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Assessment of Lumbosacral Angle Variation Among Middle Adults with Chronic Low Back Pain

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Abstract

Purpose: To Assess Assessment of lumbosacral angle variation in middle adults with chronic low back pain.

Methodology: A cross sectional study was conducted with sample size of 267 individuals from middle adults of Sikandar Medical complex Gujranwala, District Headquarter hospital Gujranwala, Gujranwala medical complex, Gujranwala. The population was Middle Adults (45-65) of both genders. Angle was measured by Measuring scale and Protractor using X-ray of lateral view of lumbosacral spine. Obtained data were analyzed using statistical package of social sciences (SPSS).

Findings: The data has been obtained from 267 chronic low back pain patient in which 143 were male and 124 were female. Data was collected using lateral radiograph. The results show significant relation between chronic low back pain and lumbosacral angle with p-value <0.5. The result further shows that 32 male and 27 female were hypo lordotic while 89 male and 92 female were hyper lordotic.

Conclusion: The study concluded that lumbosacral angle increases with chronic low back pain among middle adults. The study also concludes that age, gender also associated with lumbosacral angle variation.

Recommendations: Future study needs a through physical examination. This study focuses on radiographs only but future study needs to focus on MRI and CT scan also for better understanding of pain causes. Awareness program should be conducted on causes, prevention, complication and treatment of chronic low back pain among middle adults.

Keywords: *Chronic Low Back Pain, Lumbosacral Angle, Middle Adults*

1.0 INTRODUCTION

According to Andersson, "pain localized in middle of 12th rib lower border and the gluteal sulcus" is what low back pain (LBP) is. Back discomfort of any kind, especially LBP, affects 60–80% of people throughout the days of people.1 The beginning and impairment significantly influenced by psychosocial variables. Poor outcomes are independently correlated with depression, ineffective coping mechanisms, fear avoidance ideologies (the refusal to move or engage in action out of fear of discomfort or harm), and low expectations for recovery.2 The course of low back pain is often chronic, relapsing, and intermittent, and its nature frequently changes over time. It is often categorized as acute (remaining for 1 and half month), subacute (1 and half month to 3 months), or chronic (remaining for more than 4 months).3 Back discomfort that perseveres for more than 7 to 12 weeks is commonly referred to as chronic back pain. Others describe it as distress that continues longer than expected after curing.4

Herniated lumbar discs are a significant contributor to low back pain. Low back discomfort is frequently brought on by vertebral compression fractures (VCFs), which are also linked to significantly lower quality of life. LBP and rotated and flexed lumbar spine postures were found to have strong correlations. Sitting posture reduces lordosis of lumbar and raises muscular activity of low back, disc pressure, and pressure on the ischium, all of which are linked to the onset of pain in low back when associated with standing posture.[5] Long-term smoking is significantly linked to LBP. The hazard of protein energy deficit and muscle atrophy and feebleness may rise with reduced protein consumption. Low back discomfort can arise as a result of fragile muscles in the gluteal region and spine. The main causes of pain in low back are disc herniations and Intervertebral Disc Degeneration (IVD). If someone drinks alcohol regularly, their risk of getting low back discomfort is double that of someone who doesn't.[5]

Being older than 30 years old, smoking, drinking, being obese, having poor posture, having a mood disorder, having low social status and education, being sedentary, and engaging in work activities that require excessive flexion, rotation, vibration on the chest, and carrying weight are just a few of the factors that have been associated to the incidence of CBP.[6] Low back pain lifetime prevalence was 84%. While 10% to 15% of them, back pain develops into a chronic condition. Previous literature shows this prevalence.[7]

The spine's vertebral column is made up of vertebrae and intervertebral discs. The areas of cervical, thoracic, lumbar and sacral are all part of it, and it reaches all the way to the coccyx. The normal lumbar vertebra differs from the usual cervical or thoracic vertebra in a number of ways. The existence of a big vertebral body is the most obvious difference. In contrast to the size of the vertebra, the spinous process is short and profuse and spreads perpendicularly from the body. The superior facets are pointed postero-medially and medially, and the articular facets are clearly vertical. A curved articular surface is another distinctive characteristic of the facets. This is one characteristic that sets vertebrae of lumbar apart from thoracic.

The mammillary progression is also introduced to the posterior side of the upper articular process. There are five vertebrae in the lumbar area, identified as L1–L5. The cervical and thoracic intervertebral discs are taller than the lumbar intervertebral discs. Just one lumbar vertebra may be taken into consideration.[8] There are five vertebrae in the lumbar area, identified as L1–L5. Spinal nerves arise through a gap formed by the intervertebral discs, laminae, pedicles, and articular

procedures of adjacent vertebrae. There is a lordotic curving created by the lumbar vertebrae jointly.[9]

The extensor muscles of lumbar, which are important for mechanical steadiness and movement control, are situated posterior to the vertebral bodies. The transversospinalis (multifidus, rotators, interspinales, and intertransversarii) and the erector spinae are their two primary muscle groups (iliocostal and longissimus). The transversospinalis are thought to be in charge of tiny movements that stabilize the spine because of their deep location and attachment to the lumbar vertebrae. The erector spinae, which are located more superficially and span more of the vertebrae, are thought to play bigger part in generating spinal movement.[10]. In the inner anulus fibrosus and nucleus pulposus of degenerated discs, nerve fibers and blood vessels may have grown noticeably. The loss of disc structure also affects the rest of the loading response and alignment of the spinal column, including the facet joints, ligaments, and paraspinal muscles, which may later develop into new sources of pain.[11] The purpose of this study is to measure the lumbosacral angle in middle aged patients of chronic low back. The benefit of this study will be to provide the awareness and to the protect the patient of chronic low back from further damage. This will reduce the further cost of treatment and will help patients to eliminate the cause that lead towards the lumbosacral angle variation.

2.0 METHODOLOGY

Research Design

We used cross-sectional approach in this study.

Participants

A total of patients of mechanical low back pain of DHQ Hospital Gujranwala, Sikandar Medical Complex Gujranwala, Umer Bashir Hospital Lala Musa and City Hospital Jalal Pur Jattan were included in this study through non-probability convenient sampling. The inclusion criteria for this study was 1) Middle aged (45 - 65-year age) patients diagnosed with chronic mechanical low back pain.[7]1)Past history of violent trauma((lumbosacral dislocation), History of cancer(Chondroma, Astrocytoma, Ependymoma, Glioblastoma) pre-existing spinal and / or lower limb structural deformity(Genua valga ,Genua Vara ,Genu recurvatum, Genu flectum) presence of inflammatory arthritis(, ankylosing spondylitis present past history of bone Tuberculosis (Tuberculosis of spine e.g. Potts disease), presence of any sensory motor, autonomic and / or gait disturbances (Waddling gait, Propulsive gait).[7]2)

Pelvic or spinal surgery within past 6 month(Vertebroplasty and kyphoplasty, Spinal laminectomy/spinal decompression. Discectomy, Foraminotomy), spinal fracture (Compression, Burst, Flexion-distraction, and Fracture-dislocation), patient with scoliosis, kyphosis, spondylolisthesis, patient with limb amputation (Transfemoral (above Knee) Long transfemoral (above knee), Knee Disarticulation, Short transtibial (below knee), Transtibial (below knee), Long transtibial (below knee), patient with lower limb surgery within 6 months (Hemicorporectomy, Hemipelvectomy/ Hindquarter amputation. Hip Disarticulation), patients having leg length discrepancy.[12]

Instrumentation

Approaching the diagnosed patients with chronic low back pain a consent form was asked to sign, after giving a brief description of study. Measuring scale and Protractor were used to conduct the research.

Data Collection Procedure

Data collection procedure was started by taking their demographic data. Then through the X-ray of patient of lateral lumbosacral spine view the lumbosacral angle was measured in chronic low back patient through Measuring scale and Protractor. For that purpose, a horizontal line was drawn at the tip of sacrum as a reference line and other line was drawn through the body of sacrum. These two lines was intersected at a point forming a angle called lumbosacral angle and the angle was measured was by protractor.

Data Analysis

Data was entered and analyzed using statistical package for Social Sciences (SPSS) software version 20. For descriptive analysis, mean and standard deviation were calculated for quantitative variables whereas Frequency and percentages were calculated for qualitative variables. For inferential statistics, appropriate statistical test was applied. All results were calculated at 95% confidence interval and P-value ≤ 0.05 was considered as a significant value.

3.0 FINDINGS

Table 1: Presents Mean ± Standard Deviation of Age, Gender, Marital Status, Angle of LS Spine

Variable	Mean ±Standard Deviation
Age in years	1.2809±.45028
Gender	1,4644±.49967
Marital status	1.1873±.58373
Angle of LS spine	37.2697±7.20291

Tables 1 indicates that mean age in year of participants with SD was 1.2809±.45028, mean gender with SD was 1,4644±.49967, mean marital status with SD was 1.1873±.58373 and mean angle of LS Spine with SD 37.2697±7.20291**.**

Table 2: Frequency and Percentage of Participants in Age Group

Variables		n (%)
Age group	45-55	192(71.91%)
	56-65	75(28.09%)

Table 2 indicates that the number of participants between 45-55 years of age was 192(71.915%) and 56-65 years of age was 75(28.09%).

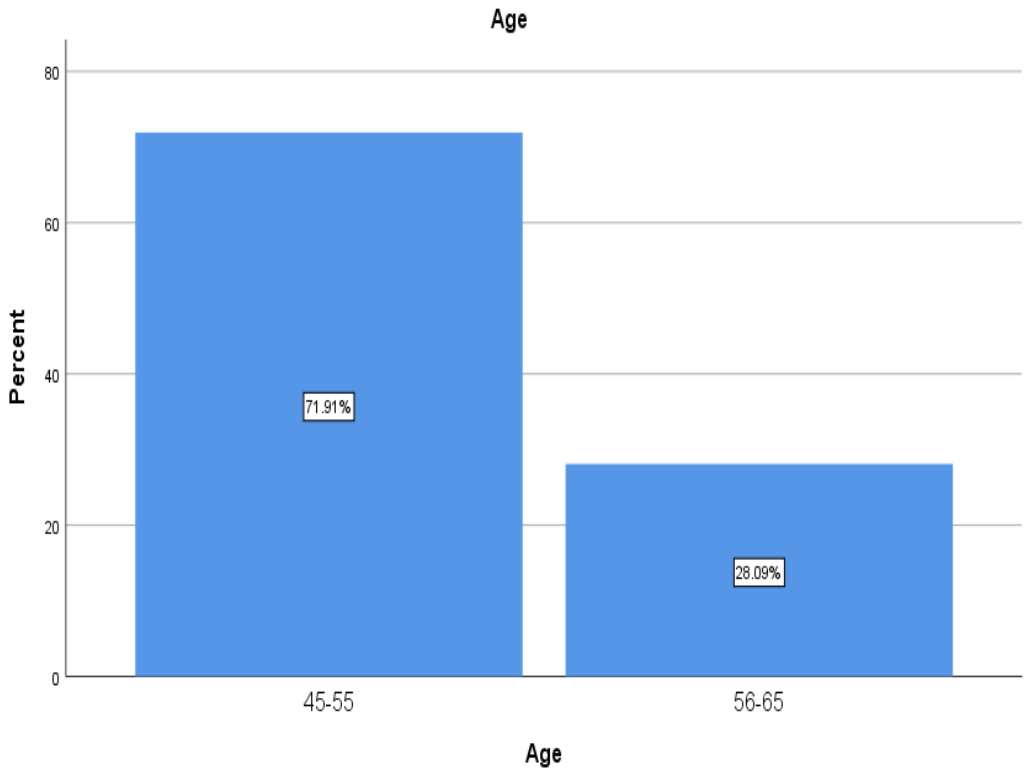

Figure 1: Percentage Categorization of the Participants in Overall Age Group

Figure 1 shows distribution of age group in years among participants in which out of total 267 individuals, highest frequency of participants was in age group 45-55 which was 192 (71.91%). While the lowest frequency of participants in age group of 56-65 i.e., 75 (28.09%)

Tables 3: Gender Distribution I.E., Male or Female Among Total Number of Participants

Variables		**N (%)**
Gender of participants	Male	143(53.56)
	Female	124(46.44)
	Total	**267(100%)**

Table 3 indicates among 267 participants that num of male was 143(53.56%) and female was 124(46.44%).

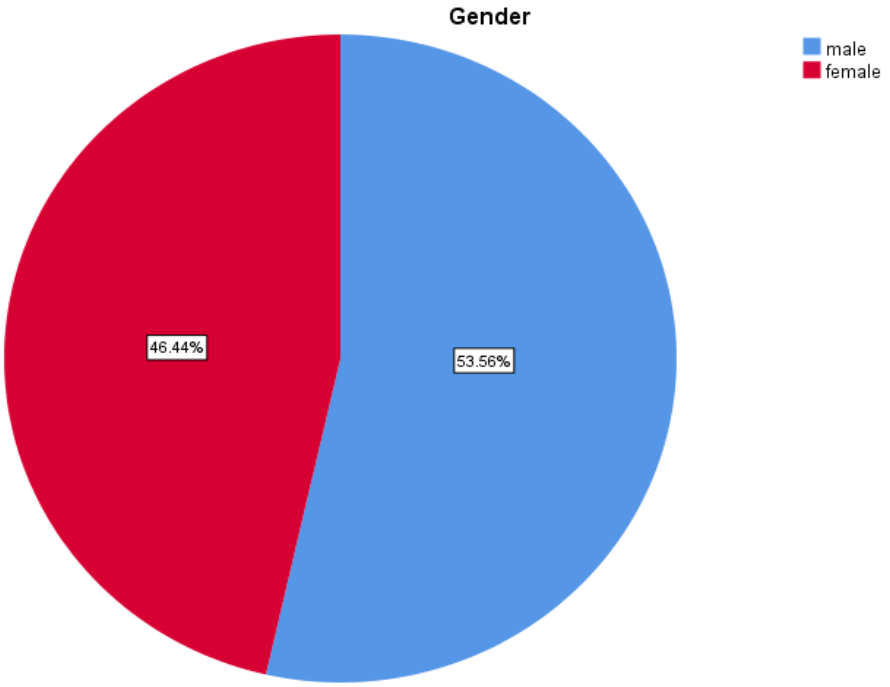

Figure 2: Gender Distribution (Male/Female) among Participants

Figure 2 Indicates the gender distribution i.e., male or female among 267 participants was observed to be 53.56% male and 46.44% female respectively

Table 4: Marital status i.e., married/divorced among total number of participants

Variables		**n(%)**
Marital status	Married	242(90.64%)
	Divorced	25(9.36%)
	Total	**267(100%)**

Table 4 indicates that among 267 participants 242(90.64%) was married and 25(9.36%) was divorced.

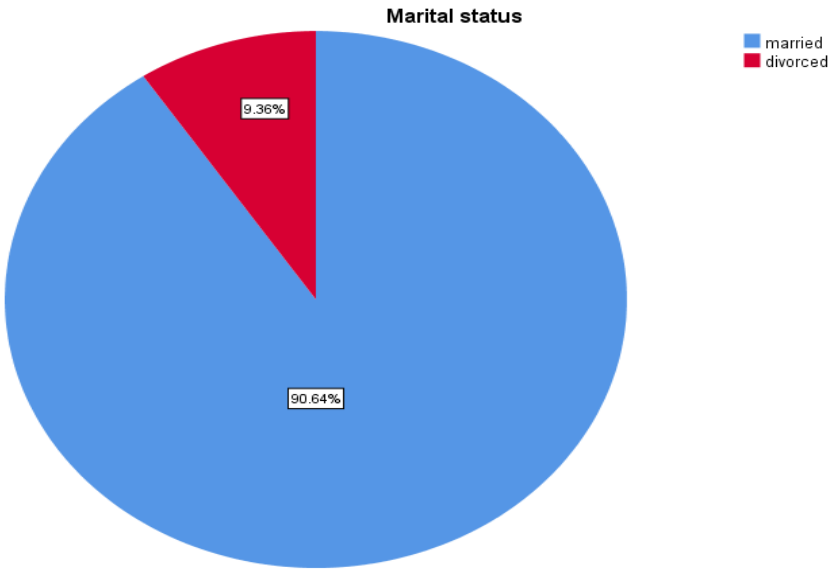

Figure 3: Marital Status Among Participants

Figure 3 indicates that marital status among 267 participants was observed to be 90.64% married and 9.36 divorced respectively.

Table 5: Frequency of Angle of LS Spine Among Total Participants

Angle of LS Spine					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	20	10	3.7	3.7	3.7
	21	5	1.9	1.9	5.6
	23	5	1.9	1.9	7.5
	27	5	1.9	1.9	9.4
	28	6	2.2	2.2	11.6
	29	5	1.9	1.9	13.5
	30	6	2.2	2.2	15.7
	32	6	2.2	2.2	18
	33	5	1.9	1.9	19.9
	34	22	8.2	8.2	28.1
	35	16	6	6	34.1
	36	33	12.4	12.4	46.4
	37	6	2.2	2.2	48.7
	38	18	6.7	6.7	55.4
	39	23	8.6	8.6	64
	40	10	3.7	3.7	67.8
	41	25	9.4	9.4	77.2
	42	6	2.2	2.2	79.4
	43	5	1.9	1.9	81.3
	44	5	1.9	1.9	83.1
	45	20	7.5	7.5	90.6
	46	5	1.9	1.9	92.5
	47	5	1.9	1.9	94.4
	49	5	1.9	1.9	96.3
	50	5	1.9	1.9	98.1
	55	5	1.9	1.9	100
	Total	**267**	**100**	**100**	

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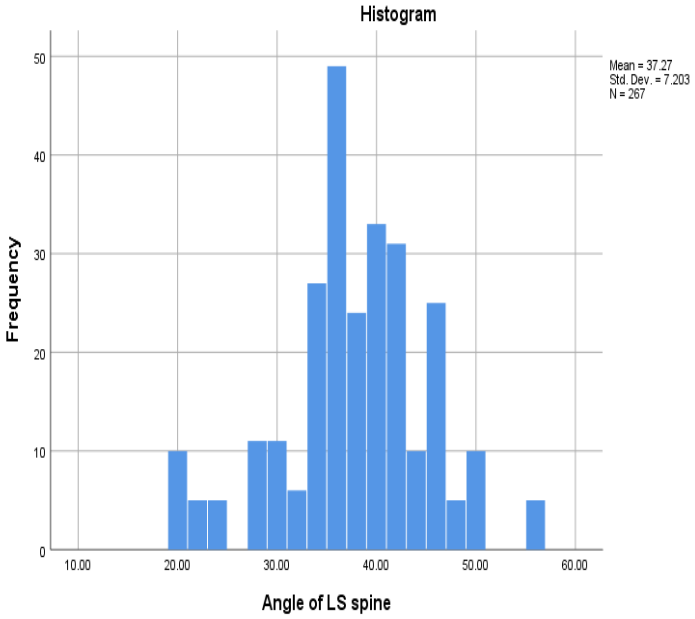

Figure 4: Frequency of Lumbosacral Angle Among Participants

Figure 4 indicates distribution of lumbosacral angle(º) among participants that was observed to be Average 37.27±7.203

Table 6: Indicates Frequency of Age Among Participants

Age					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	45	27	10.1	10.1	10.1
	46	28	10.5	10.5	20.6
	47	35	13.1	13.1	33.7
	48	16	6	6	39.7
	50	17	6.4	6.4	46.1
	51	6	2.2	2.2	48.3
	52	17	6.4	6.4	54.7
	53	21	7.9	7.9	62.5
	54	5	1.9	1.9	64.4
	55	20	7.5	7.5	71.9
	58	5	1.9	1.9	73.8
	60	11	4.1	4.1	77.9
	62	16	6	6	83.9
	64	5	1.9	1.9	85.8
	65	38	14.2	14.2	100
	Total	**267**	**100**	**100**	

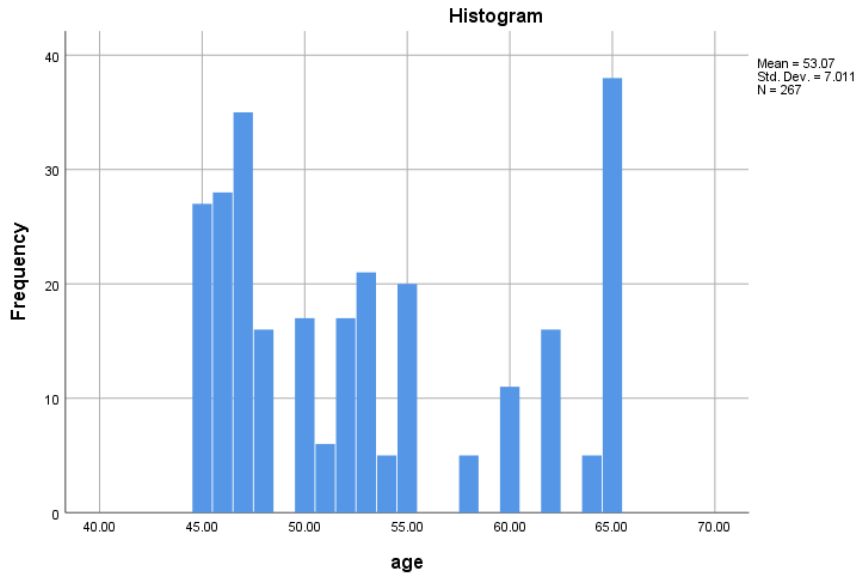

Figure 5: Frequency of Participant in each Age group

Figure 5 indicates the distribution of ages among participants that was observed the average age 53.07±7.011 years

Table 7: Indicates the Relation Between Gender and Angle of Spine

Count **Gender*Angle of LS spine**

Total	Female	Male	Gender
10	5	5	20
5	0	5	21
5	5	0	23
5	0	5	27
6	6	0	28
5	5	0	29
6	0	6	30
6	6	0	32
5	5	0	33
22	22	0	34
16	5	11	35
33	11	22	36
6	6	0	37
18	6	12	38
23	11	12	39
10	0	10	40
25	15	10	41
6	6	0	42
5	5	0	43
5	5	0	44
20	0	20	45
5	0	5	46
5	0	5	47
5	0	5	49
5	0	5	50
5	0	5	55
267	**124**	**143**	**Total**

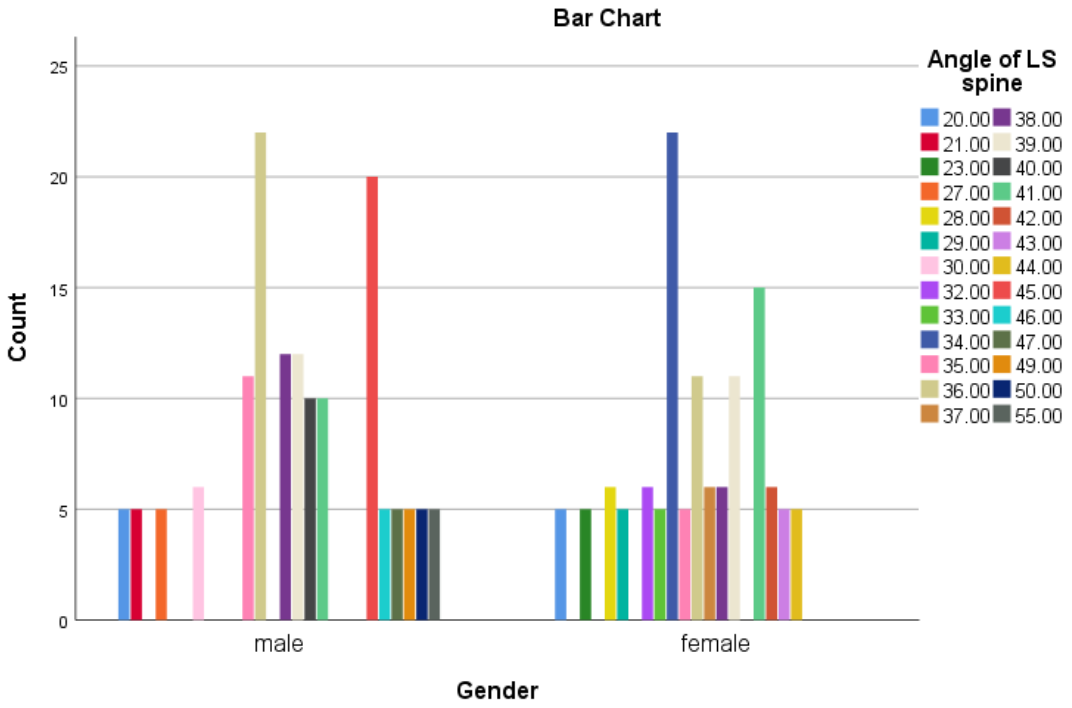

Figure 6: Indicates The Relation Between Gender and Angle of LS Spine

Figure 6 indicate that Gender has a positive relation with Angle of LS spine and female are more hyper lordotic than male with results statistically significant (P value≤ 0.05)

Table 8: Indicates the Relation Between Marital Status and Angle of Spine

Count **Marital Status*Angle of LS Spine**

Total	Divorced	Married	Marital Status
10	0	10	20
5	5	0	21
5	0	5	23
5	0	5	27
6	0	6	28
5	0	5	29
6	0	6	30
6	0	6	32
5	0	5	33
22	5	17	34
16	0	16	35
33	5	28	36
6	0	6	37
18	0	18	38
23	0	23	39
10	5	5	40
25	0	25	41
6	0	6	42
5	5	0	43
5	0	5	44
20	0	20	45
5	0	5	46
5	0	5	47
5	0	5	49
5	0	5	50
5	0	5	55
267	**25**	**242**	**Total**

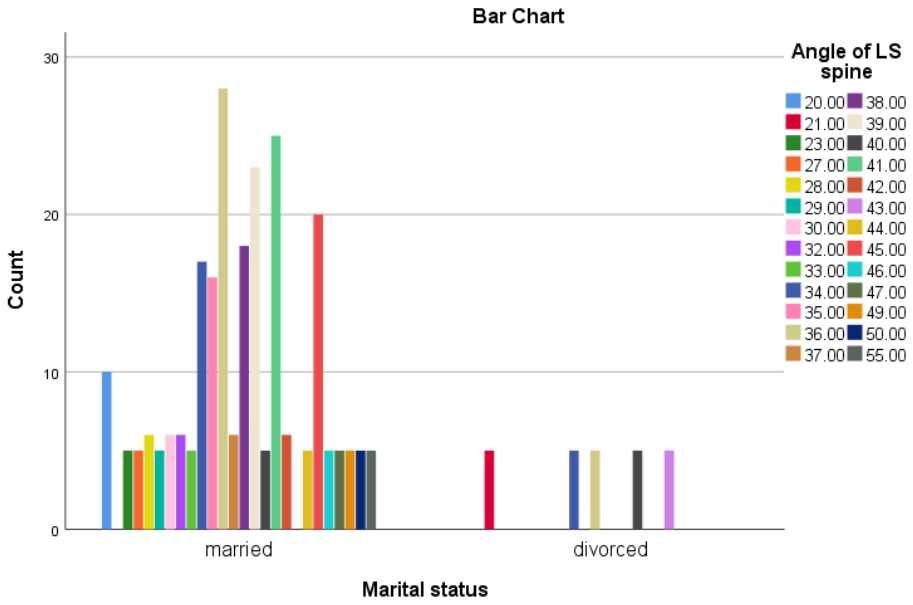

Figure 7: Indicates Relation Between Marital Status and Angle of LS Spine

Figure 7 indicates that among 267 participants 242 were married and 25 were divorced and results shows that married people are more hyper lordotic than divorced with statistically significant (p value≤ 0.05)

Table 9: Indicates The Relation Between Marital Status and Range of Angle of LS Spine

Marital Status * Range of Angle of LS Spine Crosstabulation							
Count							
		Range of Angle of LS Spine					**Total**
		20-26	27-33	34-40	41-47	48-55	
Marital status	Married	15	33	113	66	15	242
	Divorced	5	0	15	5	0	25
Total		**20**	**33**	**128**	**71**	**15**	**267**

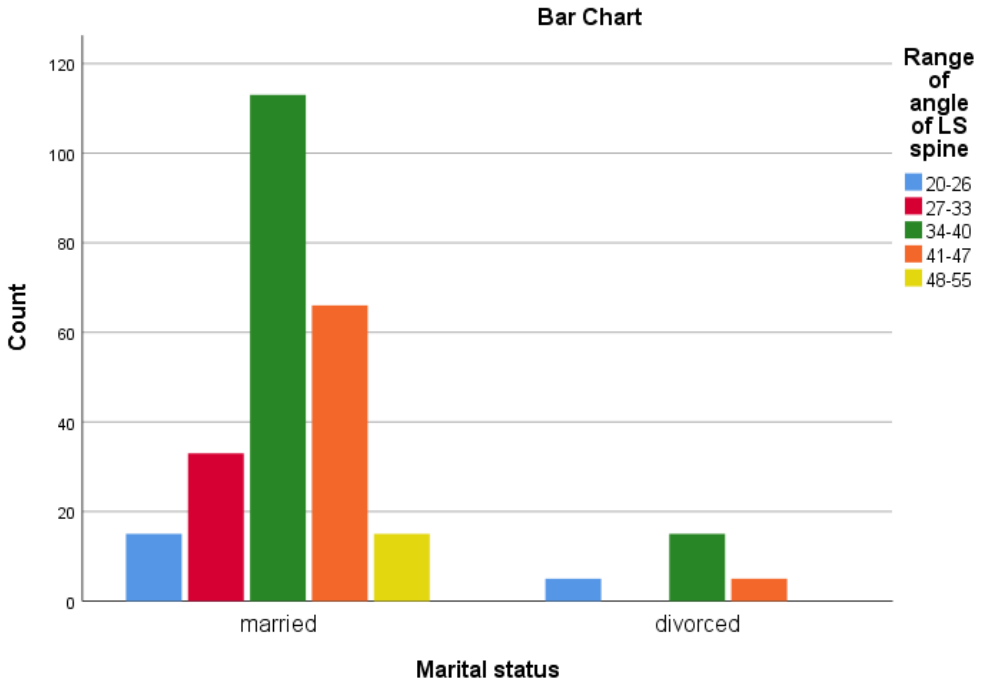

Figure 8: Indicates the Relation Between Marital Status and Range Angle of Spine

Figure 8 indicates that among 267 participants 15 married participants were those whose angle between 20-26º, 33 were those whose angle was between 27-33º,113 were whose angle was between 34-40º,66 were those whose angle was between 41-47º and 15 are those whose angle was between 48-55º. While the 15 participant whose angle was between 34-40º and 5 were whose angle was 41-47º were divorced.

Table 10: Indicates the Relation Between Gender and Range of LS Spine

Gender * Range of Angle of LS Spine Crosstabulation							
Count							
		Range of angle of LS spine					**Total**
		20-26	27-33	34-40	41-47	48-55	
Gender	Male	10	11	67	40	15	**143**
	Female	10	22	61	31	0	**124**
Total		**20**	**33**	**128**	**71**	**15**	**267**

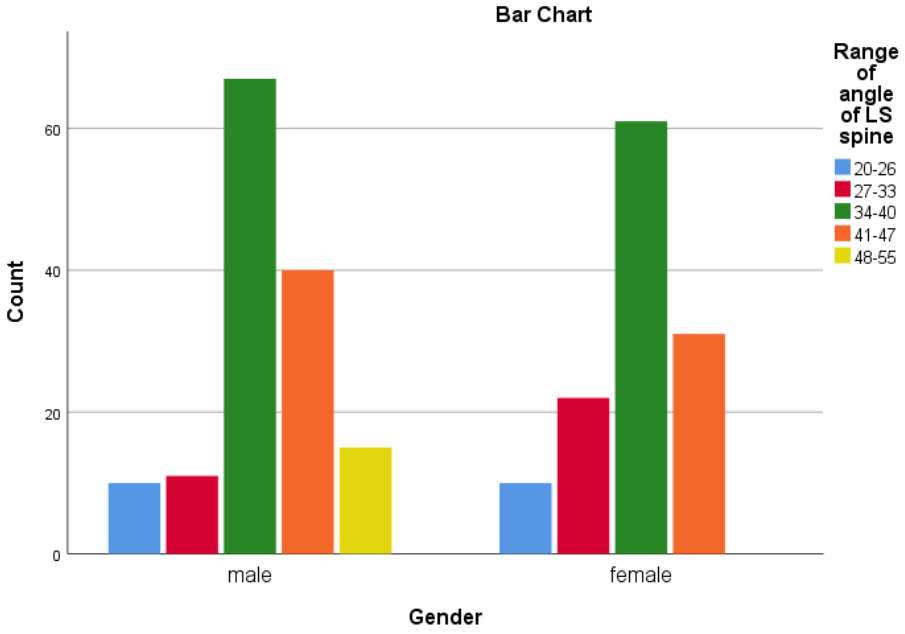

Figure 9: Indicates Relation Between Gender and Range of Angle of Spine

Figure 9 indicates that among 267 participants, the male whose angle was between 20-26º were 10,27-33º were 11,34-40º were 67,41-47º were 40 and 48-55º were 15 while female whose angle was between 20-26º were 10,27-33º were 22,34-40± were 61,41-47º were 31 and 48-55º were 0.

Discussion

Pain limited to the region between the lower borders of the 12th rib and the gluteal folds" is what low back pain (LBP) is. Back discomfort of any kind, especially LBP, affects 60–80% of people throughout the days of people.[1] The course of low back pain is often chronic, relapsing, and intermittent, and its nature frequently changes over time. It is often categorized as acute (lasting up to 6 weeks), subacute (6–12 weeks), or chronic (lasting more than 12 weeks).[3]Being older than 30 years old, smoking, drinking, being obese, having poor posture, having a mood disorder, having low social status and education, being sedentary, and engaging in work activities that require excessive flexion, rotation, vibration on the chest, and carrying weight are just a few of the factors that have been linked to the presence of CBP.[6] In our study 143 were male and 124 were female. Our study concludes that there is Increase in lumbosacral alignment with aging. Our study supports the result of previous study conducted by Burhan Fatih Kosygin and Ejder Berk in turkey having sample size of 202 in which 120 male and 82 patients participated. They proved that ageing causes specific alterations to lumbosacral alignment.[13]

Our study supports the result of study conducted by Ilke Coskun Benlidayi and Sibel Basaran in turkey. A sample size of 402 was collected in this study. They found that Elderly people's lumbar lordosis angles were significantly lower than those of young adults (36.22 11.94 vs. 39.83 10.01, respectively; p 0.001). Females had broader LLA, ST, and LSA than males when the data were examined by sex, but males had wider LSLA than females. They revealed that ageing causes a loss of lumbar curvature Furthermore, these modifications apply to men more so than they do to women.[14] A study was conducted by Ibinabo Fubara Bob-Manuel and Oghenefego Michael

Adheke in Nigeria and 226 participants participated in this study. This study supports our study and, in this study, they found that between the ages of 20 and 60, the lumbosacral angle increased gradually in both the male and female categories, but it then started to decline.

The mean lumbosacral angle for the male individuals was 35.74°, compared to 41.46° for the female subjects. In both sexes, there was a strong correlation between age and lumbosacral angle. The lumbosacral angle of males and females differed significantly ($t = 3.16$, $p = 0.002$).[15] There is also a previous study conducted by Masoud Shayesteh Aza and his colleagues in Iran. Their study does not support our study and they found that in low back pain and healthy participants, the mean lumbosacral angles were 18.5 (SD=8.86) and 23.77 (SD=12.60), respectively. These values were not statistically significant (P>0.05). Again, there was no statistically significant difference in the mean lumbar lordosis angle between the low back pain and healthy patients (p>0.05). These values were 29.47 (SD=11.90) and 29.97 (SD=15.17), respectively and according to study, low back pain incidence was not associated with lumbar lordosis or lumbosacral angle. While our study says that low back pain cause variation in lumbosacral angle.[16]

Another study which opposes our study was conducted by Cecil Maduforo in Nigeria having a sample size of 100 participants. In their study they found that in the sample population, the mean lumbosacral angle is 36.1 +/- 9.41. The lumbosacral angle was observed to rise with age, peaking in the 36–40-year age range. Thereafter, it stays largely consistent until the seventh decade. While our study says that after 40s there is increase in lumbosacral angle.[17] A study was conducted by Güldal Funda Nakipoglu et al in turkey with the sample size having a sample size of 120 participants. This opposes our study and they found that Females made up 50% of the acute LBP group and 73.3% of the chronic LBP group, respectively. The mean age of the ALBP patients was 41.00 11.63 (from 18 to 66), and that of the chronic LBP subjects was 49.26 15.6 (from 22 to 74). Between individuals with acute and chronic LBP, there was no statistically significant difference in the SIA, LSA, (p>0.05).[18]

A previous study was conducted by Ushnish Mukherjee et al in India with sample size of 105 participants. They used Ferguson technique for radiograph to measure the lumbosacral angle. This study supports our study in terms of gender but oppose in terms of age. They found that the difference between the median LSAs of male patients (median (IQR) = 37.00 (10.00)) and female patients (median (IQR) = 45.00 (8.50)) was statistically significant (p-value 0.000). Variation of LSA was found to have significant relations with sex and body mass index (BMI), but not with the age while our study said that with age lumbosacral angle also variate.[7]

This study was conducted by Syed Zohaib Gulzar Naqvi and his colleagues in Pakistan 2020 with sample size of 100. They found that Our population's lumbosacral angle (LSA) is 36°±8. Adult males had a mean angle of 36 degrees, compared to adult females' 33 degrees. The results of the current investigation showed that the LSA between the two age groups and sexes does not differ significantly. But our study showed LSA variate with gender and age.[19]

4.0 CONCLUSION AND RECOMMENDATIONS

Conclusion

The study concluded that lumbosacral angle increases with chronic low back pain among middle adults. The study also concludes that age, gender also associated with lumbosacral angle variation

Recommendations

- Future study needs a through physical examination.
- This study focuses on radiographs only but future study needs to focus on MRI and CT scan also for better understanding of pain causes.
- Awareness program should be conducted on causes, prevention, complication and treatment of chronic low back pain among middle adults

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