

Analysis of Frequency and Risk Factors Associated with Discitis Followed by Disc Surgeries for Prolapsed Inter-Vertebral Disc

ADNAN MUNIR¹, MUHAMMAD IDRIS KHAN², LAIBA FASIHAT³, SADIQ UR REHMAN⁴

¹Trainee Registrar Neurosurgery, Khyber Medical College/ Khyber Teaching Hospital, Peshawar

²In-charge Neurosurgery Unit, Assistant Professor / Consultant Neurosurgery, Khyber Teaching Hospital, Peshawar

³Research Officer, Khyber Teaching Hospital

⁴Student, Khyber Medical College

Correspondence to: Muhammad Idris Khan, Email: Idrisnsw83@gmail.com, Cell: 03349266607

ABSTRACT

Background: Postoperative discitis, an inflammatory and infectious complication, can arise following disc surgeries for PIVD (Prolapsed Intervertebral Disc).

Aim: To comprehensively examine patient demographics, affected spinal regions, surgical interventions, and risk factors related to postop discitis, providing vital insights for enhanced management and preventive measures with respect to whole spine.

Methods: A one-year retrospective study was carried out examining PIVD patients who underwent surgical interventions and developed discitis following surgery between 1st September 2022 and 31st August 2023. This research utilized descriptive statistics to explain each variable under study (including demographics, affected spinal areas, duration of stay for PIVD management, surgical procedures performed, frequency of post-operative discitis, risk factors noted, duration of hospital stay with discitis, and the time interval between discharge and re-admission). At the same time, the Haldane-Anscombe correction is used to illustrate the impact of risk factors on developing post-surgical discitis.

Results: Out of the 182 patients who had undergone disc surgeries for diagnosed PIVD, 11 developed post-operative discitis. Disc prolapse and post-op discitis both were more frequent in the lumbar spine with a percentage of 48.4 % and 45.5% respectively particularly involving the sacral vertebrae (lumbosacral; 55.5%) compared to other spinal regions. Patients ≥ 50 age were at greater risk of developing post-op discitis (RR=196.5714). The most common procedure performed for PIVD was Fenestration along with Microdiscectomy, but it was notable that a majority of patients who developed discitis were gone through modified laminectomy plus Microdiscectomy. The hospital stay duration varied considerably, likely reflecting individual patient needs.

Conclusion: In the studied population, discitis was found to be rare, affecting only 6.04%. It was more common among older age groups. These findings offer valuable insights into this population's demographics and surgical trends associated with discitis.

Keywords: Discitis, prolapsed disc, PIVD, post-op discitis

INTRODUCTION

A prolapsed inter-vertebral disc which is also known as a protruding, bulging, or ruptured disc can develop anywhere along the spine, but it most frequently affects the lower back. It is one of the most typical causes of sciatica, leg discomfort, and lower back pain¹. It is commonly associated with low back pain and can be seen in the majority at the age of 25-45 years². Twin studies were suggestive of its genetic cause other than environmental factors and concluded 60% of the variance on towards genetic ground³. In up to 25% of magnetic resonance scans, prolapsed intervertebral disc is observed, and even adults without symptoms can have it⁴. The ratio of PIVD is more prevalent in men rather women⁵. NICE guidelines advocate the conservative mode of treatment before moving towards surgical intervention including medicine, physical therapy, and counseling⁶. The prevalence of intervertebral disc disease increases with age and can be managed by various modalities including conservative management to relieve pain, molecular therapy for restoration, percutaneous intervertebral disc techniques for reconstruction, compression relieving and replacement surgery, and rigid fusion surgery⁷.

Following discectomies, the nucleus pulposus is primarily impacted, with subsequent involvement of the cartilaginous end plate and vertebral body⁸. It may lead to Discitis; which is characterized by infection-induced inflammation of the vertebral discs; an uncommon entity following a surgical procedure yet the outcomes could be substantially significant in clinical practice^{9,10}. Different studies have reported the prevalence of post-surgical infections but it is estimated to be 5% for the majority of spine surgical operations¹¹. These infections are more common at the lumbar site in the spinal section compared to other areas. It can be caused by microorganisms, particularly *Staphylococcus aureus* (S.

aureus), and could be due to patient-related risk factors such as diabetes, obesity, smoking, corticosteroid use, advanced age, and excessive duration of hospital stay¹².

Chances for acquiring infections followed by spinal procedures vary, depending on various factors along with the procedure performed for individual cases while the overall incidence is reported to be 18 percent¹³. Some studies are also suggestive of Procedural impact on developing post-operative infections like discitis though lumbar discectomies have a lower ratio of risk as compared to other procedures like spinal arthrodesis and posterior instrumentation¹⁴. 1st line of treatment usually involves 6-8 weeks of conservative management as per guidelines, to deal with radicular pain¹⁵. And surgeries are performed only in the case of neurological emergencies with the risk of developing progressive neurological disorders in the future¹⁶. Early detection and treatment result in highly positive patient outcomes and frequently avoid the need for surgical intervention. On the other hand, delayed presentations with neurological deterioration require immediate surgery and rigorous care to avoid permanent spinal cord and spinal deformities. The pivotal spinal pathology of spine infections and discitis must be properly taken into account instantly. Due to the high occurrence, it is a diagnosis that frequently goes unrecognized and requires a high degree of presumption¹⁷.

The possibility of discitis is influenced by a number of risk factors which majorly involve economically disadvantaged groups as they frequently experience a delayed diagnosis and due to late presentation with a severe illness and a peak in symptoms, vulnerability increases¹⁸. Additional risk factors for discitis development include prior infections, particularly those of the skin, respiratory tract, kidney, oral cavity, and skin, as well as HIV infections. The existence of long-standing pre-existing medical illnesses such as renal failure, rheumatological disorders, and liver cirrhosis is another co-morbidity with growing older and people with immunocompromised immune systems¹⁹.

Received on 12-01-2024

Accepted on 15-04-2024

This study investigates the frequency and associated risk factors of discitis after disc surgeries for prolapsed-intervertebral disc (PIVD) in different regions of the spine including the cervical, thoracic, lumbar, and sacral spine. The study aims to provide useful information for spine surgeons and patients who undergo disc surgeries for PIVD in a government tertiary care hospital.

MATERIALS AND METHOD

This study was carried out retrospectively in which a one-year previous record of patients who underwent discectomy for the prolapsed intervertebral disc at the neurosurgical department in a tertiary care hospital was examined. Data was extracted from the medical records of all the diagnosed patients with PIVD undergone surgical intervention, admitted to the neurosurgery ward from April 2022 to April 2023. The data obtained from retrospective patient charts included demographics (Age, gender, and district), affected area of the spine, associated symptoms, duration of stay for PIVD management, surgical procedures performed, the patients who developed post-operative Discitis, duration of hospital stay with discitis and intermittent duration between discharge and re-admission. Data was analyzed using descriptive statistics and presented in tables and graphs.

RESULTS

Demographics: In this study, the sample population included 182 patients who underwent discectomy for PIVD, shown in Figure 1 and Table 1. The age of the patients ranged from 21 to over 60, with a total of 24 patients in the 21-30 age range, 62 patients in the 31-40 age range, 57 patients in the 41-50 age range, 29 patients in the 51-60 age range, and 10 patients over 60 years of age. Of the total sample population, 91 were male and 91 were female. Patients presented from 13 different districts, with the highest number of patients from Peshawar (71), followed by Mardan (13) and Karak (12).

Graph 1: Number of Patients from different districts of KP

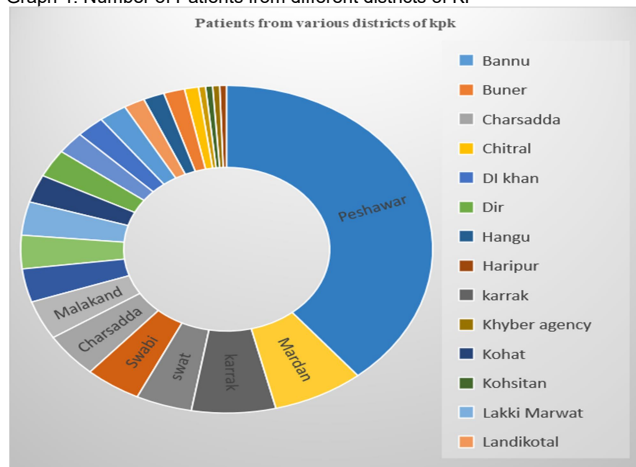


Table 1: Demographics (age and gender)

Age Range	Numbers	Male	Female
21 - 30	24	14	10
31 - 40	62	30	32
41 - 50	57	24	33
51 - 60	29	16	13
>60	10	7	3
Total		91	91
Grand total	182	182	

The Affected Areas: The affected areas included cervical, lumbar, lumbosacral, and thoracic regions. The breakdown of affected areas as shown in Table 3 by specific spinal levels showed that the

majority of patients had issues with the lumbar region, specifically at the L4-L5 level, which was affected in 62 cases. Other affected areas included the L5-S1 level with 57 cases, the L3-L4 level with 17 cases, and the cervical region, with C5-C6 and C6-C7 affected in 14 and 7 cases, respectively. Additionally, a few cases were found in the lumbosacral and thoracic regions.

The information regarding the affected area in the spine was obtained from patient records and imaging studies and analyzed in conjunction with other data collected in the study. The purpose of analyzing this information was to identify any potential correlations between the affected area in the spine and the incidence of postoperative discitis in patients who underwent discectomy for PIVD.

Table 2: Affected Area in Spine

Affected Area in Spine			
Cervical		Lumbosacral	
C5-C6	14	L3-L4, L4-L5	2
C6-C7	7	L3-L4, L5-S1	1
Lumbar		L4-L5, L5-S1	7
L1-L3	9	L4-L5, S1-S2	1
L2-L3	17	L4-L5, L5-S1	3
L4-L5	62	L4-L5, S1-S2	1
Thoracic		L5-S1	57
D7-D8	1		
Grand Total			182

Type of Surgeries Performed: A total of 182 surgeries were performed on patients who underwent discectomy for PIVD. The surgeries performed are shown in Table 2. It can be seen from the table below that most of the surgeries are fenestration and modified laminectomy with microdiscectomy.

Table 3: Type of Surgeries Performed

Surgeries Performed	
ACDF with peek cage and plate	5
ACDF with zero profile	12
conventional laminectomy	2
conventional laminectomy + fusion	6
fenestration + microdiscectomy	85
modified laminectomy + microdiscectomy	71
trans thoracic approach + discectomy	1
Grand Total	182

Risk factors observed in patients with PIVD: Risk factors noted in patients while assessing for PIVD are listed in the table 4, along with the relevant frequencies, means, and standard deviations. This data revealed that 39 out of 182 patients with diagnosed PIVD who had gone through surgical intervention were aged ≥ 50 and contributed to the highest risk factor. In contrast, failed back syndrome had a lower frequency (4) and a smaller mean (0.0219), indicating that it was less prevalent and had lower levels of population variability.

Table 4: Risk factors observed in patients with PIVD

Risk factors observed	Frequency	Mean	St. deviation
Intravenous drug use	6	0.0329	0.179
Diabetic	10	0.0549	0.228
Failed back syndrome	4	0.0219	0.147
Hypertension	15	0.0824	0.275
Wound infection	12	0.0659	0.248
Long surgical duration	7	0.0384	0.192
Revision surgeries	7	0.0384	0.192
Obesity	24	0.1318	0.339
Greater age (\geq)	39	42.549	10.731

Presentation of Patients with Postoperative Discitis: Patients who went through surgery for PIVD and developed post-surgical discitis were 11 out of 182. Among them, 6 cases had a history of disc prolapse at the lumbosacral level, 4 cases with the lumbar region only, and only one case with cervical disc prolapse developed discitis later on. Modified laminectomy plus

microdiscectomy was the commonest procedure among these patients while a great deal of variation in terms of hospital stay duration is observed with the largest duration of stay with PIVD

being 8 days, with post-op discitis was 20 days and intermitted duration after surgical intervention was 27 days.

Table 5: Presentation of Patients with Post-op Discitis

Age	Gender	District	Affected Area in the Spine	Risk factors	Duration Of Stay at Hospital (with PIVD)	Re-admission (days after discharge with Postop PIVD)	Duration of Stay with Discitis (Days)	Surgical Procedures Performed
36	M	Swabi	Lumbar (L4-L5)	Wound infection	4	20	15	fenestration + microdiscectomy
45	M	Malakand	Lumbosacral (L5-S1)	Diabetic	4	27	15	modified laminectomy + microdiscectomy
65	F	Peshawar	Lumbosacral (L4-L5, L5-S1)	Older age	8	11	12	modified laminectomy + microdiscectomy
51	F	Swat	Lumbosacral (L4-L4, S1-S2)	Older age	5	20	20	modified laminectomy + microdiscectomy
44	F	Peshawar	Lumbosacral (L3-L4, L5-S1)	Obesity	6	15	15	modified laminectomy + microdiscectomy
48	F	Malakand	Lumbar (L4-L5)	Diabetic	4	14	16	modified laminectomy + microdiscectomy
54	F	Tirah	Lumbar (L4-L5)	Older age	4	22	20	modified laminectomy + microdiscectomy
45	F	Landikotal	Lumbar (L4-L5)	Diabetic	4	10	12	modified laminectomy + microdiscectomy
27	M	Karrak	Lumbosacral (L3-L4, L4-L5)	Intravenous drug use	4	13	14	fenestration + microdiscectomy
55	M	Peshawar	Lumbosacral (L4-L5, L5-S1)	Older age	5	12	10	conventional laminectomy + fusion
28	F	Buner	Lumbosacral (L4-L5, L5-S1)	Long surgery hour	5	17	12	fenestration + microdiscectomy

Impact of risk factors on developing post-op discitis: Various risk factors were observed in the population under study but those who developed discitis later on, had the greater age factor being the most prominent in developing the condition. Odds ratio and relative risk values are given to describe the impact of risk factors on the individual variables. (Table:6)

Table: 6 Impact of risk factors on developing post-op discitis(Haldane-Anscombe correction)

Risk factors in post-op discitis patients	Odds Ratio OR	Relative risk RR
Greater age	457.3333	196.5714
Diabetes	147	103.2
Wound infection	30.81818	28.33333
Obesity	13.78261	13.25
Intravenous drugs	70.2	58.66667
Long surgery hour	58.16667	50

DISCUSSION

Retrospective studies are the key-forming tool for prospective studies in the future²⁰. In our study, discitis is observed as a post-operative complication by examining all the patients gone through disc surgeries for the parent diagnosis of the prolapsed inter-vertebral disc at the neurosurgery department. Different studies have been done previously that aim to identify the frequency, associated factors, or surgical complications related to this condition however many of them focus on specific vertebral levels for example at the lumbar site especially, while none of them describe it as a whole by mentioning cervical, thoracic, lumbar and sacral vertebrae at the same time. Thus, this rationale is adjusted here in the study and gives an overview of the vertebral disc prolapse in the overall spine.

The study was conducted in a tertiary care hospital in the capital city of the province which automatically serves as the center for major facilities including health so the patient flow at the neurosurgical unit comes from different areas of Khyber-Pakhtunkhwa and the major demographics with respect to the district or major residence of the patients came from Peshawar (n=71) followed by Mardan (n=13) and Karak (n=12). Unfortunately, in Khyber-Pakhtunkhwa, the present state of rural health centers'

infrastructure falls short of adequately addressing the requirements of local communities revealing notable deficiencies for effective healthcare²¹. Thus, an overall of 60.98% of the cases were observed to come from other districts of KPK while gender distribution was observed to be the same in both males and females.

PIVD is a prevalent clinical condition characterized by claudication pain in the lumbar spine and the manifestation of radiculopathy or myelopathy symptoms in the cervical spine and may include other symptoms like restricted movements or muscle fatigue²². In the case of cervical vertebrae, the symptoms originate as a form of Brachialgia with frequent involvement at the levels of C5, C6, and C7²³. With the literature review, it was observed that post-operative discitis is not reported in the entire spine yet different studies explain the condition with respect to specific vertebrae so our study elaborates them all together with the continuous pain being the most frequent associated symptom (n=137) with PIVD.

The hallmarks of radicular pain associated with acute-onset or myelopathy-related symptoms that occur upon sudden exertion or when lifting weight and cause early muscle fatigue; characterized by PIVD are usually treated with a conservative approach in acute stage before going towards a surgical procedure and a large number of patients get a remission of symptoms with it, though regression of herniated discs under non-surgical care is extremely uncommon²⁴. In our study, various surgical procedures were performed on the patients who didn't respond well to non-surgical treatment, including various levels of disc surgeries for their long-term relief, involving ACDF with zero profile or peek cage and plate for cervical vertebrae, laminectomies, and discectomies for lumbar and lumbosacral regions while only one case of trans-thoracic approach plus discectomy was done for thoracic vertebra at D7-D8 in the last one year which also shows that this area was quiet less common compared to lumbar and lumbosacral regions in terms of vertebral disc pathologies.

Among 182 patients who went through surgical management for disc prolapse in our study, 11 of them developed discitis later on when discharged with post-op PIVD (M=4, F=7) while the frequent infectious site was noted to be lumbosacral vertebrae. The majority of the cases were having age >40 (n=8), and those with age <40 was n=3 which corresponds to the greater risk in the

elderly population. It can be due to the fact of greater immunity and resistance towards infection in younger ages compared to older ones. The relative risk of 196.57 shows the overall impact of greater age is a major risk factor for developing discitis followed by diabetes with an RR of 147.

When assessing patients for a prolapsed disc, various risk factors were noted. Six patients in the entire population were intravenous drug users among which one developed discitis with the OR of 70.2. Obesity was the second most frequent factor observed after older age in the PIVD population while only one of them encountered discitis secondary to disc surgery. Wound infection and diabetes come next in the race while only one patient with an OR of about 58.2, developed post-op discitis while re-admission time duration post-operatively was greater than 10 days in every case with post-op discitis which means that this duration is the minimum for acquiring disc infection following surgery thus appropriate precautions should be taken by both patients and hospital staff to avoid its risk in pre, peri and postoperatively.

CONCLUSION

Post-surgical discitis observed following disc surgeries was 6.04% among the patients in one year. The condition was more prevalent in lumbar and lumbosacral vertebrae undergone surgical interventions for PIVD. Older age was associated with a greater risk of developing post-op discitis. Duration of hospital stay with discitis was noted to be greater than one week depending upon the patient's need which varied with age and condition. Although longer hospitalization should be avoided, however, the patients who came from farther districts preferred to stay longer for the treatment to avoid further complications during or after traveling.

Limitations: The study was conducted using retrospective data from a single center, which may introduce selection bias and limit the generalizability of the results to a larger population. Although analyzing the post-operative disc inflammation incidence is crucial, the lack of available data on quality of life (QOL) prevents a comprehensive comparison with the incidence and measurement of QOL's impact on the condition as it could have provided valuable insights for a more robust analysis.

Authorship and contribution declaration: Each author of this article fulfilled following Criteria of Authorship:

1. Conception and design of or acquisition of data or analysis and interpretation of data.
2. Drafting the manuscript or revising it critically for important intellectual content.
3. Final approval of the version for publication.

All authors agree to be responsible for all aspects of their research work.

Ethical approval: Ethical approval was taken from the Institutional Review Board (IRB)

Conflict of interest: The authors declared no conflict of interest.

Funding: This study not funded by any company or institution

REFERENCES

1. Ali ASM, Zafreen F, Wahab M. Study on Prolapsed Intervertebral Disc Cases Admitted in Military Hospitals. *Journal of Armed Forces Medical College, Bangladesh*. 2020;15:221-3.
2. Kelsey JL, Golden AL, Mundt DJ. Low Back Pain/Prolapsed Lumbar Intervertebral Disc. *Rheumatic Disease Clinics of North America*. 1990;16(3):699-716.

3. Battié MC, Videman T, Parent E. Lumbar disc degeneration: epidemiology and genetic influences. *Spine (Phila Pa 1976)*. 2004;29(23):2679-90.
4. Boden SD. The use of radiographic imaging studies in the evaluation of patients who have degenerative disorders of the lumbar spine. *J Bone Joint Surg Am*. 1996;78(1):114-24.
5. Singh V, Malik M, Kaur J, Kulandaivelan S, Punia S. A systematic review and meta-analysis on the efficacy of physiotherapy intervention in management of lumbar prolapsed intervertebral disc. *Int J Health Sci (Qassim)*. 2021;15(2):49-57.
6. Satpute K, Hall T, Bisen R, Lokhande P. The Effect of Spinal Mobilization With Leg Movement in Patients With Lumbar Radiculopathy-A Double-Blind Randomized Controlled Trial. *Arch Phys Med Rehabil*. 2019;100(5):828-36.
7. Wu PH, Kim HS, Jang IT. Intervertebral Disc Diseases PART 2: A Review of the Current Diagnostic and Treatment Strategies for Intervertebral Disc Disease. *Int J Mol Sci*. 2020;21(6).
8. Basu S, Ghosh JD, Malik FH, Tikoo A. Postoperative discitis following single-level lumbar discectomy: Our experience of 17 cases. *Indian J Orthop*. 2012;46(4):427-33.
9. McDermott H, Bolger C, Humphreys H. Postprocedural discitis of the vertebral spine: challenges in diagnosis, treatment and prevention. *J Hosp Infect*. 2012;82(3):152-7.
10. Singh DK, Singh N, Das PK, Malviya D. Management of Postoperative Discitis: A Review of 31 Patients. *Asian J Neurosurg*. 2018;13(3):703-6.
11. Nasto LA, Colangelo D, Rossi B, Fantoni M, Pola E. Post-operative spondylodiscitis. *Eur Rev Med Pharmacol Sci*. 2012;16 Suppl 2:50-7.
12. Hegde V, Meredith DS, Kepler CK, Huang RC. Management of postoperative spinal infections. *World J Orthop*. 2012;3(11):182-9.
13. Tsantes AG, Papadopoulos DV, Vrioni G, Sioutis S, Sapkas G, Benzakour A, et al. Spinal Infections: An Update. *Microorganisms*. 2020;8(4).
14. Olsen MA, Nepple JJ, Riew KD, Lenke LG, Bridwell KH, Mayfield J, Fraser VJ. Risk Factors for Surgical Site Infection Following Orthopaedic Spinal Operations. *JBJS*. 2008;90(1):62-9.
15. Airaksinen O, Brox JI, Cedraschi C, Hildebrandt J, Klüber-Moffett J, Kovacs F, et al. Chapter 4. European guidelines for the management of chronic nonspecific low back pain. *Eur Spine J*. 2006;15 Suppl 2(Suppl 2):S192-300.
16. Jordan J, Konstantinou K, O'Dowd J. Herniated lumbar disc. *BMJ Clin Evid*. 2009;2009.
17. Samy DA, Gandham S, DeMatas M. The diagnosis and management of discitis and spinal infection. *Surgery (Oxford)*. 2021;39(8):540-6.
18. Sai Kiran NA, Vaishya S, Kale SS, Sharma BS, Mahapatra AK. Surgical results in patients with tuberculosis of the spine and severe lower-extremity motor deficits: a retrospective study of 48 patients. *J Neurosurg Spine*. 2007;6(4):320-6.
19. Mavrogenis AF, Megaloikononimos PD, Igoumenou VG, Panagopoulos GN, Giannitsioti E, Papadopoulos A, Papagelopoulos PJ. Spondylodiscitis revisited. *EFORT Open Rev*. 2017;2(11):447-61.
20. Talari K, Goyal M. Retrospective Studies – Utility and Caveats. *Journal of the Royal College of Physicians of Edinburgh*. 2020;50:398-402.
21. Shah A, Abid M, Ye J. An Assessment of Primary Health Care Facilities and Their Preparedness Level in Khyber Pakhtunkhwa Province of Pakistan: Strengths, Weaknesses, Opportunities, and Threats (SWOT). 2020. p. 245-64.
22. Goel A. Prolapsed, herniated, or extruded intervertebral disc-treatment by only stabilization. *J Craniovertebr Junction Spine*. 2018;9(3):133-4.
23. Jensen RK, Jensen TS, Grøn S, Frafjord E, Bundgaard U, Damsgaard AL, et al. Prevalence of MRI findings in the cervical spine in patients with persistent neck pain based on quantification of narrative MRI reports. *Chiropr Man Therap*. 2019;27:13.
24. Deshpande SV, Deshpande VS, Bhosale A, Kadam M. Conservative management of acute prolapsed inter-vertebral disc with ayurveda: A case report. *J Ayurveda Integr Med*. 2022;13(2):100561

This article may be cited as: Munir a, Khan MI, Fasihah L, Rehman SU: Analysis of Frequency and Risk Factors Associated with Discitis Followed by Disc Surgeries for Prolapsed Inter-Vertebral Disc. *Pak J Med Health Sci*, 2024;18(5): 26-29.