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**Research**

# Prevalence Of Podiatric Changes In Patients Who Underwent Total Knee Replacement – A Cross-Sectional Study

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## Abstract

**Background:** Knee osteoarthritis, a chronic condition prevalent among the elderly, often results in considerable pain and mobility challenges. In severe cases, it can cause misalignment of the entire lower limb, contributing to ankle joint deterioration over time. Despite extensive research on foot changes in chronic osteoarthritis patients, the impact of total knee replacement surgery on podiatric changes remains an underexplored area.
**Methodology:** A total of 135 chronic osteoarthritis knee patients who underwent total knee replacement were evaluated for podiatric changes using various measures. These included cadence in gait analysis, the Windlass test to assess for plantar fasciitis, measurement of inversion and eversion angles using a goniometer, and completion of the Foot and Ankle Disability Index questionnaire.
**Result:** The prevalence of podiatric changes in patients who underwent total knee replacement was statistically found using SPSS software (SPSS.20). The prevalence of cadence was analysed and found normal for 60% and low for 40% among the sample. The range of motion of ankle inversion and eversion was analysed and it found that no reduction in inversion and 0.7% reduced eversion. The analysis of the Foot and Ankle Disability Index (FADI) in patients after 6 months of Total knee replacement revealed that all samples exhibited normal scores. The prevalence of plantar fasciitis was analysed, and only 1.5% were positive for the windlass test.
**Conclusion:** The study revealed that after total knee replacement surgery, a significant portion of subjects experienced a decrease in cadence, while the majority maintained a normal cadence. In terms of the windlass test for plantar fasciitis, only a small change was observed post-surgery, with most subjects continuing to show a negative result, and a very small percentage testing positive. Additionally, there were only minor differences noted in foot inversion and eversion movements, as well as in the Foot and Ankle Disability Index.

**Keywords:** Osteoarthritis, Knee joint, total knee replacement, plantar fasciitis, Pain, inversion and eversion.

## INTRODUCTION

Knee osteoarthritis is a chronic condition that particularly impacts the elderly, often causing significant pain and mobility issues. In severe cases, it can alter the alignment of the entire lower limb. This misalignment can further lead to degradation in the ankle joint over time. Therefore, managing knee osteoarthritis is crucial not only for alleviating knee pain but also for preventing secondary complications in adjacent joints like the ankles [(1)]. Foot deformities have been observed to exacerbate dysfunction in individuals with knee osteoarthritis. This chronic condition can lead to significant shifts in the alignment of the lower limb, potentially accelerating the degradation of the ankle joint over time (12). Emerging evidence suggests a clear connection between knee osteoarthritis and changes in ankle biomechanics, highlighting the importance of comprehensive management strategies to mitigate these effects on joint health. According to Kraus et al., people who had osteoarthritis in their knees frequently experienced pain in their ankles[(2)]. The foot is necessary for keeping the biomechanical performance of the lower limb. Knee osteoarthritis is a disease condition that could lead to foot deformities [(12)].

It has long been known that elderly individuals with knee osteoarthritis frequently have foot abnormalities. The most frequent foot deformity connected to osteoarthritis knee was lower cadence, plantar fasciitis, foot pain, and abnormal motion of the subtalar joint (inversion and eversion) [(3-6)]. Plantar fasciitis is a common and often frustrating condition characterized by degenerative irritation at the origin of the plantar fascia, typically at the medial calcaneal tuberosity of the heel and its surrounding structures [(14)]. The Windlass Test is frequently used in orthopedic examinations to diagnose plantar fasciitis; it's considered positive if dorsiflexing the toes causes pain in the heel area [(9)] The term "cadence" is used to describe both the rate of stepping and the total number of steps per minute [(15)]. A walking cadence of 100 steps per minute is considered normal for a moderate-intensity walk [(16)].

According to Kade L. Peterson et al., foot pain, which includes pain in the foot and/or ankle, is highly prevalent among older individuals. Epidemiological studies indicate that approximately 40% of people over 50 years old experience foot pain on most days within a given month or year [(11)]. Osteoarthritis when conservative treatments have not provided sufficient relief. It is particularly effective for individuals with symptomatic osteoarthritis affecting two out of the three compartments of the knee joint [(13)]. The primary goals of this surgery are to achieve lasting pain relief and to enhance overall functional status.

As one of the most commonly performed musculoskeletal procedures, total knee replacement significantly improves the quality of life for many patients who experience chronic knee pain and limited mobility due to osteoarthritis [(19)]. While the majority of patients achieve excellent clinical outcomes, it's important to note that some studies indicate up to 20% or more may not experience the expected benefits [(19)]. For those who do benefit, undergoing total knee replacement can lead to a profound improvement in daily life by alleviating chronic pain associated with osteoarthritis and restoring mobility. The impact of total knee replacement surgery on podiatric changes remains an underexplored area despite extensive research on foot changes in chronic osteoarthritis patients. Studies have highlighted that knee malalignment and alterations in foot posture and function can influence knee joint forces, contributing to knee pain and cartilage damage in the medial tibiofemoral compartment (13). However, the specific foot problems that may arise after total knee replacement surgery are not well understood.

Understanding these podiatric changes is critical for optimizing recovery and achieving favourable long-term outcomes post-surgery. Therefore, this study aims to investigate the podiatric changes following the realignment of the knee through total knee replacement in individuals with chronic osteoarthritis. This research seeks to fill the gap in knowledge regarding how surgical intervention impacts foot mechanics and function, ultimately guiding more comprehensive rehabilitation strategies and improving patient care

## METHODOLOGY

***Study Design:*** Cross-sectional study
***Study Setting:*** Community level
***Study Duration:*** 6 months
***Sample Method:*** purposive sampling SAMPLE SIZE: 135

**Inclusion criteria**
Both males and females.
Age above 55 years.
The patient was diagnosed with chronic OA knee before TKR.
The patient who underwent TKR with Kellgren Lawrence scale above grade 3.
Post TKR patients (duration 6 months to 1 year)

Those who can understand and obey commands.

**Exclusion criteria**
Subjects not willing to participate.
Post-TKR patient before 6 months and after 1 year.
Osteoarthritis is caused due to factors other than aging.
Irregularity of the knee joint from previous trauma.
Patients with congenital mal-development of a joint. Subjects with FFD.

**Outcome measures**
Foot and Ankle Disability Index
Cadence in gait
Ankle inversion and eversion
Windlass test

**Procedure**

After ethical approval, the data collection began. The subjects were selected according to the inclusion and exclusion criteria. The duration of intervention and the intervention being used was briefed and a consent sheet was provided to the participants. Total of 135 chronic OA knee patients who have undergone total knee replacement were assessed for podiatric changes by cadence in gait, windlass test for plantar fasciitis, inversion and eversion angle with goniometer and Foot and Ankle Disability Index questionnaire. Participants with a range less than 100 steps for cadence examination or with a positive windlass test or with goniometric inversion range below 20º and eversion range below 10º or with a Foot and Ankle Disability Index score below 104 were considered to have podiatric changes. The prevalence of each podiatric change was computed and the most prevalent change were determined. Participants who found to have podiatric changes were made aware of those changes and appropriate exercises or treatment to be taken was advised.

## RESULTS

**Demographic information**

**Table 1: Age group**

| AGE (YEARS) | MEAN | STANDARD DEVIATION | MIN: | MAX |
|---|---|---|---|---|
| Above 55 | 68.64 | 7.24 | 55 | 87 |

The table 1 shows the age group taken for the study is between 55 to 87 years and the mean age was 68.7 with a standard deviation of 7.24.

**Gender**

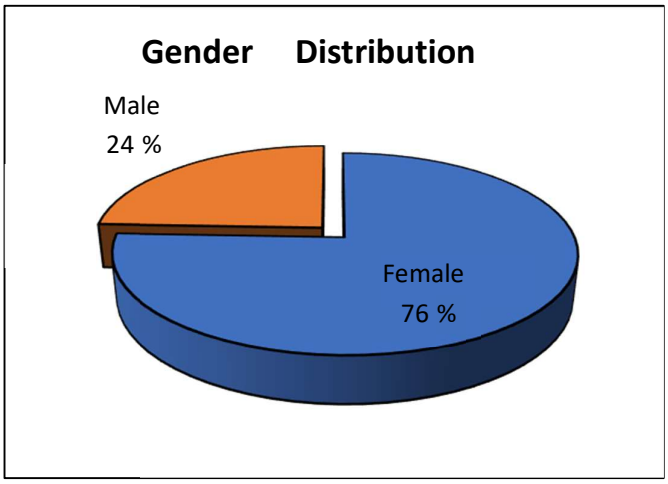


**Fig 1: Graphical representation of gender in the group.**

**Foot and ankle disability index**

**Table 2: The mean and standard deviation of the Foot and Ankle Disability scale**

| MEAN | STANDARD DEVIATION | MINIMUM | MAXIMUM |
|---|---|---|---|
| 103.73 | 0.44 | 103 | 104 |

Table Shows the mean and standard deviation of the Foot and Ankle Disability scale.

**Cadence**

**Table 3: Cadence's mean and standard deviation**

| MEAN | STANDARD DEVIATION | MINIMUM | MAXIMUM |
|---|---|---|---|
| 98.77 | 8.4 | 81 | 118 |

Shows cadence's mean and standard deviation with minimum 81 and maximum 118.

**Inversion**

**Table 4: Inversion of samples**

| MEAN | STANDARD DEVIATION | MINIMUM | MAXIMUM |
|---|---|---|---|
| 26.43 | 1.60 | 22 | 29 |

Table shows the inversion of samples taken for the study is between 22 to 29 and the mean inversion was 26.43 with a standard deviation of 1.60.

**Eversion**

**Table 5: Eversion of samples**

| MEAN | STANDARD DEVIATION | MINIMUM | MAXIMUM |
|---|---|---|---|
| 12.76 | 1.21 | 10 | 15 |

Table shows the eversion of samples taken for the study is between 10 to 15 and the mean inversion was 12.76 with a standard deviation of 1.21.

**Windlass test**

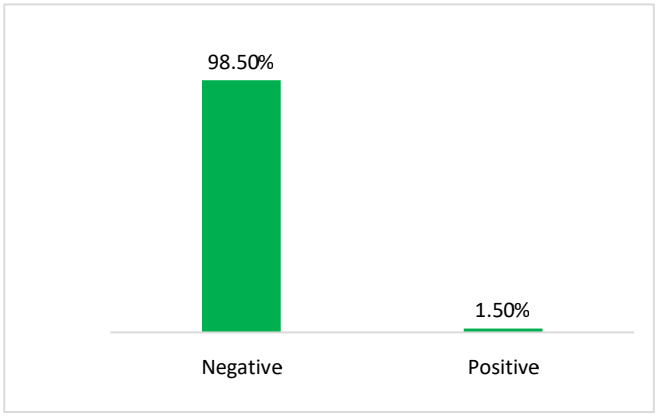


**Fig 2: Graphical representation of windlass in the group**

## DISCUSSIONS

Total knee replacement, also referred to as knee arthroplasty, is a highly dependable surgical procedure designed to reconstruct the knee joint, offering consistent and predictable outcomes. It serves as an outstanding treatment choice for individuals experiencing symptomatic osteoarthritis. Chronic knee osteoarthritis often coincides with foot pain, which can significantly impact the severity of knee-related symptoms and overall quality of life. This underscores the importance of addressing both knee and foot issues concurrently to achieve optimal outcomes for patients. Total knee replacement is extensively employed to alleviate pain and enhance functional abilities in patients suffering from symptomatic, advanced-stage knee osteoarthritis. Notably, there has been a marked increase in its use among younger adults aged forty-five to sixty-four years.

Recent studies highlight the initial benefits of total knee replacement, emphasizing its role in restoring lower limb alignment. Post-surgery, adjustments in ankle alignment can occur, underscoring the interconnectedness of joint health and alignment in the lower extremities. Nevertheless, total knee replacement patients face potential complications including reduced cadence, plantar fasciitis, decreased inversion and eversion mobility, and foot pain. These issues can significantly impact the effectiveness of the procedure, sometimes requiring revision surgery to address them effectively. Recent advancements in surgical orthopedics, particularly in joint replacement procedures, have been remarkable. The number of registered surgeons in the IJR database reached 712 by June 2020. During the same period, the volume of total knee replacements (TKRs) reported to the registry surged from 1,019 in 2006 to 27,000 in 2019. Notably, osteoarthritis of the knee was diagnosed in 98.5% of these patients [(19)].

Out of 135 subjects, all scored 100% on the FADI scale, indicating no dysfunction. This result suggests that patient who underwent total knee replacement may have experienced enhanced overall mobility and function due to reduced pain and improved knee joint mechanics. These improvements likely contributed to became normal FADI, despite previous knee issues. Following TKR, patients frequently adjust their movement and gait pattern. This adjustment could potentially conceal any lingering foot and ankle dysfunction that would typically be identified by the FADI, as the main focus post-surgery remains on knee rehabilitation. A significant improvement in cadence was observed in 60% of individuals post- TKR. This enhancement can be attributed to structured rehabilitation programs aimed at rebuilding strength, flexibility, and correct walking techniques. These programs empower patients, restoring their confidence in walking capabilities, which in turn contributes to an increased cadence. moreover, the alleviation of chronic knee pain and the resulting mobility improvements further motivate patients to walk with greater speed and efficiency, thus enhancing their cadence post-surgery.

Forty percentage of individuals displaced reduced cadence, potentially due to residual stiffness in the replaced knee joint at the six- month mark, limiting the full range of motion required for a natural walking stride. Additionally, despite significant improvement in pain following TKR, some patients may experience lingering discomfort for pain around the knee joint, especially during more demanding activities like walking. This discomfort can contribute to a cautious gait and a lower cadence in these individuals. 98.5% shows negative windlass test, this can be may be due to the effectiveness of post operative rehabilitation and physical therapy. These interventions are pivotal in enhancing strength, flexibility, and strength of the knee joint, thereby potentially influencing the outcome of the test. 1.5% shows a positive windlass test this could be due various factors, such as including inadequate rehabilitation post-surgery or other issues impacting recovery. Soft tissue problems around the knee joint, such as stress in the plantar fascia, might contribute to triggering a positive Windlass test.

The analysis revealed no reduction in ankle inversion and 0.7% reduction in eversion range of motion. This adaptation could be attributed to the body's ability to adjust to surgical changes over time. Muscles, tendons, and ligaments around the knee and ankle may adapt to the altered biomechanics, potentially improving functional outcomes such as achieving normal inversion and eversion of the foot.

## CONCLUSION

This study addresses a significant information gap regarding the effects of podiatric changes in patients following total knee replacement. Cadence: 60% of the participants exhibited a normal cadence, while 40% had a low cadence. Range of Motion: Analysis of ankle inversion and eversion revealed that 10.5% of the patients had reduced inversion, and only 0.7% had reduced eversion. Foot and Ankle Disability Scale: Six months post-surgery, 73.3% of patients scored a perfect 104/104 on the scale, and 26.7% scored 103/104. Plantar Fasciitis: The prevalence of plantar fasciitis was low, with only 1.5% of patients testing positive on the windlass test.

## REFERENCES


1. Daman Kumar Jha, Prangthong Unprasert, Bavornrit Chuckpaiwong. The Prevalence and correlation of Foot Deformity in Primary Osteoarthritis of the Knee. The Thai Journal of Orthopaedic Surgery (JRCOST). Vol. 45No. 3- 4 (2021): JulyOctober.
2. Felson DT, Naimark A, Anderson J, Kazis L, Castelli W, Meenan RF. The prevalence of knee osteoarthritis in the elderly. The Framingham Osteoarthritis Study. Arthritis Rheum. 1987 Aug;30(8):914-8. doi: 10.1002/art.1780300811. PMID: 3632732.
3. Hart HF, Birmingham TB, Primeau CA, Pinto R, Leitch K, Giffin JR. Associations Between Cadence and Knee Loading in Patients with Knee Osteoarthritis. Res (Hoboken).2021 Nov;73(11):1667-1671. doi: 10.1002/acr.24400. Epub 2021 Sep 24. PMID:32741097.
4. Miladi S, Bouzid S, Fazaa A, Boussaa H, Makhlouf Y, Souabni L, Ouenniche K, Kassab S, Chekili S, Ben Abdelghani K, Laatar A. Is there an association between plantar fasciitis and knee osteoarthritis? Musculoskeletal Care. 2023 May 22. doi:10.1002/msc.1784. Epub ahead of print. PMID: 37212781.
5. Paterson KL, Hinman RS, Hunter DJ, Wrigley TV, Bennell KL. Impact of concurrent foot pain on health and functional status in people with knee osteoarthritis: data from the osteoarthritis initiative. Arthritis Care Res (Hoboken). 2015 Jul;67(7): 989-95.doi:10.1002/acr.22537. PMID: 25581254; PMCID: PMC4482794.
6. Dominick J. Casciato, Natalie A. Builes, Luis A Rodrigues Anaya et al. Association between total knee arthroplasty and subtalar joint changes: A cadaver study. 2019VOL:07. Issue: Spring epub Month 2019: www.msrj.org.
7. De Garceau D, Dean D, Requejo SM, Thordarson DB. The association between diagnosis of plantar fasciitis and Windlass test results. Foot Ankle Int. 2003 Mar;24(3): 251-5.doi: 10.1177/107110070302400309. PMID: 12793489.
8. Hale SA, Hertel J. Reliability and Sensitivity of the Foot and Ankle Disability Index in Subjects with Chronic Ankle Instability. J Athl Train. 2005 Mar;40(1):35-40. PMID:15902322; PMCID: PMC1088343.
9. De Garceau D, Dean D, Requejo SM, Thordarson DB. The association between diagnosis of plantar fasciitis and Windlass test results. Foot Ankle Int. 2003 Mar;24(3):251-5. doi: 10.1177/107110070302400309. PMID: 12793489.
10. Martin, R., Burdett, R. and Irrgang, J. Development of the Foot and Ankle Disability Index (FADI). (1999) Journal of Orthopaedic & Sports Physical Therapy, 29, A32-A33.
11. Hwang J, Jung MC. Age and sex differences in range of motion and motion patterns. Int J Occup Saf Ergon. 2015;21(2):173-186. doi:10.1080/10803548.2015.1029301.
12. Ruba Musaid et al, June 2024. Assessment of foot deformities in patient with knee osteoarthritis. DOI:10.22153/kej.2024.09.001.
13. Pazit Levinger, Hylton B Menz et al. Changes in foot posture and function following total knee replacement surgery.
14. Benjamin K Buchanam et al: 2024. National Library of Medicine. Plantar Fasciitis.
15. Benedict W Stansfield et al:2012. What is ‘Cadence’ and why do we need an unambiguous definition? DOI:10.1016/j.jsams.2012.11.225.
16. Catrine Tudor-Locke et al:2020. Walking cadence (steps/min) and intensity in 41 to 60-year-old adults: the CADENCE-adults study.
17. Kade L Peterson et al: 2015. Concurrent foot pain is common in people with knee osteoarthritis and impacts health and functional status: data from the Osteoarthritis Initiative. [PubMed].
18. Krähenbühl N, Horn-Lang T, Hintermann B, Knupp M. The subtalar joint: A complex mechanism. EFORT Open Rev. 2017 Jul 6;2(7):309-316. doi:10.1302/20585241.2.160050. PMID: 28828179; PMCID: PMC5549175.

19. Price AJ, Alvand A, Troelsen A, Katz JN, Hooper G, Gray A, Carr A, Beard D. Knee replacement. Lancet. 2018 Nov 3;392(10158):1672-1682. doi: 10.1016/S01406736(18)32344-4. PMID: 30496082.
20. Vaidya SV, Jogani AD, Pachore JA, Armstrong R, Vaidya CS. India Joining the World of Hip and Knee Registries: Present Status-A Leap Forward. Indian J Orthop. 2020 Sep 16;55(Suppl 1):46-55. doi: 10.1007/s43465-020-00251-y. PMID: 34122754; PMCID: PMC8149501.