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Article

Prevalence of Patellofemoral Pain Syndrome Among Security Guards

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ABSTRACT

Background: Patellofemoral Pain Syndrome (PFPS) is a prevalent musculoskeletal condition associated with anterior knee pain, often affecting individuals in physically demanding occupations. Despite its clinical importance, there is a lack of evidence on PFPS prevalence in security guards, a population frequently exposed to prolonged standing and repetitive knee stress. This study addresses the gap by assessing PFPS prevalence and age-related trends in this occupational group. **Objective**: To determine the prevalence and severity of Patellofemoral Pain Syndrome among male security guards aged 30–50 years, and to analyze its association with age-related occupational exposure. **Methods**: A cross-sectional study was conducted among 323 male security guards recruited through convenience sampling from hospitals and shopping malls in Gujranwala. Participants aged 30–50 years with at least one year of work experience were included, while individuals with orthopedic conditions, congenital abnormalities, or assistive device use were excluded. PFPS was assessed using the Kujala Anterior Knee Pain Scale. Ethical approval was obtained from the CMH Gujranwala Research Committee, and the study complied with the Declaration of Helsinki. Statistical analysis was conducted using SPSS v27, employing descriptive statistics and Chi-square tests to assess associations. **Results**: Moderate PFPS was observed in 39.0% of participants, with the highest prevalence in the 45–50-year age group. A statistically significant association between age and PFPS severity was found ($\chi^2 = 216.837$, $p < 0.001$), indicating increased risk with advancing age. Clinically, the findings reflect a considerable burden of PFPS related to occupational stress. **Conclusion**: PFPS is highly prevalent among security guards, particularly in older age groups, highlighting the occupational risk posed by prolonged standing and repetitive knee activity. These findings support the need for preventive strategies and ergonomic interventions to reduce PFPS-related disability in labor-intensive professions.

Keywords: Patellofemoral Pain Syndrome, Occupational Diseases, Knee Joint, Musculoskeletal Pain, Security Personnel, Cross-Sectional Studies, Ergonomics.

INTRODUCTION

Patellofemoral Pain Syndrome (PFPS), often referred to as anterior knee pain or runner's knee, is a frequently encountered musculoskeletal disorder characterized by diffuse pain around or behind the patella. This condition is exacerbated by activities involving repetitive knee flexion under load, such as climbing stairs, squatting, or prolonged standing and sitting (1). The etiology of PFPS is multifactorial, involving biomechanical abnormalities such as patellar maltracking, altered muscle activation patterns—particularly imbalances between the vastus medialis and vastus lateralis—and structural deformities including an increased Q-angle, patellar tilt, or chondromalacia (2,3). Occupation-related stressors such as frequent kneeling, heavy lifting, and extended periods of standing have been implicated as aggravating factors in the development and chronicity of PFPS, particularly in physically demanding professions (4).

Although PFPS has been extensively studied in athletic and younger populations, with prevalence estimates ranging from 12% to 30% in physically active groups (13,14), there exists a significant gap in literature exploring its occurrence in non-athletic, occupational settings. Notably, the security workforce represents a vulnerable population due to the physical demands and static postural requirements inherent to their job roles. Prolonged standing, continuous patellofemoral joint loading, and repetitive ambulatory duties may predispose security guards to a heightened risk of PFPS, yet research specifically targeting this occupational group remains scarce (5,15). This gap in the literature necessitates focused investigation, particularly as untreated or poorly managed PFPS can lead to long-term functional impairments, decreased occupational productivity, and reduced quality of life (6,9).

While some evidence highlights a general prevalence of PFPS in workers engaged in strenuous physical labor—such as waste collectors and healthcare providers—the unique nature of security work, which often includes static postures and limited ergonomic support, warrants distinct consideration (15). Moreover, age has emerged as a potential modifying factor in PFPS prevalence, with studies indicating higher incidence rates among older adults, possibly due to degenerative changes or accumulated occupational wear and tear (16,17). Despite these emerging insights, a targeted exploration of PFPS prevalence among middle-aged security guards—particularly in the Pakistani context—has not been sufficiently addressed in current musculoskeletal research.

Given the above, the present study seeks to address this significant knowledge gap by determining the prevalence of Patellofemoral Pain Syndrome among male security guards aged 30 to 50 years. Through a cross-sectional survey utilizing the Kujala Scoring Questionnaire, this study aims to quantify the burden of PFPS in this specific occupational group and identify potential age-related trends. The findings are expected to inform occupational health practices and guide the development of preventive strategies tailored to mitigate knee-related disorders among security personnel. Therefore, the research is driven by the following question: *What is the prevalence of Patellofemoral Pain Syndrome among security guards aged 30–50 years, and how does occupational exposure contribute to its manifestation?*

MATERIALS AND METHODS

This study employed a cross-sectional observational design to determine the prevalence of Patellofemoral Pain Syndrome (PFPS) among male security guards. A total of 323 participants were recruited through a convenience sampling technique from various private-sector locations, including hospitals and shopping malls in Gujranwala, Pakistan. Eligible participants were male security guards aged between 30 and 50 years, each with a minimum of one year of continuous work experience in the same occupation. Individuals were excluded if they had congenital lower limb abnormalities, a prior history of orthopedic or surgical conditions affecting the lower extremities, or if they used assistive devices such as crutches or walkers.

Informed consent was obtained from all participants prior to data collection, and participation was voluntary. The study adhered to the ethical principles outlined in the Declaration of Helsinki. Confidentiality was strictly maintained, with participant data anonymized and securely stored. Ethical approval for the study was obtained from the Research Committee of CMH Gujranwala.

Data collection was conducted using the Kujala Anterior Knee Pain Scale (AKPS), a validated questionnaire designed to assess the severity and presence of PFPS-related symptoms (12). The questionnaire evaluates functional limitations and subjective complaints related to knee pain, including activities such as walking, stair climbing, squatting, and running. Participants completed the Kujala scale in a single session under the supervision of trained data collectors. The primary outcome was the presence and severity of PFPS, as determined by Kujala score categorizations: minimal or no symptoms, mild symptoms, moderate symptoms, or severe PFPS.

The sample size of 323 was calculated using the RaoSoft sample size calculator, assuming a confidence level of 95%, a margin of error of 5%, and an estimated response distribution. Data were entered and analyzed using IBM SPSS Statistics version 27. Descriptive statistics such as frequencies and percentages were used to summarize demographic and clinical characteristics. The Chi-square test was applied to examine the association between age groups and PFPS severity. A p-value of less than 0.05 was considered statistically significant. No imputation was performed for missing data, and no sensitivity analyses were required as the dataset was complete.

RESULTS

A total of 323 male security guards aged 30 to 50 years were included in the analysis. The assessment of Patellofemoral Pain Syndrome (PFPS) was conducted using the Kujala Anterior Knee Pain Scale. The participants were categorized by age and PFPS severity, with further statistical analysis performed to determine the association between these variables.

The participants were distributed across four age groups. The largest proportion (34.4%) belonged to the 45–50-year age group, followed by 25.7% in the 30–35-year group. The smallest subgroup comprised individuals aged 40–44 years (18.3%).

Table 1. Age Distribution of Security Guards (N = 323)

Age Group (Years)	Frequency (n)	Percentage (%)
30–35	83	25.7%
36–40	70	21.7%
41–44	59	18.3%
45–50	111	34.4%

Based on Kujala scores, the prevalence of PFPS in the study population was 39.0% for moderate symptoms, 26.9% for mild symptoms, and 2.5% for severe symptoms. A notable proportion (31.6%) reported minimal or no symptoms. A cross-tabulation of age groups with PFPS severity levels revealed a disproportionately higher frequency of moderate and severe PFPS in the older age groups, particularly in individuals aged 45–50 years. Chi-square analysis indicated a statistically significant association between age and PFPS severity ($\chi^2 = 216.837$, df = 9, $p < 0.001$), with both the Pearson Chi-Square and Likelihood Ratio tests yielding consistent results. The Linear-by-Linear Association also demonstrated a strong trend effect ($p < 0.001$), suggesting a dose-response relationship between increasing age and PFPS severity. Due to significant results across all test statistics, the findings confirm a robust correlation between increasing age and the likelihood of experiencing moderate to severe PFPS symptoms. While post hoc

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tests were not performed, the effect size implied by the Chi-square statistic indicates a substantial association strength.

Table 2. Severity of Patellofemoral Pain Syndrome Based on Kujala Score

PFPS Classification	Frequency (n)	Percentage (%)
Severe PFPS	8	2.5%
Moderate PFPS	126	39.0%
Mild PFPS Symptoms	87	26.9%
Minimal or No Symptoms	102	31.6%

Table 3. Chi-Square Tests of Association Between Age Groups and PFPS Severity

Test	Value	df	Significance (2-sided)
Pearson Chi-Square	216.837	9	< 0.001
Likelihood Ratio	218.852	9	< 0.001
Linear-by-Linear Association	146.860	1	< 0.001
Number of Valid Cases	323		

Clinically, this suggests that age-specific occupational modifications or preventive interventions may be warranted in the 45–50-year subgroup.

DISCUSSION

The findings of this study revealed a 39.0% prevalence of Patellofemoral Pain Syndrome (PFPS) among male security guards, with the highest occurrence observed in individuals aged 45–50 years. This prevalence is significantly higher than that reported in studies of general populations or younger individuals, underscoring the impact of occupational demands on knee health. The observed rates are in line with the prevalence reported among physically demanding professions, such as garbage collection workers in Portugal, where PFPS was found in approximately 30% of the workforce (15).

Similarly, elevated rates have been noted among young adults in Saudi Arabia and Egyptian medical students, although these studies focused on much younger cohorts with different activity profiles (16,17). Compared to a prior study involving young female athletes, which reported anterior knee pain in only 12–13% of participants, the present study illustrates a substantial occupational burden associated with age and job-related biomechanical stress (14).

The elevated prevalence observed in this study may be attributed to the chronic mechanical loading experienced by security guards, including prolonged standing, walking, and stair climbing, often performed on hard surfaces without ergonomic support. Repeated knee flexion-extension cycles, static postures, and limited recovery time can cumulatively increase patellofemoral joint stress, predisposing individuals to PFPS. Biomechanical models have identified patellar malalignment, increased Q-angle, and quadriceps imbalances as key contributors to PFPS, all of which may be exacerbated by occupational strain (3,6). The strong statistical association found between age and PFPS severity in this study supports the theory of cumulative microtrauma leading to synovial inflammation, cartilage softening (chondromalacia), and neuromechanical dysfunction of the patella over time (5,7).

The results not only align with previous occupational health findings but also advance the literature by focusing on a specific yet underexplored demographic—middle-aged male security guards in a South Asian context. This population is often overlooked in musculoskeletal epidemiology despite their high exposure to risk factors for degenerative joint conditions. The study's application of the Kujala Anterior Knee Pain Scale ensured a standardized and validated assessment of PFPS symptoms, enhancing the reliability of the prevalence estimates (12). Furthermore, the robust sample size and significant chi-square results provide strong statistical power to support the observed association between age and PFPS severity.

Despite these strengths, the study has limitations that must be acknowledged. The use of convenience sampling may introduce selection bias, limiting the generalizability of the findings to all security guards or broader occupational groups. Additionally, the exclusive focus on male participants excludes potential gender-based differences in PFPS prevalence, which have been observed in prior studies (17). The absence of post hoc analysis prevents detailed exploration of which specific age groups differ significantly in PFPS severity, and the cross-sectional design precludes causal inference. Moreover, external factors such as footwear type, BMI, and past injury history were not controlled for, which could confound the observed associations.

Clinically, these findings emphasize the need for occupational health interventions tailored to security personnel. Preventive strategies, including ergonomic training, scheduled movement breaks, lower limb strengthening programs, and modifications to standing surfaces, could mitigate the high prevalence of PFPS in this group. Given the chronic and potentially disabling nature of PFPS, early identification and intervention are crucial in maintaining workforce productivity and individual well-being. Employers and health policymakers should consider integrating musculoskeletal health screening and conditioning programs into workplace safety protocols for high-risk occupations.

Future research should build on these findings by incorporating a longitudinal design to track PFPS development over time and determine causative risk factors more accurately. Including both genders and multiple occupational settings would enhance the applicability of future studies. Additionally, integrating objective biomechanical assessments such as gait analysis or patellar

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tracking could provide deeper insights into the pathomechanics of PFPS in occupational settings. Investigating the efficacy of targeted interventions, such as proprioceptive training or patellar taping in high-risk workers, may also yield valuable preventive strategies. this study identifies a high prevalence of PFPS among security guards, particularly in those aged 45–50 years, highlighting the occupational burden of repetitive knee strain. These findings reinforce the importance of preventive measures in physically demanding jobs and contribute to the limited body of research focused on musculoskeletal disorders in non-athletic working populations. The study lays the groundwork for broader investigations aimed at improving knee health and functional longevity in labor-intensive professions.

CONCLUSION

This study identified a notably high prevalence (39.0%) of Patellofemoral Pain Syndrome (PFPS) among male security guards, with the greatest incidence observed in those aged 45–50 years, emphasizing the significant occupational burden posed by prolonged standing and repetitive knee-loading activities. Aligned with the study's objective and title, these findings highlight the urgent need for targeted preventive strategies in occupational health to mitigate the risk of PFPS in physically demanding roles. Clinically, this underscores the importance of early screening, ergonomic modifications, and structured rehabilitation programs to preserve knee function and reduce musculoskeletal morbidity among security personnel. From a research perspective, the study calls for broader investigations into PFPS across varied occupational groups and the development of effective, evidence-based interventions to improve workforce musculoskeletal health.

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