

# Influence of Etiology and Onset of Deformity on Spatiotemporal, Kinematic, Kinetic and Electromyography Gait Variables in Patients with Scoliosis – A Prospective, Comparative Study

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# Introduction

- This scoliosis affects the centre of mass position and weight distribution in lower limbs
- Also there is significant compromised motion of shoulder, hip and pelvis, and activity symmetry of upper and lower body muscles during gait
- It has been previously reported that gait patterns differed between patients with scoliosis and their healthy peers
- No study yet investigating the possibility of differences in gait patterns in patients with congenital and idiopathic scoliosis

**Primary Objective:** To compare the gait patterns and various parameters of gait analysis in AIS and congenital scoliosis patients

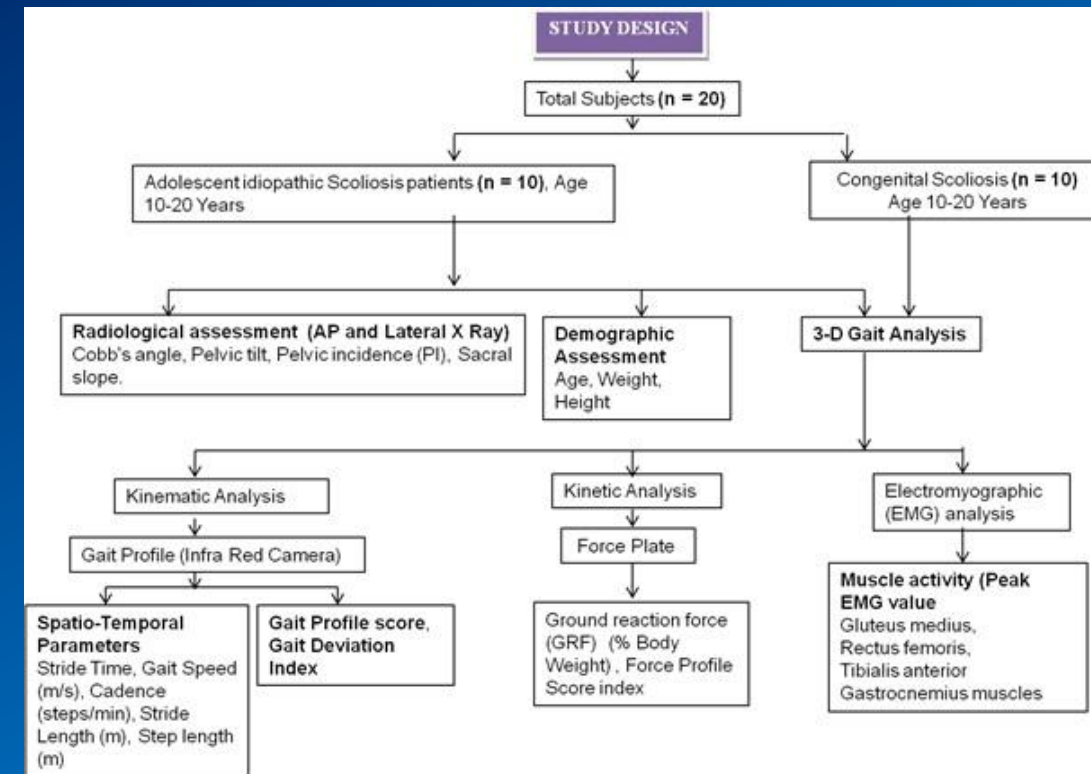
**Secondary Objective:** To confirm whether these parameters are altered in scoliosis patients as compared to healthy control group



# Methods

- Forty scoliosis patients (20 each with AIS and congenital scoliosis) and 20 healthy, age matched volunteers were prospectively recruited.
- Clinical and radiological examination was done along with gait analysis.
- The outcome measures included spatiotemporal, kinetic, kinematic and EMG activity gait analysis variables.
- Composite indices for gait analysis – Gait Profile Score (GPS) and Gait Deviation Index (GDI) were also calculated.

- Student t test was applied to compare different groups



Flow chart depicting the study design and methodology used in this study



# Results

- The two subgroups of scoliosis patients did not differ significantly with respect to any of the measured gait analysis parameters
- Compared to the healthy age-matched control group they differed significantly with respect to gait speed, stride length, step length, GDI, GPS and peak EMG activation for erector spinae (ES), biceps femoris (BF), semimembranosus (SM), rectus femoris (RF), gastrocnemius (GN), and tibialis anterior (TA).

		AIS	Congenital	P value
<b>Spatio-temporal parameters</b>	Stride time (sec)	1.15 ± 0.10	1.09 ± 0.17	0.4
	Stride Length (m)	1.09 ± 0.09	1.07 ± 0.15	0.75
	Step Length (m)	0.57 ± 0.05	0.52 ± 0.07	0.14
	Gait Speed (m/s)	0.95 ± 0.12	1.05 ± 0.19	0.28
	Cadence (steps/min)	104.46 ± 9.41	111.9 ± 18.22	0.34
<b>Kinetic analysis</b>	Vertical ground reaction force (% Body Weight)	91.66 ± 2.88	96.14 ± 1.14	0.22
	Force Profile Score index	20.87 ± 6.70 (Rt)	22.97 ± 8.22	0.15
		21.44 ± 5.01 (Lt)	21.86 ± 9.03	0.59
<b>Weight Load</b>	Rt Leg	42.04 ± 7.32	48.46 ± 10.35	0.17
	Lt Leg	56.52 ± 8.13	51.53 ± 10.35	0.52
<b>Composite Indices</b>	Gait Profile Score	8.62	10.31	
	Gait Deviation Index	88	81	

**Table:** Gait assessment of AIS and congenital scoliosis patients. Values are in mean±SD

## Conclusion

- Alteration in gait patterns exist in scoliosis patient when compared to normal individuals
- Lack of difference in gait analysis variables between AIS and congenital scoliosis patient suggests that this alteration is secondary to deformity rather than onset or etiology of deformity



Frontal and sagittal view of a Congenital Scoliosis patient equipped with cutaneous reflective markers and bipolar surface EMG probes standing in the walkway of gait laboratory