

# Study of lumbosacral angle in low back pain patients attending orthopaedic out-patient department of a medical college hospital, Telangana

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## Abstract

**Background:** Abnormal variation in Lumbosacral angle (LSA) is commonly associated with low back pain (LBP). However, normal variation of LSA itself is often debatable. Various studies around the world show wide normal variation in LSA. Hence it's imperative to distinguish LSA variation being a normal one and the one which is associated with LBP. In Indian scenario very few studies are available, especially from rural population, to know association of LSA in low back pain. Hence, the present study attempts to study LSA in chronic LBP patients from rural population of Telangana. **Material and Methods:** LSA study was carried out on 100 LBP patients attending Orthopaedic out-patient department of Medical college hospital of Telangana and the results were compared with LSA of 100 asymptomatic cases. **Results:** Overall average LSA in symptomatic cases was 35° which is more than mean LSA of 34° seen in asymptomatic cases. Mean LSA is more in female patients as compare to males. **Conclusion:** Mean LSA (35°) of low backache cases is more than mean LSA (34°) of normal cases. Though overall difference of mean LSA in two groups is not significant, however this difference is statistically more significant in 51-60 years age group.

**Key Word:** Low back pain (LBP), Lumbosacral angle (LSA), Lumbar lordosis, LSA variation, Ferguson technique.

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Received Date: 19/06/2018 Revised Date: 22/07/2018 Accepted Date: 10/08/2018

DOI: <https://doi.org/10.26611/1020724>

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Accessed Date:  
17 August 2018

## INTRODUCTION

Low back pain (LBP) is a common disorder with high rate of prevalence and incidence among population seeking medical treatment.<sup>1</sup> the cause of low back pain are multi-factorial, however many of its aetiologies are yet to be known.<sup>2</sup> It can result from injury, vigorous activity like lifting heavy objects and medical conditions like structural or functional pathologies of spine.<sup>3,4,5</sup> Abnormal variation in Lumbo-sacral angle (LSA) is also commonly associated with low back pain.<sup>6</sup> LSA, also

called as 'sacro-horizontal angle', the 'sacral angle' or the 'Ferguson's angle', is defined as "the angle formed between a line across the plane of the superior margin of S<sub>1</sub> and a horizontal line"<sup>6, 7</sup> or it is the angle formed between a line across the plane of the superior margin of the sacrum and a horizontal line.<sup>6</sup> Studies have shown that biomechanical changes in lumbar curvature can change the tension and compression in vertebral ligament and muscles which may lead to LBP.<sup>8</sup> The lumbosacral curvature of the vertebral column has a special function in terms of its mobility and weight bearing. Development of any abnormality in this curvature leads to symptoms ranging from mild discomfort to severe back pain, thus highlighting the importance of this curvature and its variability.<sup>6</sup> Normal variation of LSA is often debatable, as various literature and studies around the world shows wide normal variation in LS angle, ranging from 32° to 44°.<sup>6, 9, 10</sup> Hence it's imperative to distinguish LSA variation being a normal one and the one which is associated with low backache. Moreover some study states LSA has very small clinical importance as considered by Fernand,<sup>9</sup> which further necessitates

studying the role of LSA in low backache patients. Some study like *Caglayan et al*<sup>11</sup> concluded increase variation of LSA as risk factor for LBP, whereas some study like *Evick et al*<sup>12</sup> showed no association of LSA with LBP, while others like *Esmailiejah et al*<sup>2</sup> study showed association of decreased LSA with LBP. In Indian scenario very few studies are available, especially from rural population, to know LSA association with low backache. Hence, the present study attempts to study LSA in low backache patients of rural population of Telangana.

**MATERIAL AND METHODS**

LSA of 100 cases of LBP were studied for a period of two months in Orthopaedic out-patient department (OPD) of a Medical college hospital, Vikarabad, Telangana. Due Institutional ethical clearance was taken for the conduct of this study. Verbal informed consent was taken from study subjects before their inclusion in this study. Confidentiality of study subject data was maintained. The results were compared using statistical (t test) significance (P<0.05), with similar study of LSA in 100 asymptomatic cases conducted in same setting.<sup>13</sup> A total of 100 cases of LBP were enrolled in the study with the following inclusion and exclusion criteria.

**Inclusion criteria**

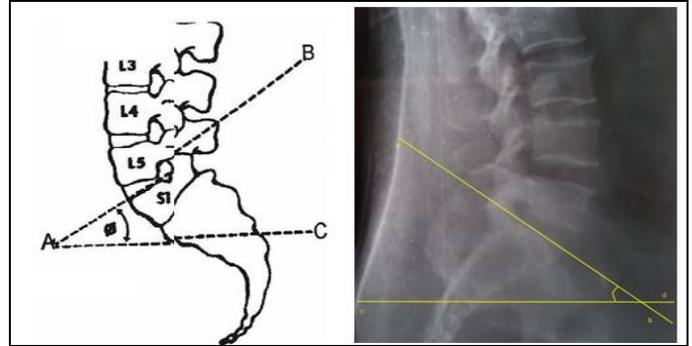
All patients between 21-60 yrs age group (both sexes) presenting with complaint of prolonged (minimum 12week) LBP with or without radiation to leg, visiting to orthopaedic OPD during the study period

**Exclusion Criteria**

All patients with acute cases of backache, backache associated with fracture, inflammatory disorder, spine disorder and dislocation of lumbar spine will be excluded. In-patients (IPD) cases were also excluded.

**Measurement of LSA**

Ferguson technique was employed for calculation of LSA in our study. Here X-ray of lumbo-sacral spine, anterior-posterior (AP) and lateral view of study subjects were taken. A-P view was taken with patient in supine position and lateral view was taken with patient in left decubitus position. Patient’s hip and knees were flexed while taking both the views to relax the spinal muscles in order to avoid alteration of lumbo-sacral curve. The processed film was mounted on the x-ray film viewing box. A straight line is drawn tangent to the superior surface of the sacrum (AB line). Another straight line is drawn horizontal/parallel to the base of x-ray film (AC). The angle formed at the intersection of line AB with AC is L.S angle and is measured using a protractor.



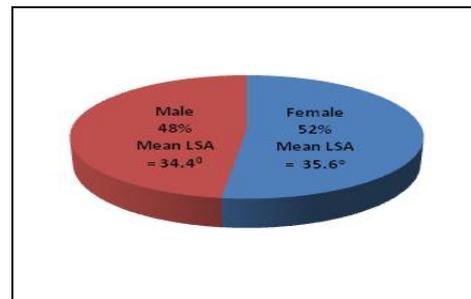
**Figure1:** Lumbosacral angle (LSA) or Sacral angle (SA) measurement (both schematic and radiographic representation). **Note:** Radiographic representation is of LBP patient; increased lumbar lordosis and sacral angle can be seen

**RESULTS**

Table-1 depicts distribution of cases according to range of LSA. Maximum cases of Low backache (60%) have LSA range of 31-40°. Least number of cases are seen in the range of 51-60°. No cases are noted in the range of 11-20° and in 60-70°.

**Table 1:** Distribution of cases according to ranges of Lumbosacral angle

Lumbosacral Angle (°)	No of cases (%)
11-20°	-----
21-30°	25 (25%)
31-40°	60 (60%)
41-50°	11 (11%)
51-60°	4 (4%)
61-70°	-----



**Figure 2:** Sex wise distribution of cases and mean LSA. Out of 100 cases of low backache studied, 52 are female and 48 are male. Mean LSA in female (35.6°) is more than male counterparts (34.4°) (Fig-2).

Maximum cases are in the age group of 41-50years. Only two cases are there in age group 21-29years. Mean LSA is maximum for the age group of 51-60 and least for age group 21-30, as depicted in table-2.

**Table 2:** Age wise distribution of cases and Mean LSA in each group

S. NO.	AGE GROUP	NO. OF CASES	MEAN LSA
1.	21 – 30	2	32°
2.	31 – 40	20	35.5°
3.	41 – 50	57	34.5°
4.	51 – 60	21	38°
Overall Mean LSA in symptomatic cases			35°

Table-3 depicts comparison of LSA among symptomatic and asymptomatic cases. Overall mean LSA of symptomatic cases is more than mean LSA of asymptomatic cases, though this difference is statistically not significant ( $P>0.05$ ). However, difference of LSA among two groups is more significant in 51-60years age group ( $P<0.05$ ).

**Table 3:** Comparison of LSA in symptomatic and asymptomatic cases

S.NO	AGE GROUP	SYMPTOMATIC CASES		ASYMPTOMATIC CASES	
		NO OF CASES	MEAN LSA	NO OF CASES	MEAN LSA
1.	21 – 30	2	32°	22	33.6°
2.	31 - 40	20	35.5°	41	34.4°
3.	41 - 50	57	34.5°	21	33.5°
4.	51 - 60	21	38°	16	34.5°
Overall mean LSA		35°		34°	

## DISCUSSION

The knowledge of the individual anatomy of lumbar curvature and range of mobility of the lumbar spine are significant aspects for the prevention of low back pain. The research regarding impact of age and sex on lumbar lordosis in asymptomatic cases is essential for distinction between painful degenerative pathologies and asymptomatic aging.<sup>14</sup> As documented in the present study, various authors report that females have greater value of lumbosacral angle than males.<sup>15,16</sup> The main purpose of lumbar curves, either in female or male is to ensure stability when standing and walking or other spinal movements. Sacrum in human is not positioned posteriorly at birth, it moves gradually posterior as erect bipedal posture develops and hence the gradual increase in the sacral angle (SA).<sup>17</sup> Further increase in SA along with changes in weight bearing kinetic of lumbosacral spine especially from 3<sup>rd</sup> to 6<sup>th</sup> decade of life can cause disc herniation or degeneration<sup>18,19</sup> Hence, LSA variation has been increasingly associated with instability of spine structure and LBP, especially in the final 3 to 6 decades of life.<sup>20</sup> Similar findings are observed in this present study, where, LSA is more in older age group than in younger patients. Therefore, knowledge of the range of normal LSA is critical in the treatment of LBP. In this study females have high mean LSA (35.6°) than males. This finding is similar to what Amonoo Kuofi *et al* concluded in their studies.<sup>21</sup> Females undergo changes in lumbar curvature in the form of increased lumbar lordosis during pregnancy. Furthermore, it has been reported that the extent of lumbar lordosis in women is significantly related with the number of pregnancies.<sup>16</sup> In the present study, maximum cases of low backache (60%) have LSA range of 31-40°. Overall mean LSA of symptomatic cases is more than mean LSA of asymptomatic cases, though

statistically this difference is not significant. However, this difference of LSA among two groups is statistically more significant ( $P<0.05$ ) in 51-60years of age groups. Although the relationship between lumbar lordosis and chronic LBP was investigated in various studies, there were contradictory findings between researches.<sup>22</sup> Certain studies like *Caglayan et al*<sup>11</sup> concluded increase variation of LSA as risk factor for LBP, This observation is similar to present study findings where LSA is more in LBP patient than in normal cases. However, various studies either showed no association of increase LSA with LBP or association of LBP with decreased angulation of LSA. Harrison *et al* compared lordotic measurements of normal, chronic, and acute low back ache patients and reported that patients with chronic back pain had hypolordosis, whereas the acute back pain group was hyperlordotic.<sup>23</sup> Jackson *et al.* reported that lumbar lordosis was significantly lower and not age-or gender-related in chronic back pain patients.<sup>8</sup> Hosseinifar M *et al* showed that lumbar stabilization and routine physiotherapy causes decrease in pain, disability and changes lumbar lordosis in patients with chronic LBP. Changing lumbar lordosis seems to depend on the abdominal muscles, back muscles, and pelvic/back ligament function and tonus.<sup>24</sup> Changes in lumbar lordosis angles may affect the diagnosis and treatment in LBP patients and also affect the planning of a proper exercise program for the back or abdominal muscles.

## CONCLUSION

In this study Mean LSA in female patients was more than male counterparts. The present study establishes the fact that LSA is more in low backache patient than in normal cases, though the overall difference is not significant; however this difference is statistically more significant in

51-60yr age group. This study attempted to show variation of LSA in normal and low backache cases; moreover results of this study can be a useful tool for health care provider for treating spinal disorder in rural Telangana population. Further large scale study is required to ascertain extent of variability of LSA in low backache cases when compared to normal cases.

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Source of Support: None Declared  
Conflict of Interest: None Declared