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Prevalence of Anterior Knee Pain and Related Functional Limitations among Physical Therapy Students – A Cross-Sectional Study

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ABSTRACT

Background: *Anterior knee pain is one of the challenge in MSK cases with pain during knee flexion, stairs climbing and functional activity. Anterior knee pain can cause hindrance in functional activity that leads to impaired physical development reduced fitness, altering your body composition with impaired motor skill. Rehabilitation protocol emphasize on posture control, extremity coordination and strengthening. The prevalence of knee pain is increasing in both male and female but mostly females. Anterior knee pain or patellofemoral pain mostly undiagnosed or untreated due to poor awareness and untrained professional with limited resources of preventive care in Pakistan. Due to lack of studies on Pakistani subject particularly young physical therapy students who had high demand of physical work and are likely to experience any additional MSK pain, this study will help to evaluate the occurrence of knee pain and limited functional activities in physical therapy students.* ***Objective:*** *To determine the prevalence of anterior knee pain and related functional limitation among physical therapy students.* ***Methodology:*** *A cross-sectional observational study on Physical Therapy university students with a sample size of 174 drawn from Indus University, Jinnah Sindh Medical University and Liaquat National University of Karachi, Pakistan. A non-probability convenience sampling technique was used to include both males and females in study. Demographics questions along Kujala knee pain scale and VAS scale were used.. Data were analyzed using SPSS version 26 to assess the prevalence of anterior knee pain and related limited functional limitation. Participation was voluntary with informed consent, and respondents' privacy and confidentiality were ensured throughout the study.* ***Result:*** *Anterior knee pain affected 55.2% of physical therapy students with females more commonly and moderate unilateral pain predominating. Over 70% experienced functional limitation in daily and academic activities, and a significant association between knee pain and functional limitation was confirmed ($x^2=9.87, p=0.002$).* ***Conclusion:*** *This study confirms that Anterior knee pain is common leading to MSK strain and academic impairment. Early screening and preventive strategies are essential to support student well-being and long-term work force sustainability.*

Keywords: *Anterior Knee pain, Functional Limitations, Patellofemoral Pain Syndrome , Kujala Knee Pain Scale*

INTRODUCTION

Anterior knee discomfort is still a major challenge for serious knee students.[1] The knee is a significant load-bearing joint that differs from the other major load-bearing joints in that the primary stabilizing factors are soft tissues rather than articular form.[2] The medial tibiofemoral, lateral tibiofemoral, patellofemoral, and proximal tibiofibular joints make up the knee joint. The knee joint is passively stabilized in all directions by a multitude of ligaments. The knee supports a significant amount of our body weight during daily activities, enabling a broad range of motion for both internal and external rotation and flexion and extension.[3]

Prolonged sitting with the knee bent, climbing and descending stairs, and typically strenuous athletic pursuits.[4] Although they have been proposed as possible causes of PFPS, muscular imbalance and tension of the lower extremity muscles with decreased strength due to hypotrophy or inhibition are yet unknown[5]. According to Vicente Sanchis-Alfonso's earlier study outlining all likely causes of anterior knee pain, there are two biomechanical aspects that may induce pain: Joint stress, which is dependent on activity intensity and duration, and patella-femoral malalignment (PFM).[6] There are numerous ways to classify anterior knee discomfort separated it into two categories: "distinct" and "obscure." The distinct included focal lesions that could be identified clinically and radiologically, while the obscure included dynamic issues including maltracking and excessive lateral pressure syndrome..[7]

Given that one in six people with knee pain see a doctor at least once a year and that one-third of them will be disabled, knee discomfort causes significant expenses for the healthcare system [8]. About 25% of adults experience knee pain. Over the past 20 years, knee pain has become approximately 65% more common, resulting in nearly 4 million primary care visits each year.[9]

Young girls' knee pain was a major factor in limiting their everyday activities, which made them more likely to lead sedentary lifestyles and develop secondary issues including early osteoarthritis and knee disorders, among other things[10]

The traditional understanding of anterior knee pain is changing to take into account pathophysiological processes, such as the increased metabolic activity of the osseous and soft tissues, as an etiologically significant factor in the development of patellofemoral pain.[7] Patellofemoral diseases are controversial in terms of classification and nomenclature. There is arguably considerable consensus and acceptability among clinical experts regarding the wide symptom description known as "anterior knee pain."[11]

Physiotherapists are one professional category that has a high level of musculoskeletal overload. The literature indicates that lifting heavy equipment and patients, moving patients, keeping the same posture for extended periods of time, manual therapy techniques, reacting to patients' abrupt movements, and repetitive movements are the work-related activities that most frequently result in injuries in health professionals.[12] A physiotherapy student would typically assess the patient's strength, range of motion, balance and coordination, posture, muscular performance, breathing, and motor function in addition to reviewing the patient's medical history. They assess a patient's level of independence and assist with their reintegration into the workplace or community following an illness or injury. They create a treatment plan that outlines the strategy, goal, and expected results of the treatment.

During the course of physiotherapy, students are frequently required to perform physically demanding tasks for extended periods of time in addition to achieving inevitable protracted static postures.This could cause harmful physiological alterations, such as shoulder, neck, knee or back pain. An injury may result from the accumulated physiological damage caused by persistent pain or discomfort.[13] Medical education has a unique position and is somewhat different from other university courses due to its lengthy duration, students' direct interaction with hospitals, and the volume of teachings.[14] Physiotherapy students frequently sustain musculoskeletal ailments, and the number of these injury and pain are rising. Musculoskeletal issues have become more common in recent years.[15]

For most AKP patients, conservative treatment of the illness has positive outcomes. Only when surgery is thought to be beneficial when the patient has well-defined structural abnormalities of the knee or limb that clinically correlate with the AKP or when the patient does not get meaningful or long-lasting symptom relief is surgical intervention required.[16] For the great majority of PFPS patients, NSAIDs, hamstring stretches, and quadriceps strengthening exercises are sufficient symptomatic treatments.[17] Most patients with anterior knee pain typically have quadriceps muscle weakness, particularly during eccentric contractions. Nevertheless, hypotrophy and decreased activity of the vastus medialis are frequently reported, leading to an imbalance between the vastus medialis and vastus lateralis, regardless of whether pain or instability is the main issue. Before beginning any quadriceps exercises, this imbalance requires correction. Depending on the patient's progress, the non-operative rehabilitation protocol structured into distinct phases according to patient's progress. Reducing pain and swelling, balancing the vastus medialis and vastus lateralis, restoring normal gait, and lowering patello-femoral joint stress are the objectives of the first phase. Enhancing lower extremity postural control and coordination, strengthening the quadriceps and, if necessary, the hip

Patient must be motivated and encouraged to resume or begin appropriate, regular physical activity. Functional exercises should therefore be part of the third phase. Functional knee scores and single-leg functional tests should be utilized to assess clinical outcome near the conclusion of treatment.[18] In low-resource environments like Pakistan, where there is little awareness and a dearth of qualified sports medical professionals, PFPS frequently goes undiagnosed and undertreated. Diagnostic delays are caused by a lack of professionals and insufficient access to preventive treatment.[19]. Literature review shows the lack of studies in Physical therapy students in this age group, the growing incidence of this age group justify the need of study because of the demanding nature of physical therapy student. The aim of this study is to create awareness and evaluate the knee pain limiting the functional activities in students as there is unavailability of studies in Pakistani subject in this age group

Significance: This research highlights on the relationship between anterior knee pain and its association with limited functional activities among students. Factors that are associated with knee pain are identified. The study's conclusion creates a huge impact on Karachi, Pakistan's physical therapy students. This study contributes to understanding how students with anterior knee pain affects their physical health and causing hindrance achieving academic goals. Focused treatment and awareness in Pakistan may lessen musculoskeletal pain resulting in achieving university students' general well-being

Research Question: Is to determine the prevalence of anterior knee pain and its correlation with functional limitation among physical therapist university students?

METHODOLOGY:

Study Design: This study was cross-sectional study design.

Sample Technique: It was a non-probability convenience sampling technique.

Data Analysis:

The data were analyzed by using descriptive and statistical techniques such as chi-square tests and data were entered in and analyzed by SPSS version 26.

RESULTS AND FINDINGS

A total of 174 physical therapy university students from three major universities in Karachi Indus University, Liaquat National University, and Jinnah Sindh Medical University were enrolled in the study. The data were analyzed using SPSS version 26. Results are presented using descriptive statistics and inferential analysis (Chi-square test) to determine the association between anterior knee pain and functional limitation

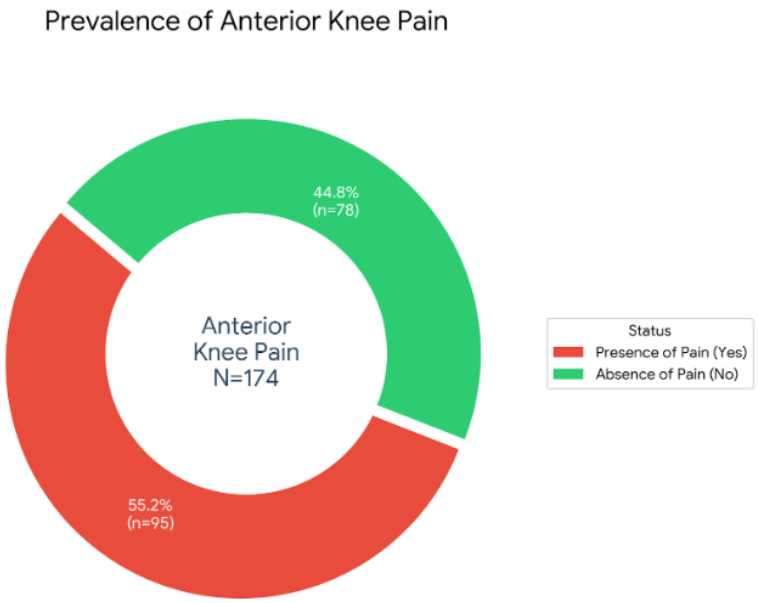
Table 1: Demographic Profile of Participants (n = 174)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	*18–20*	*52*	*29.9*
	21–25	*79*	*45.4*
	26–30	*31*	*17.8*
	31–35	*12*	*6.9*
Gender	*Male*	*72*	*41.4*
	Female	*102*	*58.6*
Clinical Training Hours	*Yes*	*121*	*69.5*
	No	*53*	*30.5*
Sports Participation	*Yes*	*67*	*38.5*
	No	*107*	*61.5*

The majority of participants (45.4%) were aged 21–25 years, reflecting the typical age distribution of undergraduate physical therapy students in Karachi. Females constituted a slightly higher proportion (58.6%), consistent with enrollment trends in health sciences programs in Pakistan. Nearly 70% of students reported having clinical training hours, indicating substantial physical load exposure. A smaller proportion (38.5%) participated in sports activities, suggesting that daily academic and clinical demands may be a more prominent contributor to knee symptoms than sports alone.

Table 2: Prevalence of Anterior Knee Pain

Anterior Knee Pain	Frequency (n)	Percentage (%)
Yes	*96*	*55.2*
No	*78*	*44.8*
Total	*174*	*100*



Anterior knee pain was reported by 55.2% of physical therapy students, indicating a high prevalence within this population. This finding highlights the substantial burden of knee-related musculoskeletal complaints among students who are routinely exposed to prolonged standing, squatting, stair climbing, and kneeling during academic and clinical activities.

Table 3: Distribution of Pain Intensity Scores among Students with Anterior Knee Pain (n = 96)

Pain Intensity	NPRS Score Range	Frequency (n)	Percentage (%)
Mild	**1–3**	**29**	**30.2**
Moderate	**4–6**	**47**	**49.0**
Severe	**7–10**	**20**	**20.8**

Mean Pain Score ± SD: 4.9 ± 2.1

Almost half of the affected students (49.0%) experienced moderate pain, while one-fifth (20.8%) reported severe pain. The mean pain score of 4.9 suggests a clinically relevant level of discomfort capable of influencing daily functional performance and academic participate

Table 4: Proportional distribution of Anterior Knee Pain

Affected Knee	Frequency (n)	Percentage (%)
Right Knee	**38**	**39.6**
Left Knee	**31**	**32.3**
Bilateral	**27**	**28.1**
Total	**96**	**100**

Unilateral knee involvement was more common than bilateral pain, with the right knee being most frequently affected. However, nearly one-third of students reported bilateral pain, indicating possible biomechanical overload or postural factors affecting both knees.

Table 5: Functional Limitation Categories According to Kujala Score

Kujala Score Range	Functional Status	Frequency (n)	Percentage (%)
≥85	No limitation	48	27.6
65–84	Mild limitation	61	35.1
45–64	Moderate limitation	43	24.7
<45	Severe limitation	22	12.6
Total		174	100

More than 70% of students exhibited some degree of functional limitation. Mild limitation was the most common category (35.1%), while 12.6% experienced severe impairment, reflecting difficulty in activities such as stair climbing, squatting, prolonged sitting, and running.

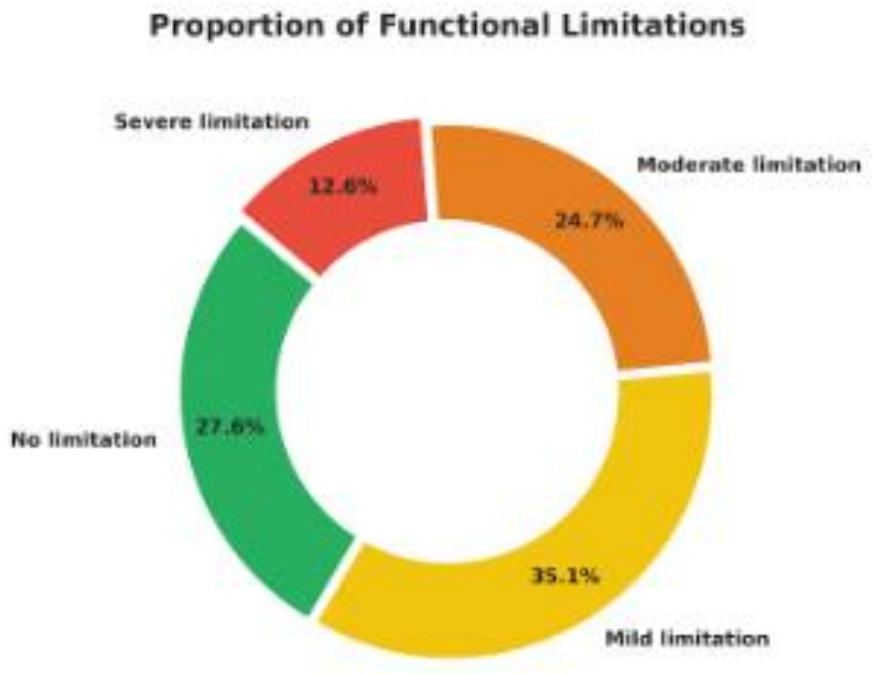


Table 6: Frequency of Difficulty in Specific Functional Activities (n = 96)

Activity	Students Reporting Difficulty n (%)
Stair climbing	69 (71.9)
Prolonged sitting with knees flexed	74 (77.1)
Squatting	66 (68.8)
Running	59 (61.5)
Jumping	52 (54.2)
Limp during walking	41 (42.7)

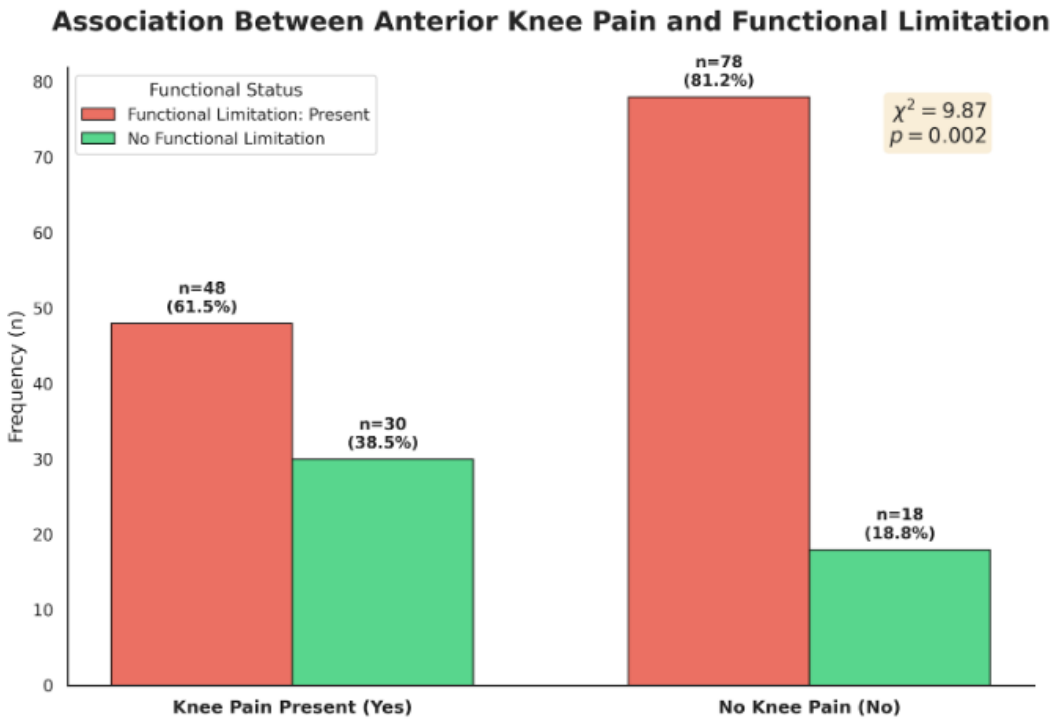
The most affected activities were prolonged sitting and stair climbing, both of which place increased stress on the patellofemoral joint. These findings align with classical presentations of patellofemoral pain syndrome and highlight functional challenges relevant to academic and clinical training environment

Table 7: Association Between Anterior Knee Pain and Functional Limitation

Anterior Knee Pain	Functional Limitation Present	No Functional Limitation	Total
Yes	78	18	96
No	48	30	78
Total	126	48	174

Chi-square value (χ^2): 9.87

p-value: 0.002



A statistically significant association was observed between anterior knee pain and functional limitation (p = 0.002). Students with anterior knee pain were significantly more likely to report limitations in daily and academic-related physical activity

Table 8: Hypothesis Testing for the Association Between Anterior Knee Pain and Functional Limitation

Hypothesis Type	Statement	Statistical Test	Test Value	p-value	Decision
Null Hypothesis (H_0)	There is no significant association between anterior knee pain and functional limitation	Chi-square test	$\chi^2 = 9.87$	0.002	*Rejected*
Alternative Hypothesis (H_1)	There is a significant association between anterior knee pain and functional limitation	Chi-square test			*Accepted*

The Chi-square test of independence demonstrated a statistically significant association between anterior knee pain and functional limitation among physical therapy students ($\chi^2 = 9.87$, p = 0.002). Since the p-value was less than the predetermined significance level of 0.05, the null hypothesis was rejected and the alternative hypothesis was accepted. This indicates that the presence of anterior knee pain is significantly associated with increased functional limitations in this population.

Summary of Key Findings

- ✓ The prevalence of anterior knee pain among participants was 55.2%, indicating that more than half of the students experienced knee pain during daily or academic activities.
- ✓ Female students were more commonly affected than male students, reflecting gender-related biomechanical and physiological differences.
- ✓ The mean pain intensity score among students with anterior knee pain was approximately 4.9 ± 2.1, with moderate pain being the most frequently reported category.
- ✓ Unilateral knee pain was more prevalent than bilateral involvement, with the right knee being most commonly affected.
- ✓ Assessment using the Kujala Anterior Knee Pain Scale revealed that over 70% of students exhibited functional limitations, ranging from mild to severe.
- ✓ Mild functional limitation was the most common category, while 12.6% of participants experienced severe functional impairment.
- ✓ The most frequently affected functional activities included:
  - Prolonged sitting with knees flexed
  - Stair climbing
  - Squatting
  - Running
- ✓ Students with anterior knee pain demonstrated significantly greater difficulty in performing academic and clinical-related physical activities.
- ✓ Chi-square analysis confirmed a statistically significant association between anterior knee pain and functional limitation ($p = 0.002$).
- ✓ The null hypothesis was rejected, and the alternative hypothesis was accepted, indicating that anterior knee pain significantly contributes to functional limitation among physical therapy students.

DISCUSSION

The present investigation was conceived to address a discernible gap in the epidemiological literature pertaining to musculoskeletal health within healthcare education[20]. Specifically, it sought to quantify the prevalence of anterior knee pain (AKP) and elucidate its relationship with functional limitations among a cohort of physical therapy university students in Karachi, Pakistan. The rationale for this focus is predicated on the unique occupational biomechanics inherent to physiotherapy education and training. Students within this discipline are routinely exposed to a confluence of provocative mechanical stressors, including sustained static postures during didactic sessions, repetitive dynamic loading during practical skill acquisition, and prolonged weight-bearing activities within clinical placement environments[21]. These activities encompassing frequent squatting, kneeling, stair ambulation, and prolonged standing are established mechanical determinants of patellofemoral joint dysfunction, the predominant patho-etiological substrate of AKP[22]. While the prevalence and impact of AKP are well-documented in athletic populations and to a lesser extent in qualified clinical practitioners, the student

phase represents a critical, yet underexplored, period of vulnerability[23]. This phase constitutes the foundational period for the development of both professional competencies and long-term musculoskeletal health patterns. The primary objectives of this study were therefore to establish baseline prevalence metrics, characterize the associated functional deficit profile, and perform an inferential analysis to determine the significance of the association between AKP and functional limitation in this specific population. The confirmation of a 55.2% prevalence rate and a statistically significant association (χ^2=9.87, p=0.002) provides substantive data to inform academic policy, curricular design, and student health initiatives.

LIMITATIONS OF THE STUDY

A rigorous interpretation of these findings necessitates acknowledgment of the study's methodological constraints. Primarily, the cross-sectional observational design fundamentally limits causal inference. While a plausible biomechanical pathway links PT activity to AKP, the temporal sequence cannot be definitively established. The potential for reverse causation, wherein individuals with pre-existing, subclinical knee pain may be more likely to perceive academic activities as provocative, or for confounding by unmeasured variables (e.g., prior injury history, genetic predisposition, extracurricular activities), cannot be discounted. Secondly, the reliance on self-reported data, though pragmatic for a large-scale survey, introduces potential biases. Recall bias may affect the reporting of pain duration and frequency, while the subjective interpretation of functional limitation on the Kujala scale may vary between individuals. The absence of a standardized clinical examination to differentially diagnose AKP and rule out other potential sources of anterior knee pain (e.g., patellar tendinopathy, fat pad impingement, meniscal pathology) is a notable limitation. Participant responses were predicated on their own understanding of "anterior knee pain," which may lack diagnostic specificity. Thirdly, the generalizability of the findings, while strong within the context of major Karachi institutions, may be limited when considering PT education in other geographical or cultural settings where curricular structures, facility ergonomics, and student lifestyles may differ. Finally, the investigation was necessarily focused on a limited set of variables. A more comprehensive etiological model would require the incorporation of objective biomechanical assessments (e.g., 3D gait analysis, dynamometric strength profiling, kinematic evaluation of squatting), psychosocial measures (e.g., pain catastrophizing, kinesiophobia scales), and detailed quantification of activity exposure (e.g., accelerometry, training logs).

FUTURE INVESTIGATE INQUIRY

To advance the understanding initiated by this study, subsequent research should pursue more complex and longitudinal designs. A prospective cohort study, tracking a student population from matriculation through licensure, would be instrumental in defining true incidence, identifying critical risk periods (e.g., the transition to clinical rotations), and establishing temporal precedence for causal relationships. Such a cohort would provide the ideal platform for nested case-control studies examining detailed biomechanical and psychological risk factors in those who develop AKP versus matched asymptomatic controls. Furthermore, the development and rigorous evaluation of targeted intervention strategies is a paramount next step. Randomized controlled trials are needed to test the efficacy of multimodal prevention programs. These could integrate structured exercise protocols focused on hip and trunk neuromuscular control, movement pattern re-education for high-risk tasks like squatting and lifting, ergonomic workshops, and cognitive-behavioral approaches to pain management. The outcome measures for such trials should extend beyond pain and function to include academic performance metrics, skill competency assessments, and long-term career health indicators. Expanding the scope of inquiry to a multi-center, international level would allow for comparative analysis across different educational systems and cultures, facilitating the identification of universal versus context-specific risk factors. This would enable the development of globally relevant, yet locally adaptable, guidelines for musculoskeletal health promotion in physiotherapy education. Finally, qualitative phenomenological studies could yield rich, contextual data on the lived experience of students with AKP, exploring its impact on professional identity formation, clinical confidence, and career intentions.

CONCLUSION

This Study provides compelling and quantitatively robust evidence that anterior knee pain constitutes a highly prevalent and functionally consequential occupational health issue among physical therapy students in the surveyed population. The elevated prevalence rate, the clinically significant pain intensity levels, and the pronounced impairment in educationally critical activities collectively paint a picture of a student body under substantial musculoskeletal duress. The statistically significant association between AKP and functional limitation confirms that this is not a collection of minor, isolated complaints, but a patterned disorder with direct implications for learning and professional development.

These findings necessitate a paradigm shift in how musculoskeletal health is conceptualized within physiotherapy education. It must be elevated from a peripheral concern to a central component of professional training an object of both practice and praxis. Educational institutions bear a responsibility to not only impart knowledge on treating musculoskeletal conditions but to actively foster the physical resilience required to endure the demands of the profession. By implementing evidence-based screening, integrating preventative education, and modifying training environments, programs can better safeguard their students. This proactive approach serves a dual purpose: protecting the well-being of the next generation of clinicians and modeling the preventative, holistic care that is the cornerstone of the physiotherapy profession itself. Ultimately, the sustainability of the workforce may depend as much on the health of its members as on the depth of their knowledge, and that foundation of health is built during the formative student years.

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