The Prevalence and Clinical Importance of Pathological Findings in Cervical MRI among Patients Presenting with Neck Pain at Kumi Orthopaedic Center

John Ekure¹, Naomi Amuron², Douglas Kilama¹, Phillip Buluma¹, Andrew Iloket¹, Faith Akello¹*

¹Kumi Orthopaedic Center, Kumi, Uganda
²College of Health Sciences, Soroti University, Soroti, Uganda
Email: *faithakello223@gmail.com

Abstract

Introduction: Neck pain is a major public health problem in the general population. It not only constitutes a major personal burden but also affects families and the health and economic structure of the countries. In Uganda, despite the impact of neck pain, its burden has not been comprehensively presented, in a way that can serve as the basis for different types of epidemiological studies and for evaluating the current abnormalities related to neck pain. We aimed to evaluate pathological findings commonly detected on Magnetic Resonance Imaging (MRI) scans of the spine, to find the frequency of these findings and to emphasize their clinical importance. **Methods:** This was a retrospective study involving all patients with neck pain (with or without radicular symptoms) seen at Kumi Orthopaedic Center between 2019 and 2023 who had an MRI of the cervical spine. These were identified in the patient register. MRI findings were extracted and quantified from the radiologist's narrative report **Results:** MRI reports of 131 patients were included. The mean age was 50.5 years (SD 15.13: range 12 - 87) and 55.7% were men. The most prevalent MRI findings were Disc bulges (54.2%), foraminal compromise (42.7%), and nerve root compression (36.6%). The least prevalent finding was fracture (2.3%). The number of abnormalities significantly increased with an increase in age. However, there was no significant difference in findings between males and females across all age groups. The most involved vertebrae were C5/C6 (67.2%), C4/C5 (60.3%) and C6/C7 (56.8%). The least involved vertebra was C1/C2 (13.8%). **Conclusion:** The findings of this study provide a comprehensive and informative overview useful in informing the clinicians in diagnosis and decision making thus improving patient management.

1. Introduction

Neck pain is a common and disabling health condition, ranking 21st in the overall burden and 4th in the overall disability among the 291 conditions in the Global Burden of Disease study [1]. It is one of the most common musculoskeletal disorders in the general population, second only to low back pain [2]. In 2017, the global age-standardized prevalence and incidence rate of neck pain were 3551.1 and 806.6 per 100,000, respectively [2]. Therefore, neck pain is a major public health problem in the general population. It not only constitutes a major personal burden but also affects families and the health and economic structure of the countries [3] [4]. Magnetic resonance imaging (MRI) is a noninvasive imaging technique usually used to investigate the potential causes of neck pain [5]. It has recently been championed as the preferred technique for pathology-specific diagnosis for most cervical pathologies [6]. The prevalence of cervical pathologies among patients presenting with neck pain in the geriatric population requires a comprehensive understanding of clinical history and physical examinations and eventually proper management [7].

A wide range of research about the epidemiology, management, morbidity, and mortality of abnormal findings in the cervical spine has been added to the literature in the last few years [8] [9].

However, in Uganda, there is a deficit in literature on the commonest findings in cervical spine MRIs and their distribution. Such data could help inform policies on preventive measures and management algorithms for common pathologies associated with neck pain.

2. Methods and Materials

Ethical approval and waiver of consent to conduct this study was granted by Mbale Regional Referral Hospital Research and Ethics Committee (Ref no MRRH-2024-417)

This was a retrospective study of 131 cervical MRI reports of patients who presented with neck pain at Kumi Orthopaedic Center from 1st January 2019 to 31st May 2024. Inclusion criteria included all patients with neck pain, with or without sensory or motor symptoms such as numbness, motor weakness, clumsiness, or gait disturbance. We excluded patients who had a history of trauma *i.e.* RTA, assault, or a fall.

Data was abstracted from both the patient files and MRI reports. These included patient demographic characteristics *i.e.* age, sex, occupation, indication for the MRI scan, and the findings.

The data was analyzed using Stata version 14.0. The chi-square test was used to evaluate differences in abnormal findings between different age groups and between males and females. Statistical significance was considered if the p-value was less than 0.05.

3. Results

This study reviewed records of 131 patients referred to MRI for cervical spine assessment. Of the total participants, males were 73 (55.7%) and females were 58 (44.3%). The mean age of participants was 50.5 years with a range of 12 to 87 years with the majority 70 (53.4%) aged between 46 to 65 years. Most of the patients were peasants 40 (30.5%) and presented with only spontaneous neck pain 95 (72.5%), as shown in Table 1.

Table 1. Patient demographic characteristics.

Variable	Frequency (%)
Age mean (SD)	50.5 (±15.13)
Sex	
Male	73 (55.7)
Female	58 (44.3)
Age groups (years)	
0 - 14	2 (1.5)
15 - 45	40 (30.5)
46 - 65	70 (53.4)
66-above	19 (14.5)
Occupation	
Peasant	40 (30.5)
Teacher	19 (14.5)
Housewife	18 (13.7)
Business	13 (9.9)
Officer	11 (8.4)
Others	30 (23)
Indication	
Pain	95 (72.5)
Pain with radiculopathy	36 (27.5)

From the study, 109 (83.2%) of the participants had a pathological finding (s). The most frequent pathological finding was disc bulge (Table 2), which was present in 54.2% of the patients, followed by foraminal compromise (42.7%) and nerve root compression (36.6%). The least frequent abnormality was a compression fracture in 2.3% of the patients.

Table 2. Number of incidences.

Findings	Number	Percentage (%)
Normal	22	16.8
Mass	6	4.6
Fracture	3	2.3
Spondylosis	42	32.1
Disc herniation	24	18.3
Disc bulge	71	54.2
Disc desiccation	39	29.8
Nerve root compression	48	36.6
Foraminal compromise	56	42.7
Foraminal stenosis	11	8.4
Central stenosis	20	15.3
Cord compression	13	9.9

Figure 1 shows the frequency of evidence according to vertebral discs in the cervical spine. Our findings show that abnormalities increase gradually in lower discs until they reach the highest rates at C5-C6 with 88 (67.2%) of the patients with abnormalities at this level. The number of abnormalities gradually decreases towards C7-T1.
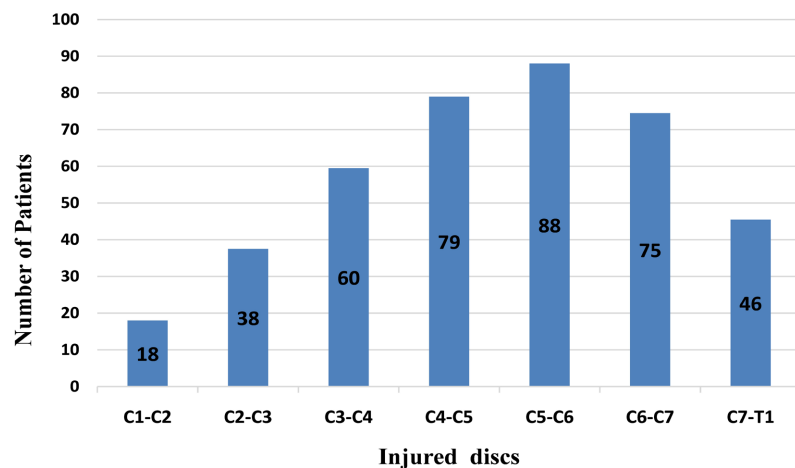
Figure 1. The most frequently injured discs.

The majority of the injuries were significantly associated with age *i.e.* their incidence increased with an increase in age. However, abnormalities were not gender dependent *i.e.* they were not significantly associated with being either male or female as shown in Table 3 below.

From the table above, the findings of disc bulge, disc desiccation, foraminal compromise, and central stenosis were significantly associated with age (p-value

Table 3. Comparisons of findings across different age groups, sex, and occupation using Chi-square test.

Findings	Across age groups (p-value)	Across sex (p-value)	Across occupation (p-value)
Mass	0.125	1.000	0.537
Fracture	0.587	1.000	0.352
Disc herniation	0.108	1.000	0.508
Disc bulge	**<0.001**	0.290	0.344
Disc desiccation	**0.035**	0.125	0.120
Nerve root compression	0.165	0.146	0.220
Foraminal compromise	**0.006**	0.477	**0.010**
Foraminal stenosis	0.109	0.547	0.162
Central stenosis	**0.010**	1.000	0.659
Cord compression	0.193	0.144	0.720
Normal	**<0.001**	0.060	0.332

less than 0.05) *i.e.* their prevalence increased with an increase in age as observed in the data collected. Therefore, their prevalence was higher in the older population compared to the younger population. Normal findings were also significantly more prevalent in the younger population (p-value less than 0.05). A foraminal compromise was significantly associated with occupation. However, the pathological findings were not significantly associated with sex.

4. Discussion

Cervical MRI is considered one of the best imaging modalities for imaging cervical vertebrae given its excellent image contrast in demonstrating the various spine structures [10] [11]. This study assessed cervical MRI reports of patients who presented with neck pain with or without radiculopathy and the findings showed that the prevalence of abnormality in the cervical spine was high (83.2%) among patients with neck pain and increases with age. The most prevalent abnormality is disc bulge (54.2%). This is similar to findings in studies done elsewhere. A cross-sectional study by Hiroaki *et al.* in Japan on 1211 patients found that 87.6% of the patients had a disc bulge even though the MRI studies were done on asymptomatic participants [6]. A study in Nepal on 750 MRIs of symptomatic patients also found disc degeneration and disc bulge as the most common findings that also increase with age with patients above 40 years being more affected than patients below the age of 40 years [12].

The most commonly affected disc level was C5-C6 (88%). This is similar to findings in multiple studies. A retrospective study on 160 cervical MRI patients in Ethiopia also found that C5-C7 was the most common level [13]. Similarly, 2 studies on patients in Switzerland and Canada found that most of the cervical

abnormalities *i.e.* Modic changes and disc herniation were most frequently observed at C5/C6 [14] [15].

Non-degenerative abnormalities were the least common findings. They were seen in 6 (4.6%) patients. Studies in Nigeria and Nepal found non-degenerative pathologies in 12.1% and 35.5% respectively. The relatively low percentage of non-degenerative pathologies in our study could be explained by the exclusion of patients with a history of trauma as the majority of the patients with non-degenerative findings in the above studies were trauma-related [12] [16].

Of the 131 patients in this study, 22 (16.8%) had no remarkable cervical spine MRI findings. This is similar to the 14.4% found in the study on 160 patients in Ethiopia [13]. The absence of abnormal imaging findings in these patients could be related to different nonstructural factors such as patient psychosocial, demographic, or socioeconomic factors as some previous studies tried to link up and explain pain with different perspectives [17] [18]. Recent literature has also shown that individual/biological factors (e.g. pre-existing neuromuscular or autoimmune disorders and genetics) can contribute to the development of neck pain [7].

The prevalence of pathological findings increases with an increase in age. This can be explained by the fact that the majority of the pathological findings are associated with degeneration which is known to increase with age hence pathology was more prevalent in the older population [19] [20].

The pathological findings of this study were not significantly associated with sex. This is different from the findings of a study in China that found degeneration higher in females compared to males [21]. The difference in findings could be attributed to the difference in study populations and method of diagnosis. The study in China was a community-based cross-sectional study where symptoms and signs were the base of diagnosis for degeneration.

The prevalence of pathological findings in the cervical spine was not significantly associated with occupation which is contrary to findings in a study done in the United States which found that cervical pathologies especially those suggestive of degenerative disease were significantly associated with some occupation [22]. This could be attributed to the fact that the majority of the people in this study were peasants with limited variability in types of occupations making it difficult to establish an association.

Our study had several limitations. It was conducted in a single center and different populations may have different risk factors from those of the study population thus the results may not be generalizable to the entire population. The reports that were reviewed were reported by a single radiologist and do not give room for comparability and thus may introduce some information bias.

5. Conclusions

In our study we found that the older population is more affected by degenerative diseases *i.e.* those older than 45 years are more affected than those below 45 while non-degenerative abnormalities are more prevalent in the younger population

compared to older ones. Lower cervical discs are more frequently affected by disc diseases than higher vertebral discs.

Abnormal findings generally significantly increase with age. However, we did not find any significant differences between men and women across all abnormalities in all age groups.

This study provides valuable information on the prevalence and distribution of abnormal findings of cervical spine MRI. This information helps clinicians suspect and diagnose cervical spine conditions more accurately hence timely and effective treatment with reduced risks of missed diagnosis. It also further informs treatment decisions taking into account the likelihood of specific conditions.

Data from this study also provides a basis for in-depth epidemiological studies on the risk factors associated with cervical pathology *i.e.* socio-economic, genetic, and behavioral factors.

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Conflicts of Interest

We do not have any conflict of interest to disclose.

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