COVID 19 And Its Impact On Orthopaedic Fracture Surgery And Traumatology In An Eastern Caribbean Island- A Retrospective Review

'COVID 19 and Orthopaedic Surgery'

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***Abstract*—Covid-19's impact on healthcare and indeed Orthopaedics and Traumatology is yet to be adequately assessed in the Caribbean region. This study explores evolving epidemiological trends of patients requiring surgical fixation of fractures during the period of Covid-19 restriction protocols. A direct comparison was drawn of fracture frequency, distribution, time to surgery and mechanism of injury between one-year pre-pandemic and one year amid the pandemic limitations. All patients who underwent a surgical fracture stabilisation during the period April 1st 2019 to March 31st 2021 were included.**

A 21.6% reduction in overall operative fracture fixation was noted across the pandemic period with a coincident 19.1% reduction in hip fracture surgery. Time to surgery increased during the pandemic period for Hip fractures from 2.14 days to 4.78 days. Significant increases in Non-Accidental Injury and Domestic Violence mechanism of injury were also noted during the pandemic period.

As we battle this pandemic, staff and resource allocation are vitally important especially in low resource settings such as our tertiary care facility, the San Fernando General Hospital in Southern Trinidad and Tobago in the Eastern Caribbean. This analysis hopes to serve as a guide for planning and delivery of orthopaedic care during these unprecedented times.

***Keywords*—COVID 19 pandemic, Orthopaedic care during COVID 19 pandemic, Management of Traumatic fracture, Caribbean**

I. INTRODUCTION

Corona Virus 19 has affected all aspects of healthcare inclusive of orthopaedics and its traumatology. The World Health Organization announced a pandemic status in March 2020 with Trinidad and Tobago recording its 1st positive case on March 12th, 2020 [1]. Subsequent increases in positive cases resulted in lockdown protocols being implemented by the Government of Trinidad and Tobago. The severities of these restrictions waxed and waned over the period April 1st 2020 to March 31st 2021 and have affected the epidemiology of traumatology as well as the surgical treatment of fractures at the Orthopaedic Department of our Tertiary Care Facility at San Fernando General Hospital in South Trinidad.

Measures including closure of schools, cessation of social gatherings, termination of sporting activities and overall restriction on travelling and mobility were implemented in order to curtail infection rates. The impact of these limitations on the epidemiology of fractures remains largely unknown in Trinidad and Tobago and the wider Caribbean despite being widely published worldwide [2-8]. The importance of this particular impact resides in the fact that we are still unaware of the period of limitation, as we progress towards the "new normal".

In this observational cohort study the influence of Covid-19 restrictions on operative orthopaedics and traumatology was analysed in an attempt to identify changes and implement solutions as we transition from a pre pandemic era, pandemic and post pandemic period in a low resource economy in the Eastern Caribbean.

Aims:

1. To compare the epidemiology of operative treatment of fractures during a non-pandemic period to a pandemic period.

2. To determine the variations in fracture distribution from a non-pandemic period to a pandemic period secondary to implementation of Covid-19 restrictions.

3. To compare the time to surgery for patients requiring Hip Fracture Surgery in a non-pandemic period compared to a pandemic period.

4. To determine changes in mechanisms of injury leading to fractures requiring operative management in a non-pandemic period versus a pandemic period.

5. To identify data that will be helpful in planning the delivery of Orthopaedic care during

pandemic and immediate post pandemic period.

Methodology:

A single institution retrospective review of notes for patients receiving operative management for any fracture was conducted at the San Fernando General Hospital, a tertiary care facility in Southern Trinidad and Tobago, for the period April 1st 2019 to March 31st 2021. Patients receiving operative treatment during the period April 1st 2019 to March 31st 2020, designated "Group 1" was identified as Non-Pandemic period since no restrictions were enforced during this period in the Eastern Caribbean island of Trinidad and Tobago. Patients receiving operative management for fractures during the period, April 1st 2020 to March 31st 2021, were designated "Group 2" due to the enforcement of social distancing protocols and lockdown restrictions of varying degrees during this period.

Age, gender, location of fracture(s), date of admission, date of surgery as well as mechanism of injury were collected by the principal investigator, subsequent to obtaining South West Regional Health Authority Ethical Approval. Time to surgery was calculated from the collected data. Results were tabulated and analysed with Microsoft Excel Version 16.3. No personal identifying patient information was collected.

Results:

A total of 751surgically treated fractures were identified during the two-year period. Group 1 Non-Pandemic accounted for 421 fractures with Group 2 Pandemic, constituting 330 fractures representing a significant decrease of 21.6%. A male to female ratio of 10:7 was observed in Group 1 compared to a roughly equal 1:1 ratio in Group 2 (Fig.1) Age brackets were constitutionally similar from Group 1 to Group 2 (Table 1).

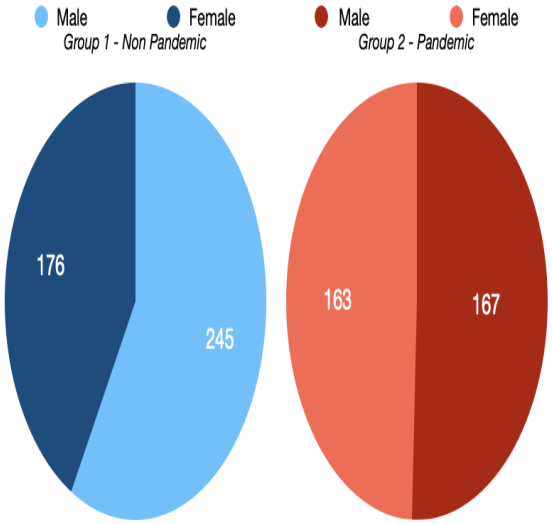

Fig. 1 showing gender distribution of fracture patients Group 1 vs Group 2.

Table 1.

Age Bracket	Group 1 - 421 Fractures		Group 2 - 330 Fractures	
Years	No. Of Fractures	Percentage	No. Of Fractures	Percentage
0 -18	30	7.03%	36	11.15%
18-40	96	22.86%	85	25.65%
41-55	67	16.08%	45	13.75%
55-65	75	18.34%	46	14.12%
>65	153	35.67%	118	39.03%

Table 1. showing age distribution and associated fracture distribution Group 1 vs Group 2

A 19.1% reduction in operatively treated hip fractures was noted during the Non-Pandemic period, decreasing from 123 to 105 fractures during the Pandemic period. A 1:2 male to female ratio was maintained for Hip Fracture patients across the entire cohort.

The >65 age bracket represented the largest division across both groups requiring Hip Fracture surgery with a slightly higher percentage in Group 2 85% compared to 78.14% in Group 1. Females accounted for 68.4% of this >65 age bracket in Group 1 compared to 91.4% in Group 2. Low Energy Falls constituted the most common mechanism of injury for this subdivision of patients, representing >90% in both groups. Time to surgery for Hip Fractures was 2.14 days in Group 1 Non-pandemic contrasted to 4.71 days in Group 2 Pandemic period (Table 2).

Table 2.

Hip Fractures	Group 1	Group 2
No. Of Fractures	123	105
Male : Female	43:80	36:69
Time to Surgery	2.14 Days	4.78 Days
Most Common Age Bracket	>65 - 78.14%	>65 - 85%
Most Common Mechanism of injury	Low Energy Fall - 91.7%	Low Energy Fall - 92.4%

Table 2. showing hip fracture statistics Group 1 vs Group 2

Lower limb fractures accounted for 77.1% of fractures in Group 1 similar to 72.7% in Group 2 (Fig. 2). Proportions of fracture distribution for lower limb fractures was largely unchanged in Group 1 vs. Group 2 excluding ankle fracture occurrence (Fig.3). An increase in ankle fractures treated operatively from 67 in Group 1 to 76 in Group 2 was present. Low energy falls was the most common mechanism of injury for lower limb fractures.

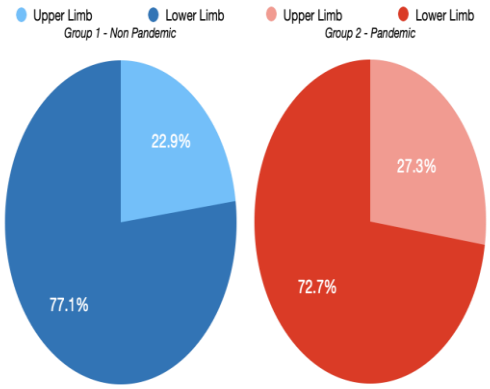

Fig. 2 showing Upper Limb vs Lower Limb fracture distribution Group 1 vs Group 2

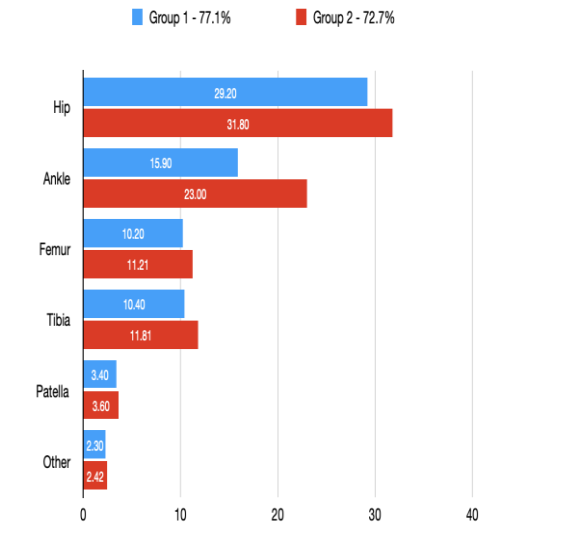

Fig. 3 showing percentage distribution of Lower Limb Fractures Group 1 vs Group 2

Upper limb fractures treated operatively in Group 1 accounts for 22.9 % versus 27.3 % in Group 2 (Fig.2). No major variations were noted with respect to upper limb fractures in Group 1 and Group 2, despite an overall decrease noted in Group 2 (Fig.5).

Mechanisms of injury represented significant changes in Group 1 compared to Group 2. A significant decrease in injuries caused by Sporting mechanisms was identified from Group 1 31.3% to Group 2 0.7% (Fig. 4). Traffic related injuries also decreased. Increases in Non-Accidental Injuries, Domestic Violence and Gun related Injuries and Assault were prominent in Group 2 compared to Group 1 (Fig.4).

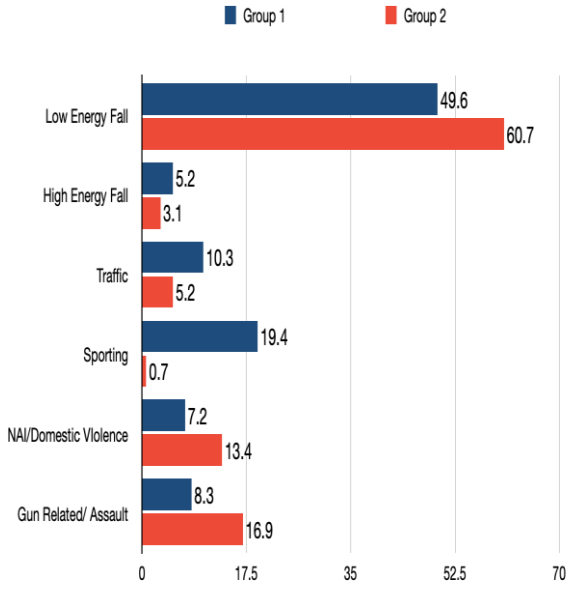

Fig 4. Showing percentage distribution of Mechanism of Injury Group 1 vs Group 2

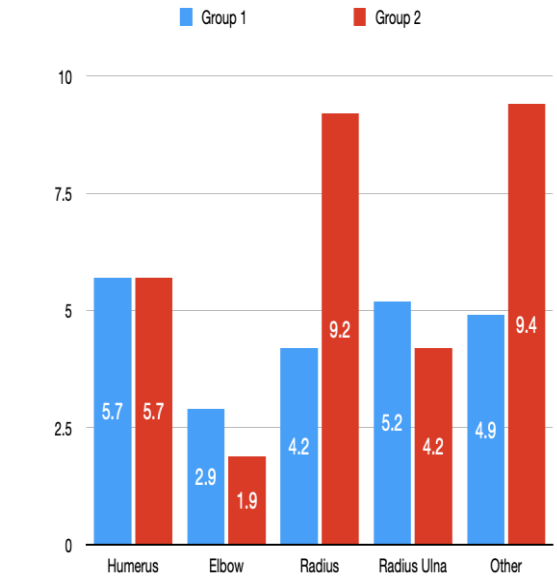

Fig.5 showing percentage distribution of Upper Limb Fractures Group 1 vs Group 2

An increase in the number of Paediatric fractures requiring operative management was present in Group 2 11.05% in comparison with Group 1 7.03% (Table. 2).

Discussion:

The novel Covid-19 virus and its consequent pandemic has forced changes upon all aspects of healthcare including orthopaedic traumatology and its subsequent management worldwide [2,6.9]. Several publications have revealed decreased rates of fracture surgery; however rates in Trinidad and Tobago and the wider Caribbean region remain largely understudied [2-8]. In an attempt to curtail the rapid spread of the virus multiple restrictions and lockdown protocols were implemented by the Government of Trinidad and Tobago from April 1st 2020 onwards. A natural assumption with decreased human transit outside the home would be to expect an alteration in number of cases requiring fracture surgery and alterations in the mechanism of injury should. This retrospective review aims to analyse the data in this regard.

As a direct result of the pandemic limitations a decrease in fracture surgery by 21.6% has occurred. This statistic has been mirrored by multiple publications in notably larger countries with larger cohorts [2-7]. A variation in gender ratio of Non-Pandemic Group 1 of males to females of 10:7 compared to a Pandemic Group 2 ratio of 1:1 was not reflected in the wider literature. Possible explanations for this variation include a drastic reduction in sport and traffic related mechanisms due to pandemic restrictions, of which men are usually more involved than women[5,] especially in more conservative societies such as ours.

Patients suffering hip fractures and requiring fracture surgery decreased by 19.1% during the pandemic period compared to Group 1, the non-pandemic year. This finding paralleled a study completed by Vaishya et al in India who described a 22.3% reduction in hip fracture surgery secondary to lockdown restrictions [3]. Notably the average time to surgery for hip fractures was increased from 2.14 days in Group 1 to 4.78 days in Group 2. In direct contrast, larger institutions recorded decreases in time to surgery citing postponement and cancellation of elective procedures such as ligament reconstruction and arthroplasty as their rationalization [7]. However other publications reported similar delays describing a number of justifications;

1. Delays in presentation to tertiary institutions due to fear of contracting Covid-19 [8].
2. Operating theatre delays due to poorly handled theatre management and staff training [9-10].
3. Reduction in implant supplies [9].
4. Decreased anaesthetic manpower and nursing staff due to staff reassignments for Intensive Care Unit Staffing and other Covid-19 care facilities [10].

All these shortcomings, particularly loss of scheduled operating theatre time via a dedicated trauma list, were experienced during the pandemic period at our tertiary care facility.

Less significantly the >65 age bracket, male to female ratio 1:2 and low energy fall mechanism of injury remained constant, irrespective of restrictions which was supported by Serra- Torres et al in the United States of America and Vaishya et al in India [3, 8].

In direct contrast to previous publications reviewed, the pandemic period, Group 2 accounted for a larger number of ankle fractures requiring operative fixation than the non-pandemic period, Group 1, representing a 13.4% increase. Multiple studies revealed significant decreases in all fracture populations during pandemic periods [3, 4]. Additional disparity was noted with respect to age demographics and mechanism of injury in this specific subsection. Group 1 revealed patients primarily in 18-40 age bracket with sporting mechanism of injury, in direct contrast to Group 2 with majority of patients in the 51-65 age bracket suffering from low energy falls leading to ankle fractures. This phenomenon could simply be explained by the increase in home confinement and reduction in sporting activities during the pandemic period and was replicated by Poggetti et al in Italy quoting a similar rationale [5]. Drastic reductions in both the incidence of lower limb fractures, 23.4% and upper limb fractures, 21.4% from non-pandemic to pandemic groups were noted. Our results replicated epidemiological analysis of fracture distribution in India and Hong Kong in this respect [3, 4].

Examination of the temporal changes in mechanism of injury resulting in fractures from Group 1 Non-Pandemic to Group 2 Pandemic uncovered significant differences. One of the key findings of our study is that the number of fractures due to Non-Accidental injuries and Domestic Violence have increased significantly from 7.2% in Group 1 to 13.4% in Group 2 represent glaring social issues created by home confinement due to restrictions. Iranian publications disclosed increased Non-Accidental injuries in the paediatric population in their epidemiological study [6]. Prominent decreases in Sporting 19.4% to 0.7% and Traffic related mechanisms 10.3% to 5.2% occurred from Group 1 to Group 2 reflecting limitation on human mobility created by lockdown protocols. Alterations like these with respect to commonality of mechanism of injury were replicated in Italy and Iran [5, 6].

All age groups remained proportionally similar with respect to fracture occurrence with the exception of the Paediatric population. Escalation of home related mechanism of injury as well a reduction in traffic related mechanism in the paediatric population was present from Group 1 to Group 2, also reflected by Nabian et al [6]. Both variations from the non-pandemic period could be supported by restrictions imposed by Covid-19 protocols. In direct contrast however, further data reported by Park et al and Turgut et al defined significant decreases in paediatric populations requiring surgical fixations for traumatic fractures [2-7]. A Danish report cited under reporting and lack of presentation specifically for Non-

Accidental injuries as likely explanations [11]. The impact of Covid-19 confinements on this particularly vulnerable population cannot be ignored.

The Covid-19 virus continues to plague healthcare systems and orthopaedic surgery is not exempt. Delays in orthopaedic treatment, reduction in implant supply and rescheduling of orthopaedic surgeries represent only a few of these issues [9]. Tay et al cited a number of recommendations which may alleviate burdens secondary to changes in the epidemiology of fracture patterns especially at low resource settings such as ours at the San Fernando General Hospital in South Trinidad;

1. Reservation of One Operating Theatre weekly specifically for fracture surgery secondary to trauma.

2. Consultant grade staffing for this theatre to minimise operative time and post-operative complications.

3. Non-operative management of traumatic fractures as far as possible.

4. Reduction of the in-patient stays of Hip fracture patients as they at highest risk of developing complications if infected with Covid-19.

5. Increase Orthopaedic presence in emergency departments to ensure proper admission and expedite discharges of non-urgent patients.

6. Increase use of tele-consultation especially in the post-operative period.

7. Negative pressure operating theatres should be employed for positive Covid-19 patients with minimal use of power tools which generate aerosols[2].

Limitations:

1. Conservatively managed fractures were not included due to non-referral to the Orthopaedic department as well as poor recording of all patients reviewed for these injuries.

Conclusion:

The novel Corona Virus 19 has impacted all aspects of Orthopaedics and Trauma but more severely affected the essential fracture surgical fixation. Mechanism of injury has shifted from traffic and sporting related to non-accidental and domestic abuse which undoubtedly worsens already present frays in our social fabric. Despite reductions in fracture numbers our inability to successfully adapt to Covid-19 limitations is highlighted with increased pre-operative waiting times for hip fracture surgery. Hence, changes in epidemiology and distribution of fracture patterns must serve as a guide as we embark on this “new normal” in staff allocation and resource distribution in the Orthopaedic Department of the San Fernando General Hospital in Trinidad and Tobago.

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Conflicts of interest- The authors declare no conflicts of interest.

References:

1. WHO announces COVID-19 outbreak a pandemic (Last accessed on 15th January 2021). https://www.euro.who.int/en/health-topics/ health-emergencies/coronavirus-covid-19/news/news/2020/3/who- announces-covid-19-outbreak-a-pandemic

2. P. Chang, K. Sugand, D. Nathwani, R. Bhattacharya, and K. M. Sarraf. “Impact of the COVID-19 Pandemic on ORTHOPEDIC Trauma Workload in a London Level 1 Trauma Center: The ‘GOLDEN MONTH.’” *Acta Orthopaedica* 91, no. 5 (2020): 556–61. https://doi.org/10.1080/17453674.2020.1783621.

3. V. Raju, A. Vaish, and A. Kumar. “Impact of COVID-19 on the Practice of Orthopaedics and Trauma—an Epidemiological Study of the Full Pandemic Year of a Tertiary Care Centre of New Delhi.” *International Orthopaedics*, 2021. https://doi.org/10.1007/s00264-021-05021-5.

4. W. J. Siu, and K. M. Cheung. “Impact of COVID-19 on Orthopaedic and Trauma Service.” *Journal of Bone and Joint Surgery* 102, no. 14 (2020). https://doi.org/10.2106/jbjs.20.00775.

5. P. Andrea, A. D. Chiaro, A. M. Nucci, C. Suardi, and S. Pfanner. “How Hand and Wrist Trauma Has Changed during Covid-19 Emergency in Italy: Incidence and Distribution of Acute Injuries. What to Learn?” *Journal of Clinical Orthopaedics and Trauma* 12, no. 1 (2021): 22–26. https://doi.org/10.1016/j.jcot.2020.08.008.

6. N. M. Hossein, F. Vosoughi, F. Najafi, S. S. Khabiri, M. Nafisi, J. Veisi, V. Rastgou, et al. “Epidemiological Pattern of Pediatric Trauma in COVID-19 Outbreak: Data from a Tertiary Trauma Center in Iran.” *Injury* 51, no. 12 (2020): 2811–15. https://doi.org/10.1016/j.injury.2020.09.015.

7. T. Ali, H. Arli, U. Altundag, S. Hancioglu, E. Egeli, and O. Kalenderer. “Effect of COVID-19 Pandemic on the Fracture Demographics: Data from a Tertiary Care Hospital in Turkey.” *Acta Orthopaedica et Traumatologica Turcica* 54, no. 4 (2020): 355–63. https://doi.org/10.5152/j.aott.2020.20209.

8. S.Torres, Michael, R. Barreda, D. Weaver, and A. T. Reveron. “Delayed Presentation of Patients with Hip Fractures during the COVID-19 ‘Stay-at-Home’ Order in the Southmost Region of the United States.” *Advances in Orthopedics* 2021 (2021): 1–8. https://doi.org/10.1155/2021/8822004.

9. H. Abid, M. Javaid, R. Vaishya, and A. Vaish. “Effects of COVID-19 Pandemic in the Field of Orthopaedics.” *Journal of Clinical Orthopaedics and Trauma* 11, no. 3 (2020): 498–99. https://doi.org/10.1016/j.jcot.2020.03.015.

10. KJD Tay, and YHD Lee. “Trauma and Orthopaedics in the COVID-19 Pandemic: Breaking Every Wave.” *Singapore Medical Journal* 61, no. 8 (2020): 396–98. https://doi.org/10.11622/smedj.2020063.

11. M. Polina, L. L. Larsen, T. G. Knudsen, G. Hesthaven, M. B. Hellfritzsch, K. K. Petersen, et al. “Physical Child Abuse Demands Increased Awareness during Health and Socioeconomic Crises like COVID-19.” *Acta Orthopaedica* 91, no. 5 (2020): 527–33. https://doi.org/10.1080/17453674.2020.1782012.