Research Article

The role of aging, body mass index and estrogen on symptomatic lumbar osteoarthritis in post-menopausal women

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ABSTRACT

Background: Low back pain is a common complaint which is always found in old age due to degeneration process. Degeneration process of spine, especially in the lumbar region is called lumbar osteoarthritis (OA). Various factors are thought to be the cause of lumbar OA, including primarily due to hormonal changes of estrogen and increase of age and body mass index in postmenopausal women.

Methods: The purpose of this study is to determine the role of hormonal changes pathogenesis in lumbar osteoarthritis in postmenopausal women and its correlation with age and body mass index. Cross sectional analytic method had been conducted to determine the role of age, body mass index and estrogen for lumbar OA in postmenopausal women. The study was conducted in Sanglah General Hospital from October 2015 until March 2016 by anthropometric measures and blood samples.

Results: From 196 samples showed that the estrogen deficiency in postmenopausal women have a correlation with the symptomatic lumbar OA (r=0.252, p = 0.000). While age and the body mass index in postmenopausal women has a correlation with symptomatic lumbar OA (r = 0.150 and 0.198, p = 0.000 and 0.013).

Conclusions: The aging process, body mass index and estrogen deficiency correlated with the symptomatic OA lumbar in post-menopausal women.

Keywords: Symptomatic lumbar OA, Estrogen, Age, Body mass index

INTRODUCTION

Back pain is a common complaint found in old age because of the process of degeneration. The process of degeneration of the spine, especially the lumbar area is called osteoarthritis (OA) of the lumbar. The prevalence of osteoarthritis at the age of 50 years both in men and women alike. Meanwhile, at the age of 50 years the prevalence is increasing in women.[1]

However, until now the cause is unknown. Various factors are thought to be the cause of lower back pain, such as hormonal changes that often occur in older women, including changes in the hormone estrogen.[1]

There is an estrogen deficiency found in menopausal women. Menopause is the cessation of menstruation due to reduced production of the female hormone estrogen.[2] The process in the body organs will undergo changes with age. Besides the effect on mechanical load, the cartilage will getting thinner and cause damage, thus the joints become stiff and painful.[1,2] Kellgren and Moore stated that menopausal arthritis with Heberden nodes in women will characterized by symptoms of osteoarthritis on various joints i.e. the hands, knees and spine called primary generalized osteoarthritis.[1,3]

The process of degeneration of the spine are classified as osteoarthritis which is characterized by a narrowing of the intervertebral disc, the formation of osteophytes and

degeneration of the facet joint.[4-6] These three components are familiar with the three joint complex interplay in lumbar osteoarthritis. There are 3 clinical signs and stages of the degeneration of spinal biomechanics i.e. disc dysfunctions, instability and stability.[7] Spinal degeneration include disc degeneration (DD), facet joint osteoarthritis (OA Facet joint), changes in components of muscle and ligament degeneration.[5-7]

Hormonal changes that occur during menopause will affect the occurrence of osteoarthritis. In postmenopausal women, the use of HRT (Hormone Replacement Therapy) lowered radiological progression. Estrogen stimulates proteoglycan changes in cartilage, either directly or indirectly through cytokines.[8,9]

Estrogen directly affects the tissue by estrogen receptors on human articular chondrocytes and indirectly by secondary messenger.[10] Estrogen affects the levels of cytokines in vitro and in vivo. Identification over two estrogen receptors ERα and ERβ on chondrocyte prove that cartilage is sensitive to estrogen.[11] Several in vivo and in vitro studies also showed that chondrocytes respond to estrogen and affect its metabolism.[11,12]

METHODS

The study was conducted from October 2015 until March 2016 at the Sanglah General Hospital Denpasar Bali. The aim of this study is to prove the correlation of age, body mass index and hormonal changes with symptomatic lumbar osteoarthritis in postmenopausal women.

This study is a cross sectional analytic design with the sample are post-menopausal women population with consecutive sampling method.

One hundred and ninety six post-menopausal women from the population were taken the anthropometry measure i.e. body weight and height to gain the body mass index. The blood sample also taken in order to check the estrogen level. After that, we performed x-ray of lumbosacral AP, lateral and oblique view to determine any lumbar OA appearance. Those who has already done x ray, were asked about back pain complaint in spite of their lumbar OA.

The obtained data are presented as mean ± standard deviation (SD) of age, body mass index and estrogen level. The correlation between the variables was analyzed with Spearman correlation test and Chi Square test also performed for statistical significant of examined variables i.e. age, body mass index and oestrogen level. The correlation was assumed to be significant at p<0.05.

RESULTS

This study using 196 samples with the lowest age distribution was 41 years old and the highest was 84 years old with an average age of 59.68 years. While based on body mass index, obtained a total of 9 samples were underweight (4.6%), 82 samples were normal (42.1%) and 104 samples were overweight (53.3%). In this study there were 189 samples (96.4%) that experienced estrogen deficiency, 186 samples (94.9%) were experience lumbar, and 106 samples (54.1%) were symptomatic with back pain. The Figure 1 and fig. 2 showed the distribution of symptomatic lumbar OA over the age, body mass index, and estrogen level.
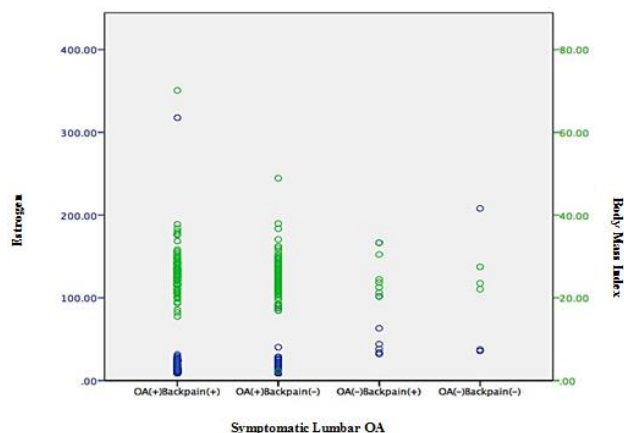
Table 1: Sample distribution and correlation between age, body mass index and estrogen level with symptomatic lumbar OA.

Variables	OA lumbar (+) symptom of back pain (+)	OA lumbar (+) symptom of back pain (-)	OA lumbar (-) symptom of back pain (+)	OA lumbar (-) symptom of back pain (-)
Age (Years)				
<51	4 (30, 8 %)	5 (38, 5 %)	2 (15, 4 %)	2 (15, 4%)
51 - 55	21 (45, 7 %)	21 (45, 7 %)	4 (8, 7 %)	0 (0, 0%)
56 – 61	35 (53, 0 %)	30 (45, 5 %)	1 (1, 5 %)	0 (0, 0 %)
>61	39 (54, 9 %)	31 (43, 7 %)	0 (0, 0 %)	1 (1, 4 %)
	r = 0,150 p = 0,000			
Body mass index (kg/m^2)				
Underweight	3 (33, 3 %)	6 (66, 7 %)	0 (0,0 %)	0 (0, 0 %)
Normal	34 (41, 5 %)	41 (50, 0 %)	5 (6,1 %)	2 (2, 4 %)
Overweight	62 (59, 6 %)	39 (37, 5 %)	2 (1,9 %)	1 (1, 0 %)
	r = 0,198 p=0,013			
Estrogen level (pg/mL)				
< = 40	98 (51, 9 %)	86 (45, 5%)	3 (1, 6%)	2 (1, 1 %)
> 40	1 (14, 3 %)	1 (14, 3 %)	4 (57, 1 %)	1 (14, 3%)
	r = 0,252 p=0,000			

Figure 1: Body mass index and estrogen distribution over the symptomatic lumbar OA.

Based on the results of Chi-Square and correlation test, there was a significant relationship between levels of estrogen with symptomatic lumbar OA. It was shown from the results of Chi-Square test with p = 0.000 (p <0.05), and the coefficient r = 0,252 which indicates the correlation of estrogen level with the incidence of symptomatic lumbar OA. While age and the body mass index in postmenopausal women has a correlation with symptomatic lumbar OA (r = 0,150 and 0,198 p = 0,000 and 0,13) which showed correlation between the incidence of symptomatic lumbar OA with age and body mass index as seen on Table 1.

These results indicate that there was statistically significant relationship between age, body mass index and estrogen level with symptomatic lumbar osteoarthritis.
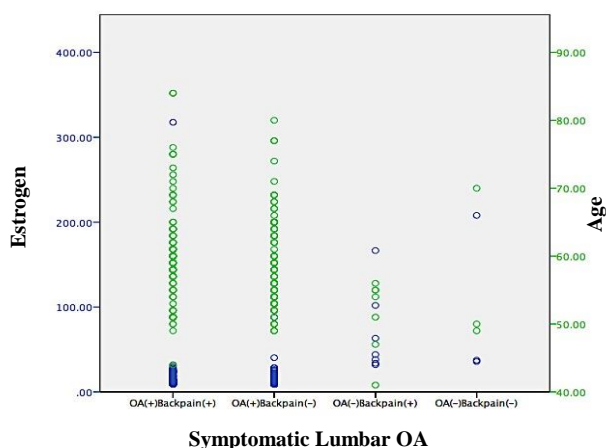

Figure 2: Age and estrogen distribution over the symptomatic lumbar OA.

DISCUSSION

The relationship between age, body mass index and estrogen levels with symptomatic lumbar OA was done by analysing the age, body mass index and levels of estrogen and linked it to the presence or absence symptomatic lumbar OA.

The results of this study were consistent with the study conducted by Richette, it was noted that the role of estrogens in osteoarthritis was occurred after the cessation of menstruation.[10] This is supported by epidemiological data that as the estrogen level decline, the incidence of osteoarthritis increase over the age above 50 years.[5,13]

Lumbar osteoarthritis is the degeneration of cartilage which involves three joint complexes that is characterized by narrowing of the lumbar intervertebral disc, vertebral osteophytes formation and occurrence of osteoarthritis in the facet joints. These pathological appearance can be result from mechanical stress loads due to aging, weight gain and possible hormonal changes that lead to cartilage thinning as well as inflammatory process.[14,16] Study of the incidence of osteoarthritis in postmenopausal women with and without hormone replacement therapy (HRT) showed strong evidence of the benefits of estrogen on osteoarthritis. Identification of the two estrogen receptors ERα and ERβ on chondrocyte prove that cartilage is sensitive to estrogen.[11] Several in vivo and in vitro studies also showed that chondrocytes respond to estrogen and its metabolism.[2,15]

Lower back pain in postmenopausal women is the most common clinical manifestation of the degeneration process over the spine main areas/segments that are most mobile lumbar segments.[16,17]

CONCLUSION

From the data analysis that had been done in this study, it can be concluded that aging, body mass index and estrogen levels were significantly correlated with the incidence of symptomatic lumbar OA. The role of these factors needs to be controlled in order to rule out other risk factors of symptomatic lumbar OA to gain more accurate result.

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