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Original Paper

The Assessment of Spinal Pathology among Taif City Population Using MRI

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Abstract

Background: *Spinal disorders are common worldwide. Causes of spinal disorders include trauma, degenerative and congenital abnormalities. The aim of this study was to assess the presence of spinal disorders among Taif population using MRI.*

Methods: *Medical files of 500 patients suffering from back pain who visited the medical, surgical and family medicine clinics were reviewed and 265 cases had spinal pathology based on MRI findings. Information about the spinal disorder for each case including the age, gender, signs and symptoms, differential diagnosis of the treating physician and MRI findings (main disorder, site of the spinal disorder, associated findings) were collected and analyzed. Data analysis was performed using SPSS software and statistical significance was considered when p value is less than 0.05.*

Results: *Our findings revealed bulge and protrusion were the commonest spinal disordered observed in 88.7% of cases. Also, higher incident of spinal diseases was detected in the age groups 45-59 and 30-44 years old.*

Conclusion: *Finding from this study may be used as database for spinal disorder at Taif region. MRI is useful tool to differentiate spinal disorders efficiently.*

Keywords

Spinal disorders, MRI, back pain, disc

1. Background

Spinal disorders are common worldwide, and patients usually present with back pain and limitation of movement (D'Aprile, Nasuto, Tarantino, Cornacchia, Guglielmi, & Jinkins, 2018). As most cases suffering from back pain are due to non-organic or mechanical causes, people tend to follow at-home remedies and pain killers without seeking medical advice to know the exact reason for the back pain.

Patients refer to physicians if their back pain become persistent and causes restrictions to their daily activities.

Spinal disorders may be caused by any pathology that affects the spine and/or the vertebrae such as trauma, degeneration, and congenital abnormalities (Andrew, Michael, & Robert, 2010). Based on the nature and progression of the spinal problem, if these conditions left untreated over time, they may lead to serious complications such as disc herniation and prolapse, spinal stenosis, spondylosis and retrolisthiasis resulting in severe pain, independence, inability to move and work absents.

According to the global burden of disease study, back pain caused by spinal disorders is considered one of the commonest problems that accounts for daily cases in the world. Thus, it is essential to get an accurate and reliable diagnosis of a spinal disorder in order to get the right care to handle the patient. Radiological imaging is critical for determining the cause and severity of spinal disorders as well as their effect on the spinal cord (Nouh, 2019). Magnetic resonance imaging (MRI) has strongly developed itself as the non-invasive modality of choice in the diagnosis and treatment of spinal disorders. Due to its ability to differentiate the spinal cord, nerve root, ligaments, intervertebral discs, and neighboring vascular structures, MRI is now preferred over computed tomography in the evaluation of spinal disorders (Li, Liu, Zheng, Miao, Chen, Quan, et al., 2018; Fang, Zhou, Liu, Sang, Xu, & Ding, 2016).

This study aims to assess the presence of spinal disorders among Taif population using MRI. The objectives for this study were to identify the different types of spinal disorders identified among Taif population using MRI and how these disorders are correlated with age and gender. Also, we examined the most common associated sign and symptom for patients suffering from spinal disorders in addition to back pain. Furthermore, the commonest site, and associated MR findings with spinal injuries were tested among the same population.

2. Methods

Official permission and ethics approval to conduct this study were obtained from the research committee of the Ministry of health and Alhada Armed Forces hospitals at Taif region.

This is a descriptive cross-sectional hospitals-based study conducted at different Taif hospitals in the duration from March 2021 to December 2021.

All medical records of patients suffering from back pain were reviewed regardless their nationality or job sector. Five-hundred patients were found to suffer from low back pain from the medical, surgical and family medicine clinics. Off the records of the 500 patients with back pain, 265 had spinal pathology based on MRI findings (131 males and 134 females).

A well-structured data collection sheet was specifically designed to this study. It is composed of two parts, the socio-demographic data which contains information about the age and gender. The second part comprises data about the spinal disorder including the following: the signs and symptoms, differential diagnosis of the treating physician and MRI findings (main disorder, site of the spinal

disorder, associated findings).

Patients were divided into six age groups (15-29, 30-44, 45-59, 60-74, 75-90, >90 years old).

Data was coded, entered, and analyzed using SPSS version 20. Descriptive statistical analysis was used to determine frequency distribution to obtained demographic variables in tables and graphs, with significant statistical correlation when p value was ≤ 0.05.

3. Result

First, we examined the final diagnosis recorded by the treating physician for spinal disorders based on the history and MRI reports. Bulge and protrusion were found in 88.7% of cases, followed by degenerative disc disease in 8.42% of patients as in Figure 1.

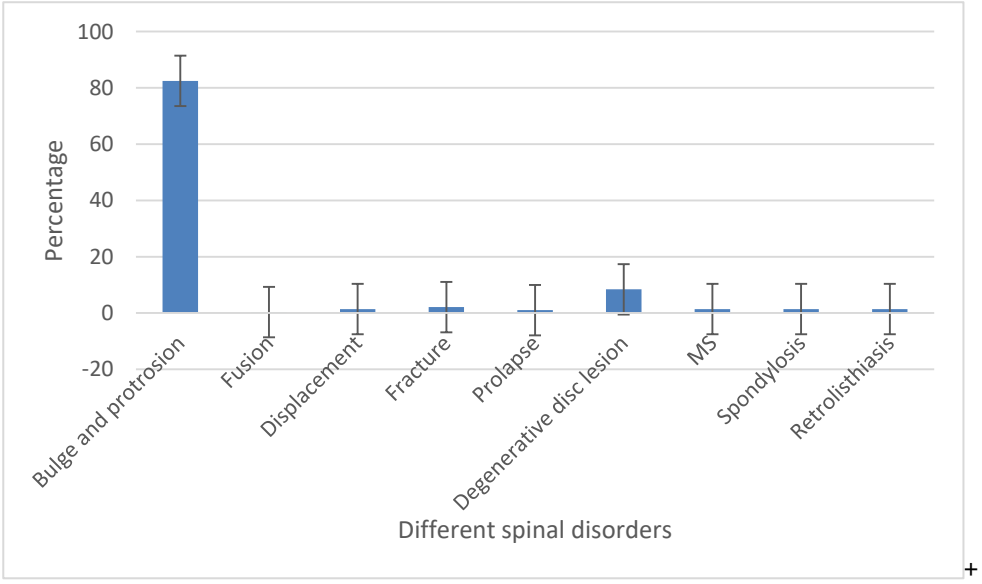

Figure 1. Types of Spinal Disorders Diagnosed by Physician Based on MRI Findings

We also examined the most common site of spinal disorders among the studied sample. It was found that in most cases (60.0%), lumber region was mostly affected followed by cervical vertebrae in (34.4 %) of cases and occurs the least in thoracic region as shown in Figure 2.

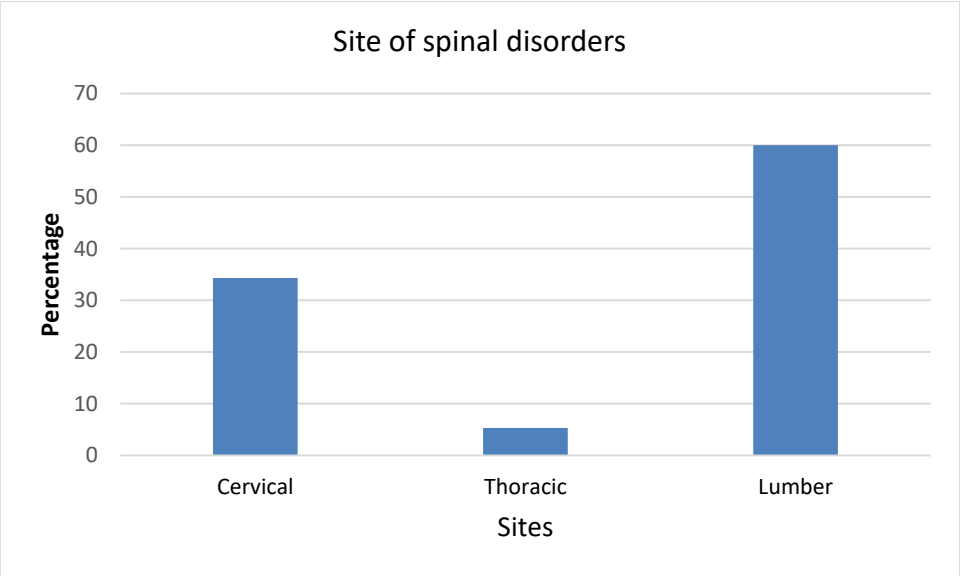

Figure 2. Sites of Spinal Disorders

Furthermore, the associated MRI findings were examined within the studied group demonstrating nerve compression in 52.8% of patients, as shown in Figure 3. Disc changes and spinal deformities were found in 17.4 and 15.1% respectively. Masses and vertebral changes occurred in almost similar percentage of cases about 7%.

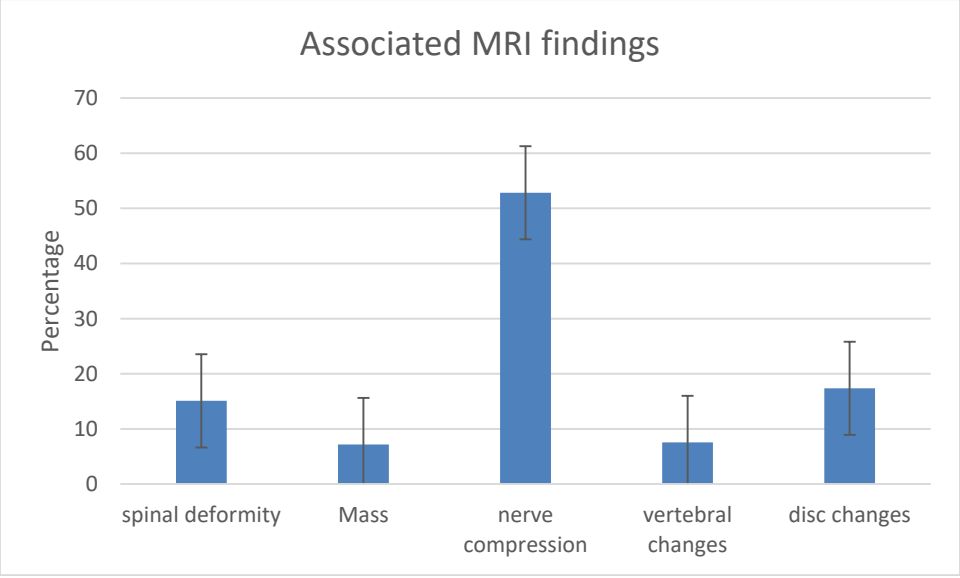

Figure 3. Associated MRI Findings

In addition, we have tested the statistical correlation between the gender and the diagnosis of different spinal disorders as well as the gender and associated MRI findings which revealed no significance for both correlations ($p \leq 0.08$) and ($p \leq 0.06$) respectively as shown in Tables 1 and 2.

Table 1. Statistical Correlation between the Diagnosis and Gender

	Gender			
	Male	Female	Total	Asymp. Sig. (2-sided)
Diagnosis				
Bulge and protrusion	111 (47%)	124 (53%)		0.085
Fusion	0 (0%)	1 (100%)	1 (0.3%)	0.084
Displacement	3 (75%)	1 (25%)	4 (1.5%)	
Fracture	4 (100%)	0 (0%)	4 (1.5%)	
Prolapse	3 (50%)	3 (50%)	6 (2.2%)	
Degenerative disc lesion	3 (100%)	0 (0%)	3 (1.1%)	
MS	2 (50%)	2 (50%)	4 (1.5%)	
Spondylosis	2 (50%)	2 (50%)	4 (1.5%)	
Retrolisthiasis	3 (75%)	1 (25%)	4 (1.5%)	
Total	131 (49%)	134 (51%)	265	

Table 2. The Correlation between Gender and Associated MR Findings

	Gender			
	Male	Female	Total	Asymp. Sig. (2-sided)
Associated MR findings				
Spinal deformity	15 (37.5%)	25 (62.5%)	40 (15%)	0.073
Mass	6 (31.5%)	13 (68.5%)	19 (7.2%)	0.068
Nerve compression	73 (52%)	67 (48%)	140 (52.8%)	
Vertebral changes	8 (40%)	12 (60%)	20 (7.5%)	
Disc changes	8 (53%)	7 (47%)	15 (5.6%)	
No finding	21 (67.7%)	10 (32.3)	31 (11.7%)	
Total	131 (49%)	134 (51%)	265	

Among the six age groups that were included in the study, the age group 45-59 years represented the higher percentage with spinal disorders (34.7%) followed by the younger age group 30-44 years old with (31.32%) as shown in Figure 4. Lower percentages of spinal disorders were found among older age groups (60-74 years had 15%), (75-90 years had 6%) and (>90 years had less than 1%) as well as younger age groups (15-29 years had 12%).

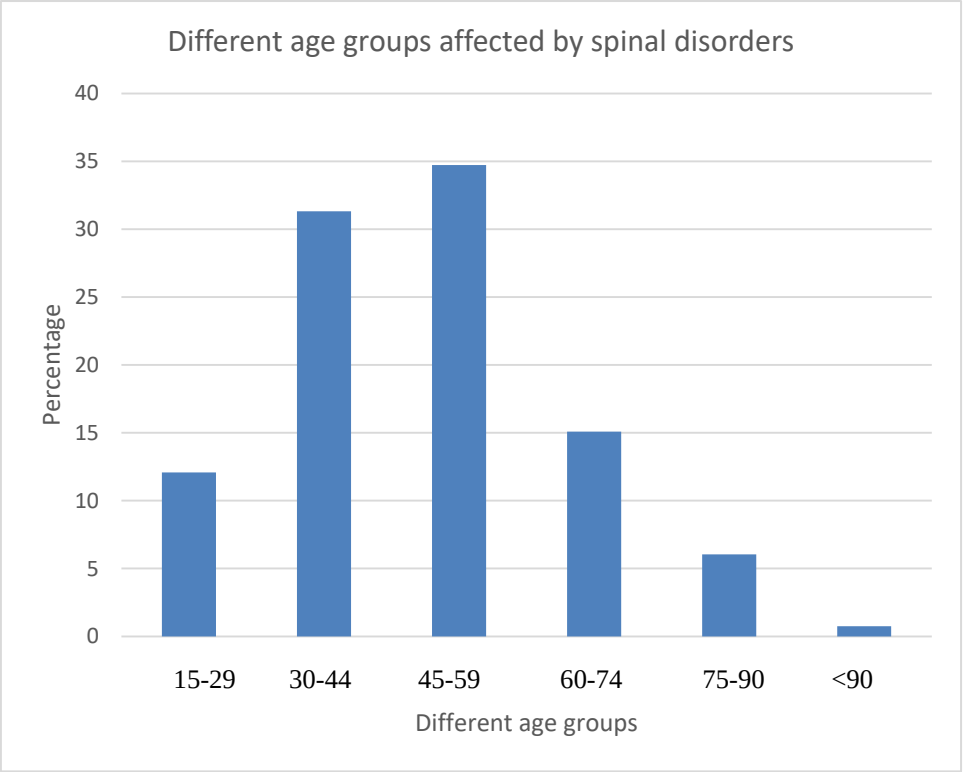

Figure 4. Different Age Groups Affected by Spinal Disorders

Finally, we assessed the correlation between the different age groups and the causes of spinal disorders. Results showed the there is a significant correlation ($p<0.001$) between the previously mentioned variables as shown in Table 3.

Table 3. Statistical Correlation between the Different Age Groups and Causes of Spinal Disorders

	Causes					
Age	Injury	Degenerative	Arthritis	Post-surgery	Other pathologies	Asymp, Sig. (2-sided)
15-29	12 (35.3%)	5 (3.3%)	1 (7.8%)	0 (0%)	1 (7.1%)	< 0.001
30-44	13 (38.2%)	32 (21.3%)	4 (30.8%)	1 (16.7%)	5 (35.7%)	
45-59	6 (17.6%)	67 (44.7%)	7 (53.8%)	2 (33.3%)	4 (24.6%)	
60-74	3 (8.8%)	30 (2%)	0 (0%)	3 (50%)	3 (21.4%)	
75-90	0 (0%)	15 (1%)	1 (7.8%)	0 (0%)	0 (0%)	
> 90	0 (0%)	1 (0.6%)	0 (0%)	0 (0%)	1 (1%)	
Total	34	150	13	6	14	

4. Discussion

This research aimed to assess spinal disorders among Taif population utilizing MRI. MRI nowadays is considered the best non-invasive modality of choice for diagnosing spinal disorder, identifying associated spinal abnormalities and the assessment of progression of treatment (Andrew, Michael, & Robert, 2010). This study revealed that the most common type of spinal disorders among Taif population was disc bulge and protrusion associated with nerve compression. Worldwide, the incidence of disc bulge is relatively very high about 5-20 cases per 1000 adult every year while male to female ratio were 2:1 (Fjeld, Grovle, Helgeland, Smastuen, Solberg, Zwart, et al., 2019; Dydyk & Mesfin, 2022). Disc herniation is one of the commonest spinal disorders especially in the lumbar region causing low back pain (Gregory, Christine, & Alexander, 2016; Boos, Rieder, Schade, Spratt, Semmer, & Aebi, 1995; Alshami, 2015). Also, our finding showed that lumber area is the most affected which is consistent with other studies (Suthar, Patel, Mehta, & Patel, 2015; Alawad, Alenezi, Alrashedan, Alsabieh, Alnasser, Abdulkader, et al., 2020). More than 90% of lumber disc protrusion cases occur in the lumber segment and is associated with nerve root compression causing symptoms of pain and dysfunction (Li, Liu, Zheng, Miao, Chen, Quan, et al., 2018; Fang, Zhou, Liu, Sang, Xu, & Ding, 2016). Thus, precise diagnosis of nerve root compression of lumber region using MRI is highly important (Zheng, Wen, & Li, 2021). Because disc protrusion is a common medical issue causing back pain encountered in the health care sectors, interprofessional team is recommended to be involved in the management (Dydyk & Mesfin, 2022).

Back pain is one of most common symptoms which showed in (70%) of people in any time of their lives (Manchikanti, Singh, Falco, Benyamin, & Hirsch, 2014). Although studies which connected most of disc abnormality with back pain, found back pain is not necessarily relate to disc abnormality, but may affected by occupation or life style (Luoma, Riihimaki, Luukkonen, Raininko, Viikari-Juntura, & Lamminen, 2000; Endean, Palmer, & Coggon, 2011). Lee et al. found (95.4%) from asymptomatic patient have disc abnormality which is higher than Miyazaky when he reported (80%) of samples in his study having disc abnormality were asymptomatic (Lee, Kim, & Lim, 2013; Miyazaki, Hong, Yoon, Morishita, & Wang, 2008). Thus, although MRI has an anatomical accuracy reaching around 80% in identifying lumbar disc herniation, yet, it does not provide physiological information about nerve root compression (Li, Liu, Zheng, Miao, Chen, Quan, et al., 2018). Detection of abnormality by MRI occurs frequently in asymptomatic individuals and is often unrelated to the patient's symptoms.

In this study, the two age groups 45-59 and 30-44 years old represented the higher incidence of cases suffering from spinal disorders (34.7% and 31.32% respectively). This finding is almost similar to results from a previous study which have shown that the most frequent affected age groups were 30-49 and 50-69 years (Alshami, 2015). However, other studies have revealed that spinal disorders with degenerative problems are reported more slightly in older age groups, 55-59 and 60-64 years old with a percentage of 22.5 and 28 respectively (Biering-Sorensen, Pedersen, & Clausen, 1990; De Schepper, Van Meurs, Ginai, Popham, Hofman, et al., 2010; Jaclyn Megan Sions, 2017). This may be due to

environmental factors from living in a high-altitude region affecting younger age in which low oxygen levels have an effect on the health and physiology of vertebral discs (Urban & Roberts, 2003; Mwale, Ciobanu, Giannitsios, Roughley, Steffen, & Antoniou, 2011; Ishihara & Urban, 1999). Also, Taif region is a military area where many males have jobs that involve activities that exert an excess stress on the spine. In addition, one of the risk factors that is believed to predispose to disc bulging and protrusion is low oxygen supply caused by smoking (Alkhedaide, 2020; Weimin Huang YQ, Kai Zheng, Lili Yu, & Xiuchun Yu, 2016). Giving the fact that smoking is increased among young people at Saudi Arabia, on the top of living in high altitude city which caused hypoxia increases the risk furthermore.

To sum up, findings from this research provides a primary database for spinal disorders at Taif city. MRI is useful in detecting and differentiating spinal disorders efficiently. However, this study suffer from shortage in other factors could be contributing to the presence of spinal disorders such as obesity, occupation, and lifestyle.

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