Correlation Between Obesity and the Depth of Lumbar Lordosis in Obesity-Typed Women in Internal Medicine Clinic Dustira Military Hospital Cimahi

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Abstract—Obesity is one of the health problems in Indonesia. According to Indonesia's Research Data Institute in 2013, the prevalence of obesity in Indonesia is greater in women and the age group of 50–54 years old. Obesity is one of the risk factors of various diseases, one of them is lumbar lordosis because of the change in a person's center of gravity. Lumbar lordosis is also one of the predisposing factors of low back pain. According to this situation, this research is focusing on the correlation between the depth of lumbar lordosis and obesity-typed women in the Internal Medicine Clinic, Dustira Military Hospital. This study is an analytical study using a cross-sectional approach. The sample size is 40 women of 40–50 years old with the BMI category is obese. This sample is taken using consecutive sampling. Data were analyzed descriptively and statistically using Spearman correlation. The result shows that there is a significant correlation between the depth of lumbar lordosis and obesity $(r=0,843, p=<0,001)$

Keywords—depth of lumbar lordosis, lumbar lordosis, obesity

I. INTRODUCTION

Obesity is a condition where there is an accumulation of excess body fat so that a person's body weight is above normal as a result of an imbalance between the energy from the incoming food and the energy used by the body. Obesity involves a variety of factors including genetics, metabolism, and lifestyle. On the other hand, technological advances that provide convenience in various ways can result in changes in daily lifestyle so that physical activity carried out is reduced. Obesity has become one of a major health problem worldwide [1,2].

According to 2014 WHO data, more than 1.9 billion adult population aged 18 years and over are overweight and an estimated 600 million adults are obese. About 13% of the world's adult population (11% men and 15% women) are obese and 39% of adults 18 years and over (38% men and 40% women) are overweight. According to Riskesdas 2013 data, the prevalence of obesity in Indonesia is increasing from year to year. Turns out that obesity is more commonly found in women than men. Obesity in women appears from the age of 20 years, and peaks in the 50–54 year age group, whereas in men obesity begins to appear at the age of 25 years, and similarly in women, peaks in the 50–54 year age group. This proves that obesity, both in women and in men, has to be watched out for since adolescence [3,4].

Obesity increases the risk of various diseases, one of which is a musculoskeletal disease, which is low back pain. In someone with obesity, lumbar lordosis occurs, which is a risk factor for low back pain. Research by Sorensen CJ et al., regarding the relationship between lumbar lordosis and low back pain, shows that there are significant differences in lumbar lordosis between patients who experience low back pain and those who do not. This is caused by excessive compression of the curvature of the lumbar vertebrae, causing muscle tension that will cause pain [5-7].

Lumbar lordosis is an abnormally enlarged arch of the lumbar vertebrae. Lumbar lordosis can be caused by various factors, one of which is obesity. Obesity causes structural changes of the vertebral column which in turn will cause lumbar lordosis. Research by Widodo and Wahyuni states that there is a positive correlation between obesity and an increase in the lumbar curve and the largest increase occurs in the female gender. Research Mi-Yeon Seok et al. regarding the correlation between obesity and lumbar lordosis in obese women who are menopausal, also shows that there is a correlation between obesity and lumbar lordosis [5,8].

Based on this, the researchers wanted to examine the correlation between the depth of lumbar lordosis and BMI of obese women. This is due to the many diseases that develop due to obesity, one of which is low back pain, while lumbar lordosis is one of the risks of low back pain. The study will be

conducted on a group of women because the prevalence of obesity is more in women aged 40-50 years. The measurement of the depth of lumbar lordosis was carried out using the subject standing upright on the wall, then the subject would be palpated by the spinous process of the seventh cervical vertebrae and sacral horn. Then, we will observe the lower back that has lumbar lordosis and will be measured using a caliper.

II. METHODS

This study was followed by 40 research subjects who met the inclusion criteria. The inclusion criteria of this study were women aged 40-50 years with a body mass index of ≥25 kg/m2, while the exclusion criteria were those with spinal disorders, pregnant women, and menopausal women. This research is an analytical study with a type of correlation test with a cross-sectional approach. Sampling was done by a consecutive sampling technique. The research instruments were a calibrated ruler, calibrated calipers, calibrated weight scales. Research subjects will be given informed consent, measurements of body weight, height, BMI, and depth of lumbar lordosis. Measurement of the depth of lumbar lordosis was carried out using the subject standing upright on the wall, then the subject would be palpated by the spinous process of the seventh cervical vertebrae and sacral horn. Furthermore, we will observe the lower back that has lumbar lordosis and will be measured using a caliper. The results of the research will be validated using the Shapiro-Wilk test, then a correlation analysis will be carried out using the Spearman correlation analysis.

III. RESULTS AND DISCUSSION

In this study, the overall mean depth of lumbar lordosis was 60.1 mm. The depth of lumbar lordosis is in the range of 43.1–85.7 mm. (table 1).

TABLE I.   FREQUENCY DISTRIBUTION OF GENERAL CHARACTERISTICS OF RESEARCH SUBJECTS BY GENDER

Variable	Mean	Deviation St.	Median	Range
Depth of Lumbal Lordosis (mm)	60.1	9.2	58.6	43.1 – 85.7

Based on table 2, the correlation value (r) between BMI of obesity and lumbar lordosis is 0.843, which means it is a very strong correlation. The results of this study are in line with the theory that obesity causes changes in the structure of the vertebral column which will later lead to lumbar lordosis. Obesity causes changes in the axis of gravity so that axial loads only fall on the vertebral column. Obesity also causes weakness of the gluteal muscles which causes the pelvis to move in a ventral direction which will increase the angle of inclination of the pelvis and result in lumbar lordosis. In obesity, there is also shortening of the paravertebral muscles due to continuous contraction to maintain an upright posture so that the curve is pulled backward and adds to the lordosis

curve. M. iliopsoas can also shorten, or contract, causing the lumbosacral angle to increase and forcing the lumbar into more lordosis. The M. rectus femoris will shorten and when exercised with extension movements, the pelvis will pull the pelvis towards the ventral so that the inclination angle of the pelvis increases, resulting in lordosis. With the shortening of the muscles mentioned above, there will be a decrease in the range of motion (ROM) in hip flexion and trunk flexor so that it will cause more lumbar lordosis [8-10].

TABLE II.   CORRELATION OF BODY MASS INDEX OBESITY TO LUMBAR LORDOSIS

Variable	Correlation Coefficient (r)	p score
Depth of Lumbal Lordosis (mm)	0.843	0.000*

*The correlation is significant at a value of 0.01

In a study by Widodo and Wahyuni, 2008, regarding the correlation between obesity and an increase in the lumbar curve of the sagittal plane, the study was conducted on 15 female and male subjects with overweight to obese BMI by calculating the depth of lumbar lordosis using a ruler and plumb line. The study states that there is a correlation between obesity and obesity with an increase in the lumbar curve. The correlation value in the study was 0.617, which indicates a strong correlation. In this study, it was found that the highest lumbar lordosis depth was the obesity BMI with the lordosis depth value of 54 mm. This happens because obesity will change the line of gravity so that axial loads will only be received by the vertebral column, especially the lumbar vertebrae. The muscular arrangement of the torso is also weakened, especially in the ventrolateral abdominal muscles. There is a difference in the correlation value between this study and this study, presumably because this study only focused on BMI in the obesity category. The study also states that the depth of lumbar lordosis is more common in women, so this study also focuses more on women.

In the study of Mi-Yeon Seok et al., 2004, regarding the correlation between obesity and lumbar lordosis in obese women who are menopausal, the study was conducted on 44 female subjects with an average BMI of 31.53 ± 3.82 kg / m2 through x-ray examination. Lumbal Lordotic Angle (LLA), Ferguson Angle (FA), and Lumbal Gravity Line (LGL) were taken in a lateral ray vertebral column. The study also showed a correlation between obesity and lumbar lordosis, with a correlation value of 0.381, which means a low correlation. The study also states that BMI calculation is one of the methods that can be used to predict lumbar lordosis. This occurs due to changes in the body axis due to increased axial compression loads due to obesity.

IV. CONCLUSION

Based on the results of research conducted by researchers, it can be concluded that mean depth of lumbar lordosis in obese women in the Internal Medicine Clinic of Dustira Military

Hospital is 60.1 mm. There is a positive correlation between obese women and the depth of lumbar lordosis, with a very strong correlation strength.

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