



RADIOLOGICAL STUDY OF LUMBOSACRAL ANGLE AMONG PEOPLE LIVING IN PORT HARCOURT METROPOLIS

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ABSTRACT

Introduction: The lumbosacral angle (LSA) is the angle formed between a line across the plane of the superior margin of the sacrum and a horizontal line. **Materials and Methods:** A retrospective study of 150 radiographs of subjects between the age of 10-80 years was carried out in radiology Department of Military Hospital Port Harcourt, Rivers State University Teaching Hospital and Foundation Hospital Omoku all in Rivers State. Ferguson's technique was employed for calculation of LSA. **Result:** In this study, there was variation of LSA ranges from 13⁰ to 71⁰ with a 95% confidence interval of 32.11-34.41⁰. A t-test was carried out to compare male and female angle and statistically, there was no significant difference between the male and female gender (P value: 0.6407). **Conclusion:** Results of the present study shows variability which further strengthen the fact that normal variation in LSA differs among different region and races; hence the results will be a useful tool to health care providers for treating different spinal disorders of people living in Rivers state.

KEYWORDS: Vertebrae spine, Lumbosacral angle (LSA), Ferguson's technique, Lumbar lordosis, Port Harcourt.

INTRODUCTION

Lumbosacral angle (LSA) is the angle formed between the Superior part of the first sacral vertebral and the last lumbar vertebral. Lumbar lordosis is the anterior-convex curvature assumed by the intact lumbar spine to compensate for the inclination of the sacrum and to restore an upward orientation.

The most important region of the vertebral column in terms of its mobility and weight bearing function is the lumbosacral region. The regional curvature of the lumbosacral vertebral does not only enable the spine to bear weight, but it also acts as a shock absorber within certain limits. Deviations from normal and healthy erect postures result in corresponding changes in the lumbosacral angle (LSA).

The development of lumbar lordosis in human is as result of evolutionary mechanisms occurring during the process of attaining bipedal gait and erect posture.^[1] Generally, it has been thought that lordosis develops in children during the first year of life, in response to new biomechanical loads (which influences the growth of individuals) as there begin to pull themselves up into attaining bipedal gait prior to taking their first step.^[2] However, recent research stated that lordosis is visible in

lumbosacral region of as much as sixty percent of human fetuses, thereby suggesting that they may be a genetic component to the morphology.^[3] Bipedal gait and erect postures usually starts between twelve and eighteen months of age and lumbar lordosis continues to develop until the completion of spinal growth, usually between thirteen and eighteen years. Growth retardation gives a delay in the emergence of the lumbar lordosis. There are different methods of measuring lumbosacral angle which includes goniometry, radiography, flexible rulers, software methods, inclinometer etc. Radiography remains the standard method for measuring lumbosacral angle. Using radiography method, lumbosacral angle is measured in a supine lateral lumbosacral spine radiograph.

The lumbosacral angle has been associated with some degree of instability and low back pain in the 3rd to 6th decades of life. Therefore, knowledge of the range of normal lumbosacral angles is critical in management of low back pain. There is also racial bias in the normal angles.^[4] There is therefore a need to evaluate lumbosacral angle with respect to age in healthy subjects. We decided to evaluate this angle to; determine the measurement of lumbosacral angle (LSA) using a radiograph, determine the normal range of lumbosacral

angle (LSA), establish a radiological angle among different age groups of Port Harcourt residence, compare lumbosacral angle among male and female, determine the range of lumbosacral angle among people residing in Port Harcourt, Rivers state, Nigeria.

MATERIALS AND METHODS

This is a retrospective study of 150 (58 females and 92 males) lateral lumbosacral spine radiographs between the ages of 11 – 80 years. The radiographs were taken from the archives of three health institutions in Port Harcourt, Rivers State, Nigeria. The institutions include, Military Hospital Port Harcourt, Rivers State University Teaching Hospital and Foundation Hospital Omoku. The study duration was six years from 2013 to 2019. Ethical clearance was gotten from ethical committee of Rivers State College of Health Science and Management Technology.

The inclusion criteria were presence of five lumbar and five sacral vertebral and patient within the age group of 11 – 80 years. The exclusion criteria include; patient less than 11 years of age or above 80 years and people residing outside of Port Harcourt.

The radiographs were mounted on the viewing box. Using a 30cm long transparent meter rule, a straight line was drawn along the superior margin of the sacrum(s) to meet the horizontal/parallel line drawn at the base of the x-ray film. The angle formed between the planes of the superior surface of the S1 to the horizontal was measured using a protractor. The Ferguson method was used for measuring the lumbosacral angle.

RESULTS

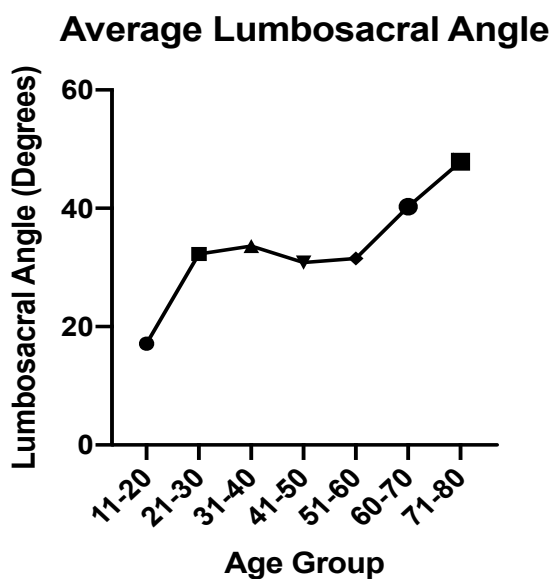


Figure 1 shows age wise distribution of study subjects. Lumbosacral angle varies from 13⁰ – 71⁰ in study cases. Mean LSA is maximum (47.9⁰) in 71 – 80 years’ age group. In the present study, the overall average LSA of all 150 subjects was 32.3⁰.

Lumbosacral Angle in a Port Harcourt study

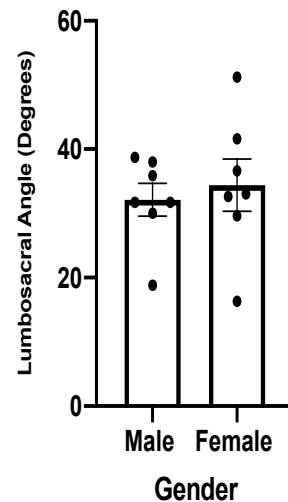


Figure 2: Shows Lumbosacral angle of both male and female.

Low back pain angle

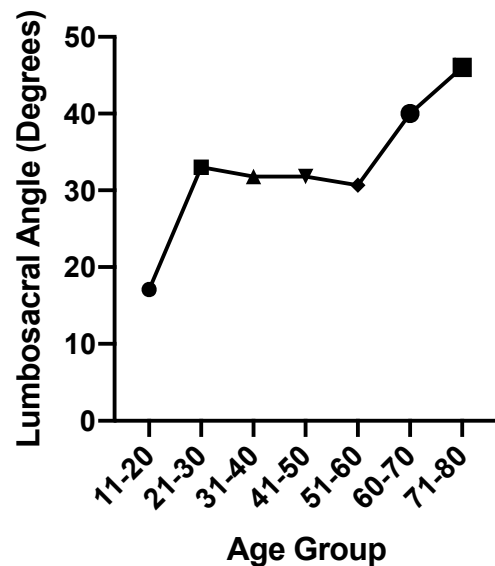


Figure 3: Shows 76 study subjects with LSA and Low Back Pain. The LSA varies from 13⁰ – 49⁰ in the study. The overall average LSA patient with LBP was 30.4⁰.

DISCUSSION

The present study shows the mean LSA in the study subjects to be 32.3⁰. This finding is in accordance with the values recorded by Lusted and Keats, Meshan who reported angle of <34⁰ and Ferguson and Friedman who reported an angle of <42⁰.^[4,9] Mitchell reported the LSA to be 41⁰ while Splithoff noted the angle to be 40⁰ - 44⁰ in a prospective study of 100 subjects in recumbent position.^[5,6,7,8,9,10] Von Lackum reported the LSA in intact pelvis to be 42.5⁰ in a study of 30 cadavers.^[10] Bryan et al reported that it varies between 15⁰ and 25⁰ in the Caucasian in erect position.^[11] Ferguson et al also

reported that when LSA exceeds 34° , an abnormality in stability exist between the lumbar and sacral spines.^[12] Troyanovich et al in their retrospective study of 50 normal healthy subjects in the erect posture recorded average LSA value of 39° .^[13] Maduforo et al reported a value of 36° in a prospective study of 100 male subjects (aged 0 – 75 years) of Nigeria.^[14] This wide variation of LSA in different studies emphasizes the role of ethnicity and different geographical region. Similar observations were also drawn by Sayed et al, which concludes that the normal LSA values are of forensic importance due to observed racial, ethnic and regional variation.^[15]

In the present study, there is no significant variation ($t = 0.48$; $p = 0.64$) between the male LSA of 31.5° when compared to the female LSA of 33.6° . This finding is contrary to the opinion of authors like Bryan et al, Amunoo Kuofi et al and Ashok Kumar Jha et al as reported in their studies.^[11,16,17] Greater LSA in females could be either due to evolutionary changes adapted to assist pregnancy and hormonal changes during reproductive age. However, Guldal et al concluded that in young individuals, male LSA was greater than female LSA, whereas in older age group females have greater LSA than males.^[18]

We also noted in this study that, patients with low back pain (L.B.P) were 76 with an average LSA of 30.4° .

CONCLUSION

The overall average LSA of 150 studies was 32.3° . The average LSA in females was greater than the males. The present study established that in all the various age groups between 11 – 80 years (which were the smallest and highest ages of the studied population), the mean LSA showed no significant differences between the groups. Furthermore, findings of the present study show variability when compared to other similar studies, which further strengthen the fact that normal variation in LSA differs among different region and races; hence the result of the present study will be a useful tool to health care providers for treating different spinal disorders in the Nigerian population.

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