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Case Report

Physiotherapy Section

Occupation-specific Physiotherapy and Ergonomic Rehabilitation in Seronegative Radiographic Axial Spondyloarthritis in a Young Farm Labourer: A Case Report

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ABSTRACT

Axial Spondyloarthritis (axial SpA) is often missed in young people, often confused with mechanical Low Back Pain (LBP), especially among those with heavy manual labour, resulting in poor management and loss of function. This case report details a 22-year-old male farm labourer who had suffered from chronic LBP (4/10 with activity and 7/10 at rest) for 1.5 years, progressive stiffness in the spine (morning stiffness> 60 minutes), and decreased work capacity. On clinical examination, decreased lumbar mobility (flexion 40°), decreased chest expansion (2.5 cm), posterior chain muscle tightness, and guarded movement without neurological deficit were noted. Laboratory investigations revealed an elevated ESR (42 mm/hour), a borderline normal C-Reactive Protein (CRP: 4.2 mg/L; reference <5 mg/L), which, while within the normal range, may carry diagnostic relevance in axial SpA, and negative HLA-B27 and rheumatoid factor. Unilateral grade II sacroiliitis (modified NY criteria) and vertebral squaring with early syndesmophytes were seen on radiographs, compatible with seronegative radiographic axial SpA. The patient fulfilled the Assessment of SpondyloArthritis International Society (ASAS) criteria for radiographic axial SpA (sacroiliitis on imaging plus ≥1 SpA feature). Amor classification criteria confirmed the diagnosis at the minimum threshold (score 6, threshold ≥6); notably, the radiological sacroiliitis item scored 0 points as unilateral grade II sacroiliitis does not meet the Amor radiological criterion (which requires bilateral ≥ Grade II or unilateral ≥ Grade III), and the total of 6 points was reached through clinical features alone. Baseline assessment indicated high disease activity and functional limitation {Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) 5.6; Functional Index (BASFI): 5.3; Metrology Index (BASMI): 2.4; Global Score (BAS-G): 8.5}. A structured 12-week physiotherapy program including spinal mobility and extension exercises, flexibility training, breathing exercises and postural correction was implemented, along with occupation-specific ergonomic interventions including neutral spine lifting, load redistribution (≤15 kg), work modification, and use of long-handled tools. At 12-week follow-up, clinically meaningful improvements were observed: BASDAI score was 3.4, BASFI score was 3.1, BASMI score was 1.6, BAS-G score was 4.2, pain score 3/10 during activity and 5/10 at rest, and a 34% improvement in work productivity (Work Productivity and Activity Impairment (WPAI) questionnaire). Improvements in BASDAI and BASFI exceeded established Minimal Clinically Important Difference (MCID) thresholds. This case emphasises early recognition of inflammatory back pain. It highlights the role of physiotherapy combined with occupation-specific ergonomic modifications in improving function and work participation among manual workers with seronegative axial SpA.

Keywords: Ergonomics, Farmers, Lumbago, Physiotherapy, Spondylitis

CASE REPORT

A 22-year-old male farm labourer presented to the physiotherapy department of a tertiary care centre with a 1.5-year history of chronic LBP and progressive spinal stiffness that significantly impaired his occupational function. On nutritional assessment, dietary deficiencies were not found, and his Body Mass Index (BMI) was 21.4 kg/m^2. Sleep quality was poor, with frequent nocturnal awakenings due to pain, typical of an inflammatory pain pattern. The patient had a history of occasional smoking (around 5 pack-years) and regular alcohol consumption (2-3 units/week), and long-term daily chewing of tobacco (gutka) for four years (around 5 g/day). His work involved continuous bending and loading of heavy crop sacks (30-50 kg) for 10-12 hours each day, as well as manual farming activities which required him to flex his trunk during bending and loading.

Symptoms began insidiously about 18 months before presentation, around the time of increased workload during the harvest season. The first symptoms were dull aching pain in the lumbar region, followed by gradual development of spinal stiffness over six months. At 12 months, the patient started to ease off heavy farming activities, and at 14 months, he was shifted to lighter irrigation-related tasks because of increased pain and functional deterioration. He presented to our department at 18 months after the onset of symptoms. He was the main breadwinner of his family, and progressive work incapacity brought a great financial and psychological load.

The pain was described as deep aching and is worsened by lifting heavy weights, by sitting or standing for long periods, and at night. The patient woke up regularly from sleep in the second half of the night due to nocturnal pain. There was no pain down the leg (radicular symptoms were absent), and the patient's pain did not extend below the knee. The patient had morning stiffness lasting more than 60 minutes per day (typically 75-90 minutes), which was partially improved by activity and movement but not by rest, and this was a feature of the inflammatory pattern. The Numeric Pain Rating Scale (NPRS) indicated the following pain intensity: at rest, 7/10; during activity, 4/10. As the difficulty increased while bending and lifting, compensatory movements were avoided.

The patient consulted an orthopaedic practitioner approximately 12 months before the referral to physiotherapy. During that time, he was treated with anti-inflammatory and analgesic drugs, but these did not provide lasting relief. A lumbar epidural corticosteroid injection was given at 13 months for clinically suspected nerve root compression, but this did not help the patient in the long-term. The patient visited various health centers over the following year. No abnormalities were seen on radiographs, and all blood tests were normal at each visit, while general exercise was advised, along with analgesics. The total period of conservative treatment across all centers was around 14 months, with no improvement, and the patient was referred for full physical therapy assessment and treatment.

Baseline spinal radiographs: X-rays of the spine showed the imaging characteristics outlined in the diagnostic assessment. No history of systemic disease, surgery, psoriasis, inflammatory bowel disease, uveitis, or recent infection of the genitourinary or gastrointestinal tract.

Clinical Findings

Written informed consent was obtained before the clinical examination. Clinically significant postural findings were found as: reduced lumbar lordosis, guarded posture (less arm swing), and a stiff trunk pattern during gait. Chest expansion decreased to 2.5 cm at the axillary level. Neurological examination was normal. Bilateral medial longitudinal arch reduction and mild heel eversion were noted as incidental findings of limited diagnostic significance in this context.

Physical Examination

Lumbar spine active Range Of Motion (ROM) was globally reduced: flexion 40° (reference 60°), extension 30° (reference 38°), and bilateral side flexion 25° (lower limit of the reference range 25-30°), all of which were associated with pain. Thoracic ROM was not formally measured with a goniometer; however, segmental hypomobility was identified at T5-T6 and T8-T9 with reproduction of local pain on central posterior-anterior pressure, consistent with thoracic axial involvement. Repeated movement testing did not demonstrate significant centralisation or peripheralisation of symptoms. Passive physiological intervertebral movement testing reproduced pain at L3-L4 during flexion and at L5 during extension, with hypomobility and a firm end-feel at L3-L4.

The Modified-Modified Schober test demonstrated a 2.5 cm increase with lumbar flexion (pre-intervention), indicating reduced lumbar mobility. Hip ROM was functionally adequate, except for bilateral limitation of internal rotation. Palpation revealed localised tenderness over the lower lumbar and thoracolumbar regions. Soft-tissue assessment demonstrated tightness in the bilateral hamstrings, calf muscles, left piriformis, upper trapezius, and levator scapulae. Functional limitations included difficulty with sustained trunk flexion during agricultural tasks, reduced lifting capacity, and compensatory hip-dominant strategies during sit-to-stand transitions. The Oswestry Disability Index (ODI) score was 42%, indicating moderate-to-severe functional disability.

Special Tests

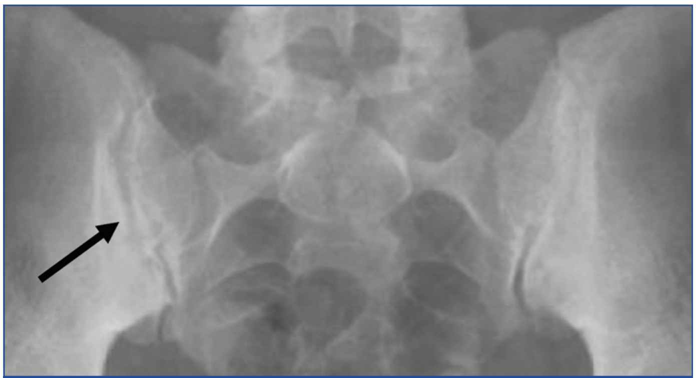
Sacroiliac Joint (SIJ) assessment demonstrated bilateral hypomobility on Gillet's test [1]. It is acknowledged that the diagnostic reliability of this test is limited and that it should not be used in isolation to confirm SIJ pathology [1]. Findings were therefore interpreted in the context of the totality of clinical and radiographic evidence. FABER, distraction, compression, and thigh thrust tests were negative [1]. Gaenslen's test elicited pain in the lower lumbar region rather than the SIJ itself. This atypical response may reflect referred lumbar pain rather than primary SIJ provocation [1]. The apparent inconsistency between negative SIJ provocation tests and a positive Gillet's test has been reported in axial SpA, where structural hypomobility may be present without mechanical provocation pain; the diagnosis was therefore based on the totality of clinical, Laboratory, and radiographic evidence rather than any single test finding [1]. Straight Leg Raise (SLR) was 90° bilaterally, no radicular symptoms, with discomfort in the SI (sacroiliac) region. Thomas's [2] and Ely's tests [3] were negative bilaterally, ruling out hip flexor and rectus femoris tightness. Clinical findings overall suggested a high level of suspicion for inflammatory spinal disease with axial involvement, justifying additional investigation.

Diagnostic Assessment

Laboratory investigations: Laboratory tests revealed an elevated ESR (42 mm/h; normal <15 mm/h). CRP was in the normal range (4.2 mg/L; reference <5 mg/L); although in the borderline range, CRP may be clinically relevant in axial SpA and has been reported here for clinical transparency [4]. HLA-B27, rheumatoid factor, and antistreptolysin-O (ASO) titer were negative. Relevant renal function was normal {Glomerular Filtration Rate (GFR): 115 mL/min}.

MRI findings: The MRI of the lumbar spine showed a few Schmorl's nodes, partial desiccation of the discs at L3-L4, annular fissuring, and mild posterior bulge of the disc at L4-L5 compressing the anterior thecal sac with no evidence of significant neural compression, and mild posterior bulge at the disc at L5-S1 without evidence of anterior thecal sac compromise (images not shown for publication). MRI of the SI joints was not performed at the time of presentation due to limited resources at the referring facility. This is a known drawback of the diagnostic workup: in early axial SpA, MRI of the SIJ is the gold standard (in HLA-B27-negative patients) for detecting bone marrow oedema. This work explicitly states that its absence is considered a major diagnostic gap, and the diagnosis was established based on sacroiliitis observed on radiograph and clinical ASAS criteria.

Radiographic findings: Plain radiographs of the hip joints showed bilateral sclerosis of the acetabular margins, indicating early degenerative changes (images not available for publication). SIJ radiography revealed right side Grade II sacroiliitis (minimal erosions and subchondral sclerosis), as shown in [Table/Fig-1]. Grading was done according to the modified New York criteria for radiological sacroiliitis (Grade 0: normal; Grade I: suspicious changes; Grade II: minimal abnormality with small, localised erosions or sclerosis without alteration of joint width; Grade III: unequivocal sacroiliitis with erosion, sclerosis, widening/narrowing, or partial ankylosis; Grade IV: complete ankylosis) [4,5]. Spinal radiographs showed sclerosis of vertebral endplates, squaring of vertebral bodies (more prominent in the thoracic region), and early syndesmophyte formation (images not available for publication). The unavailability of spinal and hip radiographic images for publication is acknowledged as a limitation that reduces the clarity of the diagnosis and transparency, and is addressed in the limitations section of the discussion [Table/Fig-1].



[Table/Fig-1]: Anteroposterior pelvis radiograph demonstrating right-sided Sacroiliac Joint (SIJ) changes (black arrows) with subchondral sclerosis and mild joint margin irregularity, consistent with Grade II sacroiliitis (modified New York criteria) [5].

Clinical Reasoning and Provisional Diagnosis

Clinical Reasoning and Diagnostic Classification: Insidious onset of LBP before age 40 years, morning stiffness for more than 60 minutes, improvement with exercise but not with rest, limitation of spinal motion, and radiographic sacroiliitis fulfilled the ASAS criteria for inflammatory back pain consistent with axial SpA [4]. In particular, the patient met the ASAS radiographic axial SpA: sacroiliitis on imaging (unilateral Grade II, modified New York criteria) plus ≥1 SpA feature (inflammatory back pain pattern, elevated ESR, and enthesopathy-type symptoms), indicating that the case met the diagnostic threshold [5].

The role of the radiograph was to support the diagnosis of seronegative radiographic axial SpA, which was based on the presence of the radiographic changes (vertebral endplate sclerosis, vertebral body squaring, early syndesmophyte formation, and unilateral grade II sacroiliitis) and an elevated ESR with the absence of HLA-B27, but was not the sole criterion. This should be noted, as radiographic sacroiliitis also meets the modified New York criteria for ankylosing spondylitis. In contemporary literature, the term 'seronegative radiographic axial SpA' is used to reflect the wider spectrum of the ASAS classification, which includes this clinical phenotype [5].

To assist the diagnosis, Amor's classification criteria for the spondyloarthropathies were used [6]. The Amor criteria are based on a weighted scoring system, and a score of ≥6 points is required for diagnosis of spondyloarthropathy. Importantly, the radiological sacroiliitis item scores 3 points if there is bilateral Grade ≥ II or unilateral Grade ≥ III sacroiliitis (as in this patient, the unilateral Grade II does not meet the radiological requirement and scores 0 points for the item). The Amor score of the patient was calculated in the following ways:

1. Lumbar or dorsal night pain and/or morning stiffness in the spine: 1 point
2. Buttock pain (unilateral): 1 point
3. Enthesopathy (talalgia and plantar tenderness, consistent with enthesopathy features): 2 points
4. Good response to NSAIDs within 48 hours: 2 points
5. Radiological sacroiliitis (unilateral Grade II): 0 points, does not meet the Amor threshold (requires bilateral ≥Grade II or unilateral ≥Grade III)

Total Amor score: 6 points (threshold ≥6), confirmed the diagnosis of a spondyloarthropathy [6].

The clinical presentation also met the characteristic features of inflammatory back pain as described by ASAS, including age of onset less than 40 years, gradual onset, improvement with exercise, and lack of improvement with rest [4,5].

Physiotherapy Interpretation and Functional Implications: From a physiotherapy perspective, the patient presented with pain and morning stiffness, globally reduced spinal mobility, restricted bilateral hip internal rotation, posterior chain muscle tightness, guarded movement behaviour, and reduced tolerance for occupational activities. An ODI score of 42% indicated moderate-to-severe functional disability. Avoidance of trunk flexion, compensatory movement patterns during lifting and transitional activities, and fear-avoidant behaviour {Tampa Scale of Kinesiophobia (TSK) score 38/68, indicating moderate kinesiophobia} also contributed to reduced work ability. This cluster of findings revealed the necessity for a structured rehabilitation program focused on pain management, movement preservation, movement reconditioning, and occupation-specific modification/ergonomic approach to the demands of heavy agricultural workloads.

Differential Diagnosis

Given the patient's age and history of heavy manual labour and chronic axial pain, multiple differential diagnosis was considered.

1. **Mechanical dysfunction syndrome (spinal flexion-related dysfunction):** Initially considered given the history of sustained bending and heavy lifting. However, the persistent and progressive nature of symptoms, improvement with activity rather than rest, morning stiffness exceeding 60 minutes, and radiographic evidence of sacroiliac and structural spinal changes are inconsistent with a purely mechanical aetiology, which typically presents with intermittent pain relieved immediately upon removal of mechanical stress.
2. **Lumbar disc pathology:** Considered given the MRI finding of an L4-L5 disc bulge with anterior thecal sac indentation. However, the absence of radicular features below the knee, negative SLR, normal neurological examination, bilateral inflammatory morning stiffness, and radiographic sacroiliitis collectively argue against disc pathology as the primary diagnosis.
3. **Facet joint arthropathy:** Considered given localised lumbar pain and segmental hypomobility. Facet pathology typically produces a capsular pattern with extension-predominant restriction. It is excluded by the presence of global rather than segmental movement restriction, negative posterior element provocation tests, and imaging evidence of a spondyloarthropathic process.
4. **Diffuse idiopathic skeletal hyperostosis (DISH):** Considered given vertebral squaring and bridging-type changes on spinal radiographs. DISH is characteristically seen in older adults (>50 years), and is marked by a line of flowing ossification along the anterolateral vertebral column without changes in the SIJs. This does not fit DISH as the patient is young (22 years) and has radiographic sacroiliitis, inflammatory morning stiffness, and an elevated ESR.
5. **Infectious sacroiliitis (septic or tuberculous):** Given the South Asian epidemiological context, where tuberculous sacroiliitis carries relevance. No constitutional symptoms (fever, weight loss, night sweats) and no history of tuberculosis contact, with a chronic indolent course over 18 months without systemic deterioration strongly suggested that the aetiology would not be infectious.
6. **Reactive arthritis:** There was no history of a preceding genitourinary or gastrointestinal infection, urethritis, conjunctivitis, or peripheral joint involvement, which made this diagnosis unlikely.
7. **Psoriatic spondyloarthropathy:** Because peripheral joint disease, nail changes, dactylitis, and psoriasis were absent, this diagnosis was discounted.

Physiotherapy Intervention

In line with International recommendations for exercise prescription in axial SpA [7,8], a structured and individualised physiotherapy program was started (Table 1) with the main objectives of reducing pain and stiffness, maintaining mobility of the spine, avoiding postural deformity, improving functional capacity, and enabling safe continuation of occupational activities for 12 weeks. The program included three in-clinic sessions a week throughout all phases and a daily home exercise program. The inflammatory nature of the condition underpinned the phase-wise approach, the heavy physical workload required of the patient, and the need to minimise mechanical stress on the spine during farming activities [7,8]. The patient continued NSAID therapy (prescribed by the treating rheumatologist) throughout the 12 weeks at a stable, unchanged dose. The observed clinical improvements, therefore, represent the combined effect of physiotherapy, ergonomic rehabilitation, and stable medical management and cannot be attributed exclusively to physiotherapy. No hydrotherapy was available at the patient's location and was not implemented; this is documented in [Table/Fig-2]. Ergonomic education (sleep posture, workload pacing, sustained posture avoidance) was integrated from Phase I, with formal workplace simulation introduced in Phase IV.

Outcomes and Follow-up

Clinical outcomes were evaluated at 12 weeks using validated disease-specific and functional measures. The same assessor administered all patient-reported outcome measures under

Phase	Goals	Interventions (Evidence-based and case-specific)	Dosage (FITT Principle)	Duration
Phase I: Pain control and mobility preservation	Reduce pain and stiffness; prevent movement avoidance; initiate safe spinal mobility	Superficial heat to the thoracolumbar region; education on the inflammatory nature of the condition and the importance of regular exercise; gentle active ROM for lumbar and thoracic spine (flexion-extension within tolerance); breathing exercises for thoracic expansion; postural awareness training (avoid sustained flexed posture); advice on sleep posture and activity pacing; early ergonomic education on load limits and posture integrated from this phase	Frequency: Daily; 3 supervised in-clinic sessions/week; home exercise daily. Intensity: Low, within pain tolerance. Type: Thermotherapy, active ROM, breathing, education. Time: Heat 15-20 min/session; spinal mobility 10-15 repetitions, 2-3 times/day; breathing 5-10 min/day	Weeks 1-2
Phase II: Flexibility and extension-based training	Improve spinal extension; reduce posterior chain tightness; correct flexion-dominant posture typical in axial SpA	Prone lying and prone extension exercises; thoracic extension over support; stretching of hamstrings and gastrocnemius-soleus; hip flexor stretching; cervical retraction and scapular setting; postural correction exercises in standing and sitting	Frequency: 3 supervised clinic sessions/week; daily home exercise. Intensity: Moderate stretch, sub-pain threshold. Type: Flexibility/stretching, extension exercise. Time: Stretch hold 20-30 sec, 3-5 repetitions, twice daily; extension exercises 10-15 repetitions, 2-3 sets/day	Weeks 3-6
Phase III: Stabilisation and functional conditioning	Improve trunk control, endurance, and movement efficiency for daily and work tasks	Low-load trunk stabilisation (abdominal and paraspinal activation); functional training including squat, sit-to-stand, and lifting pattern retraining; walking program for aerobic conditioning. Note: Hydrotherapy was recommended as an adjunct, but was not available at the patient's location and was not implemented	Frequency: 3 clinic sessions/week; daily home program. Intensity: Moderate Type: Stabilisation, functional, aerobic Time: Strength/functional 10-15 repetitions, 2-3 sets/day; walking 20-30 min/day	Weeks 7-10
Phase IV: Occupational and ergonomic rehabilitation	Reduce mechanical spinal stress during farming; enable safe work continuation; prevent exacerbations	Training in neutral spine lifting with hip–knee strategy; load limit ≤15 kg per single lift; load management and task modification; work–rest scheduling (45 min work: 15 min rest); use of lumbar support belt during heavy tasks; shoulder-supported/backpack-type load distribution for carrying crop sacks; long-handled agricultural tools (hoe, rake ≥1.2 m handles) to minimise sustained trunk flexion; education to avoid repetitive bending and twisting. Note: Formal workplace simulation introduced in Week 10; early ergonomic principles (posture, pacing) integrated from Phase I	Frequency: 2-3 supervised sessions/week, including workplace simulation; daily practice at work site. Intensity: Progressive work simulation. Type: Ergonomic, vocational Time: 45-60 min/session	Weeks 10-12
Long-term home program (throughout and beyond)	Maintain mobility and prevent progression	Daily spinal mobility routine; extension exercises; stretching program; breathing exercises for chest expansion; posture correction; lifestyle advice, including smoking cessation and long-term physical activity adherence	Frequency: Daily Intensity: Low-moderate maintenance. Type: Mobility, flexibility, lifestyle. Time: 20-30 min/day	Ongoing

[Table/Fig-2]: Phase-wise physiotherapy and occupational ergonomic intervention protocol (FITT Framework).

standardised conditions. Objective spinal ROM measurements (goniometric active ROM) were repeated at 12 weeks, along with the Modified-Modified Schober test and chest expansion measurement, enabling a complete pre-post comparison. Changes in disease activity, functional status, spinal mobility, pain, movement behaviour, and occupational performance are detailed in [Table/Fig-3] [9-16]. The BASDAI reduction of 2.2 units (5.6 to 3.4) was well above the MCID 1.1 unit, indicating a clinically meaningful improvement in disease activity. The same was true for the BASFI, with a reduction of 2.2 units (5.3 to 3.1), well above the MCID of around 1.0 unit, demonstrating a very significant functional improvement. Regarding spinal mobility, the BASMI reduction of 0.8 units (from 2.4 to 1.6) is noted with appropriate caution: published MCID thresholds for the BASMI range from 0.6 to 1.0 units across studies, and this improvement is directionally positive but does not unambiguously exceed all reported MCID thresholds; it represents a modest yet clinically relevant trend toward improved spinal mobility. Separately, the BAS-G reduction of 4.3 units (from 8.5 to 4.2) reflected a marked and clinically substantial improvement in patient-reported global health. Pain intensity on the NPRS decreased by one point during activity and two points at rest; a ≥2-point reduction is considered clinically significant on this scale. The WPAI questionnaire [16] demonstrated a 34-percentage-point improvement in occupational performance (72% to 38% work impairment). No adverse events were recorded during the 12-week program.

Domain	Assessment tool/method	Pre-intervention	Post-intervention (12 weeks)	Interpretation
Disease activity	Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) [9]	5.6	3.4	Reduction of 2.2 units, exceeding the MCID of 1.1 units, indicating clinically meaningful improvement from active to moderate disease activity
Functional limitation	Bath Ankylosing Spondylitis Functional Index (BASFI) [10]	5.3	3.1	Reduction of 2.2 units, exceeding the MCID of approximately 1.0 unit, indicating improved functional ability in daily and work-related activities
Spinal mobility	Bath Ankylosing Spondylitis Metrology Index (BASMI) [11]	2.4	1.6	Reduction of 0.8 units; published MCID thresholds for BASMI range from 0.6 to 1.0 units. This improvement approaches the lower MCID threshold and may represent clinically modest but directionally meaningful change in spinal mobility
Patient global health	Bath Ankylosing Spondylitis Global Score (BAS-G) [12]	8.5	4.2	Marked 4.3-unit reduction in perceived disease burden and overall health impact, reflecting substantial subjective improvement
Pain intensity	Numeric Pain Rating Scale (NPRS) [13]	4/10 (activity) 7/10 (rest)	3/10 (activity) 5/10 (rest)	Clinically meaningful reduction in pain; a ≥2-point NPRS change is widely accepted as clinically significant
Lumbar mobility	Modified-Modified Schober Test [14]	Flexion: 2.5 cm	Flexion: 3.0 cm	Measurable improvement in lumbar flexion mobility consistent with BASMI improvement
Chest expansion	Tape measurement, axillary level [11]	2.5 cm	3.8 cm	Improved thoracic mobility and respiratory expansion, relevant given axial inflammatory restriction
Lumbar active ROM	Goniometric measurement [14]	Flexion 40°; Extension 30°; Side flexion 25° (bilateral)	Flexion 48°; Extension 32°; Side flexion 28° (bilateral)	Clinically meaningful improvement in flexion and side flexion; modest extension gain
Muscle flexibility	Hamstring and calf length assessment [2]	Bilateral tightness present	Reduced tightness, improved extensibility	Improved posterior chain flexibility contributing to better movement mechanics and reduced compensatory posturing

Movement behaviour/ kinesiophobia	Tampa Scale of Kinesiophobia (TSK) [15]; Functional observation	Guarded movements, avoidance of trunk motion; TSK 38/68 (moderate kinesiophobia)	Improved movement confidence with neutral spine strategy; TSK 26/68 (below clinical cut-off of 37)	Reduction in fear-avoidant behaviour below the clinically significant TSK threshold; improved motor control
Occupational capacity	Work Productivity and Activity Impairment questionnaire (WPAI) [16]	WPAI work impairment 72%; reduced work hours; difficulty in manual tasks	WPAI work impairment 38%; able to perform irrigation work and light-to-moderate farming with ergonomic modifications	Clinically meaningful 34-percentage-point improvement in occupational performance and work participation
Adverse events	Clinical monitoring	N/A	None reported	No adverse events or flares attributable to physiotherapy documented during the 12-week program.

[Table/Fig-3]: Pre- and post-intervention outcomes at 12 weeks using standardised clinical measures.

DISCUSSION

This case describes a 22-year-old male farm labourer with seronegative radiographic axial SpA, a term used here within the ASAS classification framework to denote radiographic axial SpA in the absence of HLA-B27 positivity; it is acknowledged that the radiographic findings (unilateral Grade II sacroiliitis with vertebral changes) also fulfil the modified New York criteria for ankylosing spondylitis, who presented with chronic LBP, progressive spinal rigidity, and significant occupational restriction. A 12-week, structured, evidence-based physiotherapy program that included spinal mobilisation and flexibility exercises, patient education, and occupation-specific ergonomic modifications led to clinically meaningful improvements in pain, disease activity, functional ability, movement confidence, and work productivity [8]. Clinically relevant improvements in BASDAI and BASFI met MCID levels, confirming the clinical significance of the intervention outcomes.

The problem of diagnostic delay is well recognised in axial SpA, and is a significant issue in young people with non-specific LBP. Systematic reviews have reported an average delay of 2-6 years [17,18]. In the present case, the inflammatory features were concealed by the occupational context for over 1 year, which is consistent with observations that inflammatory pathophysiology may be masked by a heavy physical workload in manual labour populations [19]. The absence of HLA-B27 did not make early diagnosis difficult, but clinical and radiographic findings were useful for determining classification according to ASAS criteria [5,20].

It is well understood that exercise-based physiotherapy is a key component of non-pharmacological treatment in axial SpA. Systematic reviews and meta-analyses by Gravaldi LP et al., (2022) and Hu X et al., (2020) have revealed that supervised exercise are effective for improving spinal mobility, decreasing disease activity (BASDAI), and improving functional outcomes (BASFI) [7,21]. The Cochrane review by Regnaux J-P et al., (2019) also reported the short-term effectiveness of exercise in AS, but noted a lack of evidence for long-term structural outcomes [8]. The results of the present case align closely with these findings and are briefly compared in Table 3.

There are well-known poor prognostic factors, including the patient's history of smoking and the continuous mechanical loading on the spine. There have been reports of smoking being associated with higher disease activity, worse functional outcome, and faster structural progression in axial SpA [22]. Sustained agricultural loading is an additional mechanical stress that can aggravate inflammatory tissue damage. On the other hand, the absence of severe hip joint disease has been associated with a relatively good long-term functional prognosis [23].

One unique element in this case is the integration of occupation-specific ergonomic rehabilitation for agricultural labour, an underrepresented population in the existing vocational rehabilitation literature. The study by Kiltz U et al., (2023) reported high rates of work impairment (>70% of respondents) in axial SpA, noting a substantial unmet need for ergonomic support [24]. This case expands on these observations to a practical intervention setting. It provides evidence that a structured ergonomic protocol (with defined load limits (≤15 kg per lift), long-handled tools (≥1.2 m), structured work-rest scheduling (45 min: 15 min), back-pack type load distribution, and lumbar support) may increase the WPAI score by 34 percentage points in an agricultural worker. The results support the early use of validated occupational outcome measures and occupational-specific rehabilitation in the physiotherapy management of manual worker patients with inflammatory spinal conditions.

[Table/Fig-4] provides a structured comparative analysis of the present case against key published studies enabling contextualisation of symptoms, management approaches, and outcomes across the literature [7,8,17,21,24].

Author/Year	Study design	Population	Key symptoms/ presentation	Treatment	Key outcomes	Relevance to present case
Hu X et al., (2020) [21]	Meta-analysis of RCTs	Axial SpA/ankylosing spondylitis	Chronic LBP, spinal stiffness, reduced ROM, functional limitation	Supervised exercise programs (various modalities)	Significant improvements in pain, BASDAI, BASFI, and spinal mobility	Supports exercise-based physiotherapy; present case BASDAI (5.6→3.4) and BASFI (5.3→3.1) reductions align with pooled effect sizes
Regnaux J-P et al., (2019) [8]	Cochrane systematic review	Ankylosing spondylitis	Morning stiffness, functional limitation, spinal stiffness	Various exercise programs (home, supervised, combined)	Short-term benefit in function and mobility; limited evidence for long-term structural outcomes	Present case demonstrates short-term gains consistent with review findings; long-term follow-up remains a gap acknowledged in limitations
Gravaldi LP et al., (2022) [7]	Systematic review and meta-analysis	Ankylosing spondylitis	Spinal stiffness, reduced chest expansion, and functional limitation	Multimodal physiotherapy, including exercise and breathing exercises	Significant improvements in BASDAI, BASFI, and chest expansion were reported across the included RCTs	Chest expansion improvement (2.5→3.8 cm) in the present case is consistent with reported physiotherapy gains for thoracic mobility
Kiltz U et al., (2023) [24]	Cross-sectional survey study	Axial SpA patients in employment (n=1,234)	Occupational impairment, work disability, and negative workplace experiences	N/A (observational - no intervention implemented)	High prevalence of work impairment (>70% of respondents); negative workplace experiences common; ergonomic support needs identified	The present case extends findings to agricultural labour; WPAI improvement (72%→38%) demonstrates that targeted ergonomic rehabilitation can address the occupational impairment documented in this survey

Hay CA et al., (2022) [17]	Systematic review	Axial SpA patients with diagnostic delay (multiple countries)	Nonspecific LBP, missed inflammatory features, delayed recognition	N/A (diagnostic study - no intervention)	Mean diagnostic delay 2-6 years; HLA-B27 negativity, female sex, and manual occupations identified as contributors to delay	Present case had >1-year diagnostic delay; HLA-B27 negativity and agricultural occupation both contributed, directly consistent with review findings
Present case (2025)	Case report	22-year-old male farm labourer; seronegative radiographic axial SpA (HLA-B27 negative, unilateral Grade II sacroiliitis)	Chronic LBP, morning stiffness >60 min, progressive spinal stiffness, reduced work capacity, BASDAI 5.6, BASFI 5.3	12-week structured physiotherapy (3 sessions/ week)+occupation-specific ergonomic rehabilitation	BASDAI 5.6→3.4; BASFI 5.3→3.1; BAS-G 8.5→4.2; WPAI 72%→38%; returned to light–moderate farming	First reported case integrating validated occupational outcome measures (WPAI) and occupation-specific ergonomic protocols for agricultural labour in seronegative radiographic axial SpA

[Table/Fig-4]: Comparative analysis of present case against published literature.

Despite these limitations, notably including single case design, therefore precluding generalisation, the brief follow-up (12 weeks), the failure to separate the contributions of physiotherapy, ergonomics, and stable pharmacological management, and the lack of MRI imaging of the SIJ, and the fact that only one of the required radiographic images was available for publication, the case has important clinical implications. When evaluating young patients with persistent LBP in the occupational environment, it is important to have a high index of suspicion for inflammatory spinal conditions, especially if symptoms do not improve with rest and stiffness persists for 30-60 minutes or more in the morning. Diagnostic delay can be significantly reduced by early imaging, referral to a rheumatologist, and a multidisciplinary approach. Structured physiotherapy programs should be assessed in prospective studies that include occupation-specific ergonomic measures in axial SpA populations engaged in manual agricultural operations to evaluate long-term functional outcomes, disease progression, and work maintenance.

CONCLUSION(S)

This case demonstrates the diagnostic and functional challenges posed by seronegative radiographic axial SpA in a young farm labourer engaged in heavy manual labour. Delayed presentation emphasises the need to recognise the features of inflammatory back pain, such as morning stiffness >60 minutes and night pain that responds to activity, and to differentiate from mechanical causes in young working-age patients. A 12-week structured multimodality rehabilitation program comprising physiotherapy (targeting spinal mobility, soft-tissue flexibility, postural correction, and patient education), occupation-specific ergonomic interventions, and stable pharmacological management delivered clinically meaningful improvements in BASDAI and BASFI that exceeded established MCID thresholds, and substantially improved work capacity. It is acknowledged that these improvements represent the combined effect of all three components and cannot be attributed exclusively to physiotherapy alone. A function-specific, individualised rehabilitation program is critical to reduce disability and socioeconomic burden of disease, particularly for those who rely on strenuous physically demanding jobs.

Patient's Perspective: For more than a year, I had been experiencing back pain, which became worse and was associated with stiffness gradually. Heavy farming activities exacerbated the pain and began affecting my ability to bend, lift loads, and work for prolonged hours. I visited several doctors and took medicines, which brought temporary relief. Over time, I became worried because the stiffness had increased, and I was not able to work like I used to. Being an active earning member of my family, I found the situation very stressful. After visiting the physiotherapy department, I was assessed thoroughly and informed that my condition is not only due to strain from work but also related to an inflammatory condition affecting my spine. The exercises, heat therapy, and stretching helped me manage my pain and stiffness. I have been trained to use proper lifting and sitting techniques to perform various duties without exerting considerable strain on my back. Advice on work changes, support during heavy lifting, and rest breaks was constructive. I am much more confident in my work and can actually perform my duties better. I have learned the importance of keeping up the exercises and changing my lifestyle habits, such as reducing tobacco use. Overall, the physiotherapy treatment has helped me manage my pain, improve my movement, and continue working to support my family.

Declarations: Ethics approval and consent to participate: Ethical approval was not required, as this report describes a single patient managed as part of routine clinical care without any experimental intervention. Written informed consent was obtained from the patient before clinical assessment and use of anonymised clinical information for academic and publication purposes.

Consent for publication: Written informed consent was obtained from the patient for publication of this case report and any accompanying images. The patient was informed that all identifying information would be removed to maintain confidentiality.

Availability of data and materials: All relevant clinical data supporting the findings of this case are included within the article. Additional anonymised data are available from the corresponding author upon reasonable request.

Authors' contribution: GK, NHP, IQ and AB: Concept and design; GK, NHP, IQ, and AB: Acquisition, analysis, or interpretation of data; GK, NHP: Drafting of the manuscript; IQ and AB: Critical review of the manuscript for important intellectual content; IQ and AB: Supervision.

Note on author with Biomedical Engineering affiliation: Dr Ashutosh Bagde (Biomedical Engineering) contributed to the conceptualisation of the ergonomic rehabilitation protocol, the design of occupation specific intervention tools, and critical review of the manuscript for technical accuracy. This interdisciplinary contribution is consistent with the paper's focus on engineering based ergonomic modifications for agricultural labour rehabilitation. Additionally, for future collabouration of ergonomic tool design and development, to help the farm labourers with low back pain.

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