

## Incidence of Jumper's Knee among Recreational Badminton Players: A Literature Review

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### ABSTRACT:

Patellar Tendinopathy also known as Jumper's knee is a common condition in players which includes jumping activities and sports such as Badminton, Volleyball, Basketball, Skiing and this condition somewhere leads to obstruct the daily lifestyle apart from performance in the game. This literature review is an attempt to accumulate the studies that are focusing on jumper's knee and understand the pattern and trends. Databases such as Pubmed, Google scholar, Web of science were searched with keywords like 'Anterior knee pain' 'Patellar Tendinopathy' 'Jumper's knee' with combination to comorbidities such as risk factor. The prominence was on researches that focused on Patellar Tendinopathy.

**KEY WORDS:** PATELLAR TENDINOPATHY, ANTERIOR KNEE PAIN, JUMPER'S KNEE, BADMINTON, VOLLEYBALL, BASKETBALL.

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### I. INTRODUCTION:

Badminton is a high-energy game, the fastest of all racquet games. It is predominantly an overhead game, so excellent fitness is a prerequisite for competitive play. The athlete requires a combination of aerobic stamina, agility, strength, speed, and precision. In addition, badminton is a very technical sport requiring good motor coordination and mastery of intricate racquet moves. (Aksu, 2021) Though there has not been much research in this regard on the biomechanics of badminton, quite a few have enlightened scholars about the mechanics of the power generation during jump smash, and effectiveness of some of the lunge techniques—the essential requirement for retrieving a shuttlecock efficiently and in a successful manner. (Schwartz, 2015) Although badminton is not a contact sport, injuries are prevalent. Players are susceptible to both chronic overuse injuries and acute traumatic incidents. The upper extremity is particularly stressed due to the rapid execution of overhead forehand and backhand strokes, which involve brief hitting actions and deceptive movements. Additionally, the sport demands quick bursts of motion with abrupt directional changes, including diving to retrieve the shuttlecock. These movements increase the risk of non-contact traumatic injuries to joints and muscle-tendon units. (Pardiwala, 2020)

Localized patellar tendon discomfort is the result of tiny rips in the patellar tendon, which create "jumper's knee," also known as Anterior knee pain and patellar tendinopathy, a painful knee condition mostly associated to activity. This syndrome is mostly present in sports involving intense leaping. (Patel, 2017) The patellar or quadriceps tendon's buildup of stress is usually what causes the tears. Athletes from jumping sports—where leg extensor speed and power are highly valued—are prone to this illness. Sports like volleyball, track (long and high jump), basketball, long-distance running, and skiing can provide significant eccentric quadriceps loadings. This exercise goes over jumper's knee assessment and treatment, emphasizing the interprofessional team's responsibility in informing patients about their prognosis. (Kaldau, 2021)

The syndrome is predominantly seen in teenagers and young adults, particularly affecting men. Contrary to popular belief, the knee extensor tendons do not exhibit inflammation in cases of jumper's knee. Research conducted over the past four decades has identified jumper's knee as a degenerative condition. (Stania, 2022) A comprehensive medical history and physical examination are essential for diagnosing jumper's knee clinically. Ultrasound, being an accessible and cost-effective imaging method, can assist in the diagnostic process. Treatment primarily emphasizes conservative approaches, including reducing activities that impose stress on the knee. Once pain has diminished, physical therapy and exercise are implemented to regain function. In cases that remain unresponsive, surgical intervention is generally considered a last resort. (Kaldau, 2021)

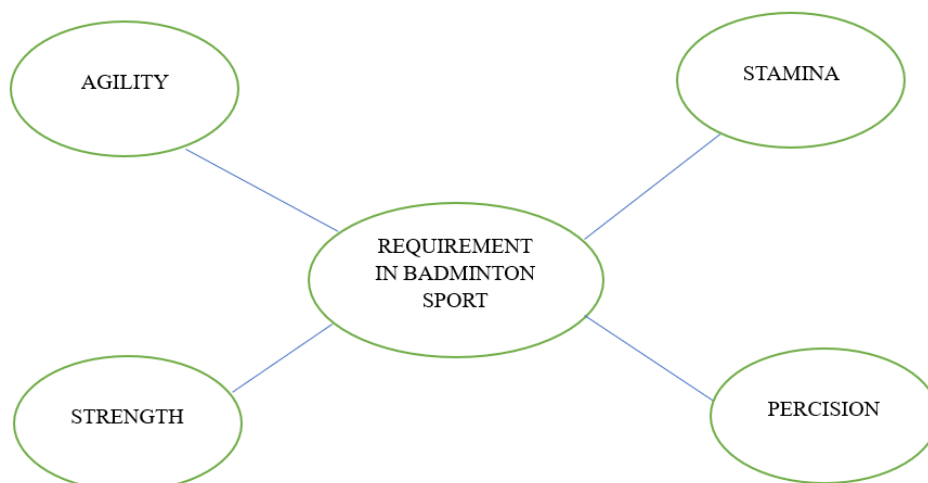


Fig.1.1 Basic Requirement in the game of Badminton sport.

### **PATHOPHYSIOLOGY OF JUMPERS KNEE**

The pathophysiology of patellar tendinopathy has been accounted for by a variety of concepts, such as vascular, mechanical, and impingement-related ones. The most frequently mentioned concept, however, is chronic overload. The tendons of the knee extensors will slowly degenerate and ultimately fail due to repetitive overload. High stresses lead to microscopic failure in the tendon, which eventually results in cellular alterations that impair the mechanical properties of the tendon. Degeneration of individual fibril can be caused by tendon microtrauma as it causes strain on the whole tendon. Chronic tendinopathy will ensue as fibril degeneration persists. (Schwartz, 2015) (Rothermich, 2015)

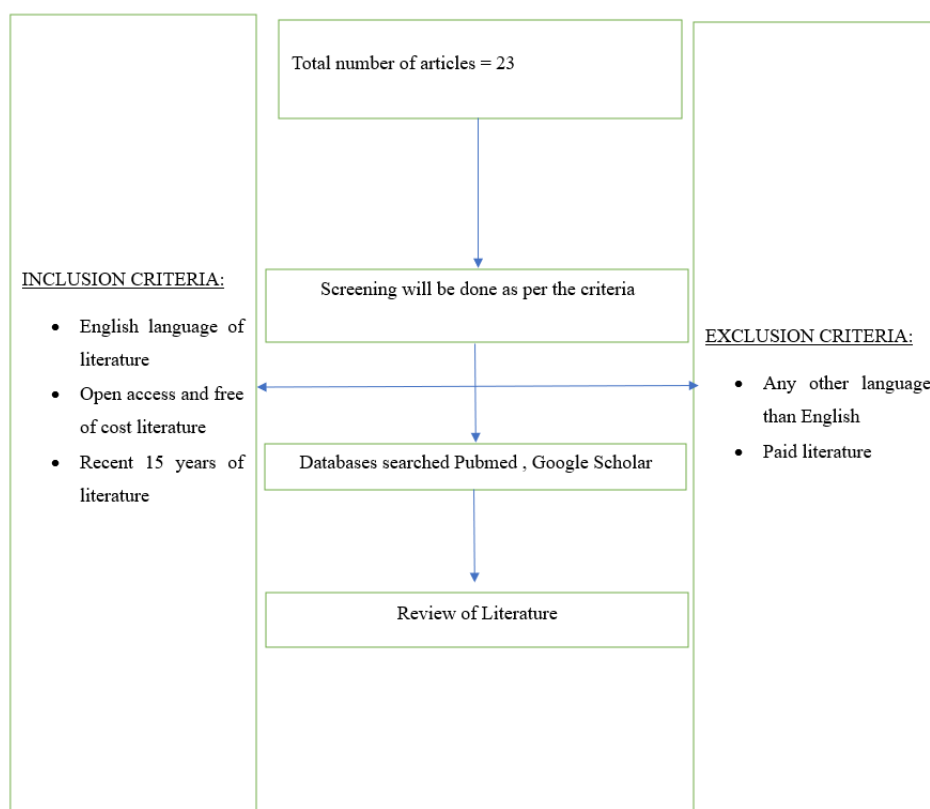


Fig1.2 Study protocol.

### **RESEARCH GAP:**

The occurrence of jumper's knee among recreational badminton enthusiasts remains unexplored in existing literature. Furthermore, this research will delve into a hypothesized connection between participating in badminton and the onset of jumper's knee, with more detailed examination to follow in the study.

## METHOD

Databases of Pubmed, Google Scholar and Web of Science were searched. Out of 150 studies only 23 were suitable for the review.

## II. REVIEW

- **Shun-Wun Jhan et al (2024)** in his study titled “A comparative analysis of platelet-rich plasma alone versus combined with extracorporeal shockwave therapy in athletes with patellar tendinopathy and knee pain: a randomized controlled trial concluded that Thirty-three athletes with patellar tendinopathy were split into two groups at random. Autologous PRP (5 mL) and sham ESWT were administered intraarticularly to the PRP + Sham (PS) group once. One intraarticular injection of autologous PRP and one intraarticular injection of ESWT (0.2 mJ/mm<sup>2</sup> energy flux density, 1350 impulses, 4 Hz) were administered to the PRP + ESWT (PE) group. Every patient was monitored for a year findings demonstrated that combination therapy is a safe treatment technique that can help with pain reduction earlier than PRP alone. In our investigation, no negative effects were observed. (Jhan, 2024)
- **Venanzio Iacono et al (2024)** in his study titled “Surgical and Biological Treatment with a Platelet-Rich Fibrin Matrix for Patellar Tendinopathy: Clinical Outcomes and Return to Sport at 2-Year Follow-Up” concluded that When compared to only surgical treatment, surgical debridement plus autologous PRFM application increased the rate of return to sports in patients with chronic PT, greatly enhanced clinical outcomes, and produced good patient satisfaction at 24 months. (Iacono, 2024)
- **Tiwari et al (2024)** in his study titled Comparison of anterior knee pain in recreational and professional Indian athletes concluded that 112 athletes, both professional and recreational, took part in the study. Our examination of participant feedback showed that there was a statistically significant difference ( $P < 0.05$ ) in AKP values between professional and leisure athletes. Recreation athletes had greater AKP than professional athletes (Tiwari, 2024)
- **Andreas Theodorou et al (2023)** in his study titled “Patellar tendinopathy: an overview of prevalence, risk factors, screening, diagnosis, treatment and prevention” concluded that Athletes frequently sustain PT, particularly in leaping sports like basketball and volleyball. Ultrasound and MRI are still highly significant diagnostic modalities, although clinical diagnosis remains the major method. Male gender, playing volleyball, and competing nationally are risk factors for PT. In jumping sports, proprioception and balance training are advised as they have been shown to be effective preventative measures. (Theodorou, 2023)
- **Karthick Rangasamy et al (2022)** in his study titled “Risk Prediction of Injury Among Recreational Badminton Players in India” concluded that In India, the prevalence of injuries among recreational badminton players was comparatively greater than that of other nations with minimal available data. 237 eligible individuals' data showed a 57.1% injury incidence rate. Injury rates may be decreased by modifying things like the way you warm up before a game, how often you exercise to be physically fit, and injury awareness initiatives. (Rangasamy, Badminton Injuries in Elite Athletes: A Review of Epidemiology and Biomechanics, 2022)
- **Magdalena Stania et al (2022)** in his study titled “Treatment of Jumper's Knee with Extracorporeal Shockwave Therapy: A Systematic Review and Meta-Analysis” concluded that For long-term outcomes, there was no significant difference between the ESWT and control groups' VAS and VISA-P ratings. Heterogeneity was regarded as high in both situations. Therefore, it is impossible to draw firm, broad conclusions on the efficacy of ESWT in athletes with patellar tendinopathy. (Stania, 2022)
- **Faiza Sharif Faiza Sharif et al (2022)** in his study titled “Efficacy of ultrasound guided dry needling as an adjunct to conventional physical therapy for patients with jumper's knee: A randomized controlled trial” concluded that 94 athletes with a clinical diagnosis of jumper's knee participated in a single-blinded randomized controlled experiment. They were split into two groups: one for the intervention (USG-DN + CPT,  $n = 47$ ) and another for the control (CPT,  $n = 47$ ). The intervention group underwent ultrasound-guided patellar tendon dry needling (DN) in addition to CPT during the 4-week program. Only CPT was given to the control group. Individuals with patellar tendinopathy who underwent ultrasound-guided tendon DN in conjunction with CPT reported less discomfort, better function, and a propensity to have thinner tendon. (Sharif, 2022)
- **Florian Rieder et al (2022)** in his study titled “Whole body vibration for chronic patellar tendinopathy: A randomized equivalence trial” concluded in his study that Thirty-nine patients were randomly assigned to one of three groups: waiting control (WLC) ( $n = 15$ ), HSR training ( $n = 11$ ), or three months of WBV training ( $n = 13$ ). 14 patients from the WLC group were re-assigned to one of the two intervention groups (five in WBV and nine in HSR) in a partially cross-over design. The symptoms of patellar tendinopathy were lowered by whole body vibration. Although it was not possible to prove equivalency for other variables, this sort of intervention is just as effective as HSR against maximum pain. For six months following the conclusion of the intervention, the positive effects of the WBV and HSR therapies remained. (Rieder, 2022)

- **Andrew L Sprague et al (2022)** In his study titled “Relationships between tendon structure and clinical impairments in patients with patellar tendinopathy” concluded that even after controlling for age, sex, BMI, and activity-induced pain, we discovered in this exploratory investigation that tendon anatomy affects quadriceps muscle performance and lower extremity function in the affected limb. Monitoring and treating these changes may help improve the results of treating patellar tendinopathy because changes in tendon structure continue even after symptoms have subsided. (Sprague, 2022)
- **Niels Christian Kaldau et al (2021)** in his study titled “Training and injuries among world elite junior badminton players – Identifying the problems” concluded that a total of 164 out of 436 participants completed the questionnaire, with a mean age of 17.1 (SD  $\pm$  0.8). A good general representation of tournament participants was provided by the participants, who came from North and South America, Europe, Asia, Africa, and the Pacific, including the top 10 performing nations. Significant injuries most frequently occurred in the lower back, ankle, and knee. The most often affected areas were the lower back and lower limbs. A player had chronic discomfort or constraints in one-third of the injuries. In badminton, stress fractures might be a significant issue that is underappreciated. (Kaldau, 2021)
- **Neslihan Aksu et al (2021)** In his study titled “Relationship of Patellofemoral Angles and Tibiofemoral Rotational Angles With Jumper's Knee in Professional Dancers: An MRI Analysis” concluded that We used magnetic resonance imaging (MRI) to assess the knees of 26 dancers (16 men and 10 women) who had knee pain, for a total of 32 knees. Seven knees had patellar tendinopathy (PT), and 21 had quadriceps tendinopathy (QT) and Anatomical changes in the PF sulcus angle and the patellar tendon's rotation with respect to the femur (femoral Insall angle) on axial MRI scans in elite dancers were linked to jumper's knee. Jumper's knee may result from dancers' knees being more exposed to external rotation forces due to turnout than those of other athletes. (Aksu, 2021)
- **Madeline Hannington et al (2020)** in his study titled “Self-reported jumpers' knee is common in elite basketball athletes - But is it all patellar tendinopathy?” concluded that Thirteen (22.7%) of the subjects self-reported PT. Of those who reported PT, only three experienced localized inferior pole pain. During the decline squat, 30 athletes felt discomfort, 15 of whom reported localized pain and 10 of whom reported generalized pain (5 missing data). Compared to those with focal pain (Md = 12 (7-26), n = 15), those with diffuse pain had more years played [Md = 21 (13-24), n = 10], p = 0.042, r = 0.3. 15% of athletes exhibited unilateral tendon abnormalities, while 45% had bilateral tendon abnormality yet According to this study, patellar tendon abnormalities were prevalent and unrelated to symptoms. (Hannington, 2020)
- **Ana Marchena-Rodriguez et al (2020)** in his study titled “Incidence of injuries among amateur badminton players” concluded that there were variations in injury incidence based on the age and sex of the athletes. 150 players produced 322 injury records in all. Muscle injuries are the most common form of injury, followed by injuries to the knee (in the lower limb) and the shoulder (in the upper limb). While more experience is a protective factor, athletes who are older, female, or commit more hours to training are more likely to sustain an injury. (Marchena-Rodriguez, 2020)
- **Dinshaw N. Pardiwala et al (2020)** in his study titled “Badminton Injuries in Elite Athletes: A Review of Epidemiology and Biomechanics” came to the conclusion that there is a considerable danger of injury even in the non-contact sport of badminton. Despite to common perception, this rate of injuries is far greater than that of other racquet sports like squash and tennis. Most badminton injuries are the consequence of high cumulative loads and subsequent to overuse. In order to allow the body to heal and break the recurrent cycle that results in overuse injuries, badminton coaches and trainers should take note of these observations and think about modifying the training load of their players. Out of all the injured regions, the lower limb accounts for 58–92.3% of cases. Additionally, given that research indicates that younger badminton players are more likely to suffer acute traumatic injuries, coaches should make sure that their players learn game management strategies that emphasize "safe" and low-risk play. (Rangasamy, Badminton Injuries in Elite Athletes: A Review of Epidemiology and Biomechanics, 2022)
- **Qassim I. Muaidi et al (2020)** in his study titled “Rehabilitation of patellar tendinopathy” Concluded that A musculoskeletal disorder called patellar tendinopathy is most commonly observed in sports involving running and leaping. The management of PT remains disputable despite the availability of several therapy alternatives. In a retrospective analysis of 66 physical therapy patients who received eccentric training, the researchers noted that 20 patients had total relief from pain and other symptoms, while 42 individuals had a noticeable improvement in symptoms. The most recommended course of treatment is conservative management, which involves functional strengthening, load control, load progression, and pain modulation. Through pain management first and increasing loading later, the goal of this type of therapy is to increase the tendon's capacity to withstand loads. (Muaidi, 2020)
- **Marcey Keefer Hutchison et al (2019)** in his study titled “Prevalence of Patellar Tendinopathy and Patellar Tendon Abnormality in Male Collegiate Basketball Players: A Cross-Sectional Study” came to the conclusion after using a diagnostic ultrasound imaging of the patellar tendon in each of the athlete's knees was

obtained. By combining the players' palpable pain complaints with the existence of a hypoechoic region on an ultrasound scan, patellar tendinopathy was identified. that PTA or PT was reported by one in three male collegiate basketball players. As part of a preseason screening procedure, sports medicine specialists should assess basketball players for PT and PTA. (Hutchison, 2019)

- **Marc Dauty et al (2019)**, in his study titled "Jumper's knee mechanical consequences in professional basketball players: the 'Camel's Back curve'" concluded that A "Camel's Back curve" at 60°/s was found in 35 (81%) of the players, and 43 had jumper's knee history. Specificity and sensitivity of the present curve were 100% and 81.3%, respectively. In comparison to the two maximal peaks, the lowest torque of strength decreased from 12 to 18 %. However, there was marked variability in strength between players with "Camel's Back curve" and those with normal curve for every 5° range of motion. Clinicians would be able to modify training regimens, knee rehabilitation, and physical preparation to enhance players' performances if there was a "Camel's Back curve." (Dauty, 2019)
- **Brianna M Ghali et al (2019)** in his study titled "Internal and External Workload in Youth Basketball Players Who Are Symptomatic and Asymptomatic for Patellar Tendinopathy" concluded that 144 players (19 cases and 125 controls) satisfied the inclusion requirements. The three outcomes: jump count (mean difference, 45 jumps; 98.3% CI: -41, 130;  $P = .177$ ), basketball sessions completed (mean difference, 0.9; 98.3% CI: -0.3, 2.2;  $P = .067$ ), and session rating of perceived exertion (mean difference, 346 arbitrary units; 98.3% CI: -459, 1151;  $P = .260$ ) did not show any significant differences between players with and without patellar tendinopathy. It is necessary to make an effort to identify athletes in the early stages of patellar tendinopathy and implement appropriate therapies. (Ghali, 2019)
- **Siyabonga H. Kunene et al (2018)** in his study titled "Anterior knee pain and its intrinsic risk factors among runners in under-resourced communities in Ekurhuleni, Gauteng" concluded that Some runners are dealing with a few risk factors that they can actually change and are experiencing discomfort in their knees. This suggests that to improve how we manage knee pain, we should pay attention to these changeable risk factors. It's also worth considering a community-based rehab approach, especially in areas where resources are limited. 40% of participants had AKP, especially men (57.9%) and young runners (57.9%) with three to five years of running experience (31.1%). Age was a strong predictor of anterior knee discomfort. (Kunene, 2018)
- **Ángel Basas et al (2018)** in his study titled "Effects of a strength protocol combined with electrical stimulation on patellar tendinopathy: 42 months retrospective follow-up on 6 high-level jumping athletes" concluded that The VAS decreased significantly ( $p < 0.01$ ) from the beginning to the 18, 24, and 48-month follow-ups. A strength program coupled with electrical stimulation produced encouraging clinical benefits in a small sample of elite jumping athletes who had chronic painful JK, with a notable decrease in pain during tendon loading exercises. (Basas, 2018)
- **Gali Dar et al (2018)** in his study titled "Immediate effect of infrapatellar strap on pain and jump height in patellar tendinopathy among young athletes" concluded that the study comprised 16 adolescent male basketball and volleyball players, ages 12 to 18, who had been diagnosed with patellar tendinopathy. Over the patellar tendon, under the patella, an infrapatellar strap was placed. With and without the strap, the athletes completed four jumping tests: the squat jump, drop jump, single-leg leap, and the 30-second jump test. An opt jump Next optical measurement system was used to evaluate jumping performance metrics, and a visual analogue scale was used to gauge the degree of pain in the symptomatic knee during jumping. Young male athletes' local pain was effectively reduced by the infrapatellar strap without affecting their ability to jump. (Dar, 2018)
- **Dilip R Patel et al (2017)** in his study titled "Evaluation and management of knee pain in young athletes: overuse injuries of the knee" concluded that after ramping up their physical activity, many young, active athletes notice some discomfort in the front of their knees. This pain can start suddenly or develop gradually, affecting one knee or both. Common activities like squatting, going up or down stairs, or even sitting for too long can make the pain worse. Athletes often experience flare-ups related to activity, where the discomfort sticks around for a few weeks, easing up with some rest. It's not uncommon for athletes to seek medical help when they find their sports performance slipping due to increased pain. They might also mention symptoms like their knees catching, feeling like they're locking up, or giving way unexpectedly. (Patel, 2017)
- **Jessica Fairley et al (2014)** in his study titled "Association between obesity and magnetic resonance imaging defined patellar tendinopathy in community-based adults: a cross-sectional study" came to the conclusion that Common in community-dwelling people, MRI-defined patellar tendinopathy is linked to a history of obesity, as measured by body weight or BMI, but not body fat mass. The results point to a mechanical pathophysiology of patellar tendinopathy, which might be one mechanism behind anterior knee discomfort associated with obesity. An MRI of the dominant knee was performed on the participants. Both T1-weighted and T2-weighted images were used to characterize patellar tendinopathy. (Fairley, 2014)

### III. CONCLUDING REMARKS

Studies have revealed that patellar tendinopathy is prevalent in athletic activities involving jumping. The condition, characterized by palpable pain stemming from overuse injuries, can affect individuals across all age groups. Males are observed to have a higher susceptibility compared to females. In terms of diagnosis, MRI stands out as the most effective tool. The management approach for this condition encompasses various strategies, including eccentric exercise programs, modifications to playing techniques, implementation of proper warm-up routines prior to vigorous activities, and efforts to raise awareness about the condition itself.

Overall, the literature emphasizes the importance of biomechanical awareness and injury prevention protocols in badminton. Acknowledging and addressing these risks through evidence-based training modifications can enhance athlete longevity and performance, especially in elite-level play

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