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ASSOCIATION OF BMI WITH LUMBAR LORDOSIS AND LOWER BACK PAIN IN NURSES

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ABSTRACT

BACKGROUND: Lower back pain is very common in nursing staff because nursing staffs are engaged in several job duties like, patient manual handling, transferring and turning patient, holding equipment for longer duration in operation theatre, prolong standing, bending carrying patients, and torso twisting, working on weekends also play a role. If the person is obese, further load is increased on lumbar spine specially while working with poor posture and ergonomics.

METHOD: Total 120 nurses were included in this study among them 114 were female and 6 were male. Height and weight were recorded. Examiner evaluated lumbar lordosis angle in standing position with flexible curve and θ angle calculated. Intensity of low back pain was measure with NPRS scale. For the statistical analysis SPSS software were used.

RESULT: Mean angle of lumbar lordosis in nurses was 52.12 degree. However, nurses with pre obesity had higher back pain than under weight. There was a significant association found between BMI and lumbar lordosis (P value < 0.001) and BMI with back pain (P value 0.04).

CONCLUSION: The significant difference was found between BMI and lumbar lordosis in present study. The study also found significant association between pre obesity group and low back pain. The significant difference was also found between age, BMI and lumbar lordosis in nurses.

KEY WORDS: BMI, Lumbar lordosis, Flexible ruler, Low back pain, Nurses, Health care workers.

INTRODUCTION

The lumbar lordosis is defined by the inward (ventral) curvature of the lumbar spine. Which is formed by the wedging of lumbar vertebral bodies and the intervertebral disc.[1] The lumbar lordosis and kyphotic curves act as a multi-segmental, flexible curved in the sagittal plane. Anatomically, the low back begins at the 12th rib and ends at the iliac crest. The muscles, fascia, ligaments, tendons, facet joints, neurovascular components, vertebrae, and intervertebral discs

vulnerable to biochemical, degenerative, and traumatic stressors and are vital part to form a lumbar lordosis.[2] Lordotic angle is increased when vertebra bodies and discs go into dorsal wedging and decreased these structures go into ventral wedging.[1]

If the lumbar lordosis shifts to hypo or hyper lordosis, there are certain changes occurs in structures like the pressure increases on the facet joint and disc, the nerve root gets compressed, the disc and facet joints degenerate, the paraspinal muscles tense, and the paraspinal ligaments sprain.[3] Another very important cause for the abnormalities in lordosis is obesity which is considered as a worldwide epidemic.[4]

According to the Global Burden of Disease Study 2017, low back pain (LBP) is a highly frequent illness in the general population around the world and has been the top cause of disability for almost three decades.[5] In developed and developing countries, LBP predominantly affects the working population and is considered one of the occupational causes of Morbidity in the industrialized world.[3,6] Prevalence of lower back pain ranges between 60% to 90% globally and declared to be an escalating health issue.[3]

LBP is very common in nursing profession than the other musculoskeletal disorders.[6] In Africa, prevalence of LBP in nurses is 71% reported in the sikiru and hanifa's study.[3] The reasons behind this scenario are that nursing staff are involved in several work duties such as repetitive tasks like patient manual handling, transferring and turning over bed, prolong standing, frequent body movement, holding equipment for longer period under time constrain and considerable stress.[5,7] If the person is obese, further load is increased on lumbar spine specially while working with poor posture and ergonomics. Body Mass Index is an index to categorize people according to their weight and height ratio. This will help medical practitioner learn the impact of obesity in musculoskeletal problems.

Strenuous work and prolong standing with heavy weight can cause reduced muscle strength and endurance which may produce low back pain or abnormalities in the lumbar lordosis such as hyperlordosis or flat back.[8] Therefore, in this study, an attempt is made to address this issue. This study is evaluating the correlation of BMI with lumbar lordosis and lower back pain in nurses to increase the work efficiency in work place.

MATHODOLOGY

This cross sectional study was approved by Sumandeep Vidyapeeth Institutional Ethics Committee (SVIEC NO: SVIEC/ON/Phys/BNMPT21/D22025) and clinical Trial Registry India (CTRI NO: CTRI/2022/08/044568). After obtaining the approval, permission was sought from Nursing superintendent of Dhiraj General Hospital SVDU to conduct a study on their nursing staff. After getting permission, nurses from various departments were identified. All the nurses were explained about the study. Inclusion criteria were age between 25-60 years, minimum experience of at least 1 year in this profession, both genders, nurses from Dhiraj General Hospital, SVDU. Exclusion criteria were history of back surgery, spinal deformities, recent lower extremity injuries or any neurological condition, pregnant women. Participants were asked to sign a written informed consent form (Annexure I) and Participant information sheet (Annexure II) was given to all participants. All Subjects were assessed in detail (Annexure III). Those subjects who were recruited for the study, their height and weight were measured and their lumbar lordosis was measured by flexible ruler and if there were back pain present then score was given by Numerical pain rating scale-NPRS.[9]

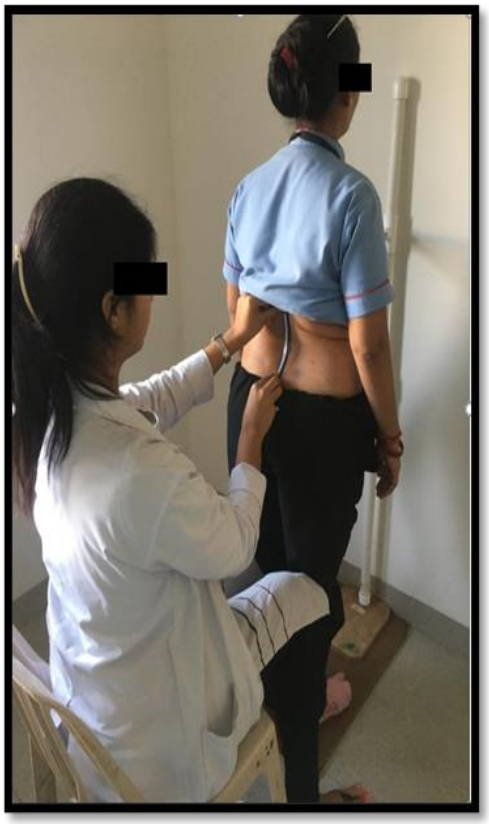

Figure 1: Measuring LL in standing position with flexible rule

RESULT

All the statistical analysis was analyzed with SPSS (statistical package for social science) version 16 software. Mean, standard deviation (SD) and ranges were calculated and included in descriptive statistics. Odds ratio was found for BMI and lumbar lordosis angle in nurses with and without LBP.

Reference value of lumbar lordosis:

For men normal value taken as $43.0^{o}\pm7^{o}$ so, $< 36^{o}$ considered as hypolordosis and $> 50^{o}$ considered as hyperlordosis.

For female normal value taken as $49.5^{o}\pm10.7^{o}$ so, $< 38.8^{o}$ considered as hypolordosis and $> 60.2^{o}$ considered as hyperlordosis.

Table 1: Descriptive statistics of age, BMI and lumbar lordosis angle in nurses

		N	**Mean**	**S.D.**	**Range**
Age	Total nurses	120	32.79	7.94	25 – 58
	Nurses with back pain	61	35.18	8.03	25 – 54
	Nurses w/o back pain		30.32	7.11	25 – 58

		59			
BMI	Total nurses	120	23.07	4.84	15 – 34.7
	Nurses with back pain	61	24.21	4.70	16 – 34.7
	Nurses w/o back pain	59	21.90	4.74	15 – 33.7
Lumbar lordosis angle	Total nurses	120	52.12	14.49	18.28 –94.96
	Nurses with back pain	61	55.46	10.93	29.6 – 81.2
	Nurses w/o back pain	59	48.66	16.84	18.28 –94.96

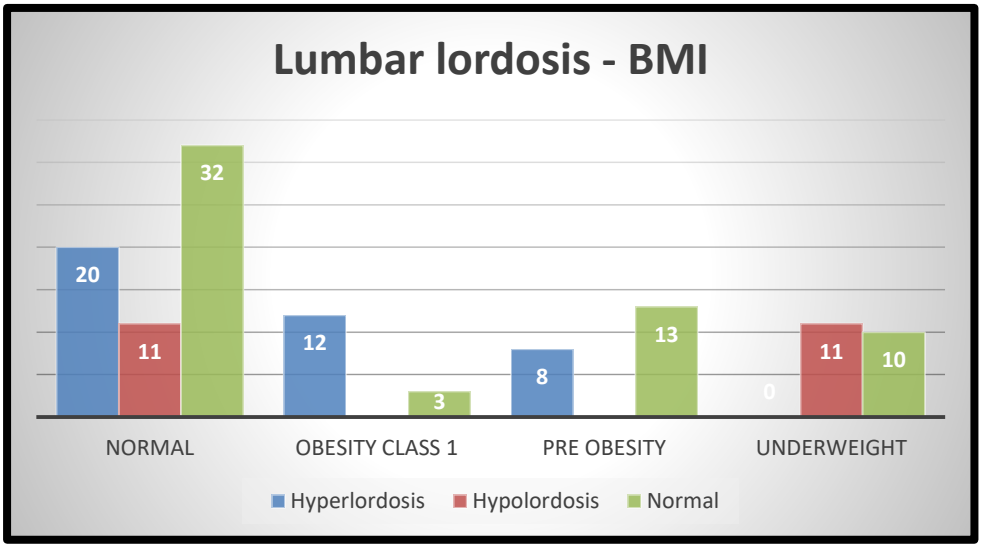

Figure 2: Distribution of lumbar lordosis and BMI

Table 2: Association of BMI with lumbar lordosis and LBP

Test variable	**Chi-Square value**	P-value
Lumbar lordosis - BMI	40.268	< 0.001*
Lower back pain - BMI	8.299	0.04*

*Shows significant result at 0.05 level

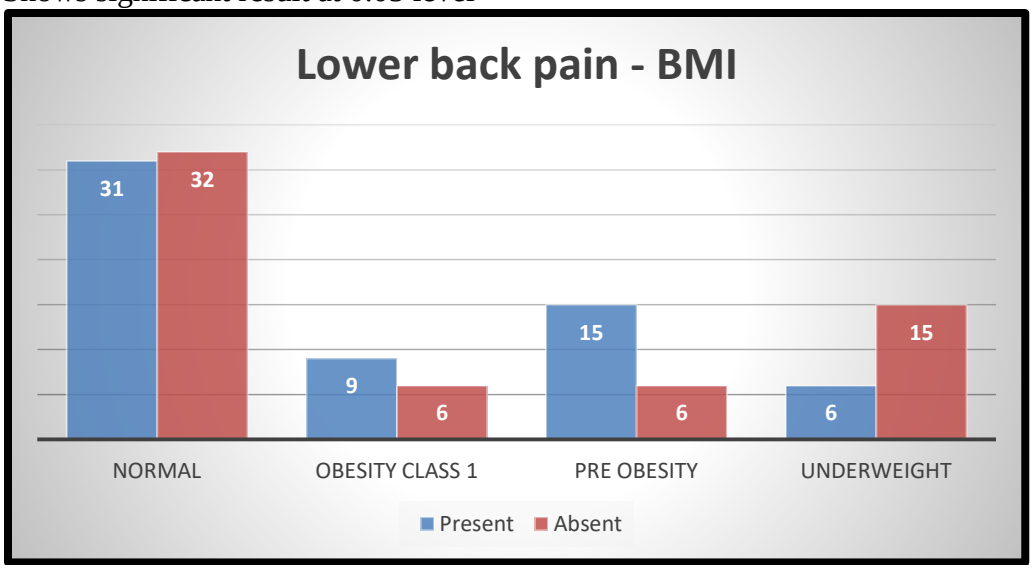

Figure 3: Distribution of BMI and Lower back pain

Table 3: Odds ratio for BMI in nurses with lower back pain.

Factors	**Nurses with Lower Back Pain/ Total Nurses in the group**	**Odds Ratio (95% CI)**	**P-value**
BMI	Normal (31 / 63)	Ref	-
	Underweight (6 /21)	0.41[0.142 , 1.201]	0.05224
	Pre Obesity (15 /21)	2.58 [0.887 , 7.507]	0.040924
	Obesity Class - 1 (9 / 15)	1.54 [0.493 , 4.866]	0.227109

DISCUSSION

In the present study, the aim was to measure the lumbar lordosis angle in nurses and to see the correlation between the lumbar lordosis and low back pain.

In this present study we found that 20 nurses having hyperlordosis and 11 having hypolordosis out of 63 nurses those who were fall in category of normal BMI. Whereas, 12 nurses were in group of hyperlordosis, only 3 having normal lumbar curvature and none of nurse having hypolordosis in group of obesity class-1 BMI. Which means as BMI increases, curvature of lumbar spine also increases. However, in pre obese group there were only 8 and 13 nurses fall in hyperlordosis and normal lumbar lordosis respectively. Overall, there was a significant association between BMI and lumbar lordosis (Table 2). Study of Wendra et al (2021) is also in support with this current study. They used caliper to measured lumbar lordosis. They found mean depth of lumbar lordosis was 60.1 mm with a very strong correlation r = 0.843 between BMI of obesity and lumbar lordosis. According to the authors, obesity alters the axis of gravity so that axial loads only fall on the vertebral column which also alters the structure of the vertebral column. There are also chances of pelvis to move in a ventral direction which leads to weakness of the gluteal muscles and contraction of the para spinous muscle that aggravates lumbar lordosis.[10] Mi-Yeon Song et al (2004) reported that there was a significant association between BMI and lumbar lordosis in obese premenopausal Korean females. According to their theory, body shape is determined by body weight and height. It's probably because of altered body shape brought on by obesity will have an impact on both mechanical structure and a variety of musculoskeletal problems.[11]

Masataka Tatsumi et al (2019) reported that there was not any relationship between sagittal alignment and LBP in Tanzania. They infer that thickening of the tissue (obesity) play an important role to measure lumbar lordosis. Because, due to the thickness of the tissue might not give correct recording of the vertebral curvature by spinal mouse in obese participants.[12]

In this present study, we also found that there is a significant association between lower back pain and BMI (Table 3). Mean BMI value for back pain is 24.21and without back pain is 21.90 (Table 1). When BMI is increased, there are higher chances of low back pain. Rahman Shiri et al (2009) compared obesity and prevalence of low back pain in non-overweight people. They found that there was significant association between obesity and low back pain (OR- 1.33) in the past 12 months. Compared with non-overweight people, overweight people had a higher incidence of low back pain but a lower incidence of low back pain compared with obese people.In the present study, pre obese nurses had 2.58 times higher chances of lower back pain compared to normal weight nurses. However, obese nurses also have 1.54 times higher chances of lower back pain compared to normal weight nurses (Table 4). The possible mechanism for this association could be due to the higher BMI as it raises the mechanical load on spinal column which may increase compressive or shear force on the structure of the lumbar spine during performing task and can give LBP.[13] Rebeca Saludes et al (2022) reveal in study that there was a twice risk of low back pain (OR- 2.172) in people with abdominal obesity than those without abdominal obesity. The connection between excess weight and nonspecific back ache is explained by the effects of mechanical stress. The biomechanical force that the weight of the abdomen imposes on the lower region of the spine may be the cause of the association between abdominal obesity and low back pain.[14]

CONCLUSION

The significant difference was found between BMI and lumbar lordosis in present study. The study also found significant association between pre obesity group and low back pain.

Hence, the study concludes that obesity plays a role in lumbar curvature abnormality and having back pain in nursing population. So, BMI can also be taken into consideration while assessing back pain in nurses.

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