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Prevalence of spinal disorders in Saudi population using conventional radiology: Age and gender correlation

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ABSTRACT

Background: Despite its limitations in diagnosing certain spinal cord and spinal column disorders, conventional radiography can be employed as the first imaging modality in patients presenting with spinal disorders caused by bone abnormalities. *Material and methods:* A retrospective study conducted in Taif City-Kingdom of Saudi Arabia's King Abdul-Aziz Specialist Hospital and King Faisal Hospital from November 2020 to February 2021 to evaluate spinal diseases in Saudi population using conventional X-ray in Al-Taif city. The data was collected after receiving ethical approval from the administration of research and studies in the directorate of health affairs-Taif, and then analyzed using SPSS version 23, descriptive statistics were used to assess the frequency and percentage of disorder, and then Pearson's chi square test was used to correlate the prevalence with age and gender. *Results:* Scoliosis is the most common spinal disorder among the selected sample (73.4 percent), scoliosis occurs more frequently in females, while transitional lumbosacral vertebrae affect males more than females regardless of the number of females in the study sampling, no There was a substantial relationship found between age, gender, and spinal disorders seen on conventional radiography (p – value > 0.05). *Conclusion:* The study concluded that the most common spine disorder diagnosed by conventional radiology among selected sample is scoliosis, with the younger age groups are more affected.

Keywords: Scoliosis; kyphosis; conventional X-ray

1. INTRODUCTION

Thanks to technical improvements, a variety of imaging approaches for detecting spinal disorders have been developed. Radiography, which employs

X-rays to view the bone structure of the spine, estimate the state of the spinal canal, and identify specific pathologies such ossification of the posterior longitudinal ligament (OPLL) and osteoarthritis, is the first-line imaging modality (Bansal, 2006). According to the US Navy Aeromedical Reference and Waiver Guide, pre-existing spinal anomalies like as severe kyphosis, scoliosis, lordosis, disk extrusion, or their combinations may make the spine unstable during ejection. Furthermore, prolonged back pain can impair a pilot's performance. Physical employment characteristics have been proven to be more powerful in predicting the need for back pain-related medical consultations than MR imaging-identified disc abnormalities (Boon et al., 2000).

In order to assess the integrity of the vertebral column and lower the high costs of military pilot training, the Italian Air Force Academy, like the Royal Norwegian Air Force, includes spinal radiography among the medical selection procedures of candidates for military aviation (Andersen et al., 1991). Because of its accessibility and low cost, plain X-ray is the most commonly requested spinal imaging modality. It has the potential to be extremely beneficial. Its capacity to detect bone abnormalities is unsurpassed. A spine X-ray is frequently the first diagnostic test. It's a gadget that's routinely used in clinic to examine spine.

The vertebral bone structure and spinal column contour can be evaluated with a good quality radiograph (Lateef and Patel, 2009). Congenital, traumatic, degenerative, inflammatory, viral, and tumour diseases all have an impact on the spine. Radiography is still useful in many cases, despite the growing use of magnetic resonance imaging (MRI) and computerized tomography (CT) in the investigation of spinal diseases. On the other hand, radiologists are becoming less familiar with the prevalent findings in normal and disorder spine, and the study and reading of spine radiographs is receiving less attention (Santiago and colleagues, 2020).

The aim of the current study was to use conventional radiography to assess spinal column anomalies in the Saudi population. It's worth considering before receiving an MRI or CT scan.

2. METHODS AND MATERIALS

A retrospective study was undertaken at King Faisal Specialist Hospital and King Abdul-Aziz Specialist Hospital to evaluate the prevalence of spinal problems in the Saudi population, particularly in Taif, as well as the most frequent age and sex of those who suffered spinal illnesses. From November 2020 through February 2021, data was collected. With a serial number (IRB registration number with KACST, KSA-HAP-02-T-067), a written ethical approval was obtained from King Faisal specialized hospital and King Abdul-Aziz specialist, then from the administration of research and studies in the directorate of health affairs in Taif. A total of 94 conventional X-ray reports were included in the sample. All of the patients were imaging using a Philips X-ray machine. All of the variables were included in the data collecting form. The following information was extracted from the patient records: ages, gender, and X-ray final diagnosis. The data analysis performed using statistical package for the social sciences (SPSS) Version .25. Descriptive statistics of Mean± Standard error was used to summarize the data obtained. The frequency for categorical data and then Pearson chi-square test to correlate between studies variables, p value ≤0.05 consider statistically significant.

Conventional X-ray of the spine

A basic view of the spine, AP or PA and lateral, takes only a few minutes on a spinal X-ray. Patients must prepare by removing all metal objects and asking them to remove their clothes and wear a gown throughout the test, as well as an apron in the area not shown in the image. Depending on the patient's health, the patients are upright or supine on the examination couch, with a hand positioned along the patient's side and a part of the spine that defines placement between the X-ray device and a cassette carrying the X-ray film. To avoid blurring the image, ask the patient to remain quiet and hold his or her breath until the exposure is made and the image is created.

3. RESULTS

According to this study, females suffer from spinal disorders at a higher rate than males (61.7 percent). The younger age group accounts more than 50% of all patients suffering from spinal problems, with the 18–38-year age group accounting for 52.1 percent, followed by the 39–59-year age group accounting for 20.2 percent (table 1). The study demonstrated that the most spine disorder detected on X-ray image of the spine radiograph is scoliosis 73.4% followed by straightened and transitional vertebrae 5.3% and 4.3% respectively, spina bifida and flat back and disc lesion are the least percentage (Table 2).

Table 1 frequency distribution of patients according to age and gender

Demographic data	Frequency	Percent	Valid Percent	Cumulative Percent
Gender				
Female	58	61.7	61.7	61.7
Male	36	38.3	38.3	100.0
Total	94	100.0	100.0	
Age group				
12-17	6	6.4	6.4	6.4
18-38	49	52.1	52.1	58.5
39-59	19	20.2	20.2	78.7
60-80	17	18.1	18.1	96.8
More than 80	3	3.2	3.2	100.0
Minimum 12 , maximum 86, mean ±St.D 40.6± 19.04 years				

Table 2 frequency distribution of X-ray spine finding

Spine disorders in radiograph	Frequency	Percent	Valid Percent	Cumulative Percent
Disc lesion	1	1.1	1.1	1.1
Flat Back	2	2.1	2.1	3.2
Flat Cervical	3	3.2	3.2	6.4
Kyphosis	4	4.3	4.3	10.6
Kyphosis -scoliosis	1	1.1	1.1	11.7
Lumbarized sacral vertebrae	2	2.1	2.1	13.8
Scoliosis	69	73.4	73.4	87.2
Spina bifida	2	2.1	2.1	89.4
Straightening	5	5.3	5.3	94.7
Transitional vertebrae	4	4.3	4.3	98.9
Transitional vertebrae & Scoliosis	1	1.1	1.1	100.0
Total	94	100.0	100.0	

The most affected region of the spine by the spinal disorders is lumber spine representing halve of cases 50%, followed by dorsal and cervical region 15.96% and 10.64% respectively (Figure 1). Significant correlation was found between the disorder and the area affected as spina bifida affected sacrum, scoliosis and kyphosis seen in lumber and dorsal respectively, while straightened occurs in cervical and transitional vertebrae occurs in L/S area, p value <0.001, (table 3).

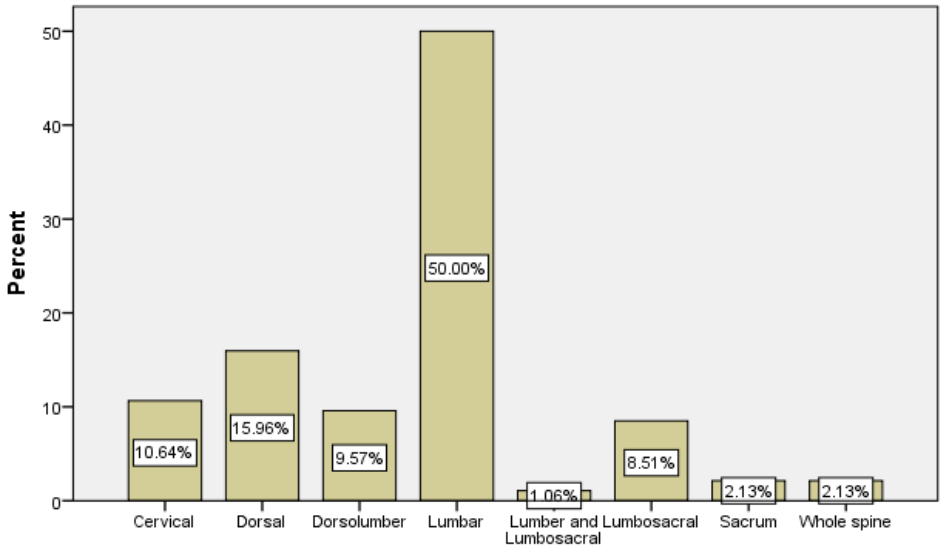

Figure 1 frequency distribution of affected region

Table 3 cross tabulation between affected region of the spine and the disorder seen

Spine disorder	Affected area								Total
	Cervical	Dorsal	D/L	Lumbar	Lumber and L/S	L/S	Sacrum	Whole spine	
Disc lesion	0	0	0	0	1	0	0	0	1
Flat Back	0	0	0	0	0	0	0	2	2
Flat Cervical	3	0	0	0	0	0	0	0	3
Kyphosis	0	3	0	1	0	0	0	0	4
Kyphosis -scoliosis	0	0	1	0	0	0	0	0	1
Lumbarized sacral vertebrae	0	0	0	1	0	0	1	0	2
Scoliosis	2	12	8	43	0	4	0	0	69
Spina bifida	0	0	0	1	0	0	1	0	2
Straightening	5	0	0	0	0	0	0	0	5
Transitional vertebrae	0	0	0	1	0	3	0	0	4
Transitional vertebrae, Scoliosis	0	0	0	0	0	1	0	0	1
Total	10	15	9	47	1	8	2	2	94
P value 0.000									

The study found that there is no significant correlation between spinal disorders seen and age of patients, p >0.05 (Table 4). No significant correlation between gender and type of spinal disorder shown, p value >0.05, (figure 2).

Table 4 cross tabulation between age group and the disorder seen

Spinal disorder	Age group					Total
	12-17	18-38	39-59	60-80	More than 80	
Disc lesion	0	0	1	0	0	1
Flat Back	0	1	1	0	0	2
Flat Cervical	0	2	1	0	0	3
Kyphosis	0	3	0	1	0	4
Kyphosis -scoliosis	0	1	0	0	0	1
Lumbarized sacral vertebrae	0	1	0	1	0	2

Scoliosis	4	34	14	14	3	69
Spina bifida	0	2	0	0	0	2
Straightening	2	2	1	0	0	5
Transitional vertebrae	0	2	1	1	0	4
Transitional vertebrae&Scoliosis	0	1	0	0	0	1
Total	6	49	19	17	3	94
P value 0.970						

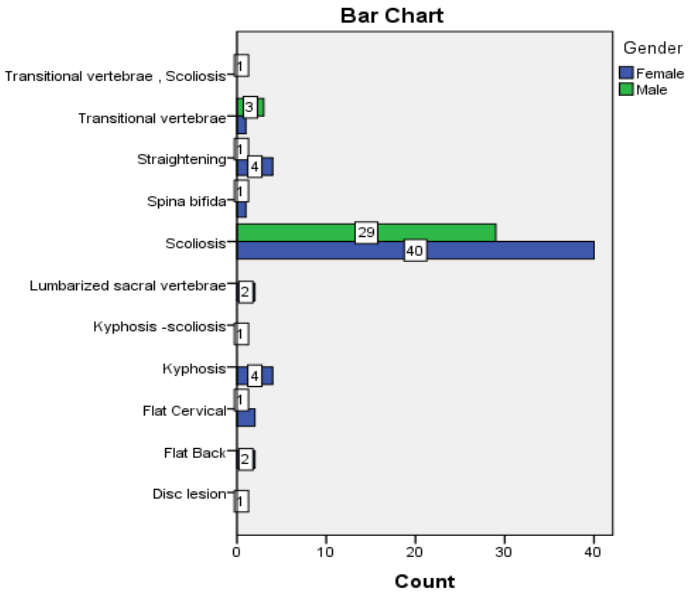

Figure 2 Bar chart assess relation between gender and spinal disorder (p value 0.330)

4. DISCUSSION

The first-line imaging modality for examining the spine is conventional radiography; it provides visibility of the spine's bone structure but has certain limits in spinal cord disorders. To begin the initial examination of the anteroposterior and lateral views of the spinal segment at the area of interest, conventional radiography is commonly used. Depending on the clinical situation, additional projections such as oblique, flexion, or extension views may be required. Conventional plain radiograph highlights the inherent advantages of evaluating structural integrity in a functional posture, especially with the patient standing and bearing weight. It also uses extension and flexion (dynamic) lateral radiography to provide a relatively accurate assessment of spinal instability. It also gives a relatively effective assessment of spinal instability using flexion and extension (dynamic) lateral radiography (Leone et al., 2007).

This study found that girls are more prone than boys to have spinal anomalies, with the lumber vertebrae being the most afflicted section of the spine, which matches Alshami's findings (2015). According to the study, the age range 18-38 years was the most afflicted by spinal disorders, accounting for 52.1 percent, followed by 39-59 years (20.2 percent). According to Alshami, (2015) the age group 30-49 years is the most impacted. According to Cheng et al., (2014), degenerative spinal problems are growing increasingly common as people age. This older age group grew at the fastest rate in the United States between 2000 and 2010, which has been linked to an increase in the need for spinal care, including adult degenerative spinal deformities (Alshami, 2015; Cheng et al., 2014).

In this study, scoliosis was the most common spinal illness found by conventional radiography (73.4 percent), with women being the most affected. According to earlier studies, idiopathic scoliosis is by far the most common type of spine deformity, with a prevalence of one to three per 100 (curves more than 10°) in an equal percentage of boys and girls. According to a recent survey, scoliosis was the most common spine illness among children aged 12 to 17. The most common spinal issues among school-aged children at western clinics in Korea were dorsalgia (31.8%) and scoliosis (13.5%), while back pain (29.0%) and neck pain (10.8%) were the most common in oriental clinics (Kane and Moe, 1999; Stirling et al., 1996; Montgomery, 1997; Kim et al., 2010).

The frequency of scoliosis was highest in the age group 18-38 years in this study, which contradicts other studies that suggest scoliosis rates increasing with age as a consequence of increased prevalence of metabolic bone disease in elderly adults (Vanderpool et al., 1969). According to a study conducted in China, females are more affected than males, with incidences of idiopathic and congenital scoliosis of 67.7% and 18.1 percent, respectively (Shang and Huang, 1996). In this study, transitional vertebrae more typically arise in the L/S area, and males are more impacted by L/S transitional vertebrae than females. Despite the fact that the sample group contains more females, more males have lumbosacral transitional vertebrae and are sacralized (Uçar et al., 2013). There was no statistically significant link between age and gender, and the kind of spinal condition in this investigation. Some of the cervical and lumbar spine illnesses have a skewed connection with age and gender (Olanrewaju, 1994).

This study demonstrates that conventional radiology detects a large number of spinal disorders, that spinal disorders are more common in women, that the lumber region is more affected than other spinal regions, and that there is no significant correlation between type of spinal disorder and gender or age. Females were more impacted by scoliosis than males, while males were more affected by transitional vertebrae than females.

5. CONCLUSION

In conventional radiography large number of spinal disorders should be detected. The most common spinal disorder found in this study in Saudi population is scoliosis, lumber spine disorders is more than another, female is more affected than male, age and gender not related to the type of spinal disorder. These findings are based on limited data and further rigorous investigation is required with consistent methodologies.

Limitations

The limitation of this study includes loss of sufficient information to support the search, difficulty accessing enough information about spine disorders, not enough time to collect more data and COVID-19. Further studies should be recommending adding clinical information is necessary.

Author's contributions

First author planning, set up the research and writing. Second up to sixth data collection, seventh up to eleventh set up to data, literature and revising, the last author number twelfth revising draft and submission.

Informed consent

The written and verbal informed consent was obtained from all participants before enrolment in the study.

Ethical approval

Ethical approval was taken from King Faisal specialist hospital and King Abdul-Aziz specialist with code (IRB registration number with KACST, KSA-HAP-02-T-067). The sequences followed were similar to Helsinki Declaration of 1975 which was revised in 2013.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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