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Research

# Clinical Demographics Characteristic of Total Knee Arthroplasty at Prof IGNG Ngoerah General Hospital, Bali, Indonesia

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## ABSTRACT

**Background:** Total knee arthroplasty (TKA) is a widespread surgical procedure for severe arthritis. By 2030, primary TKA would reach over 1.2 million procedures annually in the United States. In Indonesia, the prevalence of joint disease is about 19.5 million cases. This study aims to evaluate the clinical demographics characteristics of TKA in Prof. Ngoerah General Hospital, Bali, Indonesia.
**Subjects and Method:** This is a descriptive study using a cross-sectional method with a total 57 adult patients undergoing TKA caused by Osteoarthritis grade III/IV in Prof IGNG Ngoerah Hospital from June 2020-June 2022. Dependent Variable is TKA procedure. Independent Variable is Age, gender, grade of knee osteoarthritis, comorbidities, and complications Data from the medical record was collected and stored in a Microsoft Office Excel 365 spreadsheet, distributive table was analyzed and collected by using SPSS.
**Results:** Patient's characteristic is dominated by elderly female (84.2%), with age group 61-70 (38.6%). Comorbidities in this study include: hypertension (28.1%), type II diabetes (10.5%), and rheumatoid disease (1.8%). The main complication recorded in this study includes joint stiffness (3.5%), and persistent pain (5.3%).
**Conclusion:** After Total Knee Arthroplasty was performed on 57 patients with a wide range of comorbidities, only a small number of complications has been occurred. This study implied that TKA could be performed even if the patient had some comorbidities as long as the patient pursued a complete pre and post-operative evaluation algorithm of the procedure.

**Keywords:** knee arthroplasty, osteoarthritis, human and medicine, rehabilitation

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## BACKGROUND

Total knee arthroplasty (TKA) is a widespread surgical procedure for severe arthritis. By 2030, primary TKA would reach over 1.2 million procedures annually in the United States and 226.000 procedures in Germany (Sloan et al., 2018) (Klug et al., 2021). In Indonesia, there is no clinical data available, yet, the number of primary arthroplasties is increasing annually to our clinical ex-

periences, and observations. According to Indonesian Basic Health Research (Riskesdas) in 2018, the prevalence of joint disease in Indonesia was around 7.3%, hence to the number of the Indonesian population, the number of joint diseases would reach up to 19.5 million cases. Thus, it would reflect the number of total knee arthroplasty procedures in Indonesia (Badan Penelitian dan Pengembangan Kesehatan KEMENKES RI, 2018).

Initially considered in 1860, TKA has been through serial of improvements due to the progression of technology. It has been a common option for any chronic or acutely devastating knee problem that doesn't resolve by other treatment measures. While pain management and function improvement are arthroplasty goals, certain complications remain significant to each patient. Many studies have reported stiffness and persistent pain following TKA. Around 4-16% of patients experience stiffness after total knee arthroplasty (Singh et al., 2019). Risk factor of post-knee arthroplasty stiffness are divided into three categories, which are: preoperative, intraoperative, and postoperative factors (See Table 1). In case of stiffness, the management includes: manipulation under anesthesia, arthrolysis, and revision arthroplasty. The Kellgren and Lawrence classification may also provide healthcare providers with a treatment algorithm to guide clinical decision-making, defining which patients may benefit most from surgical treatment (Kohn et al., 2016).

Furthermore, some insurers currently require providers to submit evidence of the KL classification in order to obtain approval for a TKA. Additionally, patients with comorbidities who have undergone TKA surgery must be taken into consideration. Individual comorbidities were linked to increased hospital utilization. Due to the individual comorbidities, the length of the patient's hospital stay following TKA surgery could be prolonged. The most prevalent comorbidities were hypertension (67.8%), diabetes (20%), and obesity (19%) (Pugely et al., 2014).

Persistent pain after TKA plateaus between three and six months after surgery, therefore, post-TKA persistent pain is defined as disturbing pain on three to six months after surgery. The complexity of persistent pain involves bio-psychosocial factors. Hence, the management of persistent pain would also be considered as a multi-disciplinary problem that required the right approach. The devastating outcome of post-TKA persistent pain is believed due to the nature of persistent pain itself and lack of evidence-based recommendation of the management of persistent pain (Wylde et al., 2018).

## SUBJECTS AND METHOD

### 1. Study Design

This study was a retrospective Cross-sectional study with a total 57 adult patients undergoing TKA caused by Osteoarthritis grade III/IV in Prof IGNG Ngoerah Hospital from June 2020-June 2022.

### 2. Population and Sample

Total 57 adult patients undergoing knee arthroplasty operated by orthopedic surgeons of our hospital from June 2020 to June 2022. The diagnosis of stiffness and persistent pain was made on outpatient consultation during the follow-up period between 3 to 6 months. Samples were collected and identified from medical record in Prof IGNG Ngoerah General Hospital.

### 3. Study Variables

The dependent variable was TKA procedure. The independent variable was Age, gender, grade of knee osteoarthritis, comorbidities, and complications.

**4. Operational definition of variables**

**Total Knee Arthroplasty (TKA)** is Viable treatment for symptomatic knee osteoarthritis resistant to conservative treatment. Literature has yet to identify a potentially viable alternative option for cartilage regeneration in patients with end-stage degenerative changes compromising the articular cartilage and affecting multiple compartments of the knee.

**Grade of knee osteoarthritis**: Initially, the KL classification was described using AP knee radiographs. Each radiograph was assigned a grade between 0 and 4, which was correlated to the severity of osteoarthritis, with Grade 0 indicating no OA and Grade 4 indicating severe OA Study Instruments

**Stiffness**: there is no consensus in defining the stiff TKA, definitions in the literature refer to flexion limits ranging from 75–90°, flexion contracture greater than 10°, or a combination of the two.

**Persistent pain**: Chronic post-surgical pain is widely accepted to be pain of at least three to six months duration that develops or increases in intensity after a surgical procedure and significantly affects health-related quality of life.

**5. Study Instruments**

All of samples were collected and identified from medical record from electronic medical record system from Prof IGNG Ngoerah General Hospital.

**6. Data analysis**

Data from the medical record was collected and stored in a Microsoft Office Excel 365 spreadsheet. Distributive table was analyzed and collected by using SPSS

## RESULTS

**1. Sample Characteristics**

Fifty-seven total knee arthroplasties were performed, 55 of which were primary unilateral TKA, one bilateral one-staged surgery, and one bilateral two-staged surgery. Patients gender is dominated by females (84.2%) compared to males (15.8%). The age group of 61-70 has the highest frequency (38.6%) followed by 51-60 (31.6%) and 81-90 (21.1%) (See Figure 1).

**Table 1. Risk Factor of Stiffness Following Total Knee Arthroplasty (Rodríguez-Merchán, 2019).**

| |
|---|
| **Preoperative factors** |
| Preoperative stiffness (limited preoperative flexion range) |
| Low preoperative American Knee Society scores |
| Young age, female gender, high body mass index (BMI) |
| Previous knee surgery |
| Patients with disability (diabetes mellitus, pulmonary disease, depression) |
| **Intraoperative factors** |
| Inappropriate implant selection |
| Inadequate restoration of gap balance |
| Surgical trauma to the patella tendon |
| Implant malalignment |
| **Postoperative factors** |
| Inadequate physical medicine and rehabilitation (physiotherapy) combined with a poorly motivated patient |
| Inadequate pain control |

All the surgeries went successfully without any mortality recorded. Half of the patients presented with no comorbidities (54.4%), and the other halves presented with comorbidities, including: 16 (28.1%) patients with hypertension, 6 (10.5%) patients with type-II diabetes mellitus, 2 (3.5%) patients with chronic kidney disease, 1 (1.8%) with vascular disease and 1 (1.8%) patient has a rheumatoid disease which was rheumatoid arthritis (See Table 2).

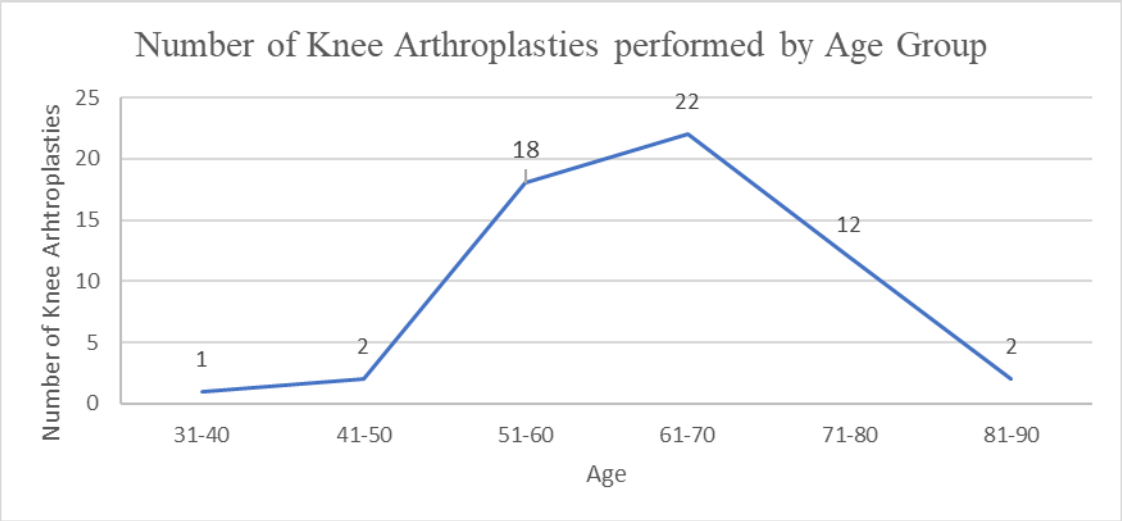


**Figure 1. Number of Knee Arthroplasties performed by Age Group**

**Table 2. Demographic Profile of TKA Patients**

| Characteristics | Category | Frequency | Percentage |
|---|---|---|---|
| **Age** | 31-40 | 1 | 1.7% |
| | 41-50 | 2 | 3.5% |
| | 51-60 | 18 | 31.6% |
| | 61-70 | 22 | 38.6% |
| | 71-80 | 12 | 21.1% |
| | 81-90 | 2 | 3.5% |
| **Gender** | Female | 48 | 84.2% |
| | Male | 9 | 15.8% |
| **OA Grading** | Grade 3 | 7 | 12.3% |
| | Grade 4 | 50 | 87.7% |
| **Comorbidities** | None | 31 | 54.4% |
| | Diabetes | 6 | 10.5% |
| | Hypertension | 16 | 28.1% |
| | Vascular Disease | 1 | 1.8% |
| | CKD | 2 | 3.5% |
| | Rheumatoid Disease | 1 | 1.8% |
| **Complications** | None | 52 | 91.2% |
| | Loosening | 0 | 0% |
| | Fracture | 0 | 0% |
| | Infection | 0 | 0% |
| | Stiffness | 2 | 3.5% |
| | Persistent pain | 3 | 5.3% |

Pre-operative management by the anesthesia team has been intensified to reduce post-operative complications. In terms of hypertension and diabetes, blood pressure and blood sugar is well-controlled to reduce morbidity and mortality related to the surgery. In terms of infection, prophylactic antibiotic was given 30 minutes prior the surgical incision in all patients. It has been successfully reducing infection rates, as recommended by the Hospital Infection Control Committee. Consequently, during post-operative period, the patients will attend continuous physical therapy program to aid their functional outcome. This study found majority of the patients have no complications, while, certain complications following TKA, includes: 2 (3.5%) patients experience stiffness, and (5.3%) patients experience persistent pain.

## DISCUSSION

In this study, we found the most dominant population underwent TKA in Prof. Dr. IGNG Ngoerah Public University Hospital, Denpasar Bali is female gender within age group 61-70 years old. This profile suits the prevalence of osteoarthritis which is female at the peak age 60-64 years old (Long et al., 2022). The indication for surgical treatment in arthroplasty depends on the patient's pain and disability. American Academy Orthopaedic of Surgeons (AAOS) recommendation for TKA includes patients with severe knee pain or stiffness that reduces their productivity and activity of daily living, chronic inflammation, deformity, and failure to improve with non-operative treatment ("Total Knee Replacement - OrthoInfo – AAOS). In OA epidemiological studies, the KL classification has been used frequently as a research tool. The KL classification was also used in the development of atlases of radiographic features of osteoarthritis (OA), and it may also assist healthcare providers with a treatment algorithm to guide clinical decision-making, specifically identifying which patients are most likely to benefit from surgical management. This recommendation has been well applied in our hospital where all our patients have at least grade 3 osteoarthritis and most patients who had arthroplasties are grade 4 osteoarthritis (87.7%).

In addition, some insurers require providers to provide documentation of the KL classification in order to obtain approval for a TKA. All research and clinical efforts utilizing the KL classification, despite its widespread use, depend critically on rigorous validation and ongoing reevaluation of the schema's relevance to patient-centered outcomes (Kohn et al., 2016). Comorbidities found in our study predominantly occupied by hypertension and type II diabetes mellitus. As AAOS recommended that blood sugar management is crucial with a grade IV evidence support. Thus, our anesthesia team maximize the comprehensive management by continuing blood sugar-lowering medication and insulin therapy as needed (AAOS, 2022). Comorbidities may negatively affect the outcome of surgeries, therefore as the operating surgeon it is crucial to manage comorbidities appropriately based on their competency and appropriate referral to the appropriate department (Levin, 2000).

The overall outcome of TKA has been well accepted. In a meta-analysis of a total 20 thousand total knee arthroplasties performed, the overall revision rate is 4.4% on a 10.7 years follow-up. The most common causes for revision were aseptic loosening, infection, and polyethylene wear (Lützner et al., 2011). In our study has demonstrated a short-term well acceptance of TKA; due to a short time of follow-up. A longer period of follow up is needed to depict the same outcome. Statistically, our study shows no complications up to 6 months follow-up for more than 90% of our patient. There is no peri-

prosthetic joint infection found in our study. It is possible due to the well-adapted infection control and prevention that has been more active in recent years, including the implementation of 30 minutes pre-surgical prophylactic antibiotic. The specific timing of 30 minutes is accepted due to the higher risk of infection when given more than 120 minutes (OR 5.36, 95% CI). Sixty minutes is an acceptable timeframe in many centers; however, the implementation of 30 minutes intervals doesn't show any statistical difference with 60 minutes intervals (de Jonge et al., 2017).

Physical therapy and rehabilitation have been well-known non-surgical treatment for osteoarthritis. Hence, this practice has been brought upon post-surgical patients as well. A meta-analysis of 4 studies and a total of 322 patients showed that physical therapy improves patients' functional outcome post-operatively (Fatoye et al., 2021). Despite the advancement of rehabilitation modalities available, the optimal rehabilitation strategies for post-operative TKA has not yet been determined (Alrawashdeh et al., 2021). It requires an immediate response for guideline documentation that could be used for functional improvement, and prevention of stiffness and persistent pain following TKA. Aside from that, complications in total knee arthroplasty procedure can be prevented by applying clean and proper clinical practice. Total knee arthroplasty has been a new hope for patients with late or end stage osteoarthritis, orthopedic surgeons must apply good clinical practice to support patients' improvement on function, pain-free life, and cost-effective treatment for their problem without introducing new problem of complication.

As shown in our research, most patients who have arthroplasties are women at an age group of 61-70 years old followed by 51-60 years old. The OA grades associated with arthroplasties are grade 3 and 4, which also match the AAOS guideline. Good hygiene practice and prophylactic antibiotics may prevent the devastating event of periprosthetic joint infection (PJI). Due to the age group of OA patients, comorbidities such as diabetes and hypertension are also prevalently found. Conducting an arthroplasty in patients with comorbidities needs a multi-disciplinary approach with good team work to ensure safe surgery with none to minimal complication for the patient.

Chronic pain after TKA can impact all aspects of health-related quality of life and has been linked to functional limitations, depression, anxiety, deteriorating general health, sleep problems, and long-term opioid use. Chronic pain in the elderly following joint arthroplasty can interfere with relationships and lead to social isolation, which is a risk factor for other problems and can limit their ability to effect change or seek pain relief. It is evident that the stiff total knee arthroplasty (TKA) is a multifactorial entity involving preoperative, intraoperative, and postoperative variables. The most effective method for treating a stiff TKA is to prevent its occurrence by controlling preoperative factors, avoiding intraoperative technical errors, and performing aggressive, painless postoperative physical medicine and rehabilitation, although there is no clear protocol for the management of TKA stiffness. The complication of post-operative stiffness and persistent pain are disabling complications of total knee arthroplasty, but the incidence is relatively low through as shown in our study.

## AUTHOR CONTRIBUTIONS

IGNWA: Performed the surgeries, contributed to the intellectual concept of the study
CGOD: Performed the surgeries, contributed to the intellectual concept of the study
F: Drafted and reviewed the article, editing

DD: Data curation, Writing-Reviewing
SL: Writing- Reviewing and Editing
LWK: Writing- Reviewing and Editing

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**CONFLICT OF INTEREST**

The authors declare that the study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest

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