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Prevalence of Quadriceps Tendonitis in Adult Trekkers

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ABSTRACT

Background: Trekking and climbing in tall height districts are related with significant wellbeing dangers due to cruel natural conditions. Trekker tends to use both of their legs for climbing over the mountains so there are chances of overuse injury. Prolonged and intense use of quadriceps muscle may lead to pathophysiological changes in the leg, including quadriceps tendonitis. Quadriceps tendonitis is characterized by pain & swelling over proximal pole of patella. It is caused by overuse on the quadriceps tendon. **Methods:** A cross-sectional study was conducted among adult trekkers in Kolhapur city. Total 97 samples are included according to inclusion criteria which consist of age between 20-30 years, all genders and has experience of more than 5 years; and individual who had previous surgery of lower limb, recent trauma to hip and knee joint and congenital deformity are excluded. The study focuses on Quadriceps tendonitis in adult trekkers, so to find quadriceps tendonitis Questionnaire to evaluate quadriceps tendinopathy is used. The pain is assed with Numerical pain rating scale and tenderness with grades of tenderness. **Results:** Result shows 63 positive and negative 34 in individuals out of 97 individuals which results in significant prevalence of quadriceps tendonitis among adult trekkers. Percentage of positive and negative results are 64.95% and 35.05% respectively so, the prevalence of the study is 64.95%. mean values of age, year of experience, gender and outcome measures was calculated and noted in tables. **Discussion:** According to the mean values of all variables in positive and negative group it suggests that the intensity frequency and year experience is more in positive group as compared to negative which indicate there are high chances of getting pathological changes in the quadriceps tendon with high frequency and intensity. **Conclusion:**The study concludes that high frequency of trekking (i.e. climbing over the mountains) may contribute in pathophysiological changes in quadriceps tendon and development of quadriceps tendonitis. Preventive strategies such as strength training, stretching routines, appropriate trekking techniques may help reduce the risk. Further research is needed to explore long term biomechanical impacts.

Keywords: *quadriceps muscle, Trekking, tendonitis,*

INTRODUCTION

The muscle located on the front side of the thigh is called the quadriceps femoris. The quadriceps extensor, quadriceps, or quads are other names for it. The four dominant muscles on the front of the thigh are all part of this group. The muscle's primary function is to extend the knee, while its secondary function is to flex the hip. It creates a big, fleshy mass that covers the femur's sides and front. There are four distinct muscles that make up the quadriceps femoris muscle.

The majority of the other three quadriceps muscles are covered by the rectus femoris, which is located in the center of the thigh. The ilium is where it starts. Its straight path is the reason for its name. The vastus lateralis muscle is located on the outer side of the femur (i. e. on the lateral side of the thigh). The vastus medialis muscle is situated on the inner part of the femur (i. e. on the medial side of the thigh). The vastus intermedius muscle is found between the vastus lateralis and vastus medialis on the anterior side of the femur (i. e. on the front or top of the thigh), but it is positioned deep to the rectus femoris muscle. Generally, it cannot be observed without performing a dissection of the rectus femoris. [1]

Quadriceps muscles originates from combined rectus femoris and vastus muscles and inserted in tibial tuberosity of tibia.

Blood supply is from femoral arteryand nerve supply is from femoral nerve. The primary action of quadriceps muscles are knee extension; and hip flexion (Rectus femoris only).

The quadriceps femoris receives its nerve supply from the femoral nerve, which is derived from L2, L3, L4. [1]

Quadriceps tendon injuries present a range from tendinosis to partial tears, and complete full thickness ruptures. Tendonitis suggests that an acute inflammatory process is present. The quadriceps tendon consists of contributions from four quadriceps muscles: Rectus femoris, Vastus lateralis, Vastus medialis, and Vastus intermedius. Quadriceps tendonitis is a condition particularly found in athletes engaged in repetitive activities like jumping, running, bicycling, or kicking. Overuse injuries are often observed in athletes who engage in intense and repetitive jumping activities, such as

volleyball and basketball. This pathological condition involves microtears at the junction between bone and tendon, leading to inflammation. Clinical symptoms of quadriceps tendonitis include pain at the proximal pole of the patella accompanied by tenderness.[2] A research study indicates that the primary factors contributing to musculoskeletal injuries and falls while trekking include the weight of the backpack, insufficient or no utilization of trekking poles, inappropriate footwear, and the irregular terrain. A research study indicates that the primary factors contributing to musculoskeletal injuries and falls while trekking include the weight of the backpack, insufficient or no utilization of trekking poles, inappropriate footwear, and the irregular terrain. Walking downhill amplifies the compressive forces acting on the entire lower leg, resulting in heightened eccentric loadings.[3] Trekking and climbing in tall height districts are related with significant wellbeing dangers due to remoteness, cruel natural conditions, common dangers, and impressive requests on physical execution and specialized abilities.

Within the case of a mishap or crisis, quick outside help is regularly inconceivable, making starting therapeutic care on location especially imperative and may be lifesaving. Trekkers and climbers may be gone up against with an expansive range of crisis scenarios, Orthopaedic complaints ordinarily show as useful complaints or actuated degenerative joint and muscle issues, indeed in case. The indications are escalation excruciating and emerge all of a sudden. The essential centre of these complaints relates to the exceedingly focused knee joint and the spinal column. When plummeting slants, there's a significant increment in patellar weight against the femoral float surface (Schwameder et al., 1999). Pre-existing cartilage harm, known as chondropathia patellae, together with weakness of the musculature that stabilizes the knee, coordination challenges, lacking physical conditioning, and presentation to new stressors in terms of escalated and term, tends to show as front knee pain, usually localized underneath or along the side to the patella. In more articulated cases, this may lead to knee joint emanation and swelling, went with by impediments in run of movement. In cases where the knee joint has responded with stamped intra-articular emissions, it isn't fitting to subject it to assist stressors.[13]

The demands placed on athletes' performance have grown within the past 20 years. Ie athletes must train more frequently, more fiercely, and for longer periods of time, there is a higher chance of acute and overuse sports injuries. Prior too recently, young and middle-aged adults were the primary participants in sports and physical activities. Many people now spend more time participating in recreational or competitive sports due to an increase in free time.

A lot of force and stress are applied to the tendon during physical activity, Ih raises the possibility of injury. Compared to patellar tendinopathy, quadriceps tendinopathy is far less common because to the higher strength, mechanical advantage, and improved vascularity of the quadriceps tendon. Avulsion injuries to the proximal patella in teenage athletes

Apophasis is more prevalent than quadriceps tendinopathy. Pain near the patella's proximal pole is reported by patients with quadriceps tendinopathy. A recent increase in jumping, climbing, kicking, or sprinting is frequently linked to the subtle pain. A physical examination indicates soreness. During the knee's maximal flexion, as well as pain from resistance to extension across the patella's superior pole. It is important to assess malalignment, including tibial torsion, femoral ante version, and an elevated Q angle, in addition to hamstring and quadriceps flexibility. Elderly people with quadriceps tendinopathy may exhibit degenerative alterations such tendon calcification or spur development at the patella's superior pole. Degeneration of the tendon's posterior insertion may be visible on an MRI when extension strength is maintained.[14]

Tendons are responsible for transmitting muscle forces to bones, enabling movement and enhancing joint stability. Additionally, tendons are living tissues that adapt to mechanical forces by altering their metabolism along with their structural and mechanical characteristics. For instance, tendons show an increase in cross-sectional area and tensile strength, while tendon fibroblasts boost collagen type I production in response to suitable physical training. The forces produced in muscles are conveyed to bones through tendons, facilitating movement in joints and limbs. The tendon features a multi-unit hierarchical structure made up of collagen molecules, fibrils, fiber bundles, fascicles, and tendon units that align parallel to the tendon's long axis.

Tendon overuse injuries, commonly known as tendinopathy (Khan et al., 2002), impact millions in both occupational and athletic environments (Almekinders and Temple, 1998). Nevertheless, there is a lack of research on non-traumatic, overuse tendon injuries. The term "overuse" signifies a repetitive stretching of a tendon and leads to the tendon's failure to withstand additional tension (Jozsa and Kannus, 1997). While tendinopathy is probably triggered by intrinsic or extrinsic factors or their combination (Kjaer, 2004; Riley, 2004), excessive mechanical loading is viewed as a primary causative element. It is thought that small, repetitive strains, which remain below the tendon's failure threshold, produce tendon micro injuries and consequently tendon inflammation.[10]

METHODOLOGY

An Observational Cross sectional study done on Age group 20-30 years for a duration of 1 year 6 months using Simple Random Sampling Method.

Materials used Patient consent form, Data collection sheet, Questionnaire to evaluate Quadriceps tendinopathy, Plinth, Pen.

Subjects were selected fulfilling inclusion exclusion criteria. Inclusion criteria More than 5 years into trekking, More than 2 trek per year, Age- 20>=30, Gender- Both, BMI- Normal Exclusion criteria Any past surgical history of spine & lower limb, Any congenital deformity.

PROCEDURE

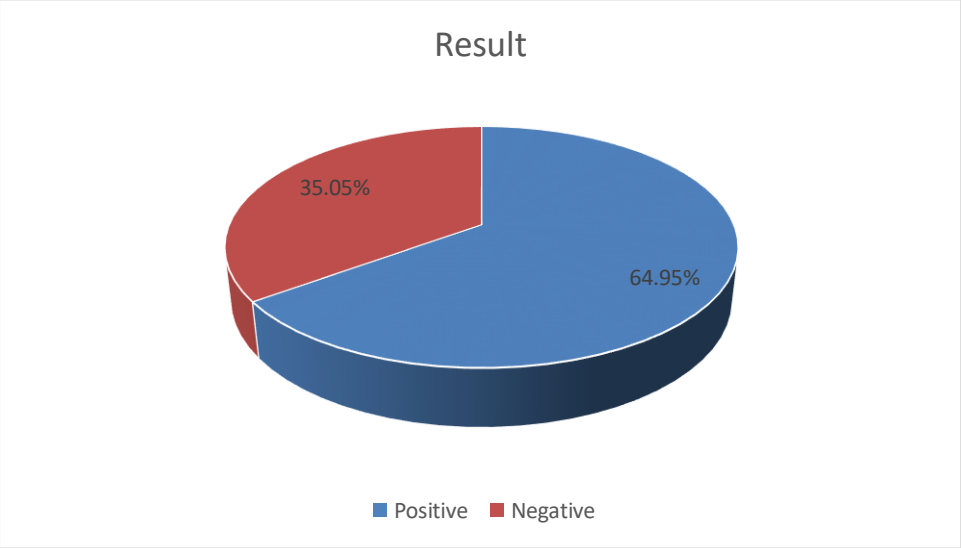
This study was an observational study which was conducted in adult trekkers, Inclusion and exclusion criteria were considered. The study protocol was presented for approval in front of institutional ethical committee and protocol committee of D. Y. Patil Education Society, deemed to be university Kolhapur and D.Y. Patil College of Physiotherapy, Kolhapur and Ethical approval was granted by the committee. The observational study titled “To study prevalence of Quadriceps tendonitis in adult trekkers" was conducted in Mulukhagiri trekkers and adventures at Kolhapur. Potential subjects were approached and provided with an explanation of the study's purpose. Written consent was obtained from those willing to participate. participants for the study were recruited and they underwent assessment of Quadriceps tendonitis by using Questionnaire to asses quadriceps tendinopathy, Numerical pain rating scale, Grades of tenderness. The study was focused on individual practicing more than 5 years, individuals who do More than 2 treks per year including both male and female with a normal Body mass index individuals aged between 20 to 30 years.

The study excluded participants who have congenital deformity. Participant who has history of surgery and participants who had trauma to hip or knee joint. These exclusion criteria aimed to focus specifically on acquired quadriceps tendonitis due to Trekking. The nature of the study was explained to interested subjects, and written consent was obtained from all participants. Demographic data including name, age, and gender were collected using a standardized data collection sheet. Participant assessed with Questionnaire to evaluate quadriceps tendinopathy to find out the dominant lower limb. It contains various tasks which will be done by participant. Data sheet score will be noted and calculated. Pain is assessed with Numerical pain rating scale. Tenderness is assessed by using grades of tenderness with patient in long sitting position and the score is noted in the data collection sheet. The statistical analysis utilized appropriate biostatistical tools and was conducted using the master chart data. This analysis aimed to calculate the prevalence of prevalence of Quadriceps tendonitis in adult trekkers.

Finally, study declared the results, discussion and conclusion.

RESULT

PIE DIAGRAMATIC PRESENTATION OF PREVALENCE OF QUADRICEPS TENDONITIS.

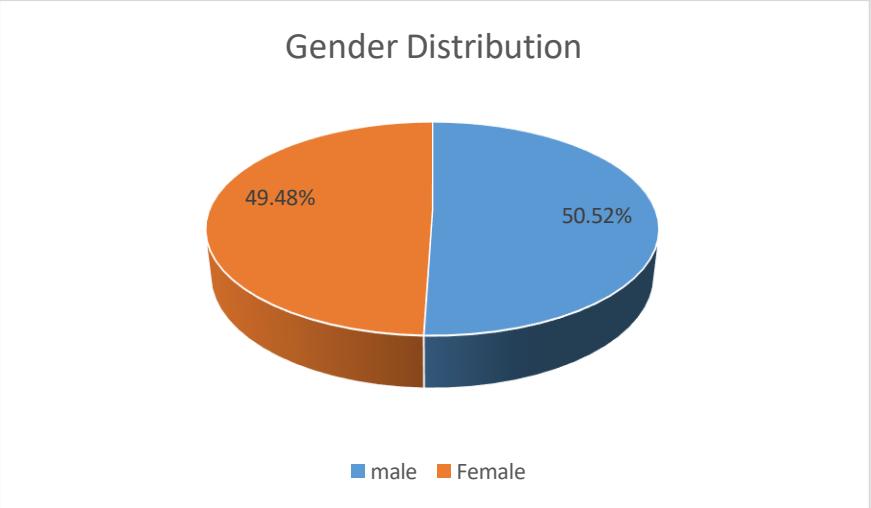


Pie diagram 1: prevalence of the study pie diagrammatic presentation

Pie diagram no. 1 shows tabular format and pie diagrammatic presentation of no. 1 of participants who have been positive

for prevalence of quadriceps tendonitis among adult trekkers. Which concluded that there were 63participants positive which constitute 64.95% whereas 34 participants were negative constituting 35.05%

PIE DIAGRAMATIC PRESENTATION OF FREQUENCY AND PERCENTAGE OF BOTH GENDERS

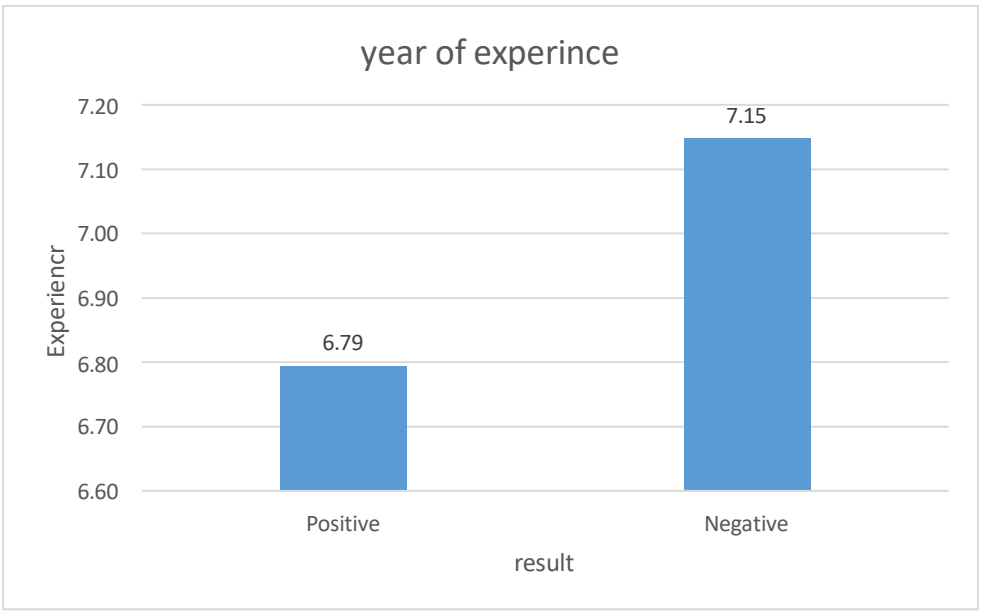


Pie diagram 2: Pie diagramatic presentation of frequency and percentage of both genders

Pie diagram no. 2 shows tabular format and pie diagrammatic presentation of frequency and percentage of both genders. The frequency of male is 49 with percentage of 50.52% and on the other hand frequency of female is 48 with percentage of 49.48%

AVERAGE VALUES OF YAER OF EXPERIENCE IN TABULAR FORMAT.

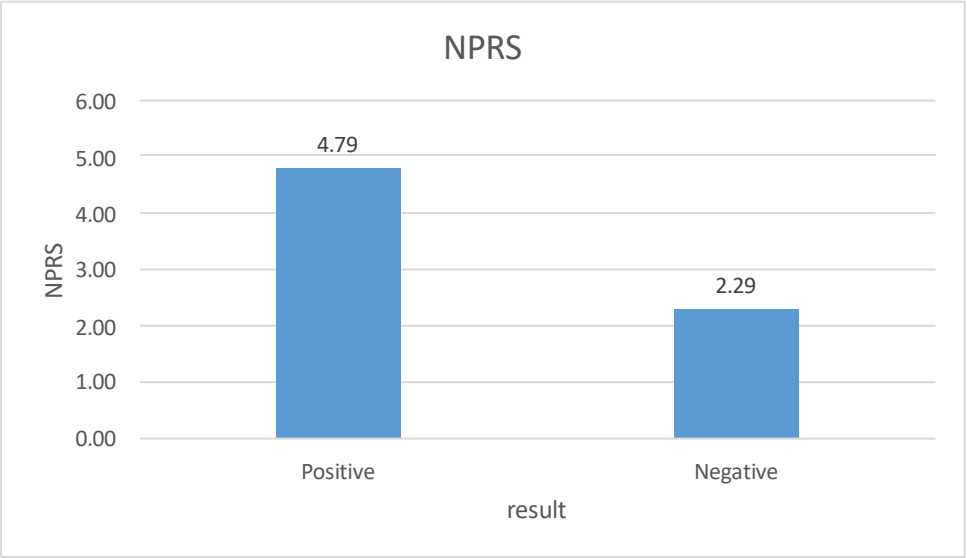
GRAPHICAL PRESENTATION OF MEAN VALUE OF YEAR OF EXPERENCE



Graph no 1: mean value of year of experience graphical presentation

Graph 1 shows tabular format and graphical presentation of mean value of year of experience. Mean value of year of experience in positive criteria is 6.79 and standard deviation is 1.98. Mean value of year of experience in negative 7.15 and standard deviation is 1.71

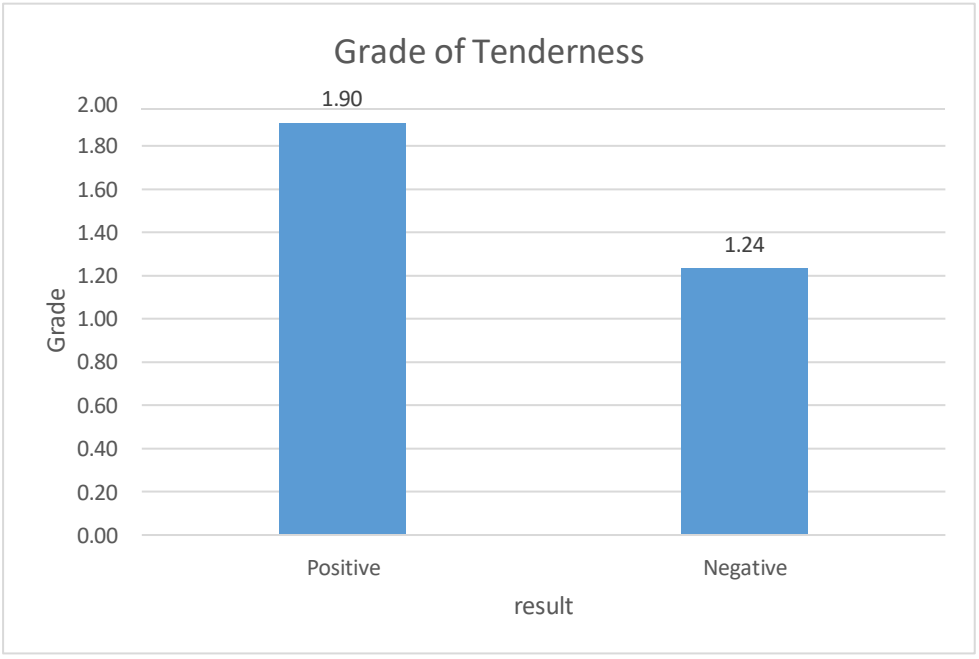
GRAPHICAL PRESENTATION OF MEAN VALUE OF NUMERICAL PAIN RATING SCALE



graph 2: mean value of numerical pain rating scale graphical presentation

Graph 2 shows tabular format and graphical presentation of mean value and standard deviation of numerical pain rating scale. Mean value of numerical pain rating scale in positive is 4.79 and standard deviation is 1.75. Mean value of numerical pain rating scale in negative is 2.29 and standard deviation is 0.94 respectively

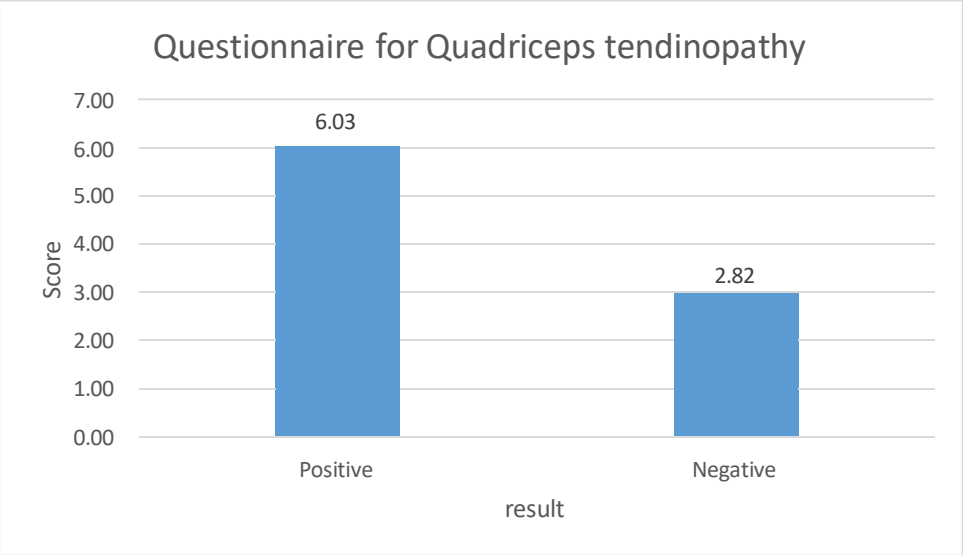
GRAPHICAL PRESENTATION OF MEAN VALUE OF AND STANDARD DEVIATION OF GRADES OF TENDERNESS



Graph no. 3: mean value of grades of tenderness graphical presentation

Graph no. 3 shows tabular format and graphical presentation of mean value and standard deviation of grades of tenderness. Mean value in positive is 1.90 and standard deviation is 0.70. Mean value in negative is 1.24 and standard deviation is 0.43 respectively.

GRAPHICAL PRESENTATION OF MEAN VALUE OF AND STANDARD DEVIATION OF QUESTIONNAIRE FOR QUADRICEPS TENDINOPATHY.



Graph no. 4: mean value graphical presentation of Questionnaire for Quadriceps tendinopathy

Graph no. 4 shows tabular format and graphical presentation of mean value and standard deviation of Questionnaire for Quadriceps tendinopathy. Mean value in positive is 6.03 and standard deviation is 2.82. Mean value in negative is 2.06 and standard deviation is 1.22 respectively.

DISCUSSION

The present study aimed to assess the prevalence of quadriceps tendonitis among adult trekkers and examine contributing factors such as years of experience, gender, pain levels, and tenderness grades. The findings indicate that 62.38% of the participants were diagnosed with quadriceps tendonitis, highlighting the high occurrence of this condition among trekkers.

The results suggest that males (71.43%) had a higher prevalence of quadriceps tendonitis compared to females (58.33%). This could be attributed to differences in muscle engagement, trekking intensity, or biomechanical factors affecting quadriceps loading. Previous research on overuse injuries in trekking and endurance sports suggests that males may engage in more aggressive trekking patterns, potentially increasing the risk of tendonitis.

The study also analysed the correlation between trekking experience and quadriceps tendonitis. The prevalence was highest among individuals with 5 years of trekking experience (80.64%) and those with 10 or more years of experience (71.43%–100%). This suggests that while beginners may have a lower risk, prolonged trekking exposure increases the likelihood of developing quadriceps tendonitis due to repetitive strain on the tendon. However, a slight decrease in prevalence was observed among trekkers with 7–8 years of experience, which might indicate that improved conditioning, training adaptations, or preventive measures could mitigate the risk.

Among participants diagnosed with quadriceps tendonitis, the average pain score (NPRS) was 4.79/10, indicating moderate discomfort. The average grade of tenderness was 1.90, suggesting that most cases were mild to moderate in severity. These findings align with existing literature, which states that quadriceps tendonitis in trekkers typically presents with gradual onset pain and tenderness, often exacerbated by excessive downhill trekking.

The findings underscore the importance of proper conditioning, warm-up exercises, and strength training in preventing quadriceps tendonitis. Since prolonged trekking experience is linked to increased prevalence, structured recovery programs, eccentric strengthening exercises, and biomechanical adjustments could help mitigate tendon overuse injuries. Furthermore, trekkers should focus on appropriate footwear, load distribution, and gradual intensity progression to minimize strain on the quadriceps tendon.

CONCLUSION

The study concludes that a high prevalence (64.95%) of quadriceps tendonitis among adult trekkers, with 50.52% male and 49.48% female particularly those with over 7 years of experience. This study highlights the significant prevalence of

quadriceps tendonitis among adult trekkers, emphasizing the impact of repetitive strain and overuse on the quadriceps tendon. The findings suggest that factors such as prolonged trekking duration, improper conditioning, inadequate warm-up, and excessive load-bearing contribute to the development of this condition. According to the results among participants diagnosed with quadriceps tendonitis, the mean value of (NPRS) was 4.79/10, indicating moderate discomfort. The mean value for grade of tenderness was 1.90, suggesting that most cases were mild to moderate in severity. These findings states that quadriceps tendonitis in trekkers typically presents with gradual onset pain and tenderness, often exacerbated by excessive downhill trekking.

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