Original Article

Epidemiological Trends of Knee Disorders in Rural India: A Retrospective Review from a Tertiary Care Knee Pain Clinic- An Observational Study

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Abstract

Background: Knee pain is one of the most prevalent musculoskeletal complaints globally, particularly affecting individuals in rural and labor-intensive settings. Despite its widespread occurrence, epidemiological data from rural India remain limited. This study aimed to analyse the demographic and clinical trends of knee disorders among patients attending a Knee Clinic at a tertiary care hospital serving a predominantly rural population, to identify the prevalence and pattern of traumatic and non-traumatic knee disorders, to assess demographic characteristics, and to explore contributing occupational and lifestyle factors.

Methods: A retrospective observational study was conducted using registry data from 4,485 patients who visited the Physiotherapy Department of Vitthalrao Vikhe Patil Memorial Hospital, Ahmednagar, between January 2023 and June 2025. Data were categorized into traumatic and non-traumatic knee conditions and analyzed based on gender, diagnosis, and type of injury.

Results: Of the total patients, 58% were male and 42% female. Non-traumatic conditions accounted for a larger proportion, with osteoarthritis (74.9%) being the most common diagnosis, followed by patellofemoral pain syndrome (16.6%). Among traumatic injuries, ACL injuries (44%) were the most prevalent, followed by joint effusion (21%) and meniscal injuries (11%). The patterns observed suggest occupational overuse, biomechanical stress, and delayed access to care as major contributing factors.

Conclusion: The study highlights a significant burden of both degenerative and traumatic knee conditions in rural populations. It underscores the need for early screening, structured physiotherapy, ergonomic education, and improved access to rehabilitation. The Knee Clinic model proves to be an effective multidisciplinary framework for the timely management of knee disorders in resource-constrained settings.

Keywords: Knee pain, osteoarthritis, ACL injury, rural healthcare, knee clinic, physiotherapy, musculoskeletal disorders, epidemiology

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Introduction

Knee pain is one of the most prevalent musculoskeletal complaints encountered in clinical settings and a leading cause of physical disability worldwide. It significantly impairs mobility, restricts daily functioning, and affects the overall quality of life, particularly in adult and elderly populations. The condition is multifactorial, arising from both traumatic injuries and chronic degenerative changes. According to the World Health Organization (WHO), over 250 million individuals suffer from knee osteoarthritis, which is one of the most common causes of chronic joint pain and disability globally [1]. The burden of knee-related disorders is expected to escalate further due to increasing life expectancy, sedentary behavior, and rising obesity rates[2].

In India, the impact of knee disorders is disproportionately higher in rural areas, where healthcare access and awareness remain limited. Rural populations, which comprise nearly 65–70% of the country's demographic profile, face unique challenges that elevate their risk for both acute and chronic knee conditions. Most individuals in these settings are engaged in physically demanding occupations, such as agriculture, construction, and domestic labor, which require frequent squatting, prolonged standing, repetitive bending, lifting heavy objects, and walking long distances on uneven surfaces. These biomechanical stressors place significant load on the knee joint and accelerate wear and tear of articular cartilage and soft tissues [3].

Moreover, rural individuals often lack access to ergonomic education, proper footwear, and structured exercise, which further predisposes them to mechanical imbalances and joint degeneration. Inadequate dietary practices, combined with vitamin D and calcium deficiencies, are commonly reported in rural communities, contributing to poor bone health and reduced muscular support around the knee joint [4]. Compounded by delayed healthcare-seeking behaviour—often due to cultural beliefs, economic limitations, or geographical barriers—many individuals resort to traditional healing practices or over-the-counter pain medications, which may offer temporary relief but fail to address the underlying pathology [5].

Knee disorders can be broadly categorised into traumatic and non-traumatic etiologies. Traumatic knee injuries typically result from falls, accidents, sports injuries, or occupational hazards and may involve ligament tears (such as ACL/PCL injuries), meniscal tears, fractures, or dislocations [6]. Non-traumatic knee conditions, such as primary osteoarthritis, rheumatoid arthritis, patellofemoral pain syndrome, and tendinopathies, develop more gradually and are often influenced by aging, obesity, hormonal changes, inflammatory conditions, and mechanical malalignment [7,8].

The lifestyle in rural areas—characterized by high physical strain, low nutrition, poor rest, and a lack of preventive care—creates a fertile ground for the early onset and rapid progression of knee disorders. Yet, these conditions often remain undiagnosed until they reach an advanced stage. This gap highlights the urgent need for early screening, diagnosis, and intervention, particularly in rural healthcare systems [9].

Establishing dedicated Knee Clinics within tertiary care hospitals offers an organized and multidisciplinary platform for early identification and management of knee-related disorders. These clinics are crucial not only for accurate diagnosis using clinical and radiological evaluation but also for delivering physiotherapy, lifestyle advice, and surgical referrals when necessary. Importantly, early physiotherapy intervention—including strengthening of the quadriceps, hamstrings, and deep stabilizing muscles; posture and gait correction; ergonomic education; and weight management—can significantly delay the progression of degenerative changes, improve function, and reduce pain [10,11]. Studies have shown that early conservative management is both cost-effective and functionally beneficial, particularly in low-resource settings like rural India [12].

Tertiary care hospitals, especially those with specialized Knee Clinics, serve as referral hubs for a large number of such underserved patient. Most existing studies focus either on specific conditions like osteoarthritis or sports injuries in urban populations, leaving a significant void in the understanding of rural knee health trends [6,13].

This study is therefore needed to:

- Generate baseline data on the demographic and clinical characteristics of patients attending a tertiary care Knee Clinic.
- Highlight the burden of knee disorders in rural populations.
- Identify modifiable risk factors associated with both traumatic and non-traumatic knee conditions.
- Promote the integration of physiotherapy and early rehabilitation in routine knee care, especially for rural and underserved groups.

Aims & Objectives

1. To assess the demographic profile of patients (including age, gender, occupation, rural/ urban origin).
2. To determine the frequency and nature of common knee conditions in a tertiary care setting.
3. To provide recommendations for preventive care and rehabilitation strategies based on identified trends

Material & Method

- **Study design:** Retrospective observational study
- **Study setting:** Musculoskeletal Physiotherapy Outpatient Department, Vitthalrao Vikhe Patil Memorial Hospital, Ahilyanagar, India.
- **Sample size:** 4,485 patients
- **Study duration:**2.5 years

Inclusion Criteria

- Patients who visited the Knee Clinic / Physiotherapy OPD at Vitthalrao Vikhe Patil Memorial Hospital.
- Patients presenting with knee-related complaints (both traumatic and non-traumatic).
- Both male and female patients.
- Inpatients and outpatients referred from the Orthopaedics department or associated hospitals.
- Patients whose data were recorded in the physiotherapy knee clinic.
- Patients treated during the period January 2023 to June 2025.

Exclusion Criteria

- Patients with incomplete or missing data.
- Patients presenting with non-knee musculoskeletal conditions.
- Patients who did not attend the Knee Clinic / Physiotherapy Department.

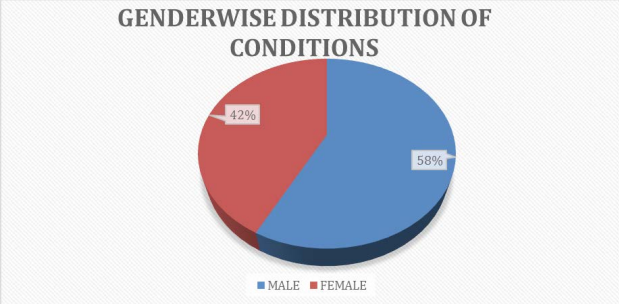
Procedure

Ethical clearance was firstly obtained from the institutional ethical committee (IEC). The data were derived from the daily patient registry of the physiotherapy department in a tertiary care hospital in Ahmednagar. The study population consisted of both in and outpatients who were referred to the musculoskeletal physiotherapy department by the orthopaedic department of Vikhe Patil Hospital and other hospitals in Ahilyanagar. Data collected from January 2023 to June 2025 in the monthly register of the Knee Clinic were segregated into traumatic and non-traumatic conditions. These conditions were represented in the form of a percentage based on each condition.

Result Analysis

The study was conducted to find out the Patients of the Knee Pain Clinic in the rural population of Ahilyanagar. Out of patients who visited a tertiary care hospital physiotherapy OPD were analyzed for their disorders and analysis was done for the percentage of trend for a specific condition.

Condition wise analysis of trends of musculoskeletal disorder in 2 years 6 months: (JAN 2023-JUNE 2025)



Gender	Number of Cases (n)	Percentage (%)
Male	2601	58
Female	1884	42
Total	4485	100

The gender-wise distribution of conditions among the study participants is illustrated in pie chart. Of the total individuals, 58% (n = 2,621) were male and 42% (n = 1,923) were female. This indicates that males constituted a greater proportion of the reported conditions compared to females.

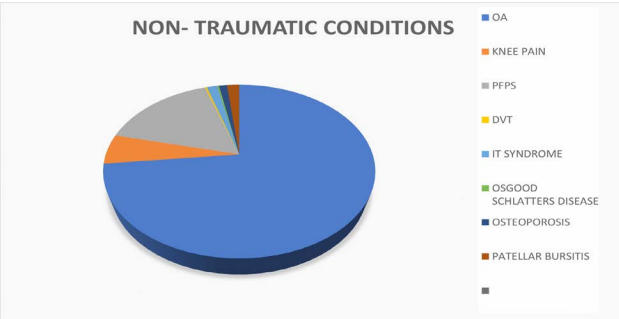


Figure 1: Pie chart Of Non -Traumatic Conditions

Table 1. Non - Traumatic Conditions

Condition	Number of Cases (n)	Percentage (%)
OA (Osteoarthritis)	1,707	74.9
PFPS	379	16.6
Chondromalacia patellae	129	5.7
Patellar Bursitis	41	1.8
Osteoporosis	27	1.2
IT Syndrome	35	1.5
DVT	6	0.3
Osgood Schlatter's Disease	6	0.3
Total	**2,330**	100

The distribution of non-traumatic knee conditions among the study participants is presented in Table X and Figure X. Osteoarthritis (OA) was the most prevalent condition, observed in 1,707 individuals (74.9%), followed by patellofemoral pain syndrome (PFPS) in 379 individuals (16.6%) and non-specific knee pain in 129 individuals (5.7%). Less common conditions included patellar bursitis (1.8%), iliotibial band (IT) syndrome (1.5%), osteoporosis (1.2%), deep vein thrombosis (DVT) (0.3%), and Osgood Schlatter's disease (0.3%).

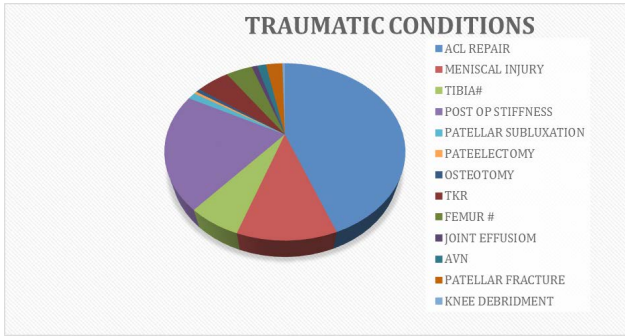


Figure 2: PiechartOf Traumatic Conditions

Table 2. Traumatic Condition

Condition	Number of Cases (n)	Percentage (%)
ACL Repair	978	44
Joint Effusion	471	21
Meniscal Injury	248	11
Tibia Fracture (Tibia#)	133	6
Osteotomy	117	5
Total Knee Replacement	94	4
Patellar Fracture	32	1

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AVN (Avascular Necrosis)	20	1
Femur Fracture (Femur#)	15	1
Patellar Subluxation	28	1
Knee Debridement	10	<1
Patellectomy	9	<1
Total	2,155	100

The distribution of traumatic knee conditions among the study participants is shown in Figure X. The most common traumatic condition was **anterior cruciate ligament (ACL) repair**, accounting for 978 cases (44%). This was followed by **meniscal injury** (248 cases, 11%), **tibia fracture (Tibia#)** (133 cases, 6%), and **joint effusion** (471 cases, 21%). Other less frequent conditions included **total knee replacement (TKR)** (94 cases, 4%), **osteotomy** (117 cases, 5%), **patellectomy** (9 cases, <1%), **patellar subluxation** (28 cases, 1%), **femur fracture (Femur#)** (15 cases, 1%), **avascular necrosis (AVN)** (20 cases, 1%), **patellar fracture** (32 cases, 1%), and **knee debridement** (10 cases, <1%).

Discussion

This retrospective observational study analyzes trends, prevalence, and demographic patterns of knee disorders in a rural tertiary care hospital in India. Data from over 4,400 patients across 30 months reveal a rising burden of degenerative and traumatic knee conditions, with osteoarthritis and anterior cruciate ligament injuries being most prevalent.

Burden of Osteoarthritis and Non-Traumatic Conditions

The most striking observation in this study is the overwhelming predominance of non-traumatic knee disorders, with OA alone accounting for nearly 75% of these cases. This trend is consistent with recent global projections by Katz et al., who estimate that the global burden of knee osteoarthritis is rising dramatically due to aging populations, obesity, and physical inactivity, especially in low- and middle-income countries [14]. In rural India, however, the risk profile is distinct. While obesity is emerging as a factor, the more prominent contributors include occupational strain, frequent squatting, heavy manual labor, and poor ergonomic awareness, which accelerate the degenerative process [15,16].

Our findings are supported by a rural Indian cohort study by Rani et al., which demonstrated that over 60% of adults with knee pain had radiological OA changes, many of them moderate to severe due to delayed healthcare-seeking behavior and reliance on non-allopathic treatments [17]. The role of micronutrient deficiencies, particularly of vitamin D and calcium, cannot be overlooked, as it exacerbates cartilage degradation and weakens musculoskeletal support [18].

Additionally, patellofemoral pain syndrome (PFPS) and non-specific anterior knee pain were found in a significant proportion of patients, particularly among younger and early middle-aged adults[19].

Traumatic Injuries: ACL Dominance and Occupational Hazards

Among the traumatic conditions, ACL injuries emerged as the leading cause, constituting 44% of trauma-related cases. This is particularly concerning as it reflects a shift in the injury demographic—from athletes to manual laborers, farmers, and industrial workers. These individuals are often exposed to uneven terrain, falls, rotational loading, and sudden directional changes without protective gear or training. The findings are in alignment with Chakravarti et al., who observed a rising incidence of ACL tears among young rural males involved in physical labor[20].

Joint effusion and meniscal injuries were the next most common findings and frequently coexisted with ligamentous injuries. Their presence indicates not only acute trauma but also inflammatory responses, chronic mechanical instability, or failed conservative management. Late-stage interventions such as total

knee replacement (TKR) and osteotomy, while less frequent, represent the tip of an iceberg of neglected or mismanaged early cases, reinforcing the critical need for early rehabilitation protocols.

Sociocultural Determinants and Gender Disparity

The study shows a male predominance (58%); however, evidence suggests women—especially post-menopausal—are biologically more vulnerable to osteoarthritis progression due to hormonal influences on cartilage. The lower representation of women likely reflects gender disparities in health-seeking behaviour, driven by financial dependence, sociocultural norms, and delayed care[21]. This highlights significant hidden morbidity among rural women and underscores the need for gender-sensitive outreach and awareness programs

Rehabilitation Gaps and the Role of Knee Clinics

The high rates of both degenerative and traumatic knee conditions illustrate a dual burden that requires a comprehensive, structured approach to care. Studies by Goh et al. and Cavanaugh & Killian provide compelling evidence that early physiotherapy, including muscle strengthening, gait correction, neuromuscular re-education, and weight management, not only alleviates symptoms but also delays the need for surgical interventions [22,23]. In our study setting, the dedicated Knee Clinic model proved effective in facilitating coordinated care pathways—enabling diagnosis, conservative treatment, and surgical referrals under one roof.

This model aligns well with recent guidelines from the World Health Organisation, which advocate for multidisciplinary musculoskeletal care hubs that prioritise person-centred, timely, and equitable management of chronic conditions [24].

Limitations of The Study

- Being a **retrospective observational study**, causality between risk factors and outcomes cannot be established.
- The study was limited to patients presenting at a tertiary care hospital, and thus may not capture community-level prevalence or untreated cases.
- Data on certain variables such as BMI, socioeconomic status, and time to presentation were not available, which could have provided additional context to the findings.
- Follow-up outcomes of treatment and rehabilitation were not assessed in this study.

Future Scope of The Study

1. **Longitudinal Tracking:** Future studies can adopt a prospective cohort design to evaluate the long-term functional outcomes of patients attending the Knee Clinic, particularly those undergoing physiotherapy or surgical interventions.
2. **Community-Level Screening:** There is potential to extend this model to primary health centers and community outreach programs for early identification of high-risk individuals, especially women and elderly manual laborers.
3. **Integration with Digital Health Tools:** Mobile-based self-assessment apps and tele-rehabilitation platforms could be developed to expand access to physiotherapy services in remote rural areas.
4. **Inclusion of Biomechanical and Nutritional Parameters:** Future studies could incorporate biomechanical analysis (e.g., gait analysis, muscle strength testing) and nutritional assessments (vitamin D, calcium) to explore modifiable risk factors more deeply.
5. **Health Economics Analysis:** Evaluating the cost-effectiveness of early physiotherapy versus delayed surgical care can support health policy formulation and budget allocation.

Clinical Implications

1. **Early Physiotherapy Intervention:** The high prevalence of non-traumatic conditions

such as osteoarthritis and PFPS underscores the importance of early physiotherapeutic interventions like strengthening, joint mobilization, and neuromuscular training.

2. **Occupational Risk Assessment:** Given the strong association between manual labor and knee injuries, clinicians should incorporate occupational screening into the assessment process and offer tailored ergonomic advice.
3. **Multidisciplinary Management:** The Knee Clinic model facilitates integrated care through collaboration between orthopedic surgeons, physiotherapists, and rehabilitation specialists, enhancing treatment efficiency and patient compliance.
4. **Public Health Outreach:** The under representation of women and elderly individuals suggests the need for gender-sensitive and community-based awareness campaigns to improve healthcare utilization.
5. **Referral Guidelines:** Establishing standardized referral protocols for different severity levels of knee disorders will ensure timely escalation of care, especially for traumatic injuries requiring surgical evaluation.

Conclusion

- This study outlines the demographic and clinical patterns of knee disorders in a rural tertiary care knee clinic.
- Osteoarthritis was the most common non-traumatic condition, while ACL injuries predominated among traumatic cases.
- These patterns reflect the combined effects of degeneration and occupational stress.
- The findings highlight the importance of early diagnosis and structured physiotherapy.
- They also support the role of dedicated knee clinics and multidisciplinary care in improving outcomes.

Conflict of Interest: The authors declare that they have no competing interests.

Ethics Approval: The Research Ethics Committee of the DVVPFs COPT, Ahilyanagar approved this study.

Reference Number- DVVPF'S/COPT/IEC-756/A- 03/10/2025

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