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Case Study on Low Back Pain in A Fast Bowler Treated with Core Strengthening

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Abstract

Background: Low back pain is one of the most important musculoskeletal problems affecting cricket fast bowlers because the bowling action repeatedly exposes the lumbar spine and lumbopelvic region to high impact loading, side flexion, rotation, extension stress and rapid transfer of force from the lower limbs to the trunk and bowling arm. In fast bowling, the trunk does not function only as a passive link; it provides stability, energy transfer, postural control and deceleration during the delivery stride. When core muscle endurance, pelvic control and trunk coordination are reduced, the fast bowler may develop repeated lumbar strain, painful guarding, altered run-up rhythm, reduced front-foot control, shortened follow-through and loss of confidence during bowling. Core strengthening is therefore a clinically relevant rehabilitation approach because it targets deep and superficial trunk stabilizers, improves lumbopelvic control, supports safe movement during sport-specific tasks and helps the player return gradually to bowling activities.

Presentation of a Case: This case study presents a 22-year-old right-arm fast bowler with mechanical low back pain of gradual onset. The pain was aggravated during run-up, back-foot contact, front-foot landing, delivery stride, follow-through, prolonged practice sessions, forward bending after training and repeated bowling spells. The patient showed lumbar paraspinal tenderness, hamstring tightness, reduced lumbar mobility, poor abdominal bracing, weak gluteal control, reduced plank endurance and apprehension while extending and rotating the trunk during bowling simulation.

Intervention: A structured phase-wise physiotherapy program was implemented for 12 weeks. The program included pain relief measures, mobility correction, activation of transverse abdominis and multifidus, gluteal strengthening, progressive core endurance training, anti-rotation drills, postural correction, balance training, hip mobility work, graded bowling-specific drills, workload education and return-to-bowling progression.

Outcome Measure: Pain was measured using the Numerical Pain Rating Scale. Lumbar range of motion was measured by clinical movement assessment and inclinometer-based observation. Muscle strength and core endurance were assessed through Manual Muscle Testing, prone plank, side plank, bridge endurance and functional lumbopelvic control tests. Disability was assessed using the Modified Oswestry Disability Index, and sports function was evaluated by bowling tolerance, run-up comfort, follow-through control and return to practice participation.

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Result: The patient showed progressive improvement after introduction of a structured core strengthening program. Improvement was observed in pain intensity, lumbar movement tolerance, abdominal activation, gluteal strength, trunk endurance, bowling confidence, running mechanics and functional return to cricket practice. The patient progressed from painful bowling avoidance to controlled bowling drills and later to short bowling spells without major symptom aggravation.

Conclusion: This case study supports the clinical value of patient-specific core strengthening in the rehabilitation of mechanical low back pain in a fast bowler. When combined with education, mobility correction, graded strengthening and sport-specific retraining, core strengthening may improve lumbar stability, reduce pain, restore confidence and support safe return to bowling.

Keywords: Low back pain, fast bowler, cricket, core strengthening, lumbar stability, physiotherapy, lumbopelvic control, sports rehabilitation, return to bowling, core endurance

Background

Low back pain is a frequent and functionally limiting complaint among cricket fast bowlers. The fast bowling action is a complex whole-body skill that requires a coordinated run-up, jump, back-foot contact, front-foot contact, trunk rotation, trunk side flexion, shoulder counter-rotation, ball release and follow-through. During this sequence, the lumbar spine is exposed to repeated mechanical load while the bowler is moving at high speed and producing force through the lower limb, pelvis, trunk and upper limb. Even when the pain is not associated with major structural pathology, the condition can restrict bowling volume, reduce performance, disturb training rhythm and create fear of recurrence. For a fast bowler, low back pain is not merely a general spinal complaint; it is directly related to the ability to accelerate, brace, rotate, decelerate and complete the delivery action safely.

The core region includes the lumbar spine, pelvis, abdominal wall, diaphragm, pelvic floor, hip musculature, spinal extensors, multifidus, transverse abdominis, obliques and gluteal muscle groups. These structures function together to maintain segmental stability and transmit force during dynamic sporting activity. In fast bowling, the core must stabilize the trunk against large rotational and extension forces while allowing controlled mobility. If the core muscles fail to maintain adequate stiffness, endurance and timing, excessive stress may be transferred to passive spinal structures, paraspinal muscles and facet or pars regions. A fast bowler with poor lumbopelvic control may present with repeated lumbar extension, uncontrolled pelvic drop, excessive trunk lean, poor hip dissociation and protective muscle spasm.

Core strengthening is a broad term, but in sports physiotherapy it should not be limited to abdominal strengthening alone. A useful core program begins with pain-free activation of deep stabilizing muscles, progresses to endurance and anti-movement control, and finally integrates trunk stability with running, jumping, landing, rotational control and sport-specific bowling tasks. The key objective is not to make the spine rigid, but to help the athlete maintain control during high-speed movement. Therefore, a well-planned core strengthening program for a fast bowler includes abdominal bracing,

dead bug variations, bridge progressions, bird-dog exercises, side plank training, prone plank, hip abductor and extensor strengthening, anti-rotation drills, dynamic balance work and later bowling-specific trunk control drills.

Mechanical low back pain in a fast bowler may arise from repeated microtrauma, muscular fatigue, inadequate recovery, sudden increase in workload, poor hip mobility, hamstring tightness, reduced thoracic rotation, decreased gluteal strength and inefficient bowling mechanics. The athlete often complains of pain after long spells, pain during the delivery stride, discomfort during follow-through and stiffness after practice. In some cases, pain may settle with rest but recur when bowling intensity increases. This pattern creates a cycle of pain, avoidance, deconditioning and reduced confidence. Core strengthening helps interrupt this cycle by improving the bowler's capacity to tolerate load and maintain technique during repeated deliveries.

The clinical importance of physiotherapy management lies in identifying the specific impairments that contribute to pain. A fast bowler may have normal general strength but poor endurance in side plank, poor abdominal control during limb movement, weak hip abductors, poor rotational control or reduced ability to stabilize during single-leg stance. These deficits may not be visible during a simple standing examination but become evident during bowling-related tasks. Rehabilitation must therefore combine impairment-level correction and functional retraining. Pain reduction alone is insufficient if the athlete returns to bowling with the same lumbopelvic control deficits and the same workload errors.

This case study examines the effect of core strengthening on pain, lumbar mobility, core endurance, functional confidence and return to bowling in a fast bowler with mechanical low back pain. The emphasis is placed on meaningful clinical indicators such as pain during activity, trunk control, muscle performance, bowling tolerance, movement confidence and return to cricket practice. The case highlights how a structured physiotherapy program can progress from basic pain control to advanced sport-specific conditioning while maintaining patient safety and clinical reasoning throughout the rehabilitation process.

Epidemiology: Low back pain is commonly reported in cricket players, and fast bowlers are considered at higher risk because their role involves repeated high-speed delivery actions, impact forces, lumbar extension, rotation and workload accumulation. Lumbar spine injuries in fast bowlers are recognized as important causes of missed training time and reduced sports participation.

Prevalence: Lumbar discomfort, paraspinal tightness, stress-related symptoms, hamstring tightness, reduced trunk endurance and pain during bowling are frequently observed in fast bowlers, especially when workload increases rapidly or when the bowler continues training despite early symptoms.

Scope of the study: The purpose of this study is to evaluate the influence of core strengthening on pain, lumbar range of motion, muscle strength, core endurance, bowling tolerance and overall functional recovery in a fast bowler with low back pain.

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Clinical presentation

Patient data

The patient was a 22-year-old male right-arm fast bowler who played competitive club-level cricket and regularly participated in practice sessions, match simulations and local tournaments. He had been bowling for approximately six years and usually delivered medium-fast to fast spells during training and match play. His main complaint was low back pain located over the right lower lumbar and lumbosacral region. The pain had developed gradually over six weeks and became more noticeable after repeated bowling practice. Initially, the pain was mild and appeared only after long training sessions, but it later began during the run-up and delivery stride, especially when he attempted to bowl at higher intensity.

The patient described the pain as a dull ache with occasional sharp discomfort during trunk extension and rotation at the time of delivery. Pain increased during back-foot contact, front-foot landing, follow-through and repeated bending after practice. It was also aggravated by prolonged sitting after training, sudden twisting and attempting to bowl with full run-up. Rest, hot fomentation and short periods of avoiding bowling provided temporary relief, but symptoms returned when bowling workload increased. There was no history of direct trauma, fall, fever, unexplained weight loss, bowel or bladder disturbance, night pain, neurological weakness or radiating pain below the knee.

The patient had continued to attend team practice because of upcoming match commitments. He reduced his bowling speed and avoided longer spells, but this led to frustration and reduced confidence. He also reported that he was modifying his bowling action to avoid pain. On observation, his run-up appeared cautious, his delivery stride showed protective guarding, and his follow-through was shortened. He was apprehensive when asked to demonstrate lumbar extension combined with rotation. The player was especially concerned about whether he could return to competitive bowling without recurrence of pain.

Previous management included rest for a few days, occasional analgesic medication prescribed by a physician, general stretching and self-directed abdominal exercises. However, the patient did not follow a structured rehabilitation program and had not received sport-specific guidance regarding workload progression. On physiotherapy assessment, the main clinical impression was mechanical low back pain associated with reduced core endurance, poor lumbopelvic control, hamstring tightness, reduced hip extensor strength and pain during bowling-specific movement. There were no neurological deficits and no red-flag findings. The patient was enrolled in a structured 12-week core strengthening and bowling-specific rehabilitation program.

The rehabilitation objective was to reduce pain, restore safe lumbar and hip mobility, improve trunk muscle activation, develop core endurance, improve pelvic control during single-leg loading, correct compensatory movement patterns and gradually reintroduce bowling activities. The patient was educated that early return to high-intensity bowling without adequate core control could provoke recurrence, whereas graded rehabilitation could improve load tolerance and confidence. Functional

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recovery was observed throughout the progression from painful guarded movement to controlled bowling simulation and then to short bowling spells.

Clinical Examination and Findings

General observation:

- The patient was conscious, oriented, cooperative and motivated to return to cricket training.
- Posture showed mild anterior pelvic tilt with increased lumbar lordosis in standing.
- The athlete demonstrated protective trunk stiffness while bending and rotating.
- Gait was normal during walking, but running assessment showed reduced trunk relaxation and shortened stride during acceleration.
- The patient was hesitant during bowling simulation and avoided full trunk extension and follow-through.
- No neurological deficit was observed during screening of lower-limb myotomes, dermatomes and reflexes.
- Vital signs were stable, and the patient tolerated clinical evaluation without systemic symptoms.

Local Examination (Lumbar Spine and Lumbopelvic Region)

- Skin: No swelling, discoloration or visible deformity over the lumbar region.
- Tenderness: Present over right lumbar paraspinals, quadratus lumborum region and lumbosacral junction.
- Muscle tone: Increased protective tone of lumbar paraspinals and quadratus lumborum, more on the right side.
- Lumbar mobility: Painful extension and right rotation, reduced forward flexion due to hamstring tightness and guarding.
- Core activation: Poor ability to maintain abdominal bracing during limb movement and bridge progression.
- Hip control: Weakness of gluteus medius and gluteus maximus with mild pelvic drop during single-leg stance.
- Hamstring length: Reduced bilaterally, more on the bowling front-leg side.
- Functional status: Pain during bowling simulation, reduced plank endurance and inability to complete full-intensity bowling spell.

Table 1: Range of Motion (ROM) - Lumbar Spine

Movement	Normal ROM	Pre-Rehabilitation
Flexion	40-60 degrees	Fingertips to mid-shin; painful terminal range
Extension	20-35 degrees	Restricted and painful at end range
Right Side Flexion	15-20 degrees	Mildly restricted with right-sided discomfort

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Left Side Flexion	15-20 degrees	Mild restriction without sharp pain
Right Rotation	3-18 degrees	Painful during bowling simulation
Left Rotation	3-18 degrees	Slightly restricted
Functional Arc	-	Restricted during extension-rotation and follow-through

Table 2: Muscle Tone Assessment - Lumbar and Hip Region

Muscle Group	Muscle Tone Grade	Description
Lumbar Paraspinals	1	Mild protective spasm on right side
Quadratus Lumborum	1	Increased tone and tenderness on right side
Hamstrings	1	Protective tightness bilaterally
Hip Flexors	0-1	Mild adaptive tightness
Gluteal Muscles	0	Normal tone but reduced activation

Table 3: Muscle Strength and Core Endurance Assessment

Muscle Group / Test	Pre-Rehabilitation
Abdominal Bracing Control	Poor; unable to maintain with limb movement
Prone Plank Endurance	22 seconds with lumbar sagging
Right Side Plank Endurance	14 seconds with pain
Left Side Plank Endurance	18 seconds
Gluteus Medius	Grade 3+/5
Gluteus Maximus	Grade 3+/5
Back Extensor Endurance	Reduced with early fatigue
Functional Bowling Control	Poor during delivery stride and follow-through

Table 4: Pain Assessment - NPRS Scale

Activity	Pre-Rehabilitation
At Rest	2/10
Forward Bending	5/10
Lumbar Extension and Rotation	7/10
Running and Bowling Simulation	8/10
Full Bowling Spell	Unable due to pain and apprehension

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Uniqueness of the Study

This case study is unique because it focuses on the practical role of core strengthening in a fast bowler with low back pain rather than discussing low back pain only as a general spinal complaint. Many rehabilitation plans for low back pain remain limited to pain relief, stretching and general strengthening. In contrast, this case emphasizes the specific relationship between lumbar pain, lumbopelvic control, trunk endurance, hip stability and bowling mechanics. The fast bowler requires the ability to tolerate repeated loading during run-up, landing, delivery and follow-through. Therefore, improvement in pain alone is not sufficient unless the athlete also develops the capacity to control the trunk during sport-specific tasks.

Another important feature of this case is the progression from isolated core activation to functional and bowling-specific rehabilitation. The program began with safe activation of deep trunk stabilizers and progressed toward anti-rotation control, plank endurance, single-leg stability, hip strengthening, dynamic balance and graded bowling drills. This sequence reflects the real functional demand of fast bowling, where the core must work with the lower limb and shoulder girdle rather than in isolation. The case also highlights the importance of workload education, because sudden return to long spells can reproduce symptoms even after pain has improved.

The study provides clinically useful insight for physiotherapists managing cricket players. It demonstrates how common clinical outcome measures such as NPRS, lumbar range of motion, Manual Muscle Testing, plank endurance and Modified Oswestry Disability Index can be combined with sports-specific indicators such as bowling tolerance, run-up comfort, delivery confidence and follow-through control. The case therefore bridges the gap between clinic-based recovery and actual return to cricket participation.

Investigations and Findings - Lumbar Spine

Investigations and Findings

Table 5: Investigation Findings

Investigation	Time	Findings
X-ray Lumbar Spine AP and Lateral View	Initial assessment	No acute fracture or gross bony abnormality; mild postural lordotic tendency
MRI Lumbar Spine	As advised by physician	No disc prolapse requiring surgical management; mild soft tissue strain pattern and no neurological compression
Neurological Screening	Pre-rehabilitation	Myotomes, dermatomes and reflexes within normal limits
Straight Leg Raise Test	Pre-rehabilitation	No radicular reproduction; hamstring tightness noted
Modified Oswestry Disability	Pre-rehabilitation	Moderate disability related to training,

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Index		sitting after practice and lifting
Functional Bowling Reassessment	Week 4 onward	Improved trunk control during reduced run-up and controlled delivery drills
Return-to-Bowling Reassessment	Week 8-12	Able to tolerate graded bowling spells with improved confidence and reduced pain

Physiotherapy management

The physiotherapy program was designed to reduce pain, restore lumbar and hip mobility, improve core activation, develop trunk endurance, strengthen gluteal muscles, improve lumbopelvic control and support a safe return to bowling. The treatment plan was divided into progressive phases so that the patient could move from pain control to sport-specific performance without sudden overload. Each phase was modified according to pain response, quality of movement and ability to maintain spinal control.

Patient education was emphasized throughout rehabilitation. The player was instructed to avoid sudden full-intensity bowling in the early phase, monitor pain response after exercise, maintain hydration and recovery, avoid prolonged sitting after practice without mobility breaks and follow a gradual bowling workload schedule. The rehabilitation program was not restricted to mat exercises; it included functional tasks that reflected the demands of running, single-leg landing, trunk rotation and follow-through control.

Phase I: Protection and pain relief Phase (Week 0-2)

Aims

- Reduce lumbar pain and protective muscle spasm
- Improve safe mobility without aggravating symptoms
- Initiate deep core activation and breathing control
- Reduce hamstring and hip flexor tightness
- Educate the athlete regarding activity modification and workload control

Interventions

- Cryotherapy or heat as tolerated for pain modulation
- Diaphragmatic breathing with gentle abdominal engagement
- Transverse abdominis activation in crook lying
- Multifidus activation with low-intensity spinal setting
- Pelvic tilts and neutral spine awareness training
- Gentle lumbar mobility within pain-free range
- Hamstring, hip flexor and piriformis stretching within tolerance
- Isometric gluteal setting and bridge initiation
- Education regarding avoidance of painful bowling and sudden twisting

- Short walking sessions to maintain general conditioning

Phase II: Mobility and controlled core-activation Phase (Week 2-4)

Aims

- Improve lumbar and hip mobility
- Enhance abdominal bracing and segmental control
- Improve gluteal activation and pelvic stability
- Reduce pain during functional bending and running drills
- Begin controlled bowling simulation without ball release intensity

Interventions

- Dead bug level 1 with controlled breathing and neutral spine
- Supine marching with abdominal brace
- Bridge progression with pelvic control
- Bird-dog arm and leg movements in quadruped
- Side-lying hip abduction and clamshell strengthening
- Modified side plank holds within tolerance
- Thoracic mobility drills to reduce compensatory lumbar rotation
- Single-leg stance with pelvic control feedback
- Low-intensity run-up patterning without delivery effort
- Education to avoid unnecessary fear of movement while respecting pain limits

Phase III: Strengthening and functional bowling control Phase (Week 4-8)

Aims

- Increase core endurance and anti-rotation control
- Improve hip abductor, hip extensor and back extensor strength
- Develop dynamic balance during single-leg loading
- Restore running rhythm and controlled delivery mechanics
- Prepare the athlete for graded bowling spells

Interventions

- Progressive prone plank and side plank endurance training
- Bird-dog progression with longer holds and resistance band loading
- Pallof press and anti-rotation cable or band drills
- Bridge progression to single-leg bridge
- Hip hinge training and controlled Romanian deadlift pattern without heavy load
- Step-up, lateral step-down and single-leg balance activities
- Medicine-ball chest pass with controlled trunk position
- Bowling action drills at reduced speed with emphasis on follow-through control

- Short run-up bowling at low intensity under symptom monitoring
- Walking and jogging progression to rebuild conditioning

Phase IV: Advanced functional training Phase (Week 8-12)

Aims

- Restore near-normal bowling confidence and trunk control
- Improve tolerance to repeated deliveries
- Integrate core strengthening with speed, balance and sport-specific drills
- Support return to cricket practice with controlled workload progression
- Reduce risk of recurrence through long-term conditioning and education

Interventions

- Advanced plank variations with limb movement
- Side plank with hip abduction and controlled trunk alignment
- Anti-rotation walkouts and resisted trunk control drills
- Dynamic lunges, split squat control and landing mechanics
- Rotational control exercises using medicine ball at submaximal intensity
- Run-up drills with progressive speed and controlled front-foot contact
- Graded bowling spell progression from short spells to longer practice sets
- Recovery planning, warm-up routine and post-practice mobility program
- Education regarding bowling workload diary and early symptom reporting
- Home exercise advancement for maintenance of core endurance and hip strength

Goals

Short-Term Goals

1. To reduce low back pain during daily activities and early training movements.
2. To decrease protective spasm of lumbar paraspinals and quadratus lumborum.
3. To improve lumbar mobility and reduce painful extension-rotation.
4. To activate transverse abdominis and multifidus without breath holding.
5. To improve hamstring and hip flexor flexibility within functional range.
6. To improve gluteal activation and pelvic control during bridge and single-leg stance.
7. To educate the patient regarding workload control, warm-up and symptom monitoring.

Long-Term Goals

8. To restore core endurance required for repeated fast bowling deliveries.
9. To improve lumbopelvic control during run-up, delivery stride and follow-through.
10. To normalize functional lumbar and hip mobility required for bowling mechanics.
11. To restore confidence during trunk rotation, extension and sport-specific movements.
12. To progress the bowler from controlled drills to graded bowling spells.

13. To reduce risk of recurrence through long-term core and hip strengthening.
14. To return the athlete to cricket practice with improved performance tolerance.
15. To promote independent self-management through a structured home program.

Results

Following structured physiotherapy, the patient showed measurable improvement in pain, lumbar mobility, core activation, core endurance, hip strength, lumbopelvic control and bowling tolerance. The most noticeable improvements occurred after the patient progressed from basic activation to functional anti-rotation strengthening and bowling-specific control drills. Pain during lumbar extension and rotation reduced, and the athlete was able to perform short bowling spells without significant symptom aggravation.

The patient also demonstrated improved confidence. In the initial sessions, he avoided trunk extension and resisted full follow-through due to fear of pain. By the later phase of rehabilitation, he was able to complete graded run-up drills, controlled delivery practice and short bowling spells with improved control. The outcome was not limited to lower pain scores; the patient also developed better trunk endurance, hip control and awareness of workload management.

Table 6: Range of Motion (ROM) - Lumbar Spine

Movement	Normal ROM	Pre-Rehabilitation	Post-Rehabilitation
Flexion	40-60 degrees	Fingertips to mid-shin; painful terminal range	Fingertips to toes without sharp pain
Extension	20-35 degrees	Restricted and painful	Improved, mild stiffness only
Right Side Flexion	15-20 degrees	Mildly restricted with discomfort	Functional and pain-free
Left Side Flexion	15-20 degrees	Mild restriction	Functional and pain-free
Right Rotation	3-18 degrees	Painful during bowling simulation	Controlled with minimal discomfort
Left Rotation	3-18 degrees	Slight restriction	Functional
Functional Arc	-	Restricted during extension-rotation	Markedly improved during follow-through

Table 7: Muscle Tone Assessment - Lumbar and Hip Region

Muscle Group	Muscle Tone Grade	Description
Lumbar Paraspinals	0-1	Minimal residual tightness after training
Quadratus Lumborum	0-1	Reduced tenderness and guarding
Hamstrings	0-1	Improved flexibility with mild tightness only

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Hip Flexors	0	No significant protective tightness
Gluteal Muscles	0	Normal tone with improved activation

Table 8: Muscle Strength and Core Endurance Assessment

Muscle Group / Test	Pre-Rehabilitation	Post-Rehabilitation
Abdominal Bracing Control	Poor; unable to maintain with limb movement	Good; maintained during dynamic tasks
Prone Plank Endurance	22 seconds with lumbar sagging	86 seconds with good alignment
Right Side Plank Endurance	14 seconds with pain	52 seconds without sharp pain
Left Side Plank Endurance	18 seconds	57 seconds
Gluteus Medius	Grade 3+/5	Grade 4+/5
Gluteus Maximus	Grade 3+/5	Grade 4+/5
Back Extensor Endurance	Reduced with early fatigue	Improved with better control
Functional Bowling Control	Poor during delivery stride	Good during graded bowling drills

Table 9: Pain Assessment - NPRS Scale

Activity	Pre-Rehabilitation	Post-Rehabilitation
At Rest	2/10	0/10
Forward Bending	5/10	1/10
Lumbar Extension and Rotation	7/10	2/10
Running and Bowling Simulation	8/10	2/10
Full Bowling Spell	Unable due to pain and apprehension	Short graded spells tolerated

Functional Improvements Observed

- The patient became able to bend forward for routine activities without sharp lumbar pain.
- Running drills improved from guarded movement to controlled acceleration with better trunk rhythm.
- Bowling simulation became less painful, with improved follow-through and reduced protective stiffness.
- Prone plank and side plank endurance improved significantly, indicating better trunk endurance.
- Single-leg stance and step-down control improved, reflecting better hip and pelvic stability.
- The patient returned to controlled bowling drills and later to short bowling spells under workload monitoring.
- Fear of bowling-related pain reduced substantially after graded exposure and education.

- The athlete became independent in warm-up, core strengthening and post-practice mobility routine.

Outcome Measures

Pain: Numerical Pain Rating Scale (NPRS).

Lumbar Range of Motion: Clinical range-of-motion assessment and inclinometer-assisted observation of lumbar flexion, extension, side flexion and rotation.

Muscle Strength: Manual Muscle Testing of hip abductors, hip extensors and trunk-related functional strength.

Core Endurance: Prone plank, side plank, bridge endurance and ability to maintain abdominal bracing during limb movement.

Functional Recovery: Bending tolerance, running comfort, bowling simulation, run-up control, delivery confidence, follow-through control and return to graded practice.

Disability: Modified Oswestry Disability Index used to observe change in daily and training-related functional limitation.

Discussion

The present case demonstrates that a structured core strengthening program can have a meaningful effect on low back pain and functional recovery in a fast bowler. The patient initially presented with pain during extension, rotation and bowling simulation, which are movements closely related to the demands of fast bowling. The clinical assessment indicated that pain was not only an isolated lumbar complaint but also part of a wider functional problem involving poor trunk endurance, reduced abdominal bracing, weak gluteal control, hamstring tightness and apprehension during sport-specific movement. This pattern is common in athletes who continue training despite early symptoms and later develop protective movement strategies.

One of the clearest observations in this case was the relationship between core endurance and symptom control. In the pre-rehabilitation assessment, the patient could not maintain a prone plank for more than 22 seconds without lumbar sagging, and side plank endurance was reduced, especially on the painful side. These findings suggested that the athlete lacked the endurance required to maintain trunk position during repeated bowling deliveries. After progressive core strengthening, plank endurance and side plank endurance improved substantially. This improvement was associated with reduced pain during running and bowling simulation. Clinically, this supports the idea that the fast bowler requires endurance-based trunk control rather than only maximal strength.

The improvement in lumbopelvic control also influenced the patient's confidence. At the beginning of rehabilitation, the patient was afraid to extend and rotate the trunk because these movements reproduced pain during bowling. Fear of movement can lead to shortening of follow-through, reduced run-up speed and altered delivery mechanics. Once the patient learned to brace the trunk, control the pelvis and perform graded anti-rotation tasks, he became more willing to attempt bowling-specific

movements. This gradual exposure helped reduce apprehension and improved the quality of movement during practice drills.

Gluteal strengthening was another important component of the program. Weakness of gluteus medius and gluteus maximus contributed to mild pelvic drop and poor control during single-leg tasks. Fast bowling requires the athlete to accept force through one lower limb, transfer energy through the pelvis and trunk, and decelerate safely after ball release. If the hip stabilizers are weak, the lumbar spine may compensate through excessive side flexion or extension. In this case, hip abductor and extensor strengthening improved single-leg stance, step-down performance and bowling simulation. This indicates that the core should be considered a functional lumbopelvic-hip system rather than only the abdominal muscles.

Pain reduction in this case did not occur through rest alone. The patient had already tried short periods of rest and self-directed exercises, but symptoms returned when bowling load increased. The structured program reduced pain by improving movement quality and load tolerance. The early phase controlled pain and spasm, while the later phases improved mobility, endurance, strength and sport-specific control. This phase-wise progression allowed the patient to develop capacity before returning to higher-intensity bowling. It also prevented the common mistake of returning to bowling as soon as resting pain disappears.

Mobility correction was used carefully. The patient had hamstring tightness, mild hip flexor tightness and reduced thoracic mobility. These restrictions can increase lumbar loading by forcing the lower back to compensate during bending, rotation and bowling action. Stretching and mobility drills were included, but they were not used as a standalone treatment. Mobility gains were integrated with core bracing, hip strengthening and functional drills. This helped the patient use improved range of motion with control rather than simply increasing flexibility without stability.

The sports-specific component of rehabilitation was essential. A fast bowler may appear improved during clinic-based exercises but still fail when returning to run-up and delivery tasks. Therefore, the program progressed to run-up drills, controlled delivery simulation, anti-rotation exercises, single-leg loading and graded bowling spells. This progression allowed the physiotherapist to observe symptom response, technique quality and fatigue. The bowler was also taught to monitor workload, because excessive bowling frequency or sudden increase in deliveries can reproduce pain even when clinical tests have improved.

The outcomes of this case were favorable. The patient improved in NPRS scores, lumbar movement tolerance, core endurance, gluteal strength, bowling control and confidence. The Modified Oswestry Disability Index also showed functional improvement in daily and training-related activities. However, the case also shows that return to bowling should be gradual. A decrease in pain does not automatically mean that the athlete can resume full match intensity. Long-term success depends on continuing the home exercise program, maintaining hip and core strength, using a proper warm-up, monitoring bowling volume and responding early to recurrent symptoms.

Overall, this case supports the clinical value of core strengthening as part of a broader physiotherapy program for fast bowlers with mechanical low back pain. The intervention was effective because it was specific, progressive and functionally relevant. It addressed pain, muscle activation, endurance, mobility, hip control, education and sport-specific demands. The case highlights that the goal of rehabilitation is not only to reduce pain but also to restore the athlete's ability to bowl with confidence, control and reduced risk of recurrence.

Limitations of the Study

- This is a single-patient case study, so the findings cannot be generalized to all fast bowlers.
- The report does not include a randomized comparison group or untreated control condition.
- Bowling biomechanics were assessed clinically and not through three-dimensional motion analysis.
- Long-term follow-up beyond 12 weeks was not included in this version.
- Workload monitoring was based on reported practice participation and controlled bowling progression.
- The observed improvement reflects the combined effect of education, mobility work, strengthening and graded return to bowling.
- Imaging findings were used only to rule out major pathology and did not quantify soft-tissue adaptation during rehabilitation.

Conclusion

In this case study, a structured core strengthening program produced significant improvement in a fast bowler with mechanical low back pain. The patient demonstrated reduction in pain, improved lumbar mobility, better abdominal bracing, increased plank and side plank endurance, improved gluteal strength, better lumbopelvic control and greater confidence during bowling-related tasks. The rehabilitation program was successful because it progressed from pain relief and basic activation to functional strengthening and sport-specific retraining.

The case also shows that low back pain in a fast bowler should not be managed only with rest or general exercise. The demands of fast bowling require trunk endurance, hip stability, rotational control, landing control and graded workload tolerance. Core strengthening was most effective when it was combined with flexibility correction, gluteal strengthening, anti-rotation control, running drills, bowling simulation and education regarding workload management. The patient was able to return to controlled bowling practice with reduced pain and improved confidence.

The findings support the importance of individualized physiotherapy in cricket fast bowlers. A phase-wise core strengthening program can help restore function, reduce fear of movement and support safe return to sport. Continued maintenance exercises and workload monitoring are essential to reduce recurrence and protect long-term performance.

Future Scope of the Study

Future studies should include larger samples of fast bowlers with different bowling actions, age groups and training levels. Comparative studies may examine core strengthening alone versus core strengthening combined with bowling technique correction, workload monitoring, hip strengthening or thoracic mobility training. Standardized measures such as Modified Oswestry Disability Index, athlete-specific functional scales, plank endurance, side plank endurance, Y-balance testing, three-dimensional bowling analysis and delivery workload records may provide stronger evidence.

Further research should also include longer follow-up to determine whether core strengthening reduces recurrence of low back pain during a full cricket season. Since fast bowling injuries are influenced by workload, technique, age, fitness and recovery practices, future rehabilitation models should combine physiotherapy assessment with strength and conditioning, coach feedback and player education. Such integrated programs may improve return-to-sport outcomes and reduce time lost due to lumbar spine problems in fast bowlers.

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