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# ASSOCIATION BETWEEN PAIN SEVERITY AND CHONDROMALACIA PATELLA (CMP) AMONG NOVICE DRUMMERS

*Original Research*

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## ABSTRACT

**Background:** Chondromalacia patellae (CMP) is a common musculoskeletal condition characterized by the softening and degeneration of the patellar cartilage, often leading to anterior knee pain. It is frequently associated with biomechanical stress, muscle imbalances, and prolonged repetitive activities. Factors such as lower limb muscle weakness, obesity, and female sex have been identified as potential risk factors. Drummers, due to the repetitive and high-impact nature of their activity, may be particularly susceptible to CMP. However, limited research has explored the relationship between CMP severity and pain intensity in this population.

**Objective:** To assess the association between pain severity and CMP among novice drummers.

**Methods:** A cross-sectional study was conducted among 171 novice drummers who had been playing for less than two years. Participants were recruited using a non-probability, purposive sampling technique. Ethical approval was obtained from the University of Lahore, and informed consent was secured. Data were collected using the Chondromalacia Patella Questionnaire and the Visual Analog Scale (VAS) for pain assessment. Statistical analysis was performed using SPSS software, with descriptive and inferential statistics applied to examine associations.

**Results:** The mean age of participants was 20.39±1.864 years, with a mean daily drumming duration of 5.83±1.459 hours. CMP severity was categorized as mild in 56.1% of participants, moderate in 25.1%, and severe in 18.7%. Knee pain severity was reported as mild in 42.7%, moderate in 32.7%, and severe in 24.6% of participants. Cross-tabulation analysis revealed a significant correlation between CMP severity and knee pain levels ($p < 0.05$), indicating that increased CMP severity corresponded to higher pain intensity.

**Conclusion:** A significant association was observed between chondromalacia patellae severity and knee pain among drummers. As CMP progressed, pain severity increased, emphasizing the need for early intervention strategies to mitigate its impact. Preventive measures, including strength training and biomechanical assessments, may be beneficial in reducing CMP-related knee pain in drummers.

**Keywords:** Biomechanics, Chondromalacia Patella, Drumming, Knee Pain, Musculoskeletal Disorders, Pain Severity, Risk Factors.

## INTRODUCTION

Chondromalacia patellae (CMP) is a prevalent condition associated with anterior knee pain, characterized by the softening and degeneration of the patellar cartilage. Despite extensive research, the precise etiology remains incompletely understood. However, several contributing factors have been identified, including lower limb muscle weakness, obesity, and female sex. Additionally, patellar malt-racking has been hypothesized as a contributing factor, particularly in individuals with cerebral palsy (1). Knee pain is one of the most common musculoskeletal complaints, ranking as the second most frequently reported knee-related condition. Among the various types of knee pain, patellofemoral pain (PFP) is particularly prevalent, with documented incidence rates ranging between 15% and 45%. PFP is defined as diffuse anterior knee pain that occurs during weight-bearing activities such as squatting, running, and ascending or descending stairs, in the absence of direct trauma (2). CMP presents with varying degrees of cartilage degeneration, ranging from minor surface cracks in the hyaline cartilage to complete cartilage loss exposing the subchondral bone. The condition manifests as anterior or anterolateral knee discomfort, frequently exacerbated by activities that place stress on the patellofemoral joint (3). Given the rising prevalence of osteoarthritis and the anticipated increase in total knee arthroplasty (TKA) procedures, there is an urgent need to adopt conservative, nonoperative treatment strategies to manage CMP effectively. Conservative rehabilitation approaches have demonstrated significant benefits, both as standalone treatments and as preparatory interventions prior to TKA, optimizing postoperative outcomes (4). Various clinical tests, such as the patellar grind, patellar tilt, and patellar glide tests, are commonly utilized to assess patellofemoral joint mobility and aid in diagnosing the underlying causes of anterior knee pain. Accurate diagnosis is essential for developing an effective management plan (5).

Degenerative changes associated with CMP primarily affect the articular cartilage on the posterior aspect of the patella, leading to softening, swelling, fraying, and eventual erosion. The underlying bone may also develop sclerosis, further contributing to pain and functional impairment (6). The patellofemoral joint (PFJ) is a structurally complex articulation influenced by intricate bony anatomy, capsuloligamentous structures, and dynamic muscular interactions (7). The knee joint, the largest joint in the human body, is a modified hinge joint that permits flexion, extension, and limited rotational movements. Its complex structure, encompassing both the tibiofemoral and patellofemoral components, makes it particularly susceptible to injury and degenerative conditions such as osteoarthritis (8). Athletes, particularly those engaged in high-impact sports, are at an increased risk of developing CMP due to repetitive stress on the knee joint. Knee injuries can significantly impact both physical performance and psychological well-being, ultimately affecting an athlete's career trajectory. Among collegiate football players, the risk of knee injuries increases progressively with training intensity, highlighting the need for preventive strategies (9). In cases involving meniscal root tears, repair rather than meniscectomy has been shown to yield superior outcomes, reducing the progression of osteoarthritis and delaying the need for TKA (10). Patellar dislocation is another common knee injury, often resulting from rotational forces or direct trauma to the medial knee. The patella is particularly vulnerable to lateral dislocation due to its anatomical configuration and the biomechanical forces acting upon it (11).

Obesity is a well-recognized risk factor for knee disorders, with subcutaneous fat frequently used as a surrogate marker in clinical and research settings. While arthroscopy remains the gold standard for diagnosing CMP, its invasive nature limits its widespread application. Surgical intervention is reserved for severe cases, with only 5% to 10% of individuals with cerebral palsy (CP) requiring operative management (12). Anatomical variations in the knee joint may contribute to diverse symptom presentations, necessitating individualized treatment approaches. Immobilization, a commonly employed orthopedic strategy, is often required for significant traumatic injuries; however, prolonged immobilization can lead to functional impairments affecting both articular and extra-articular structures (13). Anterior knee pain affects a wide demographic, including adolescents, active individuals, the general population, and military personnel, making it a significant concern in orthopedic and sports medicine (14). Clinical guidelines for managing knee pain are based on extensive research, encompassing conditions such as knee osteoarthritis, postoperative knee pain, soft tissue injuries, and complex regional pain syndrome (CRPS) (15). In the management of CP, conservative treatments are prioritized in early stages, while surgical interventions are considered for advanced cases. Various reconstructive techniques, including cartilage transplantation and total knee replacement, aim to restore the native patellar architecture and improve joint function (16). Given the multifactorial nature of anterior knee pain, a comprehensive assessment, incorporating detailed patient history and focused physical examination, is crucial for accurate diagnosis and treatment planning (17). This study aims to enhance the understanding of CMP in novice drummers, a population at risk due to repetitive knee movements and prolonged periods of weight-bearing activities. The findings of this research could contribute to the

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development of targeted prevention and treatment strategies, ultimately improving musculoskeletal health and performance in this unique group.

## METHODS

The study adopted a cross-sectional design to investigate the prevalence of chondromalacia patellae (CMP) among novice drummers. A total of 171 participants were selected using a non-probability, purposive sampling technique. The inclusion criteria required participants to be students engaged in drumming for less than two years, without any prior history of knee surgery, traumatic knee injuries, or pre-existing musculoskeletal disorders affecting the lower limbs (12). Individuals with known rheumatological or neurological conditions that could influence knee biomechanics were also excluded to ensure the accuracy of the findings. Ethical approval was obtained from the Ethical Review Committee of the University of Lahore prior to the commencement of data collection. Written informed consent was secured from all participants, ensuring voluntary participation and confidentiality. Permission for data collection was formally obtained from the management of relevant educational institutions and music academies where the participants were enrolled. This step ensured that the study population accurately reflected novice drummers rather than a clinical or hospital-based patient cohort.

Data collection was conducted using validated instruments, including the Chondromalacia Patella Questionnaire and the Visual Analog Scale (VAS) to assess symptoms and pain severity, respectively. The questionnaire, developed based on previously validated literature, was distributed in the form of pamphlets to facilitate ease of completion. Participants were provided with clear instructions to ensure accurate responses. Upon completion, all data were securely stored to maintain confidentiality and prevent bias. The data were analyzed using the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics were employed to summarize demographic and clinical characteristics, while appropriate inferential statistical tests were applied to examine associations between drumming-related factors and CMP symptoms. The study design and methodology were structured to ensure rigor, reliability, and validity in data collection and analysis, contributing to a comprehensive understanding of CMP prevalence in this population.

## RESULTS

The study analyzed data from 171 drummers with an average age of 20.39 years and a daily drumming duration of 5.83 hours. The primary focus was on knee-related symptoms, particularly the prevalence and severity of chondromalacia patellae (CMP) and its association with knee pain. Among the participants, 11.7% reported no knee discomfort, while 19.9% experienced severe pain. Additional symptoms, including swelling and crepitus, were also reported. The prevalence of CMP revealed that 56.1% of participants exhibited mild symptoms, 25.1% had moderate symptoms, and 18.7% had severe symptoms. Knee pain was categorized into severity levels, with 42.7% reporting mild pain, 32.7% experiencing moderate pain, and 24.6% enduring severe pain. A cross-tabulation of CMP severity and knee pain levels indicated a strong correlation between the two variables. Participants with mild CMP predominantly reported mild knee pain, whereas those with moderate and severe CMP exhibited progressively higher pain severity. The statistical analysis confirmed a significant association between CMP severity and knee pain levels, as demonstrated by the Pearson Chi-Square test, which yielded a p-value of less than 0.05. This result established a substantial correlation, suggesting that worsening CMP symptoms contribute to increased knee pain severity. The analysis of the data demonstrated a clear association between the severity of chondromalacia patellae (CMP) and the degree of knee pain among drummers. Among participants with mild CMP, 76.04% reported mild pain, 23.96% experienced moderate pain, and none reported severe pain. In contrast, individuals with moderate CMP showed a nearly even distribution, with 58.14% experiencing moderate pain and 41.86% reporting severe pain. Notably, in the severe CMP category, only 25% experienced moderate pain, whereas a substantial 75% reported severe pain. The findings indicate a progressive relationship between worsening CMP severity and increased knee pain levels. The Pearson Chi-Square test (p-value $< 0.05$) confirmed a statistically significant correlation, suggesting that as the degenerative changes in the patella progress, the likelihood of experiencing severe knee pain markedly increases.

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**Table 1: Prevalence of Chondromalacia Patella and Knee Pain Among Drummers**

| Severity Level | Chondromalacia Patella Frequency (%age) | Knee Pain Frequency (%age) |
|---|---|---|
| Mild | 96 (56.1%) | 73 (42.7%) |
| Moderate | 43 (25.1%) | 56 (32.7%) |
| Severe | 32 (18.7%) | 42 (24.6%) |
| Total | 171 (100.0%) | 171 (100.0%) |

**Table2: Descriptive statistics of Chondromalacia Patella (Knee Pain Cross tabulation)**

| | | Knee Pain | | | Total |
|---|---|---|---|---|---|
| | | Mild Pain | Moderate Pain | Severe Pain | |
| Chondromalacia Patella | Mild CMP | 73 | 23 | 0 | 96 |
| | Moderate CMP | 0 | 25 | 18 | 43 |
| | Severe CMP | 0 | 8 | 24 | 32 |
| Total | | 73 | 56 | 42 | 171 |

**Table3: Chi-square test between Chondromalacia Patella (Knee Pain Cross tabulation)**

| **Chi-Square Tests** | |
|---|---|
| | Asymptotic Significance (2-sided) P- Value |
| Pearson Chi-Square | .000 |

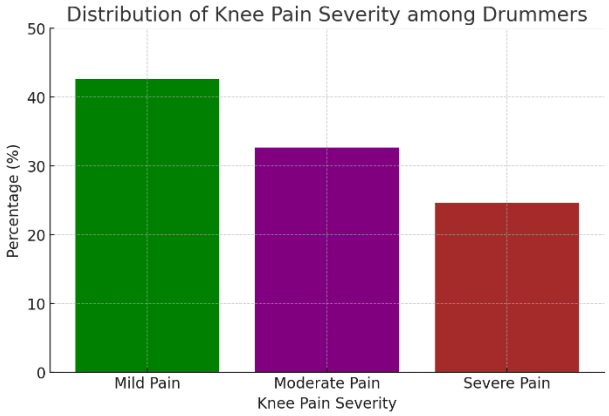


Figure 2 Distribution of Knee pain Severity Among Drummers

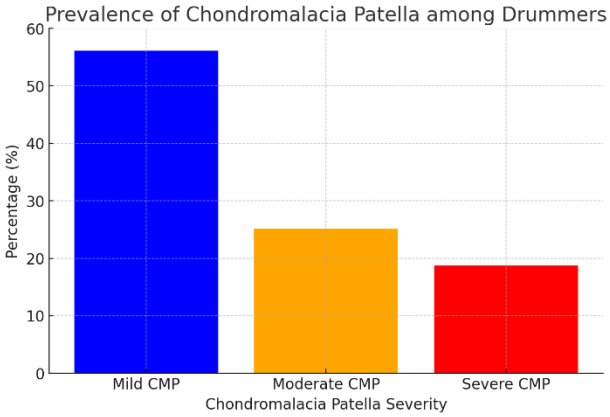


Figure 1 Prevalence of Chondromalacia Patella Among Drummers

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## DISCUSSION

The findings of this study provide substantial evidence regarding the prevalence and severity of chondromalacia patellae (CMP) among novice drummers, highlighting a significant association between CMP severity and knee pain. The mean age of participants was 20.39±1.864 years, with drumming durations averaging 5.83±1.459 hours per day. A substantial proportion of drummers experienced mild CMP symptoms (56.1%), while 25.1% reported moderate and 18.7% reported severe symptoms. Correspondingly, knee pain severity followed a similar distribution, with 42.7% experiencing mild pain, 32.7% reporting moderate pain, and 24.6% reporting severe pain. The statistical analysis revealed a highly significant correlation between CMP severity and knee pain ($p < 0.05$), reinforcing the hypothesis that progressive cartilage degeneration contributes to worsening pain levels (9,11). The findings align with previous research, which has demonstrated that individuals with chronic musculoskeletal pain exhibit decreased knee muscular strength, particularly in cases where symptoms persist beyond six months. Comparative studies have shown a significant decline in functional parameters such as peak torque flexion and peak torque extension in CMP patients, suggesting that compromised muscle strength plays a role in the pathogenesis and progression of the condition. The inverse relationship observed between MRI staging and knee extensor strength further supports the notion that advanced chondral degeneration is associated with functional impairment (18). While the current study did not directly assess muscle strength, the strong correlation between CMP severity and pain intensity indicates that muscular deficits may be an underlying factor requiring further exploration (13).

The gender-specific differences in CMP prevalence have been well-documented, with previous studies reporting a higher incidence of advanced chondromalacia among females. Increased joint laxity, anatomical differences, and biomechanical loading patterns have been proposed as contributing factors. Although gender distribution was not a primary variable in this study, future research could benefit from examining sex-based differences in CMP severity and knee pain among drummers. Additionally, existing literature has identified a positive association between age and MRI grading of patellar cartilage degeneration, suggesting that degenerative changes may progress with time (15). The present study predominantly included young adults, which may explain the relatively high prevalence of mild CMP cases. Longitudinal studies tracking symptom progression over time would be valuable in determining whether drumming-related knee stress accelerates degenerative changes. The current study's statistical findings reinforce the strong association between CMP and knee pain, which is consistent with prior research investigating knee pain outcomes in various populations. Studies evaluating post-traumatic and surgical knee conditions have found that anterior knee pain significantly impacts functional performance, even in the absence of intra-articular pathology. While previous studies have focused on knee pain following surgical interventions, the present research extends this understanding to repetitive mechanical stressors, such as drumming, which may predispose individuals to early cartilage degeneration (19). The repetitive high-impact nature of drumming could be a potential risk factor contributing to excessive patellofemoral joint loading, warranting further biomechanical assessments.

One of the study's strengths lies in its focus on a unique population, providing novel insights into CMP prevalence among drummers. The inclusion of validated assessment tools such as the Chondromalacia Patella Questionnaire and Visual Analog Scale enhances the reliability of symptom evaluation. Additionally, the statistical confirmation of the association between CMP severity and knee pain adds credibility to the findings. However, certain limitations must be acknowledged. The study did not account for individual differences in BMI, lower limb muscle strength, or drumming techniques, all of which could influence knee joint stress. Future research should integrate objective biomechanical analyses and longitudinal tracking of symptoms to gain a more comprehensive understanding of CMP progression in this population (11,18). The absence of imaging modalities, such as MRI or ultrasonography, limits the ability to objectively confirm the severity of cartilage degeneration. While clinical assessments provide valuable information, imaging studies could enhance diagnostic accuracy and allow for correlation with structural changes. Moreover, incorporating objective measures of knee function, such as strength assessments and range of motion evaluations, would strengthen future studies (20). Overall, the study underscores the significant burden of CMP among drummers and highlights the necessity for preventive strategies, such as strength training and ergonomic adjustments, to mitigate the risk of knee pain. Further research incorporating biomechanical evaluations, gender-based comparisons, and imaging-based diagnostics would contribute to a more comprehensive understanding of CMP pathophysiology and inform targeted interventions for individuals engaged in repetitive lower limb activities.

## CONCLUSION

The study concluded that a significant association exists between chondromalacia patellae and the severity of knee pain, reinforcing the understanding that as the degenerative changes in the patellar cartilage progress, pain intensity tends to increase. These findings highlight the importance of early detection and management strategies to prevent symptom progression and functional impairment. Given the

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repetitive mechanical stress associated with drumming, targeted interventions such as strengthening exercises, proper ergonomic adjustments, and preventive rehabilitation programs could play a crucial role in minimizing the risk of chondromalacia patellae and its associated discomfort. This research contributes to a deeper understanding of knee health in physically active populations and underscores the need for further studies exploring biomechanical and preventive aspects of patellofemoral joint conditions.

## AUTHOR CONTRIBUTIONS

| Author | Contribution |
|---|---|
| Arfa Asif* | Substantial Contribution to study design, analysis, acquisition of Data<br>Manuscript Writing<br>Has given Final Approval of the version to be published |
| Iqra Nazir | Substantial Contribution to study design, acquisition and interpretation of Data<br>Critical Review and Manuscript Writing<br>Has given Final Approval of the version to be published |

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