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Effectiveness of the Schroth Method in Reducing Cobb Angle and Improving Quality of Life in Adolescents With Idiopathic Scoliosis

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ABSTRACT

Background:Adolescent idiopathic scoliosis (AIS) is a progressive spinal deformity marked by a three-dimensional curvature of the spine, often emerging during periods of rapid growth. Conservative exercise-based interventions have gained prominence as alternatives to bracing or surgical correction. The Schroth method, a scoliosis-specific exercise approach, emphasizes postural correction, muscle symmetry, and rotational breathing techniques.

Objective:To evaluate the effectiveness of the Schroth method in reducing Cobb angle, alleviating pain, and improving posture and quality of life among adolescents with idiopathic scoliosis.

Methods:A total of 30 adolescents aged 10–18 years with mild to moderate AIS (Cobb angle 20°–45°) underwent a 7-week Schroth-based physiotherapy program, five sessions per week. Pre- and post-intervention assessments included Cobb angle (via radiography), Visual Analog Scale (VAS) for pain, and observational postural alignment analysis.

Results:The mean pre-treatment Cobb angle was 27.17° (±6.80), which significantly decreased to 19.03° (±6.41) post-treatment ($p < 0.001$). VAS scores reduced from 7.03 (±1.20) to 2.67 (±1.18) ($p < 0.001$), indicating notable pain relief. Observational assessments confirmed improvements in trunk symmetry and postural control.

Conclusion:The Schroth method is effective in reducing spinal curvature, relieving pain, and improving postural alignment in adolescents with idiopathic scoliosis. It presents a viable conservative treatment alternative to surgical and bracing options, especially in mild to moderate AIS cases.

Keywords: Adolescent Idiopathic Scoliosis, Schroth Method, Cobb Angle, Scoliosis-Specific Exercise, Posture, Pain, Quality of Life...

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1. INTRODUCTION:

Adolescent Idiopathic Scoliosis (AIS) is a three-dimensional spinal deformity characterized by a lateral curvature of the spine accompanied by vertebral rotation. It commonly develops during the adolescent growth spurt, typically between the ages of 10 and 18 years, and accounts for 75% to 85% of idiopathic scoliosis cases. While the etiology remains largely unknown, AIS is believed to have a multifactorial origin involving genetic, neuromuscular, and biomechanical components .

The degree of spinal curvature is quantified using the Cobb angle on standing radiographs. Curves between 10° and 25° are considered mild, those between 25° and 45° moderate, and curves exceeding 45° are classified as severe. Management strategies vary depending on the curve magnitude and skeletal maturity. While observation and bracing are common for mild to moderate scoliosis, surgical intervention is typically recommended for curves greater than 45°. However, non-surgical interventions, particularly scoliosis-specific exercise programs, have emerged as promising alternatives to improve spinal alignment and overall function without the risks associated with bracing or surgery.

1.2 The Schroth Method

Developed by Katharina Schroth in the 1920s, the Schroth method is a conservative physiotherapeutic system specifically designed for the treatment of scoliosis. This three-dimensional approach aims to elongate and de-rotate the spine through scoliosis-specific postural corrections, rotational angular breathing (RAB), and targeted isometric exercises . The technique emphasizes active self-correction and postural awareness integrated into daily activities, aiming to halt curve progression, reduce spinal deformity, alleviate pain, and enhance quality of life.

Numerous studies have reported the efficacy of the Schroth method in decreasing Cobb angles, reducing trunk asymmetry, improving pulmonary function, and boosting patients' self-esteem. Despite these benefits, the need for high-quality, focused clinical research persists to validate its standalone effectiveness across diverse populations.

1.3 Rationale for the Study

Most existing literature evaluates the Schroth method alongside other interventions or in comparison with different exercise protocols. This study isolates the Schroth method to assess its effectiveness as a sole therapeutic approach in adolescents with idiopathic scoliosis. By examining changes in Cobb angle, pain levels (VAS), and postural outcomes, this study contributes evidence on the clinical utility of the Schroth method in conservative AIS management.

1.4 Objectives

To evaluate the effect of Schroth-based exercises on Cobb angle reduction in adolescents with idiopathic scoliosis

To assess changes in pain perception using the Visual Analog Scale (VAS)

To observe improvements in postural alignment and quality of life through functional assessment.

2. Materials and Methods

2.1 Study Design

This was a single-group, prospective interventional study designed to evaluate the effectiveness of the Schroth Method in adolescents diagnosed with idiopathic scoliosis. The study followed a pre-post design where participants were assessed before and after a 7-week Schroth-based physiotherapy program.

2.2 Study Setting and Duration

The study was conducted at Pacific Medical College and Hospital, Udaipur, Rajasthan, over a duration of 7 weeks, with exercise sessions administered five times per week.

2.3 Participants

Inclusion Criteria:

Adolescents aged 10–18 years.

Diagnosed with idiopathic scoliosis

Cobb angle ranging between 20° and 45°

.Risser sign of 0–2, indicating skeletal immaturity

No prior surgical or bracing treatment

Willingness to participate with informed consent obtained from parents/guardians

Exclusion Criteria:

Age below 10 or above 20 years.

History of spinal surgery, neurological disorders, or congenital scoliosis.

Use of bracing, Pilates, manual therapy, or other interventions during the study period.

Cardiovascular, infectious, or psychological conditions that could interfere with participation

2.4 Intervention Protocol

Participants underwent supervised Schroth Method sessions focusing on the following key components:

Pelvic Alignment Corrections

Foundational step for ensuring neutral spinal base positioning

.Spinal Elongation with Rotational Angular Breathing (RAB)

Focused breathing into concave thoracic areas to promote de-rotation.

Isometric Strengthening

Targeting asymmetrical muscle groups to stabilize corrected posture.

Postural Integration into Activities of Daily Living (ADLs)

Training patients to maintain corrected posture during sitting, standing, and dynamic tasks

.Each session lasted 30–40 minutes, conducted under physiotherapist supervision. Common tools included mirrors for self-correction, TheraBands, physioballs, towels, and wall bars to assist with positional training.

2.5 Outcome Measures

Primary Outcome:

Cobb Angle:

Measured using standing anteroposterior radiographs pre- and post-intervention

.Angles ≥10° considered indicative of scoliosis; reductions ≥5° considered clinically significant

.**Secondary Outcomes:**

Pain Intensity (VAS)

0–10 Visual Analog Scale assessed pre- and post-treatment

.Postural Symmetry:

Qualitative observational analysis by the treating physiotherapist.

Functional Quality of Life (QoL):Inferred from subjective improvements in daily function and self-image (unscaled)

.**2.6 Statistical Analysis**

Descriptive statistics (mean, SD) were calculated for pre- and post-intervention values.

Paired sample t-tests assessed significance of change in Cobb angle and VAS scores.

A p-value < 0.05 was considered statistically significant.

All analyses were conducted using standard statistical software (e.g., SPSS or Excel)

.**3. Results**

3.1 Participant Overview

A total of 30 adolescents (both male and female), aged between 10 and 18 years, completed the 7-week Schroth Method intervention. All participants adhered to the treatment schedule and attended a minimum of 90% of the prescribed sessions.

3.2 Cobb Angle Reduction

Measure	Pre-Treatment (Mean ± SD)	Post-Treatment (Mean ± SD)	Mean Reduction	p-value
Cobb Angle (°)	27.17 ± 6.80	19.03 ± 6.41	8.13	< 0.001

The mean Cobb angle reduced significantly by 8.13°.

Paired sample t-test showed a statistically significant improvement ($t = 17.80$, $p < 0.001$).

3.3 Pain Intensity (VAS)

Measure	Pre-Treatment (Mean ± SD)	Post-Treatment (Mean ± SD)	Mean Reduction	p-value
VAS Score	7.03 ± 1.20	2.67 ± 1.18	4.37	< 0.001

Participants reported a significant reduction in pain (VAS score) by 4.37 points.

Statistical analysis indicated high significance ($t = 21.50$, $p < 0.001$).

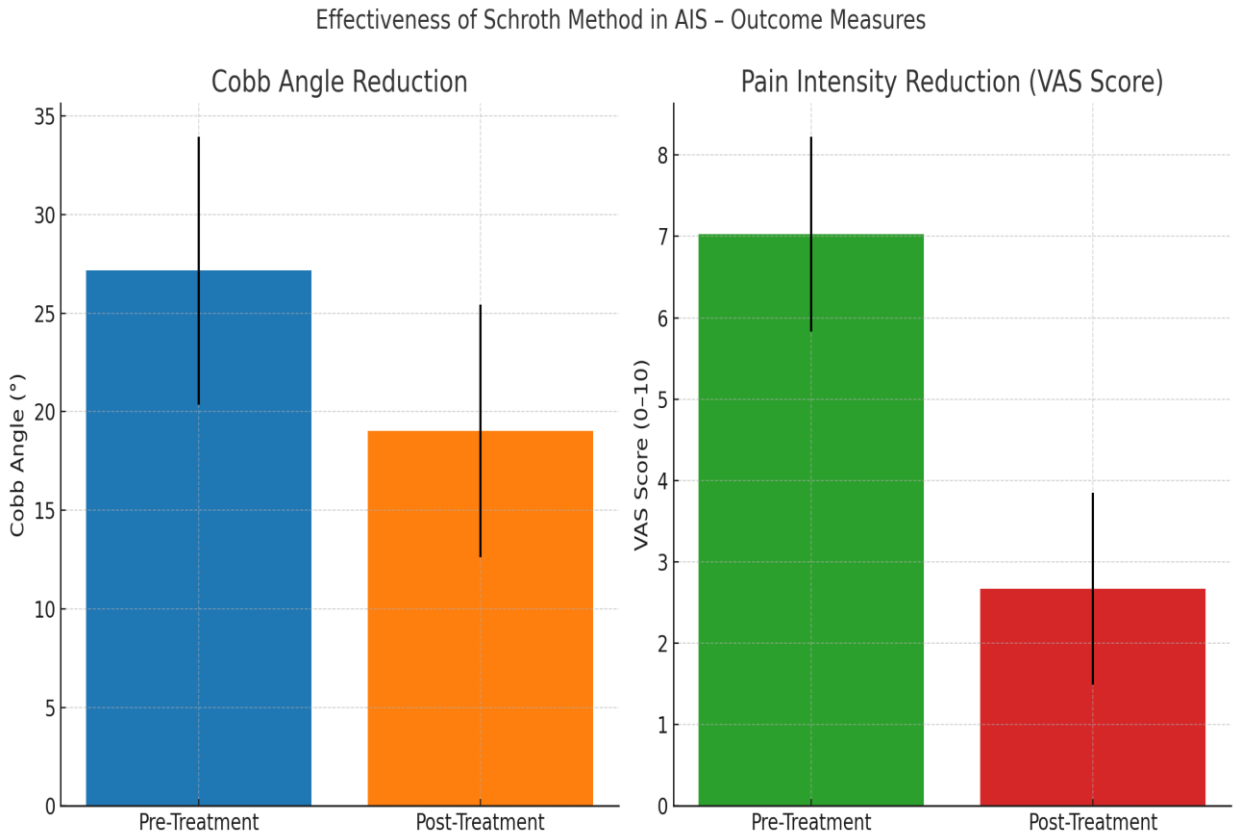

Figure 1: Cobb angle reduction with standard deviation bars

Figure 2: VAS pain score reduction with standard deviation bar

3.4 Observational Postural Improvements

Improved trunk symmetry and reduced rib hump prominence were observed

Enhanced scapular alignment, pelvic leveling, and upright posture during ADLs were reported qualitatively by treating therapists.

3.5 Adverse Effects and Compliance

No adverse events were reported during the intervention.

High compliance was noted due to structured supervision and patient education.

4. Discussion

This study investigated the isolated effects of the Schroth Method in adolescents with idiopathic scoliosis over a 7-week intervention period. The findings strongly support the use of this scoliosis-specific exercise approach, with statistically and clinically significant improvements in both Cobb angle and pain levels (VAS).

4.1 Cobb Angle Reduction

The observed mean reduction of 8.13° in Cobb angle post-treatment aligns with previous literature suggesting that Schroth exercises can induce measurable structural changes in spinal alignment. A 2022 meta-analysis by Khaledi et al. indicated moderate-quality evidence that Schroth can reduce the Cobb angle by more than 5°, particularly in mild-to-moderate AIS cases. The present results support and extend these findings, especially given the relatively short intervention period (7 weeks) and the magnitude of change achieved.

The improvement surpasses the 5° threshold often cited as the minimum clinically significant change, indicating not just statistical but functional relevance. Additionally, the use of rotational angular breathing (RAB) likely contributed to thoracic expansion and vertebral de-rotation, mechanisms consistent with the biomechanical rationale behind Schroth therapy.

4.2 Pain Reduction

A substantial 4.37-point reduction in VAS scores was observed, signifying meaningful pain relief. This effect may stem from multiple mechanisms:

Correction of postural asymmetries

Improved muscular balance

Enhanced proprioception and breathing mechanics

This aligns with previous clinical trials and reviews showing that Schroth therapy improves both pain intensity and quality of life in AIS patients (Villafañe et al., 2023; Dimitrijević et al., 2022).

4.3 Postural Improvements

Qualitative observations revealed improved trunk symmetry, scapular alignment, and postural control in most participants. These changes are consistent with the Schroth method's emphasis on 3D spinal correction and neuromuscular re-education. Incorporating corrective posture into daily functional tasks—such as sitting, standing, and walking—may contribute to the long-term sustainability of these improvements.

Such outcomes were also reflected in similar studies by Ceballos-Laita et al. (2023), which highlighted how supervised Schroth training enhances postural awareness, spinal elongation, and rib cage mobility, particularly in thoracic scoliosis.

4.4 Clinical Implications

The results of this study offer strong support for integrating the Schroth method into early conservative management of AIS, especially for adolescents with mild to moderate curves (20°–45°). Given the method's non-invasive nature and low risk profile, it may be a preferable option before considering bracing or surgical intervention.

Notably, the high compliance and absence of adverse effects underscore the feasibility and acceptability of this treatment in adolescent populations, provided sessions are supervised and individualized.

4.5 Limitations

Despite promising results, this study has several limitations:

Lack of a control group limits causal interpretation.

Short intervention period (7 weeks); longer follow-up is necessary to evaluate curve stabilization or reversal.

Quality of life and posture were assessed subjectively, without validated questionnaires such as the SRS-22r or trunk rotation angle metrics

.The study was conducted at a single center, which may limit generalizability.

4.6 Future Directions

Incorporate a long-term follow-up to assess curve progression or maintenance.

Utilize standardized Quality of Life instruments and 3D motion analysis for postural outcomes.

Compare Schroth therapy with other physiotherapeutic interventions (e.g., SEAS, Pilates, core stabilization) in larger, multicenter randomized trials.

5. Conclusion

The present study demonstrates that the Schroth Method is an effective conservative intervention for adolescents with idiopathic scoliosis. Over a 7-week supervised program, participants exhibited a statistically and clinically significant reduction in Cobb angle and substantial improvement in pain levels, alongside observable enhancements in posture and functional alignment.

These findings suggest that the Schroth Method, when delivered consistently under professional supervision, can contribute meaningfully to non-surgical management of mild to moderate AIS. Its individualized, three-dimensional corrective approach offers a viable alternative to bracing and may delay or even prevent the need for surgical intervention in many cases.While further high-quality, long-term studies are needed to validate and generalize these results, this research adds to the growing body of evidence supporting scoliosis-specific exercise programs as frontline strategies in AIS treatment

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