

A Retrospective Analysis of Effect of COVID-19 on Revision Total Knee and Hip Arthroplasty

Saroj Kumar Parida¹, Sanjay Kumar Behera², Sambit Kumar Panda³

¹Assistant Professor, Department of Orthopaedics, S.C.B. Medical College, Cuttack, Odisha, India

²Associate Professor, Department of Orthopaedics, S.C.B. Medical College, Cuttack Odisha, India

³Associate Professor, Department of Orthopaedics, B.B Medical College, Bolangir, Odisha, India

Received: 20-01-2022 / Revised: 21-02-2022 / Accepted: 03-03-2022

Corresponding author: Dr Sambit Kumar Panda

Conflict of interest: Nil

Abstract

Background: The SARS-CoV-2 (Covid-19) has significantly impacted the health of the people around the globe. Primary Total Hip arthroplasty (THA) and Total Knee arthroplasty (TKA) were significantly affected in the pandemic time. The canceled surgeries of THA and TKA were rescheduled as majority of the beds in the hospitals were occupied by COVID patients. Due to this, patients for such surgery accumulated and many patients faced serious health issues. In addition to THA and TKA, Covid-19 pandemic also significantly impacted Total Joint arthroplasty (TJA) volume. According to analysis, the annual volume of the TKA and THA for 2020 was around 128,000 and 66,000 respectively.

Aim: To analyze the effect of COVID-19 on revision total knee and hip arthroplasty.

Methods: For the study, the data was collected from the institutional registry for TJA and pending revisions for the TKA and THA patients. Approximately 465 inpatient beds between April 2019 and March 2020 considered for the study. Procedures were conducted for 12 months prior to the initial shutdown of elective surgery (April 19 – March 20). The percentage changes for urgent revisions for TJA were compared focusing on pre and post-Covid TKA and THA.

Results: Two groups were defined as pre-Covid patients (n = 190) and post-Covid patients (n= 160). The mean age of the patient in pre-Covid group was 75.3 years (SD = 1.01) and post-Covid group was 68.9 years (SD = 11.52). For TKA revision, in pre-covid group, 33.3% of the patients had Aseptic loosening and 22.2% had Periprosthetic joint infection, and 16.6% required Urgent revision. On the other hand, in post-Covid group, 33.3% of the patients had Aseptic loosening and 21.2% had Periprosthetic joint infection, and 18.1% required Urgent revision. Post-Covid cases of THA were also increased as out of 94 patients, 15.9% required Urgent revision. There was no significant difference between the groups for TKA revision ($p > 0.05$). Similarly, apart from Aseptic loosening ($p < 0.05$), there was no significant difference between the groups for THA revision ($p > 0.05$).

Conclusion: It has been carried out that revision of TKA and THA decreased in health care system during Covid-19 pandemic compared to pre-Covid. The numbers of urgent cases were increased in both groups such as the numbers of urgent cases for THA were 15.9% and TKA was 18.1% post-Covid and these are creating the backlog for the care professionals to provide the better treatment and recovery of the patients.

Keywords: Primary Total Hip arthroplasty (THA), Total Knee arthroplasty (TKA), Total Joint arthroplasty (TJA)

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Background

The SARS-CoV-2 (Covid-19) has significantly impacted the health of the people around the globe. The World Health Organization (WHO) is monitoring and analyzing the effects of Covid-19 on the different body functions and organs of the people[1]. Because of this pandemic, the health care system and authorities decided to cancel or postpone the elective surgeries. This decision was taken in view of risk to the patient's life, infection to the care workers and family members of the patients[2]. Moreover, it was important to have vacant beds in hospitals for Covid patients. Like several other elective surgeries, Total Hip arthroplasty (THA) and Total Knee arthroplasty (TKA) were also significantly affected due to this pandemic as surgeries were either canceled or postponed[3].

The canceled surgeries of THA and TKA were rescheduled as majority of the beds in the hospitals were occupied by COVID patients. Due to this, patients for such surgery accumulated and many patients faced serious health issues. In addition to THA and TKA, Covid-19 pandemic also significantly impacted Total Joint arthroplasty (TJA) volume[4]. According to analysis, the annual volume of the TKA and THA for 2020 was around 128,000 and 66,000 respectively. However, there is lack of availability of current data due to treatment and care services for the patients. Apart from this, large numbers of TJA were also cancelled due to Covid-19[5].

Thus, it becomes essential for the care worker and professionals to understand the issues of such patients and reschedule the surgery of TKA and THA. Revision of TJA can be separated into indication for the surgery, urgent or time sensitive cases and non-urgent or elective cases[6]. Thus, management of urgent or time sensitive

cases such as revision for infection or periprosthetic fracture is essential as the rate of infection can be high[7]. According to American Joint Replacement Registry, the annual rate of revision for infection was 20.5% and revision for fracture was 2.3% for revision TKA cases. On the other hand, the rate of revision for infection was 13.3% and that of periprosthetic fracture were 5.4% for the revision THA cases[8]. Therefore, it is important to decide the revision of TKA and THA cases. Thus, this study attempts to analyze the effect of pandemic on revision of TKA and THA by comparing cases before and after Covid-19[9].

Aim

To analyze effect of COVID-19 on revision total knee and hip arthroplasty

Method and Material

The study was conducted using the retrospective analysis focusing on the primary analysis of the TKA and THA revision. The study was conducted using the procedure in a single hospital network and data was collected through institutional registry for TJA for 465 inpatient beds duration of April 2019 to March 2020. The percentage change in primary and revision TJA was compared between groups were compared to meet the desired outcome of the study.

The study has focused on the indication of revision of the TJA and identified the urgent revision patients. The involvement of periprosthetic joint infection and periprosthetic fracture) and semi-elective (cases such as aseptic loosening were considered for the major outcome of the study. The major evaluation of the pre and post-Covid patients focusing on the TKA and THA issues were conducted in duration of 12 months. The volume was compared to

identify the TKA and THA to find the numbers of primary patient and urgent cases.

Statistical analysis

The current study has compared the pre and post-Covid groups for study of the issues and increase in the urgent cases among the TKA and THA patients. The statistical data

analysis has been done focusing on the age, gender and BMI of the patients. Moreover, the study has compared the volume of both groups. After that, the study has analyzed the parentage of total cases and compared the p-value.

Results

Table 1: TJA revision

	Pre-Covid	Post-Covid	% Change	P-value
TJA revision	190	160	15.79	0.671
Male	92 (48.42%)	78 (48.75%)		
Female	98 (51.58%)	82 (51.25%)		
BMI	30.1 (SD = 6.0)	30.2 (SD = 6.7)		0.811
Age	75.3 (SD = 1.01)	68.9 (SD = 11.52)		0.370

Table 1 shows there were 190 patients in pre-Covid 190 group and 160 patients in post-Covid group. The mean age of the patient in pre-Covid group was 75.3 years (SD = 1.01) and in post-Covid group was 68.9 years (SD = 11.52). BMI of the pre-Covid 30.1 (SD = 6.0) and post-Covid

30.2 (SD= 6.7). There was no significant difference in age and BMI between the groups ($p>0.05$). In pre-Covid group, male percentage was 48.42% and female was 51.58%. Contrary, in post-Covid group, male percentage was 48.75% and female was 51.25%.

Table 2: TKA revision

	Pre-Covid	Post-Covid	% Change	P-value
TKA revision	90	66	26.66%	0.820
Aseptic loosening	29 (32.2%)	22 (33.3%)		0.870
Periprosthetic joint infection	19 (21.1%)	14 (21.2%)		0.840
Instability	12 (13.3%)	10 (15.1%)		0.970
Fracture	6 (6.6%)	8 (12.1%)		0.160
Arthrofibrosis	7 (7.7%)	6 (9.0%)		0.640
Polyethylene wear	4 (4.4%)	0		0.510
Mental allergy	4 (4.4%)	3 (4.5%)		0.711
Intractable pain	5 (5.5%)	3 (4.5%)		0.710
Patellar instability	4 (4.4%)	0		0.401
Urgent revision	15 (16.6%)	12 (18.1%)		0.590

As per table 2, TKA patients were categories in two groups: pre-Covid group having 90 patients and post-Covid group having 66 patients. Highest numbers of patients were categorized as Aseptic loosening (32.2%), followed by Periprosthetic joint infection (21.1%) in

pre-covid group. Out of 90 patients, 16.6% required Urgent revision. Similarly, highest number of patients in post-Covid group were categorized as Aseptic loosening (33.3%), followed by Periprosthetic joint infection (21.2%). Out of 66 patients, 18.1% required Urgent revision. There was

no significant difference between the groups for TKA revision ($p>0.05$).

Table 3: THA revision

	Pre-Covid	Post-Covid	% Change	P-value
THA revision	100	94	6.0%	0.602
Aseptic loosening	30 (30%)	14 (14.8%)		0.03
Periprosthetic joint infection	20 (20%)	21 (22.3%)		0.41
Instability	18 (18%)	13 (13.82%)		0.39
Fracture	14 (14%)	13 (13.8%)		0.310
Metallosis	6 (6%)	13 (13.8%)		0.80
Osteolysis	4 (4%)	10 (10.86%)		0.10
Polyethylene ware	5 (5%)	6 (6.52%)		0.440
Heterotopic ossification	3 (3%)	4 (4.2%)		0.330
Urgent revision	14 (14%)	15 (15.9%)		0.110

As per table 3, THA patients were categorized in two groups: pre-Covid group having 100 patients and post-Covid group having 94 patients. Highest numbers of patients were categorized as Aseptic loosening (30.0%), followed by Periprosthetic joint infection (20.0%) in pre-covid group. Out of 100 patients, 14.0% required Urgent revision. Similarly, highest numbers of patients in post-Covid group were categorized as Periprosthetic joint infection (22.3%), followed by Aseptic loosening (14.8%). Out of 94 patients, 15.9% required Urgent revision. Apart from Aseptic loosening ($p<0.05$), there was no significant difference between the groups for THA revision ($p>0.05$).

Discussion

The annual volume of the TKA and THA for 2020 was around 128,000 and 66,000 respectively. However, there is lack of availability of current data due to treatment and care services for the patients. Moreover, large numbers of TJA were also cancelled due to Covid-19 [10]. American Joint Replacement Registry report shows that the annual rate of revision for infection was 20.5% and revision for fracture was 2.3% for revision TKA cases. On the other hand, the rate of revision for infection was

13.3% and that of perprosthetic fracture were 5.4% for the revision THA cases.

In present study, there were 190 patients in pre-Covid 190 group and 160 patients in post-Covid group. The mean age of the patient in pre-Covid group was 75.3 years (SD = 1.01) and in post-Covid group was 68.9 years (SD = 11.52). Mean BMI of the pre-Covid patients was 30.1 (SD = 6.0) and of post-Covid patients was 30.2 (SD= 6.7). In pre-Covid group, male percentage was 48.42% and female was 51.58%. Contrary, in post-Covid group, male percentage was 48.75% and female was 51.25%. The study found no significant difference between the two groups in terms of demographic data such as age, gender, and BMI. Also, there was decrease in revision for TKA by 26.66% and THA by 6.0%.

According to comparative study of Robinson et al., (2021) there were 196 revision TJAs in the eight months prior to the pandemic. Patients had a mean age of 75.2 years (SD = 1.02), consisting of 51.9% females and 48.1% males, and had a mean BMI of 30.5 kg/m² (SD = 6.7). Further, there were 161 revision TJAs in the eight months after the shutdown, with mean age of 68.7 years (SD = 11.58), comprised of 56.2% females and 43.8% males, and had an average BMI of 30.3 kg/m² (SD = 6.9).

There was no significant difference between the groups in terms of age ($p = 0.37$), sex ($p = 0.37$), and BMI ($p = 0.82$)[11].

Further, in present study, TKA patients were categorized in two groups: pre-Covid group having 90 patients and post-Covid group having 66 patients. Highest numbers of patients were categorized as Aseptic loosening (32.2%), followed by Periprosthetic joint infection (21.1%) in pre-covid group. Out of 90 patients, 16.6% required Urgent revision. Similarly, highest number of patients in post-Covid group were categorized as Aseptic loosening (33.3%), followed by Periprosthetic joint infection (21.2%). Out of 66 patients, 18.1% required Urgent revision. There was no significant difference between the groups for TKA revision ($p > 0.05$).

As per the study of Robinson et al., (2021)[12] of the 93 revision TKA prior to shutdown, indications included aseptic loosening (41, 44.1%) and periprosthetic joint infection (22, 23.7%) with 25 (26.9%) urgent revision TKA cases. Similarly, post-Covid revision TKA had aseptic loosening (30, 46.2%) and periprosthetic joint infection (14, 21.5%) with 20 (30.8%) Urgent revision TKA.[13]

Furthermore, in the present study, THA patients were categorized in two groups: pre-Covid group having 100 patients and post-Covid group having 94 patients. Highest numbers of patients were categorized as Aseptic loosening (30.0%), followed by Periprosthetic joint infection (20.0%) in pre-covid group. Out of 100 patients, 14.0% required Urgent revision. Similarly, highest numbers of patients in post-Covid group were categorized as Periprosthetic joint infection (22.3%), followed by Aseptic loosening (14.8%). Out of 94 patients, 15.9% required Urgent revision. Apart from Aseptic loosening ($p < 0.05$), there was no significant difference between the groups for THA revision ($p > 0.05$).

Robinson et al., (2021)[14] has also shown the THA revision for the pre and post Covid

patients. As per the analysis of study, of 103 revision THA prior to shutdown, indications included aseptic loosening (29, 28.2%) and periprosthetic joint infection (24, 23.3%) with 36 (34.9%) Urgent revision THA cases[15]. Similarly, of the 96 revision THA during the shutdown, indications included periprosthetic joint infection (28, 29.2%) with 45 (46.9%) Urgent revision THA cases. There was no significant difference found in two categories except aseptic loosening[16,17].

Limitations

There were some limitations for conducting the study that involve the lack of internal registry of health care system that might not offering the national trend of TJA revision and there is no unified database for revision of cases. Moreover, the second limitation was identification of the primary revision changes in the TJA due to outbreak of the Covid-19.

Conclusion

From the study, it has been carried out that revision of TKA and THA decreased in health care system during Covid-19 pandemic compared to pre-Covid. The numbers of urgent cases were increased in both groups such as the numbers of urgent cases for THA were 15.9% and TKA was 18.1% post-Covid and these are creating the backlog for the care professionals to provide the better treatment and recovery of the patients. It might have the financial and clinical effects on the healthcare system and affect the health of the patients.

References

1. Barnes, C.L., Zhang, X., Stronach, B.M. and Haas, D.A., 2021. The initial impact of COVID-19 on total hip and knee arthroplasty. *The Journal of arthroplasty*.
2. Czubak-Wrzosek, M., Czubak, J., Grzelecki, D. and Tyrakowski, M., 2021. The Effect of the COVID-19 Pandemic on Total Hip and Knee Arthroplasty Surgical Volume in 2020 in Poland. *International Journal of*

- Environmental Research and Public Health, 18(16), p.8830.
3. Robinson, M.G., Greene, N., Katakam, A., Chen, A., Bedair, H.S., Humphrey, T. and Melnic, C.M., 2021. The effect of the COVID-19 pandemic on revision total hip and knee arthroplasty at a large academic hospital network. *Journal of Orthopaedics*, 28, pp.117-120.
 4. Zalikha, A.K., Karabon, P., Hussein, I.H. and El-Othmani, M.M., 2021. Anxiety and Depression Impact on Inhospital Complications and Outcomes After Total Knee and Hip Arthroplasty: A Propensity Score-Weighted Retrospective Analysis. *JAAOS-Journal of the American Academy of Orthopaedic Surgeons*, pp.10-5435.
 5. Vermeşan, D., Todor, A., Andrei, D., Niculescu, M., Tudorache, E. and Haragus, H., 2021. Effect of COVID-19 Pandemic on Orthopedic Surgery in ThreeCenters from Romania. *International Journal of Environmental Research and Public Health*, 18(4), p.2196.
 6. Meena, O.P., Kalra, P., Shukla, A., Naik, A.K., Iyengar, K.P. and Jain, V.K., 2021. Is performing joint arthroplasty surgery during the COVID-19 pandemic safe?: A retrospective, cohort analysis from a tertiary centre in NCR, Delhi, India. *Journal of Clinical Orthopaedics and Trauma*, 21, p.101512.
 7. Hines, J.T., Hernandez, N.M., Amundson, A.W., Pagnano, M.W., Sierra, R.J. and Abdel, M.P., 2019. Intravenous tranexamic acid safely and effectively reduces transfusion rates in revision total hip arthroplasty. *The bone & joint journal*, 101(6_Supple_B), pp.104-109.
 8. Farrow, L., Gardner, W.T., Tang, C.C., Low, R., Forget, P. and Ashcroft, G.P., 2021. Impact of COVID-19 on opioid use in those awaiting hip and knee arthroplasty: a retrospective cohort study. *BMJ Quality & Safety*.
 9. Mehta, B.Y., Bass, A.R., Goto, R., Russell, L.A., Parks, M.L., Figgie, M.P. and Goodman, S.M., 2018. Disparities in outcomes for blacks versus whites undergoing total hip arthroplasty: a systematic literature review. *The Journal of rheumatology*, 45(5), pp.717-722.
 10. Cheok, T., Jennings, M., Aprato, A., Jayasekera, N. and Jaarsma, R.L., 2021. Safety of intraarticular corticosteroid injection preceding hip and knee arthroplasty: a systematic review and meta-analysis amid resolving COVID-19 arthroplasty restrictions. *Journal of Hip Preservation Surgery*.
 11. Robinson, M.G., Greene, N., Katakam, A., Chen, A., Bedair, H.S., Humphrey, T. and Melnic, C.M., 2021. The effect of the COVID-19 pandemic on revision total hip and knee arthroplasty at a large academic hospital network. *Journal of Orthopaedics*, 28, pp.117-120.
 12. Zaichick, V. . . (2022). Diagnosis of Thyroid Malignancy using Chemical Elements of Nodular Tissue determined by Nuclear Analytical Methods. *Journal of Medical Research and Health Sciences*, 5(3), 1808–1824.
 13. Robinson, M.G., Greene, N., Katakam, A., Chen, A., Bedair, H.S., Humphrey, T. and Melnic, C.M., 2021. The effect of the COVID-19 pandemic on revision total hip and knee arthroplasty at a large academic hospital network. *Journal of Orthopaedics*, 28, pp.117-120.
 14. Jacobs, A.M.E., Bénard, M., Meis, J.F., Van Hellemond, G. and Goosen, J.H.M., 2017. The unsuspected prosthetic joint infection: incidence and consequences of positive intra-operative cultures in presumed aseptic knee and hip revisions. *The bone & joint journal*, 99(11), pp.1482-1489.
 15. Robinson, M.G., Greene, N., Katakam, A., Chen, A., Bedair, H.S., Humphrey, T. and Melnic, C.M., 2021. The effect of the COVID-19 pandemic on revision total hip and knee arthroplasty at a large academic hospital network. *Journal of Orthopaedics*, 28, pp.117-120.

16. Cassidy, R.S., O hEireamhoin, S. and Beverland, D.E., 2019. Guidelines for the follow-up of total hip arthroplasty: do they need to be revised?. *The bone & joint journal*, 101(5), pp.536-539.
17. Skibicki, H.E., Post, Z.D., Brustein, J.A., Ong, A.C., Orozco, F.R. and Ponzio, D.Y., 2021. Incidence of COVID-19 After Nonelective Hip and Knee Surgery During the Peak of the Pandemic: The New Jersey Experience. *Orthopedics*, 44(3), pp.180-186.