is required during this pandemic, or any future national lockdown, that may be implemented. The use of absorbable sutures, removable splints and telephone consultations can be used, wherever possible to reduce unnecessary hospital visits. Primary prevention measures in the form of general public advice, falls prevention strategies and warnings can help reduce the workload of trauma and should be considered by the healthcare professionals.

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