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RELATIONSHIP BETWEEN RISK FACTORS AND MODIC CHANGES TYPE ON MAGNETIC RESONANCE IMAGING OF LUMBAR VERTEBRAE IN LOW BACK PAIN PATIENTS AT H. ADAM MALIK HOSPITAL MEDAN

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Abstract

Objective: *AnalyzeThe relationship between risk factors and modic change type on MRI of the lumbar vertebrae in low back pain patients at the H. Adam Malik General Hospital, Medan.* ***Method:*** *Cross sectional research that connectsmodic change type with risk factors and patient characteristics based on lumbar MRI examination in 120 patients diagnosed withLow back pain in 2023 that meet the inclusion and exclusion criteria. Modic Change Type is assessed based on the changes in Magnetic Resonance Imaging signals proposed by modic et al.* ***Results:*** *Of the 120 patients, there were more female subjects (64.2%) than male subjects (35.8%) with an average age of 58.96 years (the youngest was 40 years old and the oldest was 82 years old). Most subjects showed modic change (93.3%) with the most common type being type II (81.3%) and the most common location being L5 and L4. Most subjects also had disc herniation (72.5%) and disc degeneration (84.2%). This study did not find any relationship between modic change and gender (p=0.455), age (p=0.663), work history (p=0.671), disc herniation (p=0.213) and disc degeneration (p=1.000) in low back pain patients. From this study, there was no relationship between modic change type and gender (p=0.868), age (p=0.285), work history (p=0.130), disc herniation (p=0.510) and disc degeneration (p=0.435) in low back pain patients. From this study, there was no relationship between modic change location (L1, L2, L3, L4, L5, S1) and modic change type in low back pain patients with p>0.05.* ***Conclusion:*** *There is no significant relationshipbetween Risk Factors for Modic Changes Type in Magnetic Resonance Imaging of the Lumbar Vertebra in Low Back Pain Patients at H. Adam Malik General Hospital, Medan.*

Keywords:*Modic Changes Type, Low Back Pain, MRI Lumbar*

INTRODUCTION

Low back pain (LBP) is a common health problem with serious socioeconomic impacts. Despite the high prevalence of LBP, many aspects of the pathophysiology of LBP remain unknown. The most common symptom is low back pain radiating to the lower leg, especially when bending forward. The pain is caused by compression of the nerve bundles in this area. Generally, this condition is often associated with acute mechanical trauma, but it can also be an accumulation of several traumas over a long period of time over a certain period of time.[1,2]

Magnetic resonance imaging (MRI) is the primary modality for determining the cause of back pain. MRI scans are excellent at detecting disc herniation, with a sensitivity and specificity of approximately 96-97%. MRI is the best method for assessing soft tissue morphology without the use of radiation. Observe soft tissue morphology without the use of radiation and make cross-sections in different cutting directions without changing the patient's position. In addition to its excellent ability to detect intervertebral disc herniation, MRI is the only method that can detect Modic end plate changes, which are a risk factor for the development of low back pain.[3] Modic changes (MC) in the vertebral body were first described by Modic and Steinberg in 1988. These changes are described as changes in signal intensity in the vertebral body end plates and bone marrow and can be seen on MRI. Modic changes end plates are signal changes in the vertebral body, and are classified into the following three types based on differences in signal changes and pathophysiology. Type I (bone

marrow edema), Type II (fatty infiltration), and Type III (subchondral sclerosis). In some journals, these modic changes are associated with low back pain syndrome, especially MC type I. However, many people also report MC findings without pain symptoms.[4.5]

Modic endplate changes are a relatively common pathology, often accompanied by other pathological processes such as low back pain and other pathological processes, disc degeneration, but the pathology of MC itself is still unknown and there has been no study discussing the relationship between all types of Modic changes, one of the most common causes of low back pain. Therefore, this study aims to determine the relationship between low back pain findings and the image of modic changes in the end plate of the lumbar vertebral corpus in an observational analytical descriptive manner using the results of lumbosacral MRI imaging at the Radiology Department of the H. Adam Malik General Hospital, Medan. It is hoped that this study can also be initial data to help colleagues, especially related departments, in therapy and establishing the right diagnosis for patients with low back pain.[6.7]

METHOD

This study is an analytical study using a cross-sectional design that connects and determines the characteristics of patients undergoing lumbar MRI and the relationship between clinical findings of low back pain patients with modic changes type on lumbar MRI at H. Adam Malik General Hospital Medan and previous years of observation, until the minimum sample size is met.

The population of this study was low back pain patients who underwent lumbar MRI examination at H. Adam Malik General Hospital, Medan from January 2022 to June 2023. The study sample was a population that met the inclusion and exclusion criteria. The inclusion criteria of this study were: adult patients aged >18 years, patients who underwent MRI examination at H. Adam Malik General Hospital, Medan. The exclusion criteria in this study were: Lumbar MRI results of patients with a history of vertebral surgery, vertebral tumors, congenital abnormalities, and vertebral fractures involving the Th 12 vertebra to the lumbar vertebra. The presence of artifacts in the MRI examination results that interfere with the interpretation of modic changes in the lumbar vertebral corpus. Incomplete medical record data. and patients with incomplete, missing, or inaccessible medical record data.

Data analysis was performed using statistical software. Subjects' clinical and demographic data including age and gender will be displayed in percentage values and presented in tabular form. Then an inferential analysis was performed to analyze the relationship between risk factors and Modic Changes Type using the Chi-Square test or Fisher Exact test.

RESULTS

The research subjects were taken based on medical record data for the period 2022-2023 at H. Adam Malik General Hospital, Medan. There were 120 research subject data that met the inclusion and exclusion criteria. Demographic data of the subjects can be seen in Table 1. The majority of subjects were female, totaling 77 people (64.2%). The average age of the subjects was 58.95 years with the youngest being 40 years old and the oldest being 82 years old. Most of the subjects were in the 50-59 year age group, totaling 46 people (38.3%). Based on work history, 95 people (79.2%) had a high risk of developing LBP.

Tabel 1. Demographic Characteristics of Research Subjects

Demographic Characteristics	**n = 120**
Gender, n (%)	
Man	43 (35.8)
Woman	77 (64.2)
Age, years	
Mean (SD)	58.95 (8.74)
Median (min – Max)	58.5 (40 – 82)

40 – 49 years	17 (14.2)
50 – 59 years	46 (38.3)
60 – 69 years	42 (35)
70 – 79 years	13 (10.8)
≥ 80 years	2 (1.7)
Employment History, n (%)	
High Risk	95 (79.2)
Low Risk/No Risk	25 (20.8)

Based on 120 samples that have become research subjects, MRI data examination was conducted and displayed the frequency distribution of clinical characteristics of LBP patients. Characteristic data are seen in Table 2. It is known that the most common main complaint is back pain radiating to the legs as many as 59 people (49.2%). A total of 112 subjects (93.3%) showed mordic change. Based on the type of modic change, the most is type II as many as 91 people (81.3%). The location of the most modic change is L5 as many as 50 people (44.6%) and L4 as many as 42 people (37.5%). Disc herniation was found in 87 people (72.5%) and disc degeneration in 101 people (84.2%) patients.

Table 2. Clinical Characteristics of Research Subjects

Clinical Characteristics	**n = 120**
Chief Complaint, n (%)	
Weak lower limbs	1 (0.8)
Lower back pain	6 (5)
Lower back pain	2 (1.7)
Lower back pain radiating to the legs	59 (49.2)
Lower back pain	48 (40)
Radiating lower back pain	4 (3,3)
Modal Change, n (%)	
There is	112 (93.3)
There isn't any	8 (6,7)
Modic Change Type, n (%)	
I	11 (9.8)
II	91 (81.3)
III	8 (7.1)
II and III	2 (1.8)
Modic Change Location, n (%)	
L1	4 (3.6)
L2	8 (7.1)
L3	29 (25.9)
L4	42 (37.5)
L5	50 (44.6)
S1	7 (6.3)
Disc Herniation, n (%)	
There is	87 (72.5)
There isn't any	33 (27.5)
Disc Degeneration, n (%)	
There is	101 (84.2)
There isn't any	19 (15.8)

An analysis of the relationship between gender, age, work history, disc herniation and disc degeneration with modic change in LBP patients was conducted. The results of the analysis can be seen in Table 3. Of the 43 male patients, there were 39 (90.7%) with modic change. Meanwhile, of the

77 female patients, there were 73 (94.8%) with modic change. Using the Fischer's Exact test, it was shown that there was no significant relationship between gender and modic change (p = 0.455). Based on age, the largest proportion of LBP patients with modic change were patients aged ≥ 80 years, which was 2 people (100%). The second largest proportion was patients aged 60-69 years as much as 97.6%, followed by patients aged 70-79 years as much as 92.3% and the least was patients aged 40-49 years as much as 88.2%). Using the Kruskal Wallis test showed that there was no significant relationship between age and modic change (p = 0.663). Of the 95 patients with high-risk jobs, there were 89 people (93.7%) with modic change. Meanwhile, of the 25 patients with low/no risk, there were 23 people (92%) with modic change. Using the Fischer's Exact test, it was shown that there was no significant relationship between work history and modic change (p = 0.671).

Of the 87 patients with disc herniation, 83 (95.4%) had modic change. Meanwhile, of the 33 patients who did not have disc herniation, 23 (92%) had modic change. Using the Fischer's Exact test, it was shown that there was no significant relationship between disc herniation and modic change (p=0.213). Of the 101 patients with disc degeneration, 94 (93.1%) had modic change. Meanwhile, of the 19 patients without disc degeneration, 18 (94.7%) had modic change. Using the Fischer's Exact test, it was shown that there was no significant relationship between disc degeneration and modic change (p = 1,000).

Table 3. Relationship of Gender, Age, Work History, Disc Herniation and Disc Degeneration with Modic Change in Low Back Pain Patients

Variables	*Modic Change*		p
	Yes	No	
Gender, n (%)			
Man	39 (90.7)	4 (9.3)	0.455a
Woman	73 (94.8)	4 (5.2)	
Age, n (%)			
40 – 49 years	15 (88.2)	2 (11.8)	0.663b
50 – 59 years	42 (91.3)	4 (8.7)	
60 – 69 years	41 (97.6)	1 (2.4)	
70 – 79 years	12 (92.3)	1 (7.7)	
≥ 80 years	2 (100)	0	
Employment History, n (%)			
High Risk	89 (93.7)	6 (6.3)	0.671a
Low Risk/No Risk	23 (92)	2 (8)	
Disc Herniation, n (%)			
There is	83 (95.4)	4 (4.6)	0.213a
There isn't any	29 (87.9)	4 (12.1)	
Disc Degeneration, n (%)			
There is	94 (93.1)	7 (6.9)	1,000a
There isn't any	18 (94.7)	1 (5.3)	

An analysis of the relationship between gender, age, work history, disc herniation and disc degeneration with the type of modic change in LBP patients was conducted. The results can be seen in Table 4. Of the 73 female patients, there were 60 people (82.2%) with type II modic change while of the 39 male patients, there were 31 people (79.5%) with type II modic change. No significant relationship was found between gender and type of modic change (p = 0.868). Based on age, it appears that for each age category the largest proportion is patients with modic change type II. Using the Fischer's Exact test showed that there was no significant relationship between age and modic change type (p = 0.285).

Of the 89 patients with a high-risk work history, there were 73 people (82%) with type II modic change, while of the 23 patients with a low-risk/non-risk work history, there were 18 people

(78.3%) with type II modic change. No significant relationship was found between work history and modic change type (p=0.130). Of the 83 patients with disc herniation, there were 73 people (82%) with modic change type II, while of the 29 patients who did not have disc herniation, there were 26 people (89.7%) with modic change type II. There was no significant relationship between disc herniation and modic change type (p = 0.510).

Of the 94 patients with disc degeneration, there were 76 people (80.9%) with modic change type II, while of the 16 patients who did not have disc degeneration, there were 15 people (83.3%) with modic change type II. There was no significant relationship between disc degeneration and modic change type (p = 0.435).

Table 4. Relationship between Gender, Age, Occupational History, Disc Herniation and Disc Degeneration with Modic Change Type in Patients with Modic Changes Endplate.

Variables	Modic Change Type				p
	I	II	III	Mixed	
Gender, n (%)					
Woman	7 (9.6)	60 (82.2)	5 (6.8)	1 (1.4)	0.868a
Man	4 (10.3)	31 (79.5)	3 (7.7)	1 (2.6)	
Age, n (%)					
40 – 49 years	0	15 (100)	0	0	0.285b
50 – 59 years	4 (9.5)	35 (83.3)	2 (4.8)	1 (2.4)	
60 – 69 years	7 (17.1)	30 (73.2)	3 (7.3)	1 (2.4)	
70 – 79 years	0	9 (75)	3 (25)	0	
≥ 80 years	0	2 (100)	0	0	
Employment History, n (%)					
High Risk	7 (7.9)	73 (82)	7 (7.9)	2 (2,2)	0.130a
Low Risk/No Risk	4 (17.4)	18 (78.3)	1 (4.3)	0	
Disc Herniation, n (%)					
There is	10 (12)	65 (78.3)	7 (8.4)	1 (1,2)	0.510a
There isn't any	1 (3,4)	26 (89.7)	1 (3,4)	1 (3,4)	
Disc Degeneration, n (%)					
There is	10 (10.6)	76 (80.9)	8 (8.5)	0	0.435a
There isn't any	1 (5.6)	15 (83.3)	0	2 (11.1)	

Finally, we analyzed the relationship between modic change location and modic change type in LBP patients. The results can be seen in Table 5. Of the 4 patients with modic change location in L1, there were 3 people (75%) with modic change type II, while of the 108 patients not located in L1, there were 88 people (81.5%) with modic change type II. There was no significant relationship between modic change location in L1 and modic change type (p = 0.235). Of the 8 patients with modic change location in L2, there were 7 people (87.5%) with modic change type II, while of the 104 patients not located in L2, there were 84 people (80.8%) with modic change type II. There was no significant relationship between the location of modic change in L2 and the type of modic change (p = 0.374).

Of the 29 patients with modic change location at L3, there were 23 people (79.3%) with modic change type II, while of the 83 patients not located at L3, there were 68 people (81.9%) with modic change type II. There was no significant relationship between the location of modic change at L3 and the type of modic change (p = 0.062). Of the 42 patients with modic change location at L4, there were 32 people (76.2%) with modic change type II, while of the 70 patients not located at L4, there were 59 people (84.3%) with modic change type II. There was no significant relationship between the location of modic change at L4 and the type of modic change (p = 0.835).

Of the 50 patients with modic change location at L5, there were 41 people (82%) with modic change type II, while of the 62 patients not located at L5, there were 50 people (80.6%) with modic change type II. There was no significant relationship between the location of modic change at L5 and the type of modic change (p = 0.850). Of the 7 patients with modic change location in S1, there were

6 people (85.7%) with modic change type II, while of the 105 patients not located in S1, there were 85 people (81%) with modic change type II. There was no significant relationship between the location of modic change in S1 and the type of modic change (p = 0.401).

Table 5. Relationship between Modic Change Location and Modic Change Type in Low Back Pain Patients

Location *Modic Change*	Modic Change Type				p*
	I	II	III	Mixed	
L1, n (%)					
Yes	0	3 (75)	1 (25)	0	0.235
No	11 (10.2)	88 (81.5)	7 (6.5)	2 (1.9)	
L2, n (%)					
Yes	0	7 (87.5)	1 (12.5)	0	0.374
No	11 (10.6)	84 (80.8)	7 (6,7)	2 (1.9)	
L3, n (%)					
Yes	5 (17.2)	23 (79.3)	1 (3,4)	0	0.062
No	6 (7.2)	68 (81.9)	7 (8.4)	2 (2.4)	
L4, n (%)					
Yes	5 (11.9)	32 (76.2)	3 (7.1)	2 (4.8)	0.835
No	6 (8.6)	59 (84.3)	5 (7.1)	0	
L5, n (%)					
Yes	5 (10)	41 (82)	2 (4)	2 (4)	0.850
No	6 (9.7)	50 (80.6)	6 (9.7)	0	
S1, n (%)					
Yes	1 (14.3)	6 (85.7)	0	0	0.401
No	10 (9.5)	85 (81)	8 (7.6)	2 (1.9)	

DISCUSSION

This study involved 120 Low Back Pain patients who underwent lumbar MRI examination at H. Adam Malik General Hospital, Medan, from January 2022 to June 2023. All subjects met the inclusion and exclusion criteria of the study. The distribution of respondents based on the demographic characteristics of the research subjects shown in table 4.1 above shows that the data obtained showed that there were 77 female subjects (64.2%) more than male subjects, which were 43 (35.8%). The average age of the subjects was 58.95 years with the youngest being 40 years old and the oldest being 82 years old. Most of the subjects were in the 50-59 year age group, which amounted to 46 people (38.3%).

Physiologically, men's muscle strength is stronger than women's. Women's muscle strength is only about two-thirds of men's muscle strength.43 This is in accordance with Tawaka's research which states that women's muscles are smaller in size and their strength is only two-thirds (60%) of men's muscles, especially the muscles of the arms, back and legs. Previous studies have stated that women have a strong potential for LBP and are at twice the risk.44 Based on research conducted by Abdulbari Bener, et al., lower back pain is more common in women (67.7%) than in men (51.6%). The highest proportion of lower back pain is in the 45 to 55 age group in both sexes (37.6% and 36.4%, respectively). More than half of women with lower back pain are housewives.[8]

Generally, complaints on skeletal muscles begin to be felt at the age of 24-65 years.348 Complaints will continue to increase with age. This is because as humans get older, muscle strength and endurance begin to decline so that the risk of muscle complaints increases. There is a relationship between age, length of service, nutritional status and sitting work posture with complaints of lower back pain.[9] Research conducted by Andi S stated a significant relationship between age and low back pain complaints in batik craftsmen at Batik Semarang 16. At the age of 30 years, degeneration occurs in the form of tissue damage, replacement of tissue with scar tissue,

reduction of fluid. This causes the stability of bones and muscles to decrease. The older a person is, the higher the risk of that person experiencing decreased elasticity in the bones which triggers LBP.[10]

The same study was also conducted by Harwanti which showed that the factor proven to influence LBP in batik home industry workers in Sokaraja was age with a p value of 0.046. LBP complaints are rarely found in young age groups, this is related to several specific etiological factors that are more often found in older factors. In line with increasing age, bone degeneration will occur and this condition begins to occur when someone is 30 years old. 47 These results are also supported by a study of sifai where there is a relationship between age (p = 0.004) and length of service (p = 0.02) and complaints of lower back pain. [11]

Based on work history, 95 people (79.2%) have a high risk of developing LBP. This is in line with research conducted by Ambar Dani, et al., where the study stated that a work period of >10 years has a 3.2 times greater risk of experiencing low back pain compared to a work period of ≤10 years, an abnormal posture at work has a 2.5 times greater risk of potentially experiencing low back pain compared to a normal body posture, lifting a heavier load >5 kg has a 2.3 times greater risk of experiencing low back pain compared to lifting a weight <5 kg. The most dominant factor that influences low back pain together is the length of service, with a probability value of 68%.[12]

Based on the results of this study, the most common primary complaint found in the sample was back pain radiating to the legs in 59 people (49.2%). A total of 112 subjects (93.3%) showed mordic change. Based on the type of modic change, the most common was type II in 91 people (81.3%). The most common location of modic change was L5 in 50 people (44.6%) and L4 in 42 people (37.5%). Disc herniation was found in 87 people (72.5%) and disc degeneration in 101 people (84.2%) patients. Low back pain (LBP) is a common health disorder with severe socioeconomic impacts. Although LBP has a high prevalence, many aspects of the pathophysiology of LBP are still unknown. Approximately 40% of low back pain is caused by disc herniation. This disorder is a condition in which the annulus fibrosus and its nucleus pulposus protrude into the spinal canal. Disc herniation is very important because it is one of the most common causes of degenerative low back pain. The most common symptom of disc herniation is back pain that radiates to the lower legs, especially when doing bending activities. The onset of pain is caused by pressure on the pinched nerve system in the area. In general, this condition is often associated with acute mechanical trauma, but can also be an accumulation of several traumas over a certain period of time.[13]

A study conducted by Albert involving 166 patients showed that 60% of the samples previously detected with MC later complained of the onset of low back pain.51 Braithwaite et al52 and Weishaupt et al53 showed that modic changes have a very high specificity (96%-96.8%) and positive predictive value (88%-91.3%) for pain reproduction during discography in patients with chronic LBP.[14] The prevalence of Modic changes in patients with low back pain varies from 18% to 62%, with different ratios for each Modic type. According to some studies, Modic type I and type II changes are the most common changes. However, the most common Modic changes according to each study are contradictory, with some studies stating Modic type I changes as the most common changes and other studies stating Modic type II changes as the most common changes.[15,16]
Another study said that modic changes most often occur at L4-L5 and L5-S1 and are associated with increasing age. These changes usually occur adjacent to degenerating or herniated intervertebral discs.[17]

Most intervertebral disc degeneration is asymptomatic, making estimation of prevalence difficult. In a meta-analysis of 20 studies evaluating magnetic resonance imaging (MRI) of asymptomatic individuals, the reported disc abnormalities at any intervertebral level were: 20-83% reduced signal intensity, 10-81% bulging, 3-63% protrusion, 0-24% extrusion, 3-56% for disc narrowing, and 6-56% with annular tears. These studies support that incidental findings of disc disease are common. 55 Teraguci et al studied the prevalence and distribution of disc degeneration in 975 participants and found that the prevalence of DD in the spine was 71% in men and 77% in women aged <50 years, and >90% in men and women aged >50 years. The prevalence of the most

frequently affected intervertebral discs is C5/6 (men: 51.5%, women: 46%), T6/7 (men: 32.4%, women: 37.7%), and L4/5 (men: 69.1%, women: 75.8%).[18]

Based on this study, out of 43 male patients, 39 (90.7%) had modic change. Meanwhile, out of 77 female patients, 73 (94.8%) had modic change. Using the Fischer's Exact test, it was shown that there was no significant relationship between gender and modic change (p=0.455). The same research was also conducted by Florence who conducted research on 3500 population samples and reported that Modic changes were not influenced by gender (p = 0.249).57 A similar thing was also reported by Juhani who reported that no significant relationship was found between gender and Modic changes.58 The findings in these studies are in accordance with the findings obtained in this study.

The results of this study based on age, the largest proportion of LBP patients with modic change were patients aged ≥ 80 years, which was 2 people (100%). The second largest proportion was patients aged 60-69 years as much as 97.6%, followed by patients aged 70-79 years as much as 92.3% and the least was patients aged 40-49 years as much as 88.2%). Using the Kruskal Wallis test showed that there was no significant relationship between age and modic change (p = 0.663). This is in line with the results of research conducted by Jense et al., where there was no significant relationship between age and changes in modic experiencing radicular pain (p=0.105).[19] Research conducted by Peter M. Udby on the assessment of modic changes where he conducted research on subjects divided into three groups, namely the No-MC, MC1, MC2 groups, in the study no significant differences were found in terms of gender (p = 0.833), age (p = 0.521), body mass index (p = 0.357), smoking status (p = 0.426) with a p value> 0.5. As age increases, disc fibrochondrocytes will experience aging and decreased proteoglycan production. This decrease in proteoglycans causes dehydration and collapse of the disc, increasing pressure on the annulus fibrosus, resulting in cracks and fissures, and ultimately facilitating the occurrence of HNP.[20] Based on this study, 95 patients with high-risk jobs, 89 people (93.7%) had modic change. Meanwhile, from 25 patients with low risk/no risk, 23 people (92%) had modic change. Using the Fischer's Exact test, it was shown that there was no significant relationship between work history and modic change (p=0.671).

Han C conducted a study on the relationship between MC types and influencing factors where the pattern related to the level of work was consistent with the pattern of body weight; that is, no significant difference was found between patients with MC Type I and Type II (P > 0.05), however, compared with the moderate physical work group, patients in the hard physical work group were more likely to show MC Type III (P < 0.05).[21]

Workload is any work that requires muscle or thought that is a burden for the doer, the burden includes physical, mental or social burden according to the type of work. Previous research on nurses at RS. Roemani Semarang showed results that there is a relationship between workload and complaints of lower back pain.[22] Based on this study, 87 patients with disc herniation, 83 people (95.4%) had modic change. Meanwhile, from 33 patients who did not have disc herniation, 23 people (92%) had modic change. Using the Fischer's Exact test, it was shown that there was no significant relationship between disc herniation and modic change (p = 0.213).

This is in line with research conducted by Julius et al., where in their research a slightly higher incidence was found in women for both disc herniation (53%) and Modic changes (53%). The Pearson Chi-Square statistical test showed no significant relationship between gender and the degree of disc herniation (p=0.378) or the type of Modic changes (p=0.255).[23]Disc herniation is a shift of intervertebral disc material beyond the normal boundaries of the disc but involving less than 25% of the disc circumference (to distinguish it from disc bulging). The simplest definition of LDH is the occurrence of herniation or pathological protrusion of intervertebral disc content into the vertebral canal in the lumbar segment that can interfere with the motor and sensory functions of an individual chronically and extensively.[24]

Based on this study, 101 patients with disc degeneration, 94 people (93.1%) had modic change. Meanwhile, from 19 patients who did not have disc degeneration, 18 people (94.7%) had

modic change. Using the Fischer's Exact test, it was shown that there was no significant relationship between disc degeneration and modic change (p = 1,000). Increased pain is associated with the extent of Modic changes, spinal stenosis, and disc degeneration. Several studies have shown no association between disc degeneration and low back pain, especially in older individuals.62 Overall Modic changes (Modic 1-3) were not associated with low back pain. In a systematic review of the prevalence of Modic changes in asymptomatic and symptomatic populations.[25]

Based on this study, 73 female patients, 60 people (82.2%) had modic change type II, while from 39 male patients, 31 people (79.5%) had modic change type II. There was no significant relationship between gender and modic change type (p = 0.868). Mindong Lan, et al conducted a study on 208 patients where no significant difference in gender was found between the two groups (P > 0.05). However, the incidence of MII in women was 64.52% (40/62) higher than in men 35.48% (22/62). The most common distribution of MII was L5/S1 (40 cases).[26] The results of this study based on age, it appears that for each age category the largest proportion is patients with modic change type II. Using the Fischer's Exact test showed that there was no significant relationship between age and modic change type (p = 0.285). The prevalence of Modic changes in patients with low back pain varies from 18% to 62%, with different ratios for each Modic type. According to some studies, Modic type I and type II changes are the most common changes. However, the most common Modic changes according to each study are contradictory, with some studies stating Modic type I changes as the most common changes and other studies stating Modic type II changes as the most common changes.[27]

Chung et al. stated that the prevalence of Modic changes in patients with low back pain is higher compared to the asymptomatic population. In the study involving 59 asymptomatic subjects, 11 Modic type I changes and 38 Modic type II changes were found.[28] Research conducted by Tarukado stated that the prevalence of Modic Change increases with age to some extent, with the frequency observed in individuals in their 60s and decreasing in individuals in their 70s and 80s. The findings of this study suggest that MC may not progress with age, especially after the seventh decade of life.[29] The same study was also conducted by Mindong Lan, et al. where from the review of MR images of 208 patients. 29.81% (62/208) patients with MII based on LDD were used as the MC group. One hundred and forty-six patients were used as the DD group. The mean age of patients in the MC group and the DD group was 51.65 ± 11.34 and 49.08 ± 13.55, respectively, with no significant difference between the two groups (P = 0.193).[30]

Based on this study, 89 patients with a high-risk work history, 73 people (82%) had modic change type II, while from 23 patients with a low-risk/non-risk work history, 18 people (78.3%) had modic change type II. No significant relationship was found between work history and modic change type (p = 0.130). In a Finnish study reported on modic findings on MRI in a sample of middle-aged male workers. Overall there were 178 MCs in 128 subjects with a prevalence of 30% in MI, 66% in MII and 4% in mixed type of MI and MII. The study concluded that MCs in L5/S1 lesions and MI were more likely to be associated with pain symptoms than other types of MCs, or MCs located at other lumbar levels.[31]

Based on this study, 83 patients with disc herniation, there were 73 people (82%) with modic change type II, while from 29 patients who did not have disc herniation, there were 26 people (89.7%) with modic change type II. There was no significant relationship between disc herniation and modic change type (p = 0.510). Research conducted by Henna B. Albert who observed 166 subjects for 14 months found no modic changes in follow-up, new modic changes were found in the same vertebra as the previous disc herniation. None of the subjects with normal disc contours experienced modic changes. Modic changes appear to be more closely related to sequestrated discs than to other types of disc herniation.[32] Based on this study, 94 patients with disc degeneration, there were 76 people (80.9%) with modic change type II, while from 16 patients who did not have disc degeneration, there were 15 people (83.3%) with modic change type II. There was no significant relationship between disc degeneration and modic change type (p = 0.435). The intervertebral disc is the largest bloodless tissue in the human body, highly dependent on nutrients supplied by the

cartilage plate; the blood vessels in the cartilage plate are essential for the nucleus pulposus.66 A study conducted by Mindong Lan found no significant difference in the Pfirrmann DD score between the LDD and MC groups (P > 0.05). Farshad-Amacker et al., conducted a long-term follow-up study to find predictors of lumbar degeneration progression in terms of LDD and MCs, but they found no relationship between LL, SS, and MC progression.

However, another study with contradictory results reported that endplates with MC in thoracolumbar/lumbar degenerative kyphosis were negatively correlated with LL (r = - 0.562, P = 0.012) and SS (r = - 0.46, P = 0.048). Obviously, the different conclusions of the above studies are based on different research subjects.[33] In a study conducted by Yufeng Chen et al. on the relationship between modic change and disc degeneration, the results were obtained where for patients with type I changes, 23 were bulged, 11 were protruded, and 1 was extruded; for patients with type II changes, 58 were bulged, 46 were protruded, and 6 were extruded. Patients with type I changes had a higher proportion of protruding hernias but a lower proportion of protruding and extruding hernias, but there was no statistical difference between the groups.[34]

Modic changes are manifestations of biochemical changes in the endplate on MRI and are early manifestations of endplate degeneration. Damage such as gaps and defects in the endplate also affect the nutrient supply of the intervertebral disc. When the intervertebral disc degenerates, the water content and type II collagen content in the nucleus pulposus tissue decrease, and part of the nucleus pulposus may protrude into the posterior spinal canal, which weakens the stress absorption and shock-absorbing effect of the intervertebral disc against axial stress, resulting in biomechanical changes in the entire lumbar spine. Therefore, the spine bears greater pressure and eventually accelerates the damage to the endplate. Severe degeneration of the intervertebral disc means severe damage to the endplate, and therefore type II changes often occur. Endplate degeneration and disc degeneration are closely related.[35]

Based on this study, 4 patients with modic change location in L1, there were 3 people (75%) with modic change type II, while from 108 patients not located in L1, there were 88 people (81.5%) with modic change type II. There was no significant relationship between the location of modic change in L1 and the type of modic change (p = 0.235). Based on this study, 8 patients with modic change location in L2, there were 7 people (87.5%) with modic change type II, while from 104 patients not located in L2, there were 84 people (80.8%) with modic change type II. There was no significant relationship between the location of modic change in L2 and the type of modic change (p = 0.374).

Based on this study, 29 patients with modic change location at L3, there were 23 people (79.3%) with modic change type II, while from 83 patients not located at L3, there were 68 people (81.9%) with modic change type II. There was no significant relationship between the location of modic change at L3 and the type of modic change (p = 0.062). Based on this study, 42 patients with modic change location at L4, there were 32 people (76.2%) with modic change type II, while from 70 patients not located at L4, there were 59 people (84.3%) with modic change type II. There was no significant relationship between the location of modic change at L4 and the type of modic change (p = 0.835).

Based on this study, 50 patients with modic change location at L5, there were 41 people (82%) with modic change type II, while from 62 patients not located at L5, there were 50 people (80.6%) with modic change type II. There was no significant relationship between the location of modic change at L5 and the type of modic change (p = 0.850). Based on this study, 7 patients with modic change location in S1, there were 6 people (85.7%) with modic change type II, while from 105 patients not located in S1, there were 85 people (81%) with modic change type II. There was no significant relationship between the location of modic change in S1 and the type of modic change (p = 0.401). The distribution of Modic changes was reported to be more in the lower endplate than the upper endplate (59.4% vs 40.6%). The most frequently involved levels were L4-5 (30.7%) followed by L5-S1 (26.3%), L3-4 (23.9%), L2-3 (12.4%) and L1-2 (6.8%).[36] The results of the study

conducted by Yufeng Chen showed that type II changes were the most common changes and the proportion was 71.9% for type II, 22.9% for type I 5.2% and for type III. Changes that occurred in the L4/5 and L5/S1 segments accounted for 77% of all cases. The study also found that when two or more segments were involved, the segment with the largest ratio of change area (abnormal signal area/total vertebral body area) was considered the affected segment. For patients with type II changes, there were 13 L1/4 segments, 41 L4/5 segments, and 56 L5/S1 segments. There was no significant difference between the three groups. with p = 0.613.[37]

CONCLUSION

There is no significant relationship between Risk Factors for Modic Changes Type in Magnetic Resonance Imaging of the Lumbar Vertebra in Low Back Pain Patients at H. Adam Malik General Hospital Medan. From this study, there was no relationship between modic changes and gender (p = 0.455), age (p = 0.663), work history (p = 0.671), disc herniation (p = 0.213) and disc degeneration (p = 1.000) in low back pain patients, there was no relationship between modic change type and gender (p = 0.868), age (p = 0.285), work history (p = 0.130), disc herniation (p = 0.510) and disc degeneration (p = 0.435) in low back pain patients, and there was no relationship between modic change location (L1, L2, L3, L4, L5, S1) and modic change type in low back pain patients with p> 0.05.

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