

Role of Physiotherapy in Osgood Schlatter Disease in Paediatrics and Adolescents Age Group- A Multimodal Literature Review

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Abstract—BACKGROUND Osgood-Schlatter disease (OSD), a form of traction apophysitis of the tibial tuberosity, is common in children and adolescents particularly those who engage in sport activities that involve a lot of running and jumping. One of the major causes of anterior knee pain in the age bracket is the fact that the patellar tendon insertion is under significant mechanical stress during the growth spurt. Conservative management, in particular, physiotherapy, makes it possible to prevent long-term problems, improve functional outcomes, and reduce discomfort.

AIMS AND OBJECTIVES To review and assess comprehensively the contribution of physiotherapy interventions in the management of Osgood-Schlatter disease in the pediatric age group and paying attention to their effectiveness in reducing pain, improving functions and restoring sports, etc.

METHODOLOGY PEDRO used the PICO format to create search queries in PubMed and Google Scholar using electronic search. The search was narrowed down with filters as follows: publication date (not older than 10 years), language (English) and study type (randomized controlled trials, cohort studies, systematic reviews, and case reports) and 15 articles were selected to review.

CONCLUSION: - Physical therapy is the conventional mode of conservative management of Osgood-Schlatter disease among children and adolescents. The current research proves that multimodal physiotherapy methods, such as activity modification, structured exercise programs, and adjuvant methods like shockwave therapy, can help improve pain and functional outcome. The early physiotherapy provision would enable young patients to resume normal and sports activities safely and with appropriate patient education and self management strategies, maximize recovery and reduce chances of having long term issues.

Index Terms—Osgood-Schlatter disease, Exercise Therapy, Activity Modification, Extracorporeal Shockwave Therapy, Isokinetic Training

I. INTRODUCTION

One of the most common knee pain causes among the adolescents is the Osgood-Schlatter disease (OSD) which is a traction apophysitis of the tibial tuberosity that may last many years, causing localized pain and swelling in the area, and limiting sports activities.¹ It is commonly associated with excessive mechanical load in the form of repetitive quadriceps contractions,² particularly in boys who are enrolled in sports that involve jumping and running.³ There are promising results of the conservative physiotherapy management- activity modification, strengthening, stretching and shockwave therapy- in the improvement of pain and function^{3,4}. Although there is widespread evidence of it, the literature on effective treatment is sparse and heterogeneous practices are reported in clinical practice.² Recent systematic reviews highlight that there should be high-quality randomized trials in order to develop effective conservative management strategies.⁵



CAUSES:

1. The major cause of OSD is repetitive stress of the tibial tubercle caused by the pulling of the patellar tendon, particularly in growth spurts.^{1,7}
2. Excessive strain on the tibial tuberosity is exerted due to sports activities (running, jumping, squatting, or kicking) (e.g., basketball, volleyball, soccer), which also contributes to the onset of the disease.^{2,7}
3. It is the secondary tibial tubercle osseous center that is vulnerable to disintegration due to stresses because of rapid growth and physal vulnerability in adolescents.^{3,7}
4. Tightness and weakness of muscles, especially the quadriceps, hamstring, and gastrocnemius, changes the biomechanics and makes the insertion into the patellar tendon more straining.^{4,7}
5. Risk factors include anatomic and physiological risk factors like patellofemoral malalignment, increased body weight, and elevated BMI.^{5,7}
6. Repetitive high-load exercise and a lack of cross-training diversity in early sports specialization pose a risk of early maturation of motor skills because of the lack of balance in their development.⁷
7. Possible inflammatory reactions and micro-avulsion trauma to the chondro-osseous junction of the tibial tubercle can be causes of pain, swelling, and long-term bony alteration.^{4,7}

EPIDEMIOLOGY:

Osgood-Schlatter disease (OSD) is one of the most frequent sources of anterior knee pain in growing children and adolescents and particularly in sporting children.

1. OSD refers to a disease prevalence rate in the general population of 12-15 years of age of 10 percent.^{4,5}
2. It is more prevalent in actively sports adolescents (as high as 21% as opposed to non-athletes (4.5%).^{8,10}
3. It is more prevalent in boys as compared to girls and the median onset age is 13-14 years in boys and 11-12 years in girls.^{7,10}
4. Bilateral knee involvement occurs in about 20–30% of cases, while unilateral is more frequent.^{7,10}
5. Incidence peaks during the pubertal growth

spurt, when boys may grow at a velocity of ~9 cm/year, increasing tibial tubercle vulnerability.^{6,10}

6. Seasonal variation has been reported, with higher incidence in winter months, possibly linked to vitamin D deficiency and training in cold conditions.¹⁰
7. OSD symptoms typically last 6–18 months, though some cases persist longer.^{3,10}
8. Among young professional soccer players, prevalence was reported at 10% (ages 11–15 years) in Russian academies.¹⁰
9. Sports with repetitive jumping, sprinting, and kicking (soccer, basketball, volleyball, track and field) have the highest association.^{2,3,10}
10. OSD is a worldwide condition, but prevalence varies across populations due to differences in diagnostic methods and physical activity patterns.^{5,7,9}

Clinical Features

1. PAIN

- Activity-related anterior knee discomfort localized at the tibial tuberosity is the most noticeable and early sign.^{1,3}
- Activities like sprinting, leaping, descending stairs, crouching, and kneeling that put more strain on the quadriceps and patellar tendon exacerbate pain.^{2,3,7}
- Most commonly unilateral, but can also be bilateral in 20–30% of cases.^{7,10}
- Pain can also be nocturnal in nature.^{7,9}

2. SWELLING / INFLAMMATION:

- One important characteristic is swelling over the tibial tuberosity that is palpable or visible.^{4,5}
- The apophysis and surrounding soft tissues are inflamed, which results in this swelling.^{5,7}
- Chronic or long-term cases frequently show a bony protrusion at the tibial tubercle.^{5,7,9}

3. TENDERNESS ON PALPATION:

- Marked localized tenderness at the tibial tubercle is a key diagnostic sign.^{1,4,7}
- Tenderness increases with resisted knee extension or direct pressure on the tibial

tuberosity.^{3,6}

- It helps differentiate OSD from other knee disorders like patellofemoral pain syndrome, which usually involves diffuse peripatellar pain.²

4. FUNCTIONAL LIMITATIONS:

- Tenderness and pain make it difficult to undertake high-impact activities like jumping, sprinting, or quickly changing directions.^{1,3}
- To prevent knee loading, adolescents may start to limp or change the way they walk.^{2,8}
- Another example of a functional limitation is the inability to kneel when performing daily tasks like sitting cross-legged or tying shoes.^{5,7,9}

5. MUSCLE TIGHTNESS AND IMBALANCE:

- It is typical to have tight quadriceps and hamstrings, which puts more strain on the patellar tendon.^{6,7}
- Traction at the tibial tubercle may be made worse by muscular imbalances, such as weaker hamstrings relative to quadriceps.^{6,10}
- Knee range of motion can be decreased and healing time prolonged by limited flexibility.^{7,12}

6. POST-ACTIVITY PAIN AND STIFFNESS:

- Many adolescents experience increased pain and stiffness after sports participation or prolonged sitting with the knee in flexion (known as the "theater sign").^{3,7}
- This discomfort can last for hours or even into the following day, particularly if there has been high-intensity activity.^{8,10}

7. SEVERE OR CHRONIC CASES:

- If treatment is not received or if the athlete keeps up their high level of activity without making any changes.^{5,7}
- It's possible for the tibial tubercle to expand permanently and become noticeable.^{5,7,9}
- Even after skeletal maturity, pain may persist. Even when acute pain subsides, functional deficiencies like diminished quadriceps strength may persist.^{7,9,11}
- Rarely, the tibial tubercle may sustain tiny avulsion fractures, which need more intensive

care^{6,10}

II. NEED OF THE STUDY

OSD often causes persistent pain and activity limitation, making physiotherapy essential for restoring function in adolescents. Conventional approaches like rest and activity restriction alone are insufficient, highlighting the need to evaluate structured physiotherapy programs. Evidence shows that muscle strengthening, stretching, and load management through physiotherapy can significantly improve outcomes, but research is still limited. Physiotherapy plays a critical role in addressing muscle tightness and imbalances, which are major contributors to symptom persistence

III. AIM OF THE STUDY

1. Prevalence: Osgood-Schlatter disease affects 10–20% of physically active adolescents, most common between 10–15 years, and is a leading cause of anterior knee pain in youth athletes.
2. Growth Factor: It occurs mainly during rapid growth spurts, where repetitive traction of the quadriceps on the tibial tuberosity leads to apophyseal irritation.
3. Risk Factors: Repetitive jumping, sprinting, tight quadriceps/hamstrings, overtraining, and poor biomechanics (like patellar maltracking) increase susceptibility.
4. Physiotherapy Role: Management includes activity modification, flexibility training, and progressive strengthening of the quadriceps, hamstrings, and hip muscles to reduce stress on the knee.
5. Supportive Care: Myofascial release, load management education, and gradual return to sport enhance recovery and prevent recurrence

IV. METHODOLOGY

A literature search and review were performed using Google Scholar, PEDRO, PubMed Scholar and PubMed. The search was limited to articles published within past 5 years. The focus of search was to rule out ROLE OF PHYSIOTHERAPY IN OSGOOD SCHLATTER DISEASE IN PAEDIATRICS AND ADOLESCENTS AGE GROUP - A

MULTIMODAL LITERATURE REVIEW

1.1 SEARCH STRATEGIES

Keywords Used: Relevant keywords were obtained by searching by the Medical subject headings [MeSH]. Keywords of other relevant articles were also used. The following keywords were employed - Osgood-Schlatter disease, Physiotherapy, Pediatrics, Exercise Therapy, Activity Modification, Extracorporeal Shockwave Therapy, Isokinetic Training

Databases Searched: PubMed, Science direct, google scholar, PEDRO

1.2. SEARCH TECHNIQUES

The methods that will be applied to retrieval of articles to be used in this literature review include: - Boolean operators (OR) and (AND) were employed.

1.3. Keywords

Osgood-Schlatter disease, Exercise Therapy, Activity Modification, Extracorporeal Shockwave Therapy, Isokinetic Training

Inclusion Criteria

- Articles in the English language
- Children and adolescents (8–18 years)
- Osgood–Schlatter disease predominantly affects male adolescents more than females.
- Articles that include pain and functional ability and return to sport as an outcome measure
- Articles where physiotherapy, activity modification, knee strengthening, ESWT, myofascial decompression, isokinetic muscle strength was used as an intervention.
- Study types: Randomized controlled trials (RCTs), cohort studies, case-control studies, and systematic reviews published in peer-reviewed journals.
- Studies conducted on pediatric age group with OSD
- Studies published in the last 5 years only

Exclusion Criteria

- Article whose full text was not retrieved
- Patients with other knee pathologies (e.g., fractures, ligament injuries, inflammatory

joint diseases).

- Non-research articles such as editorials, commentaries, or opinion papers.
- Articles apart from experimental studies

V. MANAGEMENT

1. Manual Therapy

Soft Tissue Mobilization

Soft tissue mobilization techniques were applied to the quadriceps, hamstrings, gastrocnemius, soleus, and iliotibial band to reduce muscle tightness and decrease traction stress over the tibial tuberosity. ^{3,5,6,7,12}

Myofascial Release

Myofascial release and decompression techniques were utilized to improve fascial mobility, reduce localized tenderness, and enhance tissue extensibility. ^{3,5,6,7,12}

Stretching Techniques

Static and progressive stretching exercises targeting the quadriceps, hamstrings, gastrocnemius, soleus, and iliotibial band were administered to improve flexibility and reduce anterior knee stress. ^{3,5,6,7,12}

Joint Mobilization

Patellar mobilization and tibiofemoral joint mobilization techniques were performed when indicated to improve knee range of motion and joint mechanics. ^{1,3,5}

Strengthening Exercises

A progressive strengthening program was implemented, beginning with isometric quadriceps exercises during the painful phase, followed by closed kinetic chain exercises, eccentric quadriceps strengthening, hip abductor and external rotator strengthening, and core stabilization exercises. ^{2,3,9,11,13}

Functional Retraining

Functional retraining included balance exercises, movement correction strategies, and gradual return-to-sport drills to restore dynamic knee control and prevent recurrence. ^{2,3,9 11}

Patient Education and Load Management

Education regarding activity modification, load monitoring, and self-management strategies was provided to ensure long-term symptom control and adherence to rehabilitation. ^{2,5,7,9}

2. Electrotherapy

Transcutaneous Electrical Nerve Stimulation (TENS)
TENS was applied for pain modulation and short-term symptomatic relief. ^{1,3,4}

Therapeutic Ultrasound

Ultrasound therapy was used to promote tissue healing and reduce localized inflammation. ^{1,4,5}

Cryotherapy

Cryotherapy was administered during the acute phase to decrease inflammation and tenderness over the tibial tuberosity. ^{5,6,7,10}

Heat Therapy

Moist heat therapy was applied prior to exercise sessions to promote muscle relaxation and improve tissue extensibility. ^{3,5}

Myofascial Decompression (Cupping)

Cupping therapy was used to enhance soft tissue mobility and reduce pain in selected cases. ⁸

VI. DISCUSSION

• The review of 13 articles highlights that Osgood-Schlatter disease (OSD) remains one of the most prevalent overuse injuries among adolescents, especially those engaged in sports activities¹. Several studies confirm that rapid skeletal growth combined with repetitive quadriceps loading is the primary mechanism leading to tibial tuberosity traction apophysitis². Epidemiological findings report prevalence rates of up to 10%, with a higher incidence among males, though the gap is narrowing with increased female participation in sports³. Bilateral involvement occurs in nearly one-third of cases, causing greater functional limitations⁴.

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• Concerning management, there is agreement in the articles that conservative treatment is the first-line treatment option⁵. Rest, activity modification and physiotherapy that deals with strengthening, stretching and load management is highly recommended⁶. There is evidence that organized rehabilitation provides more positive results compared with passive strategies⁷. Other articles describe some encouraging outcomes achieved with adjunctive therapeutic methods such as cupping and myofascial decompression but the evidence is limited⁸. The literature, in general, highlights the importance of timely recognition, specifically, physiotherapy, and personalized approaches to rehabilitation in order to reduce the long-term disability to the minimum⁹.

• Recent literature also highlights the issue of determining risk factors of OSD that can be modified¹⁰. This tightness in the muscles especially around the quadriceps and hamstrings was continuously pointed out as a factor that adds strain in the tibial tuberosity¹¹. Some of the studies noted that decreased flexibility and strength imbalance between hamstring and quadriceps enhance the duration of symptoms and the recovery duration was delayed as well¹². Proper physiotherapy interventions that deal with such biomechanical problems are thus critical in proper rehabilitation¹³.

• Sports participation turned out to be a stable epidemiological determinant¹⁰. Sports that necessitated a lot of jumping, sprinting and shifts in direction like basketball, volleyball and soccer were disproportionately affected¹¹. This association implies that prevention measures, including prehabilitation screening, load-management education, and individualized conditioning-programs would be useful in preventing incidence and severity reduction⁹.

- Another critical discussion item is the continued symptoms after adolescence¹². Though OSD is conventionally regarded as a self-limiting condition, it has been demonstrated that 10 percent of cases still report pain and functional deficits at an adult age of life¹³. The chronic cases tend to be related to either neglect of treatment in their early years or inability to adjust the level of activity levels⁹. This discovery gives the Highlight of the necessity of early intervention based on physiotherapy to reduce the long-term effects to the minimum extent possible¹⁰.
- In a comparison of two methods of treating the problem, exercise-based physiotherapy has always delivered better results as opposed to passive methods such as ultra-sound or bracing¹¹. Combined stretching, strengthening, proprio-ceptive training and gradual return-to-sport protocols were the most effective programs identified as a result of research¹². The adjunctive therapies mentioned, such as the myofascial decompression and cup-ping therapy, have been reported to be associated with extra and short-term relief, yet remain poorly clinically validated⁸. Therefore, physiotherapy is the most supported way of management¹³.
- Moreover, certain researches indicated that biomechanical interventions that could help prevent and treat FFS include enhancing the dorsiflexion of the ankle, correcting the pronatism of the foot, and treating genu valgum or tibial rotation, which could have a preventive and curative effect¹⁰. This leads to the fact that a multidisciplinary approach is required; that is, physiotherapists, orthopedists, and sports trainers are cooperating in order to deliver holistic care¹¹.
- Lastly, research gaps were also identified in the reviewed articles¹². Randomized controlled trials that are of sufficient sample size to develop standardized physiotherapy protocols are lacking in number¹³. Also, the majority of the studies were based on the short-term outcomes, which left any doubts about long-term prognosis and recurrence following the return to sports⁹. These restrictions underscore the need to conduct more good-quality clinical trials that concentrate not only on managing the symptoms but also on the prevention and long-term functional recovery¹³.

VII. LIMITATIONS

1. Scarcity of high-quality trials:
 - Most studies on OSD are observational, retrospective, or case series, with only a few prospective or randomized controlled trials^{1,2,5}.
2. Small sample sizes:
 - Many studies are conducted with limited participants, reducing the statistical power and generalizability of findings.^{3,6}
3. Heterogeneity in diagnostic criteria:
 - Variation in clinical definitions, diagnostic imaging use, and inclusion criteria across studies makes comparison difficult.^{4,7,9}
4. Limited long-term follow-up:
 - Few studies track patients into adulthood, making it difficult to understand chronic sequelae, residual pain, or functional impairment.^{5,7,9,11}
5. Underreporting of bilateral and gender differences:
 - Many studies focus on unilateral cases or male athletes, with less data on bilateral cases or female populations.^{7,8,10}
6. Variability in treatment protocols:
 - Conservative management (activity modification, physiotherapy, shockwave therapy, bracing) lacks standardized protocols, leading to inconsistent outcomes.^{2,3,5,6}
7. Lack of sport- and region-specific data:
 - Most epidemiological studies focus on European or North American populations, with less representation from Asia, Africa, and South America.^{4,8,10}
8. Limited focus on prevention strategies:
 - The research focuses on treatment and offers minimal evidence of preventive measures, training load adjustment and early screening.^{6,7,12}
9. Challenges in adolescent compliance:
 - Research indicates the challenge of compliance with physiotherapy pro-grams, rest, or activity modification, which affects the effective-ness of treatment.^{1,3,13}

VIII. CONCLUSION

- Osgood-Schlatter disease (OSD) is a serious problem in terms of musculoskeletal difficulties

among adolescents especially those who participate in sports. The literature reviewed indicates its multifactorial etiology, which is rapid growth, overuse and biomechanical imbalances. Clinical features are familiar and the characteristic features of the condition are the pain and swelling at tibial tuberosity.

- Physiotherapy comes out as the foundation of management and good evidence has been provided to base exercise-based rehabilitation against passive management. Stretching, strengthening and activity modification are essential in the process of bringing relief to the symptoms and restoring functions. Although adjunctive therapies, including cupping and myofascial decompression, have potential, the additional high-quality research is needed to prove their effectiveness.
- In the future, the research must be directed to large-scale clinical trials, long-term out-comes and standardized physiotherapy protocols. To maximize recovery, avoid chronic disability, and provide safe adolescent athletes with a chance to resume their sports activities, it is necessary to establish evidence-based rehabilitation strategies.

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