

RESEARCH

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Total Knee Replacement Epidemiology in a Single Secondary Hospital Before and After the COVID-19 Pandemic: A descriptive Comparative Study

Endrotomo Sumargono, MD^{1,2}, Maria Anastasia, MD², Ifran Saleh, MD¹, Astuti Pitarini, MD¹

Maria Florencia Deslivia, MD, PhD¹, Claudia Santosa, MD¹, Erica Kholinne, MD, PhD^{1,3}

¹St. Carolus Bone & Joint Center, St. Carolus Hospital, Jakarta, Indonesia

²Faculty of Medicine, Universitas Katolik Indonesia Atma Jaya, Jakarta, Indonesia

³Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia

ABSTRACT

Background: The purposes of this study were (1) to describe the characteristics of patients underwent TKR during COVID-19 Pandemic and (2) to compare the demographic of patients underwent TKR before and after COVID-19 Pandemic in St. Carolus Hospital, Jakarta, Indonesia.

Methods: Data were extracted from January 2016 to December 2020 from the annual reports of arthroplasty registry (single surgeon). Patient demographic data were collected (Gender, age, comorbidity). Post-operative characteristics were defined as: (1) Length of hospitalization (days); (2) Complication rate (%); (3) Revision event (%). The complication rate included: (1) Deep vein thrombosis; (2) Prosthetic joint infection; (3) Periprosthetic fracture. The above parameters were compared before and after the COVID-19 Pandemic.

Result: A total of 730 primary TKR procedures (12.3 cases per month) were performed from January 2016 to February 2020, meanwhile there were 54 primary TKR (6 cases per month) done in 9 months after COVID-19 Pandemic from March 2020 to December 2020. The lowest case monthly after the COVID-19 Pandemic was found on April 2020 (1 case per month), on the other hand, the highest case monthly was found on December 2020 (14 cases per month). The complication rate decreased from the Pre COVID-19 Pandemic (8.6% to 1.8%).

Conclusion: The number of cases was reduced during Indonesia large-scale social restriction (40 %) and returned to the Pre-Pandemic period on December 2020.

Level of Evidence : Descriptive study, level III

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Corresponding Author:

Erica Kholinne, MD, PhD. Faculty of Medicine,
Universitas Trisakti, Department of Orthopedic
Surgery, St. Carolus Hospital, Jakarta, Indonesia.
Email: erica_kholinne@yahoo.com
ORCID ID: 0000-0002-4326-8205

Introductions

The World Health Organization (WHO) declared COVID-19 as a Public Health Emergency of International Concern on 30 January 2020, and a pandemic on 11 March 2020.¹ In Indonesia, the first COVID-19 case was announced by the Government on March 2nd 2020.² Healthcare services were impacted significantly by the COVID-19 Pandemic. In the United States, considering the shortage of healthcare resources, elective surgery was suggested to be halted.³ This certainly has affected total knee replacement (TKR) surgery as the most common procedure performed in orthopaedic surgery. It was estimated more than 30,000 hip and knee arthroplasty procedures weekly were cancelled in the United States.^{3,4} In Singapore, elective surgery should have been postponed to compensate inpatient beds for suspected or confirmed COVID-19 cases. Only emergency trauma, oncology, and one-day surgery (Arthroscopy or soft-tissue surgical procedure) were allowed to proceed. For this reason, hip and knee arthroplasty procedure were cancelled during early months of the COVID-19 Pandemic. This obviously led to unfavourable consequences on patients, both physically and mentally, with degenerative joint disease.⁵

Our institution performed more than 150 TKR cases annually.⁶ During the COVID-19 Pandemic, especially after the first case was declared by the Government, the trend of orthopaedic cases in our institution has dropped compared to the pre-pandemic situation, including TKR cases. The purposes of this study were (1) to describe the characteristics of patients underwent TKR during COVID-19 Pandemic and (2) to compare the demographic of patients underwent TKR before and after COVID-19 Pandemic

Methodology

This Institutional Review Board was exempted from the current study. Data were extracted from the 4 most recent years of annual reports of arthroplasty registry data from a single

surgeon of the current institution and 9 months after the first COVID-19 case was reported in Indonesia. These registries were chosen based on the availability of procedural data. Pre-operative assessment includes medical clearance from internist, cardiologist, and anaesthesiologist which followed by a chest x-ray and PCR test for the COVID-19 screening. Apart from the diagnostic test, the patient history and symptom were also examined for potential exposure to the COVID-19. For the post-hospitalization care following the surgery, all patients went to hospital for face-to-face consultation meanwhile for patients who were not willing to go to hospital were monitored via virtual outpatient clinic (Zoom Video Communications, Inc., San Jose, California, USA). Patient demographic data were collected as follows: (1) Age; (2) Gender; and (3) Comorbidities. Post-operative characteristics were defined as: (1) Length of hospitalization (days); (2) Complication rate (%); (3) Revision event (%). The complication rate included: (1) Deep vein thrombosis; (2) Prosthetic joint infection; (3) Periprosthetic fracture. The revision burden was defined as the number of revision surgeries performed as a percentage of the total number of arthroplasty procedures performed during a given period. Data were collected from medial record by 4 medical doctor posted in orthopaedic service whom did not involve in the surgery (MA, NS, VH, RS). Descriptive statistics were utilized to report the characteristics of this registry.



Figure 1. Example of virtual polyclinic for post-surgery care

Result

A total of 730 primary TKR procedures were performed from January 2016 to February 2020, meanwhile there were 54 primary TKR done in 9 months after COVID-19 pandemic from March 2020 to December 2020. Monthly average TKR per year in 2020 pandemic was significantly decreased, 6.3 case per month after COVID-19 Pandemic (From 15.2 cases per month before COVID-19 Pandemic); as shown in figure 1. The lowest case monthly was found on April 2020 (1 case per month).

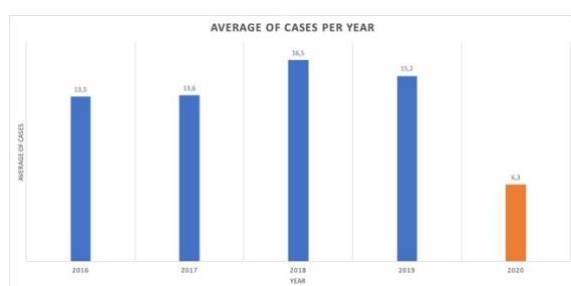


Figure 2. Number of TKR cases per Month from 2016 to 2020

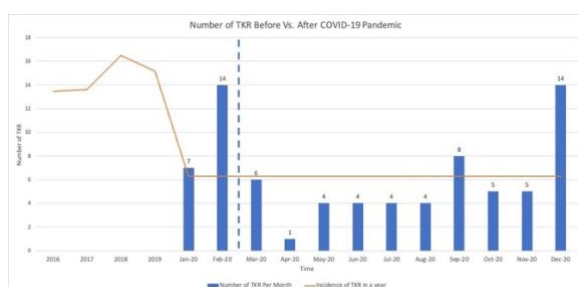


Figure 3. Number of TKR Before and After COVID-19

The average age of patients undergoing primary TKR before COVID-19 was similar (68.1 years vs 70 years) with most of the patients were above the sixth decades (85%). The gender distribution among patients was dominated by females both before (82.1 %) and after pandemic (72.2%).

Before the pandemic, the number of patients presented with comorbidities was 59,8%. This number increases after the pandemic, reaching 72,2%. The most common comorbidity found was hypertension, which is similarly found before and after pandemic.

As for the post-operative patients' characteristics, the average hospitalization days before COVID-19 Pandemic were 4,4 days and 3,3 days after COVID-19 Pandemic.

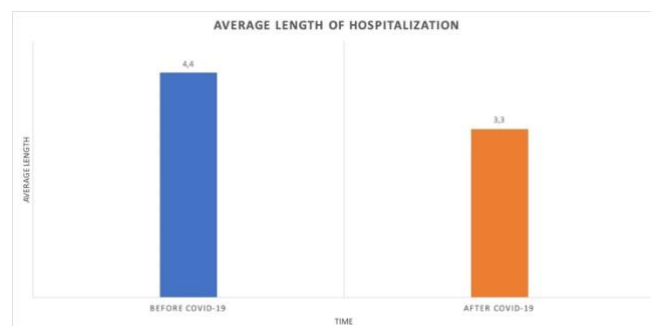


Figure 4. Average length of hospitalization before and after the COVID-19 Pandemic

The complication rate was 8.6% before COVID-19 Pandemic and decreased to 1.8% after COVID-19 Pandemic. Deep vein thrombosis (DVT) is the most frequent complication before and after the pandemic. Prosthetic joint infection (PJI) was found in 6 patients (0.75%) before COVID-19 Pandemic and none was observed after the Pandemic. Three of 784 patients underwent revision (0.3%), which were all performed before COVID-19 Pandemic.

Discussion

The current study described the data collected from the annual reports of arthroplasty registry data from a single surgeon at a single institution to show the trends of the procedure performed before and after the COVID-19 Pandemic. Prior to the COVID-19 pandemic, the number of primary TKR at this Institution were more than 150 cases annually or more than 10 cases per month, with the peak in 2018, reaching more than 15 cases monthly on average. The trend of TKR cases after the COVID-19 Pandemic hits Indonesia (After March 2020) was significantly reduced (6 procedures monthly). The government official of the country declared Indonesia large-scale social restriction (*Pembatasan Sosial Berskala Besar* / PSBB) since April 10th 2020.⁷ With this restriction, the number of cases performed was dropped to 1 case per month. The Government has implemented transitional period

starting on June 2020 (*PSBB transisi*/transitional period). This is also reflected by the slight increase of the cases in this transition period (4 cases per month).⁷ Since November 2020, the incidence of COVID-19 case were slightly decreased in Jakarta.⁸ For this reason, average number of cases were slightly increased in December 2020 (15 cases in December 2020) in our institution because patients felt confidence to do hospital visits. Hence, the highest number of cases performed after the COVID-19 Pandemic was in December 2020. A study by Santoso A et al., which was conducted in a single tertiary hospital in Indonesia, described the similar trend of TKR surgery. There was a significant decrease in April – June and regaining its number in September.⁹ Another study by Phatama et al. which evaluated the impact of COVID-19 to the hip and knee arthroplasty from three studies conducted in Europe and the USA, showed that 82.1% of 1770 surgeons reported that they did not perform all primary total joint arthroplasty (TJA). It was also concluded that 89.8% of 1671 surgeons from two studies described a drastically reduced surgical volume.¹⁰

There was no difference regarding the patient's demographic before and after the COVID-19 Pandemic. DVT still remains the most common complication, even though the number was significantly reduced, considering the change of postoperative protocol in the institution which comprised mechanical DVT prophylaxis, Intermittent Pneumatic Compression Device (IPCD) (Flowtron® Excel, Arjohuntleigh, Bedfordshire, UK) aside from pharmacological prophylaxis (Aspirin 80 mg, Rivaroxaban 30 mg or Edoxaban 10 mg for 7 consecutive days post-surgery). There was no Prosthetic Joint Infection case reported after the COVID-19 Pandemic, perhaps because the number of cases was too low to observe a complication. The usual pre-surgical skin preparation was with 2% chlorhexidine gluconate cleansing and surgical skin preparation using alcohol-based solution and povidone-iodine along with prophylactic antibiotics which was intravenous (IV) two gram cefazoline (or IV 1.5

gram Cefuroxime if the patient has an allergic to Cefazoline) as our routine given 1 hour prior to the incision and continued up to 24 hours dose (Based on the guideline from the American Academy of Orthopaedic Surgeon)¹¹ in our institution.

The length of hospitalization was shorter during the COVID-19 Pandemic, because of the negative impression towards in-hospitalization during COVID-19 Pandemic, therefore they were discharged two days post-operative.

The clinical outcome were evaluated with the "traditional" face-to-face clinic appointment. The institution encouraged virtual clinical follow-up since Indonesia large-scale social restriction (*Pembatasan Sosial Berskala Besar / PSBB*) was started, facilitated by video call. All of the patients were able to participate in this form of evaluation. Further evaluation is being performed for the effectivity of this virtual clinical follow-up.

There are some strengths and limitations of this study. The unique part of this study compare to other literature is that the study described the rate of return to the pre-pandemic condition. The number of cases was reduced during Indonesia large-scale social restriction (40 %) and returned to the Pre-Pandemic period on December 2020. The current study was the first descriptive study to report the demographic of TKR during the COVID 19 Pandemic period. For this reason, the database provided can be useful for the comparison before and after the COVID-19 Pandemic. Second, all cases given in this study were performed by a single surgeon in a single institution, thus, all the procedures here had identical perioperative protocol before and after the COVID-19 Pandemic. Lastly, this report proved that arthroplasty surgery, especially TKR still can be done regardless the COVID-19 Pandemic, as long as strict COVID-19 Protocol is implemented before, during, and after surgery. A study in Greece by Kort et al.¹² reported that prior COVID-19 PCR testing to patient up to 7 days before TKR procedure is required. Physical distancing, hand hygiene protocol and use of masks were mandatory, along with restriction of visiting

person (maximum 1 single person for each patient). Despite the strength, the study also has its limitation concerning the retrospective design of the study.

Conclusion

This study described the experience of TKR surgery before and after the COVID-19 Pandemic. The number of cases was reduced during Indonesia large-scale social restriction (40%) and returned to the Pre-Pandemic period on December 2020. The revision rate remains the same before and after the COVID-19 Pandemic.

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