Injury burdens and care delivery in relation to the COVID-19 pandemic in Kigali, Rwanda: A prospective interrupted cross-sectional study

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ARTICLE INFO

ABSTRACT

Introduction: Injuries cause significant burdens in sub-Saharan Africa. In Rwanda, national regulations to reduce COVID-19 altered population mobility and resource allocations. This study evaluated epidemiological trends and care among injured patients preceding and during the COVID-19 pandemic at the Centre Hospitalier Universitaire de Kigali (CHUK) in Kigali, Rwanda.

Methods: This prospective interrupted cross-sectional study enrolled injured adult patients (≥15 years) presenting to the CHUK emergency department (ED) from January 27th-March 21st (pre-COVID-19 period) and June 1st-28th (intra-COVID-19 period). Trained study personnel continuously collected standardized data on enrolled participants through the first six-hours of ED care. The Kampala Trauma Score (KTS) was calculated as a metric of injury severity. Case characteristics prior to and during the pandemic were compared, statistical differences were assessed using χ^2 or Fisher's exact tests.

Results: Data were collected from 409 pre-COVID-19 and 194 intra-COVID-19 cases. Median age was 32, with a male predominance (74.3%). Road traffic injuries (RTI) were the most common injury mechanism pre-COVID-19 (47.8%) and intra-COVID-19 (53.6%) ($p = 0.27$). There was a significant increase in the number of transfer cases during the intra-COVID-19 period (52.1%) versus pre-COVID-19 (41.3%) ($p = 0.01$). KTS was significantly lower among intra-COVID-19 patients ($p = 0.04$), indicating higher severity of presentation. In the intra-COVID-19 period, there was a significant increase in the number of surgery consultations (40.7%) versus pre-COVID-19 (26.7%) ($p < 0.001$). The number of hospital admissions increased from 35.5% pre-COVID-19 to 46.4% intra-COVID-19 ($p = 0.01$). There was no significant mortality difference pre-COVID-19 as compared to the intra-COVID-19 period among injured patients ($p = 0.76$).

Conclusion: Emergency injury care showed increased injury burden, inpatient admission and resource requirements during the pandemic period. This suggests the spectrum of disease may be more severe and that greater resources for injury management may continue to be needed during the ongoing COVID-19 pandemic in Rwanda and other similar settings.

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African relevance

- Injuries cause significant morbidity and mortality in sub-Saharan African countries such as Rwanda.
- The COVID-19 pandemic caused shifts in resource allocations in Africa and specific data on the impact of these changes are needed to inform ongoing care delivery.
- During the COVID-19 pandemic an increase in injury burden and resource requirements was observed, suggesting a more severe disease spectrum and continued need for injury care resources

Introduction

Injuries cause major morbidity and mortality worldwide, accounting for over 10% of the global burden of disease and approximately five million deaths annually [1]. Disproportionately, more than 90% of morbidity and mortality from injuries occurs in low- and middle-income countries (LMICs) [1]. In Africa where injuries burdens are high, road traffic incidents (RTIs) are the most common mechanism of injury [1–3].

Injury care requires rapid access to potentially life-saving treatments due to the diverse and time sensitive nature of illness [3]. Yet, injury care resources remain limited in LMICs, making delivering appropriate emergency care challenging. Trauma, a significant burden in Rwanda, accounts for 22% of the deaths in the capital city of Kigali [4–5]. Furthermore, an estimated 9% of deaths and 10% of disability adjusted life years (DALYs) in Rwanda are attributable to injuries [6].

In early 2020, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus which causes coronavirus disease (COVID-19), became a global pandemic threat [7]. The first case of COVID-19 in Rwanda was identified on March 14, 2020. In response, Rwanda implemented prevention and containment measures, including: a national lockdown consisting of closure of all borders, limitations on air travel, suspension of public transport, restrictions on unnecessary movements, closure of public spaces, as well as isolation and care for COVID-19 infected patients and suspected cases. Following this lockdown, the Rwandan government implemented curfews and limited social gatherings [8,9]. These actions reduced population mobility in Rwanda, particularly motorized transport [8–9].

The COVID-19 pandemic has changed health care delivery, particularly the allocation of resources for pandemic response but also all other forms of health care [10–11]. In LMIC settings which already have reduced access to healthcare resources and personnel, the impacts of the pandemic response on other common disease processes such as injuries may be substantial [12–14]. This study evaluated injury epidemiology and emergency injury care in Kigali, Rwanda prior to and during the COVID-19 pandemic.

Methods

This prospective cross-sectional study was designed to evaluate adult injury burdens and acute care treatments at the emergency department (ED) at CHUK, the main public referral health facility and teaching hospital in Rwanda. CHUK is the largest of 4 injury referral hospitals which serve Rwanda's population of more than 6 million and one of the two located in Kigali [15]. The proportion of patients seeking injury care is estimated to be as high as 45% [16]. For the study protocol, the first 6 h of care were defined as the acute emergency care period of interest. The epidemiology of injuries and the provision of acute emergency care during these first hours of treatment were defined as the outcomes of interest. Subsequent to the pandemic restrictions, the outcomes were expanded to include final ED disposition. All patients older than 15 years of age presenting to the ED with an injury were eligible for inclusion. Patients with concurrent medical needs unrelated to the index injury, pregnant patients, those unable or unwilling to provide informed consent, and legal prisoners of the state were excluded. The research activities were approved by the CHUK ethics committee (CHUK.EC.

155.2019, CHUK.EC. 024.2019), University of Rwanda College of Medicine and Health Sciences and the institutional review board of Rhode Island Hospital (Lifespan IRB00000396).

Data collection was initially planned for a continuous period of 16 weeks. However, due to disruptions related to the COVID-19 pandemic data were collected from January 27th-March 21st and June 1st- June 28th 2020, with a cessation of all research activities during the first nation-wide lockdown which took place from March 22nd to May 3rd. Data collection resumed on June 1st, 2020 after regulations were relaxed, but a curfew from 9 pm to 5 am was still enforced. Due to these external regulations, the data available represents four time periods: pre-COVID-19 (study period, January 27th-March 21st, 2020), intra-COVID-19 (during lockdown, non-study period, March 22nd-May 3rd, 2020), intra-COVID-19 (non-lockdown, non-study period, May 3rd-May 31st, 2020) and intra-COVID-19 (non-lockdown, study period, June 1st-June 28th, 2020) [9,17].

Adult patients presenting for care to the CHUK ED were continuously screened during the pre-COVID-19 (study period, January 27th-March 21st, 2020) and intra-COVID-19 (non-lockdown, study period, June 1st- June 28th, 2020) recruitment periods. Patients were screened after initial triage and stabilization had been conducted by clinicians as to not impede care. Screened patients meeting inclusion criteria and providing informed consent were enrolled. If a patient was unable to consent due to incapacity, a legally authorized patient representative provided informed consent.

Dedicated research personnel trained in standardized protocols collected data continuously using structured case reporting forms. Data were collected via hourly assessments, for the first 6 h of care after presentation. This was achieved by directly assessing enrolled participants or their authorized representative and from the medical records. Following enrolment, prospective data was gathered on sociodemographic and anthropomorphic characteristics, vital signs, mechanism of injury, markers of injury severity and medical interventions, and ED disposition. Time since injury to presentation was calculated in minutes. A Kampala Trauma Score (KTS), a validated prognostic indicator of injury severity in LMICs was calculated [18,19]. A lower KTS ($\leq$12) indicates more severe injury whereas a higher KTS ($\geq$13) indicates a less severe injury state [18]. Shock index at triage was calculated using heart rate divided by systolic blood pressure and dichotomized at a cut point of >0.9 consistent with prior studies [20].

Data were inputted daily into a secure electronic database by trained study personnel. For cases in which the final ED disposition was not known within 6 h of presentation patient charts were retrospectively reviewed to ascertain the ED outcomes status if the final outcome status was available from the medical documentation. Additionally, to evaluate case presentations during the intra-COVID-19 lockdown, non-study period and intra-COVID-19 non-lockdown, non-study period which included the dates March 22nd to May 31st, 2020 registry logs were reviewed with standardized data retrospectively abstracted and entered into an electronic database.

STATA Version 15.0 (Stata Corp; College Station, USA) was used for analyses. The epidemiologic profile of the population was characterized using descriptive statistics based on the comparative study periods of interest. Summary statistics were calculated using frequencies and percentages for categorical variables, and continuous variables were described using median values with associated interquartile ranges (IQR). Cases were stratified by time periods Pre-COVID-19 and Intra-COVID-19. Differences in characteristics were assessed using χ^2 or Fisher's exact tests for categorical variables and independent t-tests for continuous variables.

Trends in ED cases were summarized and analysed by collapsing daily counts into weekly injured patient frequencies. Period specific averages with associated standard deviations (SD) were calculated. Linear regression models were constructed to assess weekly changes in ED patient volume, including fitting trendlines for study periods and performing hypothesis testing to query significance of regression

coefficients, including trendline slopes. A box and whisker plot was created to describe elapsed time from injury to ED presentation stratified by transfer status across the pre-COVID-19 and intra-COVID-19 study periods. Outliers were identified and excluded from the plot if data points were greater than 1.5 times the bounds of the associated IQR for the specific series plotted.

Results

A total of 864 adult patients seeking care for injuries were screened for study inclusion. Of these, 603 (70.0%) consented and were enrolled. Of those enrolled, 409 (67.8%) patients presented for injury care pre-COVID-19 (January 27th-March 21st) and 194 (32.2%) patients intra-COVID-19 (June 1st-June 28th) (Fig. 1).

The average weekly volumes of injury cases varied significantly throughout the four-time periods (Fig. 2). During the pre-COVID-19 study period, there was an average of 84.5 ($\pm$SD = 11.8) injured patients per week in the ED with an insignificant negative trend in the slope over the time period (-3.24 weekly, p = 0.07). During the intra-COVID-19 lockdown non-study period there was an observed reduction in weekly cases, with an average of 45 ($\pm$SD = 9.36) injury cases per week. However, despite this decrease in observed weekly cases during this time period there was still a significant positive trend in slope with increasing weekly average case presentations (+4.69 weekly, p = 0.006). There was an average of 64 ($\pm$SD = 11.5) ED injury patients per week during the intra-COVID-19 non-lockdown non-study period, with an insignificant up trending slope per week (+1.20 weekly, P = 0.87). During the intra-COVID-19 non-lockdown study period when the study's enrolment resumed, ED injury volume averaged 89.8 ($\pm$SD = 8.10) cases per week with an insignificant positive slope trend line (+1.10 weekly, p = 0.83) (Fig. 2). When all three intra-COVID periods are combined as one continuous intra-COVID period (lockdown, non-lockdown, and enrolment) the slope of the trendline is significantly positive (+4.68 weekly, p < 0.001).

In comparison of cases from the pre-COVID-19 and intra-COVID-19 time periods, there was no statistical difference in gender (p = 0.19) or age (p = 0.99) (Table 1). The primary injury mechanism was RTIs in both time periods (47.8% vs. 53.6%), with no statistical differences in mechanisms of injury between groups. During both time periods, the most common anatomical regions of injuries were extremities and craniofacial, with no statistical difference between regions of injury. There was a significant increase in the number of patients transferred intra-COVID-19 (52.1%) when compared to pre-COVID-19 (41.3%%) (p = 0.01). The distribution of calculated KTS were less severe in the pre-COVID-19 population than the intra-COVID-19 one (p = 0.04). There was a slight increase in median time from injury to care presentation during the pandemic; however, this was found to not be statistically different (238.5 vs. 289 min, p = 0.55) (Table 1).

There were observed increases in the proportion of ED procedures performed during the intra-COVID-19 period compared to the pre-COVID-19 period. Splinting (35.1% vs. 24.26%, p = 0.006), tourniquet use (3.61% vs. 0.74%, p = 0.01), point of care ultrasound (eFAST) (36.6% vs 23.7%, p < 0.001), and IV fluids (51.6% vs. 38.6%, p = 0.003) were found to all have occurred more frequently in the intra-COVID period (Table 2). There was a significant increase in patients receiving surgical consultations during the intra-COVID-19 period (64.4%) versus pre-COVID-19 (50.1%, p < 0.001). Evaluation by a subspecialty between the time periods of interest showed significantly more consultations during the intra-COVID-19 period for orthopaedics (40.7% vs. 26.7%, p < 0.001) and neurosurgery (16.0% vs. 9.05%, p = 0.01). Overall, hospital admission increased from 35.5% pre-COVID-19 to 46.4% intra-COVID-19 (p = 0.01). However, there was no significant difference between the two time periods in outcomes based on ED mortality with 1.71% pre-COVID-19 vs. 2.06% intra-COVID-19 (p = 0.76).

Between the study periods of interest there was a significant increase in the proportion of injury cases that were transferred from other health facilities to CHUK. During the pre-COVID-19 period transfers accounted for 41.3% of cases while in the intra-COVID-19 period they accounted for 52.1% of cases (p = 0.013) (Table 2).

As represented in the box and whisker plot the median time from injury to ED arrival was greater for transferred cases versus those not transferred when evaluating the pre- and intra-COVID-19 time periods. However, there was no substantial difference observed in median times, and the associated variance, for those transferred or not transferred
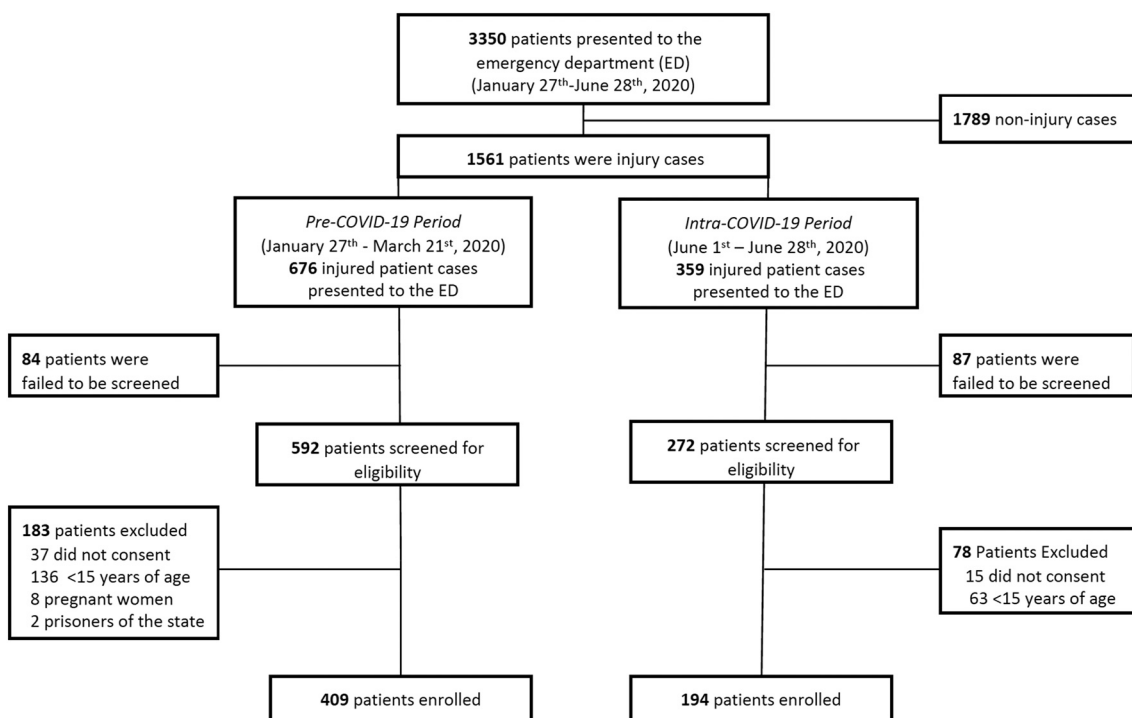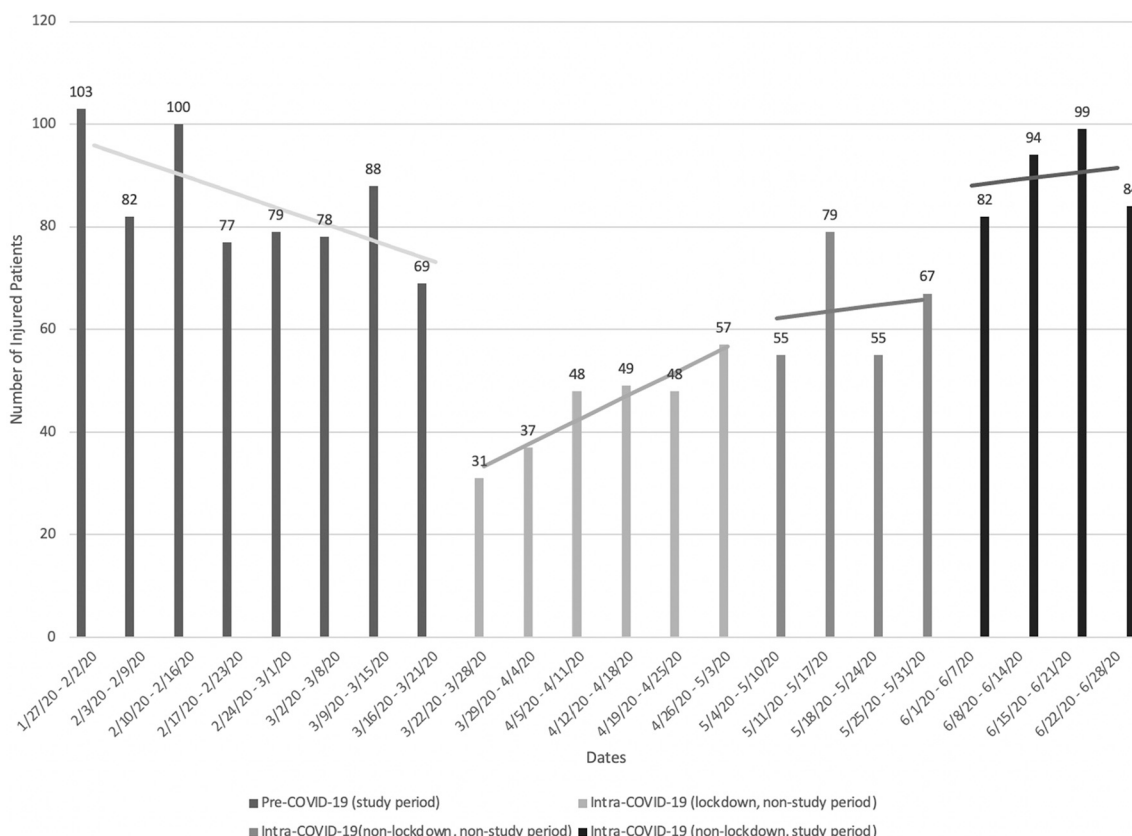

Fig. 1. Study flow diagram.

Fig. 2. Frequency of injury cases presenting for emergency care over time.[a]
[a]Trendlines represent the slope for each time period of interest.

(Fig. 3).

A comparison of emergency care provision among transfer cases pre-COVID-19 and intra-COVID-19 is located in supplement 1.

Discussion

A total of 864 adult patients seeking care for injuries were screened for study inclusion. Of these, 603 (70.0%) consented.

In this prospective emergency care population studied, where injury cases were accrued pre- and intra- COVID-19 pandemic, there were notable observed differences in presentation and required acute treatments. Specifically, injury care at the study site had high disease burdens, increased inpatient admission with greater resource requirements during the intra-COVID-19 pandemic period. This suggests that as COVID-19 continues injuries remain an important driver of health needs and may require greater resources for management in Rwanda and other similar settings in Africa.

Observations in gender, age, mechanism, and anatomical locations of injuries remained similar pre-COVID-19 and intra-COVID-19, as observed in other countries during the pandemic [21,22]. RTIs were the most common cause of trauma and there was no significant difference in their prevalence between the pre- and intra-COVID-19 periods. These findings are similar to reports which found the prevalence of RTIs persisted during the pandemic, possibly due to greater risk-taking behaviour on roads with lower densities of motorists [23,24]. In contrast, some studies found decreased RTIs after the implementation of measures to reduce social mobility which could stem from population differences in terms of access to motor vehicles or public transport [25–29]. Given the ongoing need for pandemic control through physical distancing and social prevention measures, further understanding of the factors involved in seeking injury care would be beneficial to inform public health approaches in relation to COVID-19.

During the COVID-19 pandemic the number of patients presenting to the ED for injury care varied. Notably reduced numbers of ED injury patients seeking care were observed as the public health response enacted strict guidelines on mobility during the lockdown periods. Similar to reports from other settings, the Rwandan population has likely been less mobile, spending more time indoors, reducing exposures that may cause injury [25,26]. Combined with the finding that the cases presenting utilized more acute interventions, surgical consults and hospital admissions, the decrease in weekly number of injury patients at the ED may indicate that patients were not readily seeking care for mild or moderate injuries [25]. This could be related to delays in healthcare-seeking behaviours due to mobility restrictions or fear of entering health facilities during the pandemic. As the pandemic continues, observations found in the current results point towards the need for the provision of more comprehensive injury care services such that the immensely common healthcare needs due to trauma in LMICs can be sufficiently met.

When comparing pre-COVID-19 and intra-COVID-19 periods, there was a significant increase in number of injured patients transferred to CHUK from other health centres during the pandemic time periods. As the study site is the largest and one of the most well-resourced public referral centres for injury care in Rwanda, this may indicate that more patients presenting to outside health centres had increased healthcare needs necessitating transfer. As indicators of injury severity were greater in the intra-COVID-19 period this hypothesis would be supported and has been observed in other countries [30,31]. Alternatively, care of pandemic patients may have diverted human and material resources away from other medical care, an effect that may be pronounced in smaller health centres and result in more patient transfers to higher-level centres. Future work should aim to disentangle the driving factors for transfers so setting appropriate adjustments can be enacted to ensure resources match needs at both lower-resourced referring and

Table 1

Case comparisons between the pre-COVID-19 and intra-COVID-19 periods.[a]

	Pre-COVID-19 (n = 409)	Intra-COVID-19 (n = 194)	P value
	n (%) or median (IQR)	n (%) or median (IQR)	
Gender			
Male	297 (72.79%)	151 (77.84%)	0.19
Female	111 (27.21%)	43 (22.16%)	
Age (years)	32 (25, 43)	32 (25, 42)	0.99
Mechanism of injury			
Road traffic injuries	194 (47.8%)	104 (53.6%)	
Fall	115 (28.3%)	53 (27.3%)	
Burn/electrocution	15 (3.69%)	3 (1.55%)	0.27
Stab/cut	35 (8.62%)	8 (4.12%)	
Other penetrating	24 (5.91%)	15 (7.73%)	
Other blunt	6 (1.48%)	2 (1.03%)	
Assaults unspecified	17 (4.19%)	9 (4.64%)	
Anatomical regions of injuries[b]			
Craniofacial	136 (33.25%)	71 (36.6%)	0.42
Neck	15 (3.67%)	9 (4.64%)	0.57
Thorax	49 (11.98%)	18 (9.28%)	0.32
Abdomen-pelvis	34 (8.31%)	11 (5.67%)	0.25
Cervical spine	15 (3.67%)	5 (2.58%)	0.49
Thoracic spine	9 (2.20%)	2 (1.03%)	0.32
Lumbar spine	11 (2.69%)	2 (1.03%)	0.19
Upper extremity	135 (33.0%)	55 (28.35%)	0.25
Lower extremity	166 (40.6%)	78 (40.21%)	0.93
Genitalia	5 (1.22%)	2 (1.03%)	0.84
Types of injuries			
Fracture closed	127 (31.1%)	65 (33.5%)	0.55
Fracture open	49 (12.0%)	39 (20.1%)	0.008
Bruise	143 (35.0%)	67 (34.5%)	0.92
Open wound	112 (27.4%)	52 (26.8%)	0.88
Burn	14 (3.42%)	3 (1.55%)	0.19
Vascular injury	14 (3.42%)	2 (1.03%)	0.09
Nerve injury	5 (1.22%)	0 (0.0%)	0.12
Dislocation	7 (1.71%)	9 (4.64%)	0.04
Time since injury (minutes)	238.5 (83, 820)	289 (80, 970)	0.55
Time of injury			
5 am to 9 pm (non-curfew)	340 (83.7%)	170 (87.6%)	0.21
9 pm to 5 am (curfew)	66 (16.3%)	24 (12.4%)	
Transferred from other health facility			
Yes	169 (41.3%)	101 (52.1%)	0.01
No	240 (58.7%)	93 (47.9%)	
Shock index			
<0.9	374 (91.4%)	175 (90.2%)	0.62
≥0.9	35 (8.56%)	19 (9.79%)	
Kampala trauma score			
10	1 (0.24%)	1 (0.52%)	
11	3 (0.73%)	5 (2.58%)	
12	13 (3.18%)	8 (4.12%)	0.04
13	25 (6.11%)	11 (5.67%)	
14	97 (23.72%)	51 (26.29%)	
15	242 (59.17%)	112 (57.73%)	
16	28 (6.85%)	6 (3.09%)	
Glasgow Coma Scale			
3-8	5 (1.24%)	6 (3.21%)	
9-12	15 (3.73%)	12 (6.42%)	0.09
13-15	382 (95.0%)	169 (90.4%)	

[a] Pre-Covid-19 data was collected from January 27th-March 21st and intra-COVID-19 from June 1st-June 28th, 2020.

[b] Variable categories are not mutually exclusive therefore cumulative percentages may be greater than 100%.

high-resourced receiving facilities.

Finally, as Rwanda has had one of the most successful pandemic responses in Africa, and globally, comparisons with other countries of the COVID-19 impact on trauma may yield insights into whether and how public health measures in Rwanda mitigated or prevented harmful changes to emergency healthcare delivery [32]. It is important to note at the time of this writing, Rwanda gradually eased lockdown measures and was settling into a new, long-term normal, until January 19th, 2021.

Table 2

Comparison of emergency care provision Pre-COVID-19 and intra-COVID-19.[a]

	Pre-COVID-19 (n = 409)	Intra-COVID-19 (n = 194)	P value
	n (%) or median (IQR)	n (%) or median (IQR)	
In ED procedures[b]			
Intubation	10 (2.44%)	9 (4.64%)	0.15
Spinal immobilization	23 (5.64%)	11 (5.67%)	0.99
Splinting	99 (24.26%)	68 (35.1%)	0.006
Wound care	173 (42.40%)	90 (46.4%)	0.36
Vasopressors	3 (0.74%)	0 (0.0%)	0.56
Tourniquet	3 (0.74%)	7 (3.61%)	0.01
Chest tube	49 (12.0%)	18 (9.28%)	0.06
Point-of-care ultrasound	97 (23.7%)	71 (36.6%)	<0.001
IV fluids	158 (38.6%)	100 (51.6%)	0.003
Red blood cell transfusion	14 (3.42%)	6 (3.09%)	0.83
Platelet transfusion	1 (0.24%)	3 (1.55%)	0.07
Plasma transfusion	1 (0.24%)	1 (0.52%)	0.59
Surgery consultations[b]			
Total	205 (50.1%)	125 (64.4%)	<0.001
General surgery	46 (11.3%)	12 (6.19%)	0.05
Orthopaedics	109 (26.7%)	79 (40.7%)	<0.001
Neurosurgery	37 (9.05%)	31 (16.0%)	0.01
Otolaryngology	3 (0.73%)	4 (2.06%)	0.22
Stomatology	5 (1.22%)	9 (4.64%)	0.009
Urology	1 (0.49%)	1 (0.8%)	0.54
Ophthalmology	1 (0.49%)	0 (0.00%)	1.00
Burn unit	1 (0.49%)	0 (0.00%)	1.00
Emergency care disposition			
Admitted	145 (35.5%)	90 (46.4%)	0.01
Deceased	7 (1.71%)	4 (2.06%)	0.76
Discharged	227 (55.5%)	87 (44.9%)	0.01
Transferred	5 (1.22%)	2 (1.03%)	1.00
Missing	25 (6.07%)	11 (5.67%)	0.97

[a] Pre-Covid-19 data was collected from January 27th-March 21st and intra-COVID-19 from June 1st-June 28th, 2020.

[b] Variable categories are not mutually exclusive therefore cumulative percentages may be greater than 100%.

At that time, a new city-wide lockdown in Kigali was implemented after increased COVID-19 cases [33]. Restrictions on social mobility and public transportation were implemented with a plan for gradual re-opening.

There are limitations to this study. Firstly, the initial intent of the prospective assessment was designed specifically to evaluate temporal trends associated with acute injury care at the study site. However, the COVID-19 pandemic occurred during data collection and the study was adapted to meet the constraints existing in the research setting. This allowed for reorientation of the work and the data evolved in a manner that logically supported the present analysis. However, the lack of a pre-planned approach for the pandemic topical matter must be acknowledged. Relatedly, prospective individual case level data collection was ceased during the period of national lockdown, due to considerations for public health and adherence to guidelines, which prevents full understanding of injury trends during portions of the COVID-19 pandemic.

It is important to address that this study took place 3 months prior to the pandemic and then 1 month during the pandemic. This is a limited observation time to draw conclusions on the pandemic's full impact on injury care. The possible influence of seasonal trends and other cyclical effects could not be quantified. However, the observations here are similar to reports from other country's trauma registries which observed decreases in injury presentations [34–37]. Also, despite the employment of a prospective methodology, there were cases not captured in the screening process. Although the number of missed cases was not large it is possible selection bias was introduced, and it is unknown if the missed cases were significantly different from those that were studied. There was also missing data for final ED disposition. This was secondary to an
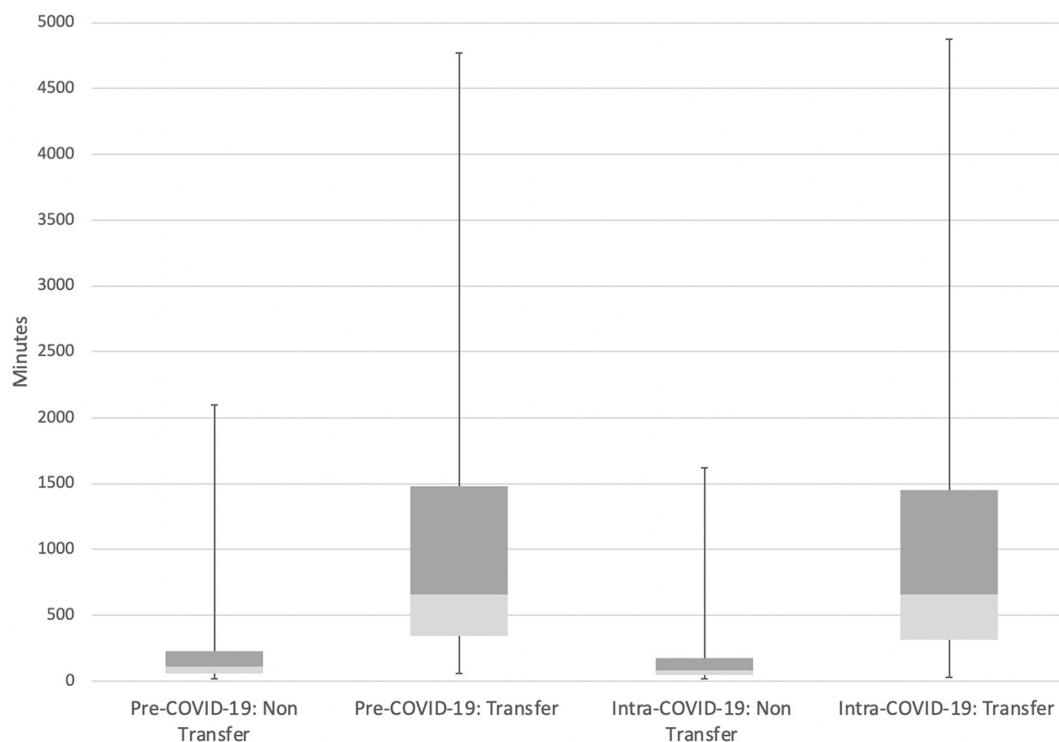
Fig. 3. Box and whisker plot of time since injury to presentation based on transfer status for pre-COVID-19 and intra-COVID-19 periods.[a]
[a]Pre-Covid-19 data was collected from January 27th-March 21st and intra-COVID-19 from June 1st-June 28th, 2020.

inability to discern final outcome status from the available medical documentation. Although possible that the missingness in the dispositions data could have impacted the findings, this was a small number of cases comprising only 5.9% and as such is unlikely to alter any of the findings in a clinically substantial manner.

Additionally, the presented data does not allow to differentiate between intentional and unintentional injuries as this may be important. Finally, the current data are derived from a single centre with relatively robust access to injury care services and the extrapolation to country level implications and other health facilities is not clear. Despite these limitations, the results allow for observations in injury trends and resource needs in the setting of the COVID-19 pandemic in Rwanda and could be used to inform future research and may serve as a recourse for healthcare development and policy in the study setting and other similar LMICs.

Adult injury patterns and related acute emergency care in Rwanda preceding the COVID-19 pandemic were different as compared to during the pandemic. Patient volumes decreased during lockdown periods while injury care needs increased during the pandemic period, suggesting regulations may have affected exposures and health-seeking behaviour with a skewing of injury events to a more severe spectrum of trauma. As one of the few prospective studies on injury care in a LMIC during the COVID-19 pandemic, this study provides insights on the impacts of the pandemic and public health response on injury patterns in Rwanda and may serve to inform care delivery as the pandemic continues.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.afjem.2021.06.007.

Dissemination of results

Preliminary results from this work were presented at the Society for Academic Emergency Medicine. The results of this study were also shared with the ED at the study site through an informal presentation.

Authors' contribution

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: CU, CGM and AB contributed 45%; ARA 10%; and ZM, FRT, LJ, VN, DU, MN, OT, SN, SJ 5% each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of competing interest

The authors have no conflicts of interest.

Acknowledgements

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