ISSN: 2347-6567

International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

IJAMSCR |Vol.14 | Issue 2| Apr - Jun - 2026

www.ijamscr.com

DOI : https://doi.org/10.61096/ijamscr.v14.iss2.2026.736-742

A Literature Review on Various Physiotherapy Intervention in Osgood- Schlatter Disease

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Published on: 29.04.2026
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Abstract:

Background: Osgood–Schlatter disease is a common cause of anterior knee pain in adolescents, particularly during periods of rapid growth. Leading to inflammation, pain, and activity limitation. It is frequently observed in physically active individuals and is associated with repetitive stress at the patellar tendon insertion. The condition develops due to repeated strain on the tibial tuberosity during activities such as running and jumping.

Objective: This review aimed to assess the effectiveness of physiotherapy interventions in reducing pain, improving knee function, and preventing recurrence in individuals with Osgood–Schlatter disease.

Methods: Relevant studies published between 2015 and 2025 were identified using electronic databases such as PubMed and Google Scholar. Clinical trials, case reports, and review articles focusing on conservative physiotherapy management in adolescents with clinically diagnosed OSD were included.

Results: The reviewed studies demonstrated that exercise-based interventions, including strengthening, stretching, and activity modification, were effective in reducing pain and improving functional outcomes. Additional modalities such as cryotherapy, ultrasound, electrotherapy, and kinesiology taping were found to provide supportive benefits in pain relief and flexibility. Recent studies also highlight the importance of self-management strategies, including patient education and adherence to exercise programs. A total of eight studies met the inclusion criteria and were analyzed in this review.

Conclusion: Physiotherapy plays an important role in managing symptoms and improving knee function in adolescents with OSD.

A combined approach involving exercise therapy, activity modification, and patient education appears to provide the most effective outcomes and reduce the risk of recurrence.

Keywords: Osgood–Schlatter Disease, Physiotherapy, Strengthening, Activity Modification, Conservative Management, Adolescent.

INTRODUCTION

Osgood–Schlatter disease is commonly seen in physically active adolescents, especially those involved in repetitive sporting activities, and is considered a common growth-related knee condition. It is mainly associated with repeated stress on the knee joint during activities such as running and jumping.

The condition may result in pain, swelling, reduced participation in sports, and decreased quality of life**.** [1]It typically occurs between 8–13 years in girls and 10–15 years in boys, corresponding with periods of rapid growth [2] .Its manifestation coincides with the development of the secondary ossification centre of the anterior tibial tuberosity (apophyseal phase), which usually occurs at around age 9 in girls and 11 in boys.

However, symptoms usually first appear between ages 8 and 12 among the former, and between 12 and 15 among the latter [3].The condition develops due to repetitive stress on the knee during activities such as running,

jumping, and sports that involve frequent loading of the lower limb [4]Individuals typically present with localized pain, which may or may not be associated with swelling.

The symptoms may be unilateral or bilateral. In some cases, the pain may interfere with normal walking or physical activity [5]. Repetitive micro trauma of the tibial tuberosity or due to a tight quadriceps.

It is often linked to rapid bone growth combined with relative muscle tightness during adolescence, in particular the rectus femoris muscle, during the maturation stage. Repeated stress may lead to irritation of the tibial tuberosity and, in severe cases, minor traction injuries of the tibial tubercle apophysis. "This increased tension can irritate the tibial tuberosity and, in some cases, may even lead to small traction injuries [6]

A long-standing problem in sports is the unsystematic approach to physical training, which is necessary for the prevention of knee joint injuries, as it is known from studies and clinical practice that most sports techniques and loads cause or require a high level of exertion/loading of the leg/knee joint musculature [7].

OSD is secondary to repetitive stress activities with the extensor mechanism. However, this pathology is self-limited and resolves at the end stages of skeletal growth [8].Boys have it more often than girls, with a male-to-female ratio of 3:1 . The prevalence of OSD is 9.8%, and it can be bilateral in 20–30% of patients.

Multiple contributing factors, including increased sports participation, reduced muscle flexibility, and rapid growth phases, have been associated with its development have been linked to the development of this condition, although the exact cause is still not completely clear but its etiology and etiopathogenesis are not fully understood [9]OSD is slightly more common in boys than girls but likely equally common with similar sports participation [10]

Early sport specialization increases the risk of OSD by 4-fold, several factors such as rapid growth, reduced flexibility, muscle imbalance, and increased training load contribute to the development of OSD. Patellofemoral malalignment, Overload training volume, Hamstring tightness or relative weakness in ratio to the quadriceps [11]

Primary risk factors encompass stature, weight, body mass index (BMI), reduced flexibility in both lower limbs, heig Participation in repetitive-jumping sports and sports with heavy quadriceps activity (football, volleyball, basketball, hockey, soccer, skating, gymnastics) Ballet (2-fold risk compared with nonathletes) [12].

ht of the internal longitudinal arch of the supporting foot (with an elevated risk associated with a greater arch height), diminished ankle dorsiflexion of at least 10°, tibial rotations (indicated by an increase in the condyle-malleolar angle and external rotation of the tibia), concurrent genu valgum, and a pronated foot [13].

With regards to conservative and non-operative treatment options, "Most treatment approaches are based on clinical experience and available research, although strong evidence is still limited." and some empirical data on the potential benefits is available [14]

Management of OSD focuses on reducing pain and enabling a safe return to daily and sports activities on conservative physiotherapeutic interventions aimed at reducing pain, restoring function, and preventing recurrence [15]. Common treatment approaches include activity modification, therapeutic exercises, stretching, and pain management techniques. [16]

Activity modification, which involves temporary reduction or cessation of activities that exacerbate pain, allows for tissue recovery without compromising long-term athletic performance [17].

Strengthening of the quadriceps, hamstrings, and hip muscles helps reduce stress on the knee joint and improves function have demonstrated significant improvement in pain reduction and functional outcomes among adolescent athletes [18]. A prospective study by Rathleff et al. (2020) reported significant improvement following a structured strengthening and return-to-sport program (2020) involving 51 adolescents reported that a 12 week program combining knee and hip strengthening exercises with a graded return-to-sport ladder led to 80% of participants reporting improvement within three months and 90% after one year [19].

In addition to strengthening, stretching exercises for the quadriceps, hamstrings, and gastrocnemius are frequently employed to reduce tensile stress on the tibial tuberosity and improve flexibility. Modalities such as cryotherapy, ultrasound, and kinesiology taping may provide short-term pain relief. to provide short-term pain relief and enhance patient adherence to exercise programs [20] .

Patellar tendon straps or braces may also be used to reduce traction forces during physical activity [21]. Neuromuscular re-education techniques and proprioceptive training are often incorporated in later rehabilitation phases to ensure safe return to sport [22].

In patients with persistent, activity-limiting Osgood–Schlatter disease who fail an adequate course of conservative care, several advanced non-operative and operative options have emerged in the literature [23].

Emerging treatments such as extracorporeal shock wave therapy have shown promising short-term results, although further research is required both radial and focused modes — has been investigated as a non-invasive option for recalcitrant apophyseal injuries; recent cohort studies and a focused systematic review report clinically meaningful short-term reductions in pain and faster return to sport after 1–2 ESWT sessions provided relative activity modification is maintained [24].

These studies conclude ESWT is promising and appears safe in adolescents, but the trials are small and heterogeneous, so larger controlled studies are needed to confirm optimal dosing and long-term benefit [25].

METHODOLOGY

Study design

This review was conducted by systematically identifying and analysing relevant studies based on predefined inclusion criteria.

Inclusion Criteria and Exclusion Criteria

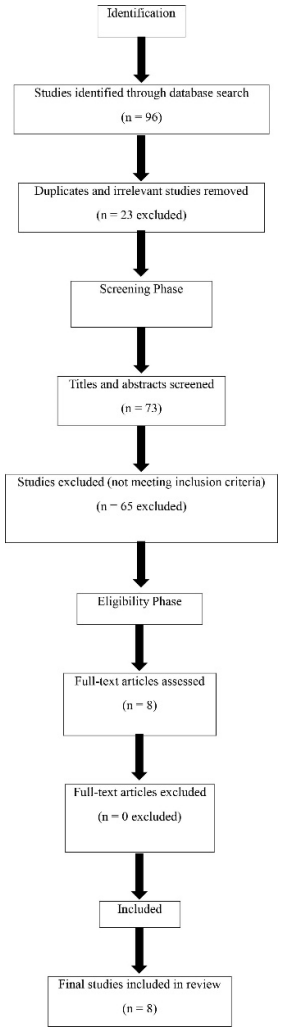
Studies focusing on physiotherapy and conservative management of Osgood–Schlatter disease, including clinical trials, case studies, and review articles, were included in this review in individuals diagnosed with Osgood–Schlatter disease. Studies published between 2015 and 2025 were identified using electronic databases such as PubMed and Google Scholar.

Only articles published in English and involving adolescents aged 10–18 years with clinically diagnosed OSD were included with clinically confirmed OSD, and those Studies focusing on interventions such as exercise therapy, stretching, strengthening, kinesiology taping, electrotherapy, and self-management programs were included. Only studies with full-text availability and measurable outcomes such as pain reduction, functional improvement, or return to activity were included. Studies focusing on surgical management, non-English publications, or those without full-text access were excluded.

Studies involving adult populations, unrelated knee conditions, or non-physiotherapy interventions were excluded... Conference abstracts, editorials, and studies lacking relevant outcome data were also excluded.

Selection of studies

A total of 94 studies were initially identified through database searching. After removing duplicates and screening titles and abstracts, 42 articles were selected for full-text review, these studies were further screened based on the predefined inclusion and exclusion criteria.



RESULTS

The reviewed studies consistently demonstrated that physiotherapy interventions are effective in managing symptoms of Osgood–Schlatter disease. Most studies reported a reduction in pain levels and improvement in functional performance following structured rehabilitation programs.

Exercise-based interventions, particularly strengthening and stretching exercises, were identified as the primary components of conservative management. Activity modification and gradual load progression were also found to play a crucial role in symptom reduction and safe return to sports activities.

Studies such as Rathleff et al. (2019) showed that combining strengthening exercises with load management resulted in significant improvement in pain and functional outcomes. Similarly, Neuhaus et al. (2021) reported that structured physiotherapy programs were more effective than rest alone in improving long-term outcomes.

The use of adjunctive modalities, including kinesiology taping, ultrasound, and transcutaneous electrical nerve stimulation (TENS), was associated with additional benefits such as reduction in pain and swelling, and improvement in flexibility.

Recent evidence also emphasizes the importance of self-management strategies. Programs that included patient education and home-based exercises showed better adherence and long-term improvement.

Although variations in treatment protocols were observed across studies, the overall findings support the effectiveness of a multimodal physiotherapy approach in reducing symptoms and improving functional ability in adolescents with OSD.

The reviewed studies consistently reported reductions in pain and improvements in functional performance following physiotherapy interventions .Physiotherapy interventions were found to effectively reduce pain, improve knee function, and Physiotherapy interventions were found to reduce pain, improve knee function, and enhance quality of life in adolescents with OSD in adolescents with Osgood–Schlatter Disease., improving knee function, and enhancing quality of life among adolescents diagnosed with Osgood–Schlatter Disease (OSD).

The findings across the reviewed studies demonstrated significant improvements in pain levels and functional performance following rehabilitation aproaches. Exercise therapy, activity modification, and progressive strengthening were consistently identified as the core components of conservative management.

According to Rathleff et al. (2019), a combination of knee strengthening and load management education demonstrated notable reductions in pain and enabled an earlier return to sports activities .Similarly, Neuhaus et al. (2021) highlighted that structured physiotherapy programs including stretching and strengthening resulted in superior long-term functional outcomes when compared to rest alone. In studies by Gaweł et al. (2021) and Kuchmacz et al. (2024), the addition of kinesiology taping and therapeutic modalities such as ultrasound and TENS were associated with reductions in pain intensity and swelling, along with improvements in knee flexibility and functional performance.

Furthermore, Krommes et al. (2024) suggested that self-management approaches, combining exercise and education, promote adherence and independence among adolescent patients. Most studies primarily focused on exercise-based interventions and activity modification, although variations in exercise intensity and duration were observed across studies, the findings consistently indicate that conservative management strategies are effective and safe for adolescents with OSD.

No single standardized protocol was identified, but evidence supports a multimodal approach including strengthening, stretching, load regulation, and patient education. Overall, the evidence indicates that these conservative approaches contribute to symptom relief, functional improvement, and reduced risk of recurrence in Osgood–Schlatter Disease.

Author & Year	Title	Aim of Study	Participants	Intervention	Outcome Measures (OM)	Results / Findings
Krommes K., Holden S., Rathleff M.S. (2024)	Self Management Including Exercise, Education and Activity Modification for Adolescents with OSD	To test the feasibility and outcomes of self managed physiotherapy for OSD	40 adolescents with clinically diagnosed OSD	Self guided exercise protocol, educational booklet, load management	Pain rating (VAS), self efficacy, adherence rate.	Significant improvement in pain and function; high adherence to self management reported.
Kuchmacz K., Węgrzynow	Effect of Kinesiology Taping on	To assess the impact of kinesiology	30 adolescents	Kinesiology taping (2–3 sessions/w	Pain score (VAS), knee girth	Taping significantly reduced pain

ska Teodorczyk K., Wolski P. (2024)	Reducing Pain and Swelling in OSD	taping on pain and swelling in OSD.	diagnosed with OSD..	eek for 4 weeks)	measuremen t.	and swelling; functional mobility improved
Waghe V.R., Bhure S.A. (2024)	Role of Physiothera py in the Managemen t of OSD – A Case Report	To demonstrate the effectiveness of physiotherap y techniques in OSD	1 male adolescent (15 yrs).	Isometric quadriceps exercises, ultrasound, TENS, stretching.	Pain (VAS), ROM, functional ability.	Notable pain reduction and full return to sports after 4 weeks of therapy.
Corbi F., Massoni F., Migliorini F. (2022)	Osgood Schlatter Disease: Appearance, Diagnosis and Managemen t	To provide an updated overview of diagnosis and management approaches	Review article of clinical studies on OSD	Strengthenin g, proprioceptiv e training, physiotherap y-led rehabilitation .	Pain score, functional outcomes	Conservative physiotherap y management shown to improve symptoms and prevent recurrence.
Neuhaus C., Appenzeller-Herzog C., Faude O. (2021)	A Systematic Review on Conservativ e Treatment Options for Osgood Schlatter Disease	To evaluate the effectiveness of non surgical, physiotherap y-based interventions in managing OSD symptoms.	12 studies reviewed, ages 10 18 years	Exercise therapy, stretching, activity modification, strengthening	Pain intensity (VAS), functional activity, return to sport	Physiotherap y-based interventions significantly reduced pain and improved knee function; exercise therapy was most effective
Gaweł E., Zwierzchows ka A., Wójcik M. (2021)	Role of Physiothera py in Osgood Schlatter's Disease in Adolescent Patients	To review physiotherap y modalities used in OSD and their clinical effectiveness.	Review of adolescent OSD cases (ages 11 17).	Stretching, eccentric strengthening , ultrasound, kinesiotaping	Pain level (VAS), muscle flexibility, quadriceps strength.	Combined physiotherap y approaches improved flexibility and reduced pain intensity effectively
Rathleff M.S., Roos E.M., Rasmussen S. (2019)	Activity Modificatio n and Knee Strengthenin g for Adolescents with OSD: A 12-Month Prospective Study	To determine whether activity modification combined with strengthening reduces knee pain in OSD.	51 adolescents (average age 13.7 yrs.).	Progressive knee strengthening , load management education, home program.	Knee pain (NPRS), function (KOOS), return to sport rate	80% of participant s reported reduced pain and resumed sport activity by 12 months.
Circi E., Atalay Y., Beyzadeoglu T. (2017)	Treatment of Osgood Schlatter Disease: Review of the Literature	To summarize current treatment options and highlight effective	Literature-based review, ages 10 18 years	Conservative management, stretching, rest, gradual loading.	Pain (VAS), return-to play time.	Physiotherap y and load modification are superior to rest alone for faster recovery

		physiotherapy measures.				

DISCUSSION

Osgood–Schlatter disease is a common condition among adolescents, primarily caused by repetitive stress on the tibial tuberosity during periods of rapid growth. This review highlights the important role of physiotherapy in managing symptoms and improving functional outcomes.

The findings indicate that exercise therapy forms the foundation of conservative management. Strengthening exercises targeting the quadriceps, hamstrings, and hip muscles help reduce stress on the knee joint, while stretching improves flexibility and decreases tension at the patellar tendon insertion. These interventions collectively contribute to pain reduction and improved mobility.

Activity modification is another key component in the management of OSD. Temporary reduction in high-impact activities allows adequate recovery and prevents worsening of symptoms. Gradual return to sports, guided by pain levels and functional ability, appears to be effective in preventing recurrence.

Adjunctive therapies such as ultrasound, TENS, and kinesiology taping may provide short-term pain relief and support rehabilitation. Although these modalities are not primary treatments, they can enhance patient comfort and improve adherence to exercise programs.

Recent studies have also emphasized the role of patient education and self-management. Educating adolescents about load management and exercise adherence helps in long-term recovery and reduces dependency on clinical supervision.

Despite positive findings, there is variability in treatment protocols and outcome measures across studies. This makes it difficult to establish a standardized approach. However, the overall evidence supports the use of a combined physiotherapy approach rather than relying on a single intervention.

Further research with larger sample sizes and standardized protocols is required to establish clear clinical guidelines for the management of OSD.

LIMITATION

This review has several limitations. First, the number of high-quality studies available on physiotherapy interventions for Osgood–Schlatter disease is limited, which may affect the strength of the conclusions.

Second, there was variability in study design, sample size, intervention duration, and outcome measures among the included studies, making direct comparison difficult.

Third, most studies focused on short-term outcomes such as pain reduction, with limited evidence on long-term effectiveness and recurrence prevention.

Finally, the lack of standardized physiotherapy protocols across studies limits the ability to recommend a uniform treatment approach.

RECOMMENDATIONS

Future research should focus on developing standardized physiotherapy protocols for the management of Osgood–Schlatter disease.

Well-designed randomized controlled trials with larger sample sizes are needed to evaluate long-term outcomes of different interventions.

Rehabilitation programs should include patient education and self-management strategies to improve adherence and recovery.

A multidisciplinary approach involving physiotherapists, physicians, and coaches may help in effective management and prevention of recurrence.

CONCLUSION

Physiotherapy plays a key role in the management of Osgood–Schlatter disease by reducing pain and improving functional ability. Exercise-based interventions, particularly strengthening and stretching, along with activity modification, are effective in restoring knee function.

Supportive modalities such as cryotherapy, ultrasound, and taping may provide additional pain relief. A combined approach that includes exercise therapy, load management, and patient education appears to be the most effective in achieving recovery and preventing recurrence.

Although current evidence supports the effectiveness of physiotherapy, further research is required to establish standardized treatment guidelines and optimize rehabilitation strategies.

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