

## Factors Associated with Dysfunctional Low Back Pain in Patients with Rheumatoid Arthritis

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### Abstract

**Background:** An estimated one-tenth of the population suffered from Rheumatoid Arthritis (RA), the most prevalent chronic inflammatory arthritis. The purpose of this study is to identify the risk factors for dysfunctional low back pain in RA patients, as well as to examine the relationship between these variables and the severity, activity, and clinical symptoms of the illness. **Methods:** This study included 40 RA patients and 40 age and sex matched healthy individuals with low back discomfort. All patients were subjected to back examination, assessment of RA disease activity using the disease activity score (DAS28), clinical assessment of RA disease severity using RA severity score (RASS) and the modified Larsen score (MLS). Structural radiographic changes were evaluated by plain radiograph and magnetic resonance image (MRI) on lumbar spine. **Results:** RA patients had higher DAS, visual analogue score (VAS), RASS, increased Platelet count, low Hemoglobin percentage and total leukocyte count, vertebral endplate and/or facet erosion, disc bulge and disc prolapse in MRI of the back which are linked to dysfunctional lower back pain. **Conclusion:** Radiological lumbar abnormalities, particularly lumbar spondylolisthesis, are common among RA patients. Furthermore, despite the fact that LBP in RA patients was effectively managed, the activity of daily living may be more influenced by LBP, which was higher among patients with active disease status. These findings show that RA patients' lumbar therapy should focus on disease management as well.

**Keywords:** Dysfunctional Low Back Pain, Rheumatoid Arthritis, modified Larsen score, RA severity scale

### 1. Introduction

Around 1% of the general population has rheumatoid arthritis (RA), the most prevalent chronic inflammatory type of arthritis. Pain and inflammation in the joints, as well as eventual joint loss and major functional impairment, are common outcomes when it is left untreated or treated in an ineffective manner [1]

If therapy is started as soon as feasible after a diagnosis of RA in accordance with the newest guidelines of the European League Against Rheumatism, this detrimental effect may be avoided (EULAR) [1]

As the second most common cause for a doctor visit, low back pain (LBP) accounts for 10% of all chronic health disorders in the general population. LBP affects 60–80 percent of the population at some point in their lives, with the incidence being higher in women and increasing with age [2]. Degenerative disc disease and facet joint involvement are the two most prevalent causes of chronic low back pain in 90% to 95% of cases, particularly in people 35 to 50 years old [2].

The spine is largely spared by rheumatoid arthritis (RA) except for the cervical regions. On the other side of the coin though, a recent cross-sectional research indicated that 24% of RA patients experienced LBP [3]

Patients with rheumatoid arthritis are more likely to suffer from low back pain (LBP) than the general population, with a frequency of 33% to 40% in these small studies.

RA patients with and without co-occurring LBP had considerably worse ratings on physical functioning and enjoyment of their life [3].

The purpose of this study is to identify the risk factors for dysfunctional low back pain in RA patients, as well as to examine the relationship between these variables and the severity, activity, and clinical symptoms of the illness.

### 2. Patients and methods

**This case –control study** was conducted on 40 RA patients diagnosed according to ACR/EULAR 2010 classification criteria of RA [4] suffered from dysfunctional low back pain. They were selected from the those attending the Rheumatology outpatient's clinic, Faculty of medicine Benha University Hospitals. Together with forty age and sex matched apparently healthy volunteers suffered from low back pain not known to be RA as a control group.

**Inclusion Criteria :** RA patients with dysfunctional low back pain fulfilled the 2010 American College of Rheumatology/European League against Rheumatism classification criteria for rheumatoid arthritis: This classification establishes a point value between 0 and 10. Every patient with a point total of 6 or higher is unequivocally classified as RA patient.

**Participants were excluded if they were presented with**

- 1) Previous spine surgery
- 2) Inability to stand without assistance.
- 3) Patients with other auto immune disease or seronegative arthropathy

**All patients were subjected to** Full medical history , clinical examination and

Back examination as following

- **Test for Evaluating Spinal Function Schober Sign(5)**
- **Thomsen Sign—Prone Knee Flexion Test (6)**
- **Spinous Process Tap Test (6)**
- **provocation test of the sacroiliac joint (7)**
- **Patrick Test (Fabere Sign): Slump Test (8)**
- **Lasègue Sign (Straight Leg Raising Test) (9)**
- **Femoral Nerve Traction Test (10)**

**RA disease activity** was assessed using the disease activity score of 28 joint count (DAS28) [11]

**Clinical assessment of disease severity:-**

1. **Rheumatoid arthritis severity scale (RASS)** [12].

2. **Modified Larsen score** [13]

**Assessment of functional status**

(1) **Modified Health Assessment Questionnaire (MHAQ)** [14]

**Roland morris questionnaire** [15]

**Assessment of low back pain by Visual analogue scale** [16].

**Score interpretation:**

A higher score indicates greater pain intensity. Based on the distribution of pain VAS scores intensity of pain was described as no pain (0–4 mm), mild pain (5–44 mm), moderate pain (45–74 mm), and severe pain (75– 100 mm). Normative values are not available.

MRI was also ordered on lumbar spine.

Kallgren and Lawrence score was also done and calculated [17]

**Laboratory investigations** included: C-reactive protein, Erythrocyte sedimentation rate and Rheumatoid factor (RF), Anti-cyclic citrullinated peptide antibody (anti-CCP-Ab).

**2.1. Statistical Analysis**

The data were coded, entered and processed on computer using Statistical package for social science (SPSS) (version 24). The results were represented in tabular and diagrammatic forms then interpreted.

**3. Results**

**Regarding RA patients**, they were 34 females (85.0%) and 6 males (15.0%), whose ages ranged between 29-70 years (mean± SD 45.25 ± 10.77 years). Their body mass index ranged between 24.03-41.62 kg/m<sup>2</sup> (mean± SD 31.36±4.99kg/m<sup>2</sup>).

The control group were 12 males (30%) and 28females ( 70 %) whose ages ranged between 29-70 years (mean ± SD 49.55 ±10.65years) and their BMI ranged between 24.03-41.62kg/m<sup>2</sup> (mean ± SD 30.49±3.64 kg/m<sup>2</sup>).

There were no statistically significant differences between the studied groups as regards to age, gender and body mass index (p>0.05). Mean Disease duration among the studied RA patients was (10.35±7.99 years).

The Anti-CCP anti bodies were positive in 95% of RA patients and negative in 5%. CRP was positive in 55% of RA patients and negative in 45%. Regarding other laboratory parameters, HB (mean ±SD 11.8±1.65) , mean platelets count (269.9±84.47), mean total leukocyte count was 7.26±2.90, and mean ESR was 56.95±33.63.

Our results represent highly statistically significant differences (p<0.001) between cases and controls

regarding Hb, platelets count and total leukocytes count.

Regarding Health assessment questionnaire , it was 0 in 20% of cases , 1 in 55% , 2 in 25%.

Mean DAS-28 was 5.09±0.82 among the studied RA patients. Mean Roland morris questionnaire was 13.70±3.65. Mean VAS was 6.2±1.68 and mean RASS was (60.65±26.18).

Femoral nerve traction test, Spinous process tap test , Schober sign and Thomsen sign-prone knee were +ve in 55% and –ve in 45% of cases.

Straight leg raising test and Slump test were +ve in 90% and –ve in 10% of cases.

Patrick test was +ve in 25% and -ve in 75% cases.

There were highly statistically significant differences between cases and control group regarding VAS, Spinous process tap test, Patrick test, Schober sign and Thomsen sign-prone knee flexion test (p<0.001).

While other clinical parameters showed statistically insignificant differences (p>0.05).

Total Larsen score was (mean ±SD 154.65±65.54). Osteoarthritic score was (mean±SD 2.53±1.11). Structural radiographic changes of the back were reported as follow: Bone erosions were detected in 50% of cases. Normal MRI was present in 30% of cases . Disc bulge was seen in 65% of cases. Disc protrusion was present in 35% of cases. Disc prolapse was detected in 5% of cases. Disc sequestration was found in 15% of cases.

Facet Joint synovial hypertrophy was found in 80%of cases. There were a statistically (p<0.05) significant difference between cases and control groups regarding to bone erosion in plain x ray of the back, and a highly (p<0.001) statistically significant difference between both groups regarding the presence of facet synovial joint hypertrophy, disc bulge and disc prolapse in MRI of the back.

There were statistically insignificant relation between Roland morris questionnaire and DAS, Modified Larsen score, Health assessment questionnaire (HAQ), Disc protrusion, and Disc prolapse (p<0.05).

There were highly statistically significant relation between Roland morris questionnaire and disc bulge in MRI and bone erosion in plain x-ray.

Our results showed a statistically significant correlation (p<0.05) between

disease activity score and disc protrusion and disc sequestration , while other radiological parameters showed insignificant correlation (p>0.05).

There were a statistically significant correlation between Total modified Larsen Score and facet J synovial hypertrophy and a highly statistically significant correlation between Total score and osteoarthritic score.

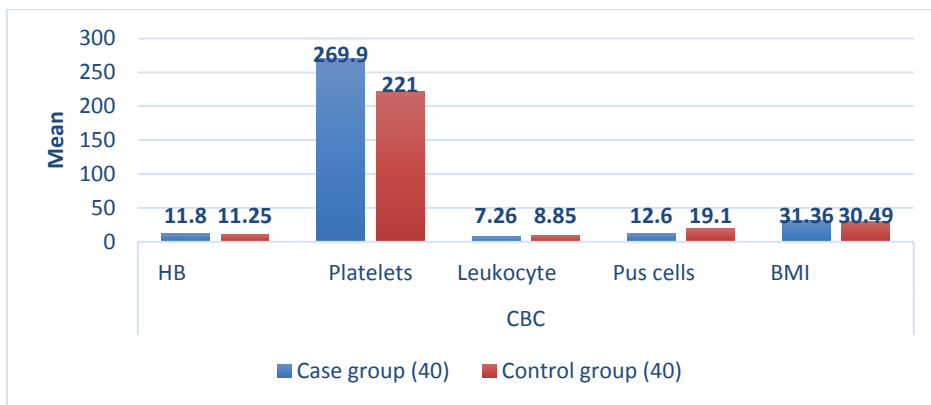


Fig.(1) Comparison between the studied group regarding laboratory parameters and body mass index.

Table (1) Comparison between case and control groups regarding age,sex,and BMI.

	Case group (40)		Control group (40)		Statistical test	P value
	No	%	No	%		
Sex						
Male	6	15.0	12	30.0	X <sup>2</sup> = 2.58	0.11
Female	34	85.0	28	70.0		
Age mean ±SD	45.25 ±10.77		49.55 ±10.65		St t=1.80	0.08
BMI mean ±SD	31.36±4.99		30.49±3.64		St t= 0.89	0.37

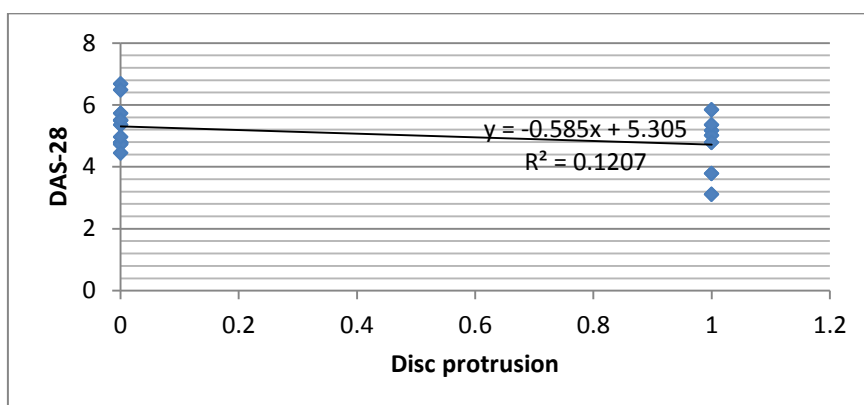


Fig. (2) Correlation between DAS-28 and Disc protrusion.

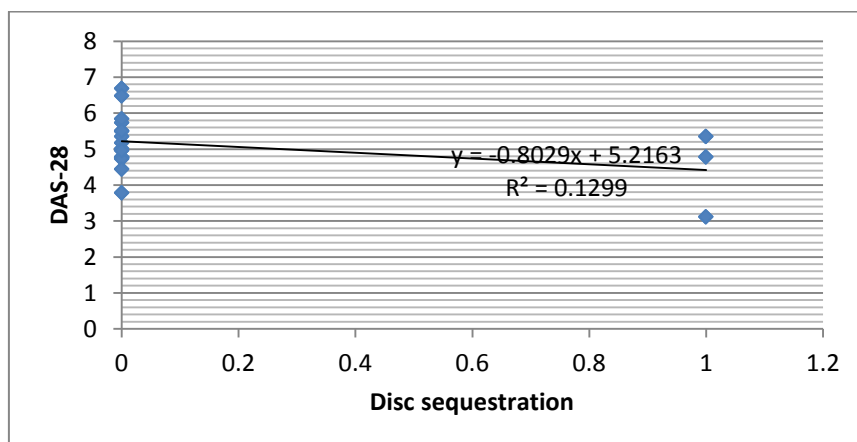
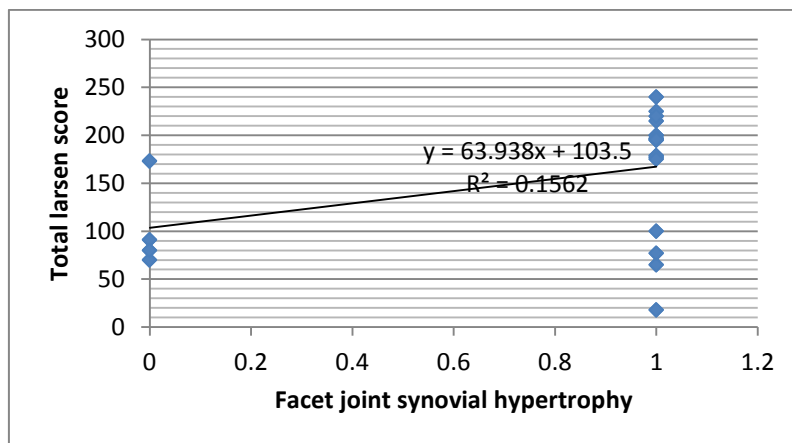
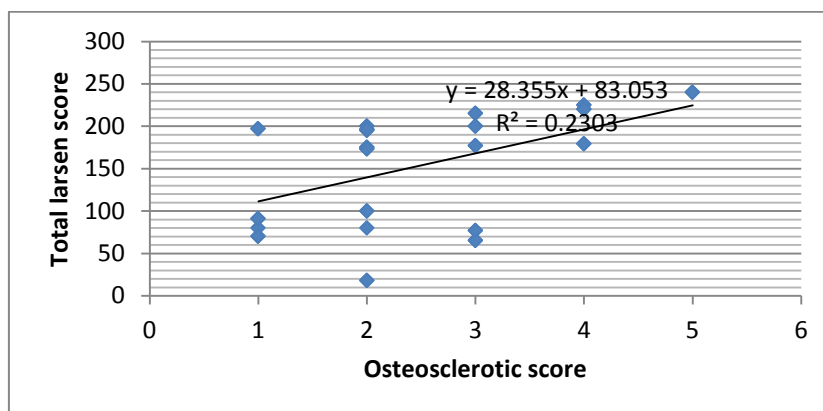


Fig. (3) Correlation between DAS-28 and Disc sequestration.

**Table (2)** correlation between DAS28 and radiological parameters of the back.

	DAS28	
	Pearson Correlation	P value
<b>TOTAL Larsen SCORE</b>	0.130	0.436
<b>Facet J synovial hypertrophy</b>	0.037	0.825
<b>Bone erosion</b>	-0.121	0.468
<b>Normal MRI</b>	-0.145	0.384
<b>Disc bulge</b>	0.048	0.773
<b>Disc protrusion</b>	-0.347	0.033*
<b>Disc prolapse</b>	0.186	0.264
<b>Disc sequestration</b>	-0.36	0.026*
<b>Osteo arthritic score</b>	-0.001	0.996

**Fig. (4)** Correlation between Total Larsen score and Facet synovial joint hypertrophy.**Fig. (5)** Correlation between Total Larsen score and osteoarthritic score.**Table (3)** Correlation between modified Larsen Score and radiological parameters of the back:

	TOTAL Larsen SCORE	
	Pearson Correlation	P value
<b>DAS28</b>	0.130	0.436
<b>Facet J synovial hypertrophy</b>	0.395	0.012*
<b>Bone erosion</b>	0.081	0.619
<b>Normal MRI</b>	-0.204	0.207
<b>Disc bulge</b>	0.130	0.422
<b>Disc protrusion</b>	0.083	0.609
<b>Disc prolapse</b>	0.143	0.379
<b>Disc sequestration</b>	0.158	0.330
<b>Osteo arthritic score</b>	0.480	0.002**

#### 4. Discussion

It's estimated that millions of people in the United States suffer from rheumatoid arthritis each year, which is a chronic inflammatory illness that reduces quality of life (QoL), increases mortality, and costs society billions of dollars each year [4]. Seropositive

RA is currently managed by starting treatment as soon as an individual develops symptoms and clinically identifiable inflammatory arthritis (IA) that may also be classified as RA by established criteria for individuals with abnormalities of rheumatoid factor (RF) and/or antibodies to citrullinated protein antibodies (ACPAs) [18].

There was a statistically significant difference between the cases and the control groups regarding bone erosion in plain x-rays of the back ( $p=0.021$ ), and a highly statistically significant difference between both groups regarding the presence of facet synovial joint hypertrophy ( $p=0.001$ ), disc pulge ( $p=0.003$ ), and disc prolapse ( $p=0.003$ ) in MRI of the back.

Research has shown that RA patients are more likely than non-RA people to have low-back lesions, according to a number of recent studies. In a study of LBP patients with and without RA, Hagege et al. [17] looked at the frequency of spondylolisthesis, and they found that the prevalence was substantially greater in RA patients (41.8 percent) than in non-RA individuals (18.1 percent).

Deformed vertebrae are more common in patients with RA than in the general population, according to a study by Rstavik et al. [19] and Okano et al. (20). (30.0 percent).

76.6 percent and 70.6 percent of RA patients had lumbar facet joints and end plate erosion, respectively, in a lumbar MRI investigation. Disc degeneration and adjacent vertebral body fracture were substantially associated with end plate erosion, while facet erosion was linked to spondylolisthesis." It's still not known whether facet and end plate erosions are more common in RA patients, although they may occur in persons without the disease. Radiological lumbar lesions in individuals with RA may be influenced by factors other than facet or end plate erosions, such as a reduction in osteophyte production or a decrease in bone quality [21].

VAS differences between the case and control groups were statistically significant ( $p=0.001$ ). Cases cost 6.201.68 and controls cost 4.251.60. No statistically significant differences were identified between patients and controls, according to Roland Morris Questionnaire ( $p>0.05$ ).

In addition, a statistically insignificant relationship was found between Roland Morris questionnaire and the DAS, the Modified Larsen score, the Health Assessment Questionnaire (HAQ), the normal magnetic resonance imaging (MRI), the disc protrusion, the disc prolapse, and the Osteo sclerotic score on plain x-ray ( $p>0.05$ ). Regarding radiological findings, significant correlation was found between

Roland morris questionnaire statistically with disc bulges and bone structural changes.

However, contrary to the findings of Suzuki et al. (22) who observed that 27.6% of RA patients and 25.55% of controls had LBP-related VAS, there was no statistically significant difference either in prevalence or average VAS. According to these findings, "LBP rate in RA patients is equal to that in healthy population," however two crucial considerations should not be disregarded. These two points are: First, the RA group used analgesics at a rate of 43.8%, which was substantially greater than the control group's rate (6.9 percent). Anesthetic medications may be used for LBP in some patients and for peripheral joint involvement in others, but this research did not examine the rationale for their usage. LBP in RA patients seems to be well-controlled at the same level as that of the general population, according to the results of this research. Second, the RDQ score was shown to be lower in the RA group ( $p=0.068$ ) compared to the control group. According to this, people with RA are more likely to be affected by LBP, and this may be owing to extra joint problems in the limbs, especially in the knees.

DAS 28 score and disc protrusion and sequestration indicated a statistically significant link ( $P=0.05$ ) in the current investigation, whereas other radiological measures showed an insignificant correlation ( $p>0.05$ ). Facet J joint hypertrophy was associated with a lower modified Larsen score ( $P=0.05$ ).

For example, Suzuki et al. [23] found that RA patients with low back pain (LBP) were significantly different from RA patients without LBP in terms of their age, symmetry, illness duration, DAS28-CRP, Steinbrocker's stage, and use of corticosteroids and anti-osteoporotic drugs. According to the results of the multivariate analysis, RA patients' LBP was correlated with older age and higher DAS28-CRP levels, but not with radiological lumbar abnormalities.

#### 5. Conclusion

Radiological lumbar abnormalities, particularly lumbar spondylolisthesis, are more common among RA patients. Furthermore, despite the fact that LBP in RA patients was effectively managed, the activity of daily living may be more influenced by LBP which was higher among patients with active disease status. These findings show that RA patients' lumbar therapy should focus on disease management as well.

#### References

- [1] L.Gossec, J.Baro-Riba, M-C.Bozonnat, J-P.Daurès, J.Sany, J-F.Eliaou, et al. Influence of sex on disease severity in patients with rheumatoid arthritis. The Journal of rheumatology.vol.32: (8),pp.1448-1451,2005.
- [2] J.S.Smolen, D.Aletaha and I.B.McInnes, Rheumatoid arthritis. The Lancet.vol.388: (10055),pp.2023-2038,2016.

- [3] **K.Yamada, A.Suzuki, S.Takahashi, H.Yasuda, T.Koike and H.Nakamura**, Severe low back pain in patients with rheumatoid arthritis is associated with Disease Activity Score but not with radiological findings on plain X-rays. *Modern rheumatology*.vol.25: (1),pp.56-61,**2015**.
- [4] **D.Aletaha, T.Neogi, A J.Silman, J.Funovits, D T.Felson, C O.Bingham III, et al.** 2010 rheumatoid arthritis classification criteria: an American College of Rheumatology/European League Against Rheumatism collaborative initiative. *Arthritis & Rheumatism*.vol.62:(9),pp.2569-2581,**2010**.
- [5] **D.M.Cameron, R.W.Bohannon and S.V.Owen**, Influence of Hip Position on Measurements of the Straight Leg Raise Test. *Journal of Orthopaedic & Sports Physical Therapy*.vol.19:(3),pp.168-172, **1994**.
- [6] **A.N.Christodoulides**, Ipsilateral sciatica on femoral nerve stretch test is pathognomonic of an L4/5 disc protrusion. *The Journal of Bone and Joint Surgery*. British volume.vol.71-B:(1),pp.88-89,**1989**.
- [7] **P.Dreyfuss, M.Michaelsen, K.Pauza, J.McLarty and N.Bogduk**, The Value of Medical History and Physical Examination in Diagnosing Sacroiliac Joint Pain. *Spine*.vol.21:(22),pp.2594-2602,**1996**.
- [8] **G.D.Maitland**, The Slump Test: Examination and Treatment. *Australian Journal of Physiotherapy*.vol.31:(6),pp.215-219,**1985**.
- [9] **B.Jönsson and B.Strömqvist**, The Straight Leg Raising Test and the Severity of Symptoms in Lumbar Disc Herniation. *Spine*.vol.20:(1),pp.27-30,**1995**.
- [10] **P.Dyck**, The femoral nerve traction test with lumbar disc protrusions. *Surgical neurology*.vol. (3),pp.163-166,**1976**.
- [11] **M L L.Prevo, M A.Van'T Hof, H H.Kuper, M A.Van Leeuwen, L B A.Van De Putte and P L C M.Van Riel**, Modified disease activity scores that include twenty-eight-joint counts development and validation in a prospective longitudinal study of patients with rheumatoid arthritis. *Arthritis & Rheumatism*.vol.38: (1),pp.44-48,**1995**.
- [12] **W A.Bardwell, P M.Nicassio, M H.Weisman, R.Gevirtz and D.Bazzo**, Rheumatoid Arthritis Severity Scale: a brief, physician-completed scale not confounded by patient self-report of psychological functioning. *Rheumatology*.vol.41: (1),pp.38-45,**2002**.
- [13] **H.Rau and J.Rau**, *Chemische Gleichgewichtsthermodynamik*. Vieweg+Teubner Verlag,**1995**.
- [14] **Fries JF, Spitz P, Kraines RG, Holman HR**.1980,Measurement of patient outcome in arthritis. *Arthritis Rheum* ; 23: 137– 45.
- [15] **L G.Macedo, C G.Maher, J.Latimer, M J.Hancock, L A C.Machado and J H.McAuley** Responsiveness of the 24-, 18- and 11-item versions of the Roland Morris Disability Questionnaire. *European spine journal : official publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research Society*.vol.20: (3),pp.458-463,**2011**.
- [16] **H.Berry and E C.Huskisson**, Treatment of rheumatoid arthritis. *Clin Trials J*.vol.4,pp.13-5,**1972**.
- [17] **Yochum TR, Rowe LJ.Yochum and Rowe's essentials of skeletal radiology**, **2005**.
- [18] **J A.Singh, K G.Saag, Bridges S L.Jr, E A.Akl, R R.Bannuru, M C.Sullivan, et al.** 2015 American College of Rheumatology guideline for the treatment of rheumatoid arthritis. *Arthritis & Rheumatology*.vol.68: (1),pp.1-26,**2016**.
- [19] **B.Hagege, F.Tubach, T.Alfaiate, M.Forien, P.Dieudé and S.Ottaviani**, Increased rate of lumbar spondylolisthesis in rheumatoid arthritis: A case-control study. *European journal of clinical investigation*.vol.48:(9),pp.e12991,**2018**.
- [20] **R E.Ørstavik, G.Haugeberg, P.Mowinckel, A.Høiseth, T.Uhlig, J A.Falch, et al.** Vertebral deformities in rheumatoid arthritis: a comparison with population-based controls. *Archives of internal medicine*.vol. 164: (4),pp.420-425,**2004**.
- [21] **T.Okano, K.Inui, M.Tada, Y.Sugioka, K.Mamoto, S.Wakitani, et al.** High frequency of vertebral fracture and low bone quality in patients with rheumatoid arthritis—results from TOMORROW study. *Modern rheumatology*.vol. 27:(3),pp.398-404,**2017**.
- [22] **K.Yamada, A.Suzuki, S.Takahashi, H.Yasuda, M.Tada, Y.Sugioka, et al.** MRI evaluation of lumbar endplate and facet erosion in rheumatoid arthritis. *Clinical Spine Surgery*.vol. 27: (4),pp.E128-E135,**2014**.
- [23] **A.Suzuki, K.Tamai, S.Takahashi, K.Yamada, K.Inui, M.Tada, et al.** Do rheumatoid arthritis patients have low back pain or radiological lumbar lesions more frequently than the healthy population?—Cross-sectional analysis in a cohort study with age and sex-matched healthy volunteers. *The Spine Journal*.vol. 20(12),**2002**.