

Comparative study of orthopaedic workflow in pre-COVID and covid era in a tertiary care private teaching hospital in eastern India

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Abstract

Background: COVID-19 is a new coronavirus that appeared in late December 2019 in Wuhan, China, and is responsible for the biggest pandemic of infectious illnesses in this century. These constraints, as well as the rising number of COVID-19 cases, had a significant impact on the delivery of healthcare to patients in orthopaedics and trauma. **Objective:** To determine the number, their distribution and characteristics of patients visiting OPD, ER and IPD in a tertiary care private teaching hospital before and during Covid 19. **Methods:** This study was conducted in Department of Orthopaedic, Medica Superspecialty Hospital, Kolkata. Retrospective data [Pre Covid data] from March 2019 to 23rd March 2020 and Retrospective + Prospective data [during Covid data] from 24th March 2020 to March 2021 visiting orthopaedic department were collected. This study followed universal Sample size collection method for the entire duration of study periods. **Results:** Both the initial cases and follow up cases have declined significantly during covid compared to pre-covid era. When means of the number of new patients and follow-up patients per month in the outpatient clinic during the pre-COVID and the COVID period were compared using the Mann-Whitney *U*-test, it was found to be highly statistically significant (p value = 0.0041 and 0.00006 respectively). **Conclusion:** Our analysis emphasizes the extreme decrease in both surgical and outpatient clinic workflow and the secondary effects on emergency workload during the continuing corona epidemic at our institute. According to our findings, differences in age, the technique of damage, and patterns of injury in orthopaedics-related trauma were highly correlated with the high level of internment caused by the COVID-19 outbreak. It also shows a severe visit to operational advancement and mobile clinic and within the emergency advancement throughout our Institute's continued corona pandemic, which is subject to significant collateral effects throughout the amount.

Key words: COVID-19, Orthopaedic department, arthroscopy, arthroplasty, Trauma,

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INTRODUCTION

On March 11, 2020, the World Health Organization (WHO) declared it a pandemic.¹ The first case of COVID-19 in India was reported on the 30th of January 2020 in Kerala and on the 3rd of March 2020 in Delhi.^[2] According to a top official of the state health department, Kolkata reported its first case of Covid-19 on 18-year-old male who returned from the UK on March 15 tested positive. More than one million people in the country have been infected with the illness, and the figure is continuously growing. To combat the virus's extraordinary spread, a nationwide lockdown was enforced in several phases, as a consequence of which nonessential services, such as outpatient treatments in hospitals, were temporarily shut

down.^[3] Only emergency and life-saving operations were permitted to continue, as well as needed commodities (medicines and food supplies). Behavioral modification strategies such as rigorous social distancing, frequent hand washing, and wearing face masks, among others, were also strongly suggested. The major proclaimed tactics for public health by healthcare systems are lockdowns and self-isolation.^[4] Cough, dyspnea, tiredness, and fever are the most common COVID-19 symptoms, which are comparable to those of other upper-respiratory infections.^[5] This virus can cause pneumonia, as well as secondary bacterial infections such ventilator-associated pneumonia, septic shock, and acute renal damage.⁶ The present treatment options for COVID-19 are primarily supportive and conservative, however research produced a vaccine or effective antiviral medicines.⁷ Covid-19 has dramatically altered the landscape for both public and private hospitals, with typical Ortho OPD case-loads falling by 50-55% and scheduled orthopedic operations falling by 70-80% from March to July. Orthopaedic cases, elective and emergency operations (e.g., trauma patients) need mobility into and out of operating rooms, which are high-risk sites for COVID-19 transmission to patients and health-care personnel. There was decrease in patients visiting tertiary care centers for other ailments, particularly chronic orthopaedic illness, as well as a decrease in Trauma cases such as motor vehicle collisions and work place injuries due to restrictions in people's movement and the closure of work places during lockdown, as a result of Covid 19. The World Health Organization (WHO) and other organizations have published advice for halting elective orthopedic operations in order to free up hospital beds for expected Covid-19 admissions. It's important to understand the epidemiological characteristics of patients and the resulting workflow changes in a tertiary care private teaching hospital's orthopaedic department. Because of India's pre-existing shortage of health-care workers, this would assist to identify the trend and allocate resources appropriately for the most pressing issues.

METHODS

This study was conducted in Department of Orthopaedic, Medica Superspecialty Hospital, Kolkata. All the patients visiting hospital for orthopaedic treatment.

Inclusion criteria: All the patients visiting both OPD, ER and IPD in Orthopaedic department were included in the study. All age group and genders were included.

Exclusion Criteria: There were no exclusion criteria.

Study duration: Retrospective data [Pre Covid data] from March 2019 to 23rd March 2020 and Retrospective + Prospective data [during Covid data] from 24th March 2020 to March 2021 visiting orthopaedic department were collected. Basically it was an Ambispective study.

Study design: Retrospective and Prospective study design [Statistics and characteristics of patient pre Covid 19 was collected by records and prospective data was collected for the current study duration]

Sample size: This study followed universal Sample size collection method for the entire duration of study periods.

Sampling: Purposive sampling method was used during the study period to collect data of all the patients fulfilling the inclusion and exclusion criteria.

Data Collection Methods: Data was collected using pre-structured questionnaire method. Details of Hospital number, demographic details such as age, gender, religion, locality, and others were collected from records or from patients. Reason for the visit to Orthopaedic department was also noted and classified as Trauma, Chronic illness – such as Osteoarthritis etc., infections and others. The data collected were compared between pre Covid and during Covid times.

Methodology: The present study was conducted after obtaining clearance and approval from the Institutional Ethics Committee Medica Superspecialty Hospital, Kolkata. Written informed consent was taken from the patients' side. This study was conducted in the Department of Orthopaedic and basically it was an Ambispective study. We collected data retrospectively of all patients who attended, treated and were operated at our institute under the Department of Orthopedics from March 2019 to 23rd March 2020 retrospectively and prospective data were collected from Prospective data from 24th March 2020 to March 2021. These data were then divided into two groups – pre-COVID period (March 2019 to 23rd March 2020), and during the COVID pandemic (24th March 2020 to March 2021). The diagnosis, surgeries performed their nature – major or minor, routine or emergency was compared between the two groups.

Statistical Methods: Data were tabulated in MS excel and analyzed using SPSS 22.0 version software. Qualitative data were presented in the form of Proportions and pie diagrams, bar charts will be used to represent graphically. Quantitative data were presented as mean, standard deviation. Student's t test was the test of significance for quantitative data and chi-square test was the test of significance for qualitative data. A p value <0.05 is considered as statistically significant.

RESULTS

Table 1: Month wise Distribution of Orthopedics OPD cases in Pre-covid and Covid Era

| Month | Pre-Covid Era (March 2019 to 23 rd March 2020) | Covid Era (24 th March 2020 to March 2021) |
|-----------------------|-----------------------------------------------------------|-------------------------------------------------------|
| | | |
| March | 1887 | 9 |
| April | 2043 | 160 |
| May | 2058 | 266 |
| June | 1872 | 490 |
| July | 2124 | 354 |
| August | 1751 | 376 |
| September | 1645 | 513 |
| October | 1227 | 597 |
| November | 1486 | 695 |
| December | 1585 | 874 |
| January | 1582 | 988 |
| February | 1563 | 1056 |
| March | 1005 | 1460 |
| Mean ±SD | 1679.07±327.68 | 602.92±404.85 |
| Statistical Inference | z-score - 4.15385. p Value- <0.0001 | |
| Mann-Whitney U test | | |

The comparison of month wise distribution of orthopedics OPD cases in pre-covid and covid era. It is quite obvious and also shown in the above table that the numbers of orthopedics OPD cases are significantly higher in pre-covid era compared to covid era period. When the means of the number of OPD cases per month in the pre-COVID and during the COVID period were compared using Mann-Whitney *U*-test, it was found to be highly statistically significant (p value = < 0.0001).

Table 2: Month wise Distribution of all Initial and Follow up in OPD cases in Pre-covid and Covid Era

| Month | Pre-Covid Era (March 2019 to 23 rd March 2020) | | Covid Era (24 th March 2020 to March 2021) | |
|-----------------------|-----------------------------------------------------------|-----------------|-------------------------------------------------------|-----------------|
| | Initial Cases | Follow up Cases | Initial Cases | Follow up Cases |
| | March | 489 | 1398 | 2 |
| April | 477 | 1566 | 95 | 65 |
| May | 521 | 1537 | 161 | 105 |
| June | 455 | 1417 | 269 | 221 |
| July | 965 | 1159 | 187 | 167 |
| August | 417 | 1334 | 189 | 187 |
| September | 563 | 1080 | 300 | 213 |
| October | 789 | 438 | 330 | 267 |
| November | 525 | 961 | 395 | 300 |
| December | 549 | 1036 | 496 | 378 |
| January | 972 | 670 | 546 | 442 |
| February | 938 | 625 | 599 | 457 |
| March | 601 | 404 | 845 | 615 |
| Mean ±SD | 635.46±204.74 | 1048.07±405.95 | 339.53±232.94 | 263.38±172.51 |
| Statistical Inference | Initial Cases – z-score - 2.87179. p Value- 0.0041 | | | |
| Mann-Whitney U test | Follow up Cases - z-score - 4. p Value- 0.00006 | | | |

Month wise distribution of initial cases and follow up cases of orthopaedics during and before the surge of covid-19 pandemic is presented. Both the initial cases and follow up cases have declined significantly during covid compared to pre-covid era. When means of the number of new patients and follow-up patients per month in the outpatient clinic during the pre-COVID and the COVID period were compared using the Mann-Whitney *U*-test, it was found to be highly statistically significant (p value = 0.0041 and 0.00006 respectively).

Table 3: Comparison regarding mean numbers of various Applications done in Procedure room in Pre-covid Era and Covid Era (Paired samples t test)

| Procedures | Pre-Covid Era (March 2019 to 23 rd March 2020) | | Covid Era (24 th March 2020 to March 2021) | | p value |
|--------------------------------------------------------|-----------------------------------------------------------|---------------|-------------------------------------------------------|---------------|-------------------|
| | Mean | ±SD | Mean | ±SD | |
| Dressing/ Stitch Cutting | 144.46 | ±26.05 | 75.46 | ±37.03 | 0.001 |
| Pop Slab / CAST Application / CTEV Casting | 48.30 | ±6.42 | 27.30 | ±14.13 | 0.001 |
| Arthrocentesis | 14.38 | ±2.43 | 5.76 | ±3.41 | <0.001 |
| Intra-articular Injection | 30.69 | ±6.31 | 15.84 | ±9.23 | 0.003 |
| Closed Reduction/ Manipulation under local Anaesthesia | 2.61 | ±0.96 | 1.69 | ±0.75 | 0.004 |
| Others | 49.53 | ±11.80 | 19.61 | ±14.32 | 0.001 |
| Total number of Procedures | 289.92 | ±41.41 | 145.69 | ±73.09 | <0.0001 |

The distribution of various applications performed in the procedure room of orthopedics department during and prior covid. When means of the number of various applications performed in the procedure room in the outpatient clinic during the pre-COVID and the COVID period were compared it was found to be highly statistically significant in all the aspects (p value <0.05).

Table 4: Month wise Distribution of all Emergency cases in Pre-covid and Covid Era

| Month | Pre-Covid Era (March 2019 to 23 rd March 2020) | Covid Era (24 th March 2020 to March 2021) |
|------------------------------|-----------------------------------------------------------|-------------------------------------------------------|
| March | 1326 | 304 |
| April | 1168 | 579 |
| May | 1198 | 639 |
| June | 1289 | 806 |
| July | 1350 | 879 |
| August | 1301 | 718 |
| September | 1259 | 871 |
| October | 1471 | 958 |
| November | 1438 | 973 |
| December | 1402 | 927 |
| January | 1376 | 941 |
| February | 1421 | 963 |
| March | 872 | 1176 |
| Mean ±SD | 1297.76±156.79 | 825.69±221.56 |
| Statistical Inference | z-score - 3.89744 p-value -0 .0001 | |
| Mann-Whitney U test | | |

Distribution of all the emergency cases presented to our institution during covid and prior covid is presented. While comparing the flow of emergency cases coming during and prior covid it significantly declined during the pandemic as there was a lockdown going on during the surge of it.

Table 5: Month wise Distribution of all Elective cases in IPD in Pre-covid and Covid Era

| Month | Pre-Covid Era (March 2019 to 23 rd March 2020) | Covid Era (24 th March 2020 to March 2021) |
|------------------------------|-----------------------------------------------------------|-------------------------------------------------------|
| March | 102 | 16 |
| April | 119 | 26 |
| May | 88 | 31 |
| June | 84 | 54 |
| July | 110 | 30 |
| August | 101 | 54 |
| September | 97 | 40 |
| October | 78 | 51 |
| November | 103 | 54 |
| December | 122 | 77 |
| January | 130 | 99 |
| February | 86 | 96 |
| March | 84 | 135 |
| Mean ±SD | 100.30±16.33 | 58.69±34.31 |
| Statistical Inference | z-score -3.07692. p Value- 0.0208 | |
| Mann-Whitney U test | | |

Month wise distribution of all the elective cases in orthopedics department during and pre-covid era is presented. As the elective surgeries were postponed during the pandemic surge to reduce the rate of spreading of the disease it was quite obvious that the rate of elective surgeries would definitely reduce significantly compared to pre-covid era.

Table 6: Month wise Distribution of all Daycare cases in IPD in Pre-covid and Covid Era

| Month | Pre-Covid Era (March 2019 to 23 rd March 2020) | | Covid Era (24 th March 2020 to March 2021) | |
|------------------------------|-----------------------------------------------------------|-----|-------------------------------------------------------|-----|
| | Mean | ±SD | Mean | ±SD |
| March | 9 | | 2 | |
| April | 7 | | 0 | |
| May | 11 | | 0 | |
| June | 7 | | 3 | |
| July | 11 | | 0 | |
| August | 11 | | 2 | |
| September | 8 | | 5 | |
| October | 5 | | 3 | |
| November | 3 | | 4 | |
| December | 8 | | 6 | |
| January | 5 | | 9 | |
| February | 5 | | 2 | |
| March | 3 | | 8 | |
| Mean ±SD | 7.15±2.85 | | 3.38±2.93 | |
| Statistical Inference | z-score -2.76923. -- p-value -.0056 | | | |
| Mann-Whitney U test | | | | |

The month wise distribution of day care cases. Day care cases were also reduced significantly during the pandemic just like any other services of orthopedics department.

Table 7: Comparison regarding mean numbers of various types of Arthroplasty done in IPD in Pre-covid Era and Covid Era

| Procedures | Pre-Covid Era (March 2019 to 23 rd March 2020) | | Covid Era (24 th March 2020 to March 2021) | | p value |
|------------------------------------------|-----------------------------------------------------------|-------|-------------------------------------------------------|--------|---------|
| | Mean | ±SD | Mean | ±SD | |
| Bilateral Total Knee Replacement | 0.76 | ±1.01 | 0.00 | ±0.00 | 0.018 |
| Unilateral Total Knee Replacement | 21.69 | ±7.63 | 11.53 | ±17.18 | 0.087 |
| Revision Total Knee Replacement | 0.07 | ±0.27 | 0.07 | ±0.27 | 1.000 |
| Unicompartmental Knee Replacement | 0.23 | ±0.59 | 0.46 | ±0.96 | 0.387 |
| Total Hip Replacement | 3.30 | ±1.84 | 2.46 | ±1.85 | 0.333 |
| Bipolar Hemiarthroplasty | 3.53 | ±2.22 | 2.84 | ±2.07 | 0.457 |

Comparison of different kinds of arthroplasty performed during and prior covid era showed that there were no significant differences in numbers of arthroplasty except bilateral total knee replacement.

Table 8: Comparison regarding mean numbers of various types of Arthroscopy done in IPD in Pre-covid Era and Covid Era

| Procedures | Pre-Covid Era (March 2019 to 23 rd March 2020) | | Covid Era (24 th March 2020 to March 2021) | | p value |
|-----------------|-----------------------------------------------------------|-------|-------------------------------------------------------|-------|---------|
| | Mean | ±SD | Mean | ±SD | |
| Knee | 8.92 | ±3.17 | 5.38 | ±4.94 | 0.045 |
| Ankle | 0.30 | ±0.63 | 0.38 | ±0.50 | 0.753 |
| Wrist | 0.61 | ±0.65 | 0.30 | ±0.63 | 0.219 |
| Elbow | 0.07 | ±0.27 | 0.00 | ±0.00 | 0.337 |
| Shoulder | 1.69 | ±1.25 | 1.30 | ±1.03 | 0.406 |

Comparison of different kinds of arthroscopy performed during and prior covid era showed that there were no significant differences in numbers of arthroscopy except bilateral knee arthroscopy.

DISCUSSION

We are currently seeing one of the deadliest illness epidemics in the history of the century. The world has seen its third coronavirus outbreak in less than 20 years. SARS-CoV first appeared in 2002, then MERS in 2012, and finally COVID-19 in late 2019. [8] This viral outbreak was first reported as a cluster outbreak in late December 2019 in Wuhan, China, and has been linked to a wholesale wet market, however there are a few additional ideas.⁸ In this study, we describe our orthopedics department's experience during the continuing COVID-19 epidemic by examining how and to what extent hospital workflow has altered. We also looked at the number, distribution, and characteristics of patients who visited the orthopedics department's OPD, ER, and IPD before and after Covid 19. The present study was conducted in department of Orthopedics, Medica Super Specialty Hospital, Kolkata. It was an ambispective study. Retrospective data were collected from March 2019 to 23rd March 2020 and Retrospective + Prospective data were collected from 24th March 2020 to March 2021. Various authors have projected that there would be a considerable decrease in the number of emergency and orthopaedic-related injuries over this time period as a result of these causes. The observations in our investigation were found to be in agreement with this. [9] During the covid-19 lockdown period, orthopedics-related trauma cases were significant in nature, but diminished and of various processes and patterns. The consistency of trauma-related injuries and the early therapy of these cases, even during the covid-19 phase, was critical for reducing patient morbidity and mortality. As a result, the orthopedic department's role in such a situation was critical.¹⁰ There are numerous factors that contribute to the reduction of workflow in orthopedics departments during the covid era. The end of elective surgery changed the focus of orthopedics to emergency care. The cancellations slowed the spread of the virus, saved bed capacity and personal protective equipment (PPE), and freed up workers to deal with the issue. In the weeks leading up to the gradual termination of most electives, more urgent electives were emphasized.¹¹ Although there is a global consensus to reduce "elective" orthopedic surgery, we must also be cautious in reducing the harm caused to patients as a result of elective procedures being postponed.¹² The orthopedic surgeon must assess the issue from a practical standpoint, and the choice to postpone surgery must be taken with medical and logistical factors in mind. Each case should be handled individually, based on its merits and hazards. According to a survey of international surgeons,¹³ there have been significant changes in trauma management and orthopedic practice around the world; 63 orthopaedic centers from 28 countries reported that 91 percent of their workload had

decreased, and only 17 percent of these were performing elective surgeries. Prior to May 15, 2020, 30% of these had needed to deploy orthopaedic personnel to assist in non-orthopaedic sectors. This is identical to our own experience, as our own functioning has changed significantly. The number of orthopedic admissions decreased as well, with a large decrease in clinic admissions and an increase in emergency department admissions. The outpatient facility was limited to semi-elective and urgent concerns such as infections, fractures, and malignancies, which resulted in a change in admissions. Patients were also hesitant to visit the hospital because they were afraid of catching the COVID-19 virus. Wong *et al.*¹⁴ observed a 49.2 % drop in orthopedic hospital admissions across 43 public hospitals and a 21.9 % reduction in outpatient clinic volume among 122 outpatient facilities in a cross-sectional study done in Hong Kong. The COVID-19 epidemic has had a significant impact on the international economy, which is already struggling. The protracted lockdown, ongoing economic dislocation, and unemployment have made it difficult for poorer countries to cope. Relaxing the limits, on the other hand, will almost certainly result in a faster spread of COVID-19 and a massive rise in the load of COVID-19 patients on the health-care system, which may not be able to handle the situation. This has occurred in Italy, the United Kingdom, Spain, and other European countries. Restrictions on commerce, industry, and mobility, on the other hand, are not long-term sustainable, since they can lead to other types of crises, such as poverty, starvation, desperation, and crime, all of which have negative consequences for the people. The problem is aggravated by a widespread lack of awareness of the harm COVID-19 poses, as seen by widespread and remorseless violations of the SOPs that governments have implemented in areas of both developed and developing countries. The way forward in the near future is to strike a balance: imposing "smart lockdown," which includes avoiding non-essential gatherings, maintaining social distance, frequent hand washing, and strict use of face masks –all while simultaneously opening businesses, industries, and hospitals for elective work. We don't know when the chaos and uncertainty will end, or if the world will ever be the same again – but the damage can be reduced by making reasonable decisions based on strong scientific evidence.

CONCLUSION

Our analysis emphasizes the extreme decrease in both surgical and outpatient clinic workflow and the secondary effects on emergency workload during the continuing corona epidemic at our institute. According to our findings, differences in age, the technique of damage, and patterns of injury in orthopedics-related trauma were highly

correlated with the high level of internment caused by the COVID-19 outbreak. Tele consultation was not intended to be used in the field of orthopedics, but during the Covid-19 pandemic, tele-consultation was made available to patients who were not in a life-threatening situation. The term “ telemedicine” was used to describe the use of technology to deliver uninterrupted medical care. In this circumstance, orthopaedic surgeons must find the appropriate balance between providing the best possible therapy for their patients while simultaneously avoiding the spread of the COVID-19 infection. A rebound surge in elective operations such as surgical procedure, treatment of malunion fractures, and contractures is expected as a result of the delayed and inadequately managed cases during the internment, according to our projections.

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