Artículo original

Clinical profile of patients with inter vertebral disc disorders

Caracterización clínica de pacientes con trastornos de los discos intervertebrales

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ABSTRACT

Introduction: Intervertebral disc disorders (IDDs) are being commonly observed nowadays among the young and middle aged population.

Objectives: This hospital record based study was done to study the risk factors, clinical presentation, imaging findings and management practices among patients with all types of IDDs.

Methods: A validated proforma was used to obtain information of patients confirmed with IDDs over the past three years.

Results: Mean age at onset of disc disorders among the 219 patients was 44.7±14.2 years. History of poor exercising habits were present among 72(32.9%) patients. The most common site of disc involvement was L4-L5 [151(68.9%)]. 143(65.3%) patients had single site disc involvement. The most common clinical symptom was lower back pain [180(82.2%)]. Nerve root compression was present among 154(70.3%) patients. Disc bulge, protrusion, extrusion and sequestration were present among 116(53%), 90(41.1%), 52(23.7%) and 4(1.8%) patients respectively. Age at onset >65 years (p=0.035), age at onset ≤55 years (p=0.004) and history of direct impact to the neck region (p=0.017) were associated with disc prolapse at L2-L3 level, L4-L5 level and C5-C6 level respectively, among patients with single site disc involvement.

Risk of multiple level disc involvement was found to increase after 35 years (p<0.001). It was seen more involving cervical vertebrae (p=0.0068).

Lumbar (p<0.0001) and lumbosacral vertebrae (p<0.0001) involvement were seenmore among patients with single site disc involvement.

NSAIDs [155(70.8%)] were the most the commonly used medication. Microdiscectomy was done among 35(76.1%) out of the 46 patients who underwent surgical management.
Conclusions: Exercising habits need to be encouraged among people for the prevention of IDDs. The various high risk groups identified in this study need to be periodically screened for IDDs.
Keywords: Intervertebral disc disorders; Risk factors; Clinical features; Management; Hospital based study.

RESUMEN
Introducción: Actualmente, los trastornos de los discos intervertebrales (TDI) son frecuentes en la población joven y de mediana edad.
Objetivos: Este estudio hospitalario de las historias clínicas se realizó para examinar los factores de riesgo, la presentación clínica, los hallazgos imagenológicos y las prácticas de tratamiento entre los pacientes con todos los tipos de trastornos de los discos intervertebrales.
Métodos: Se utilizó una proforma validada para obtener información de los pacientes confirmados con trastornos de los discos intervertebrales en los últimos tres años.
Resultados: La edad media de aparición de los trastornos discales entre los 219 pacientes fue de 44,7 ± 14,2 años. El historial de malos hábitos de ejercicio estuvo presente en 72 (32,9 %) pacientes. El sitio más común de afectación del disco fue L4-L5 [151 (68,9 %)]. 143 (65,3 %) pacientes tenían compromiso de disco en un solo sitio. El síntoma clínico más frecuente fue el dolor lumbar [180(82,2 %)]. La compresión de la raíz nerviosa estuvo presente en 154 (70,3 %) pacientes. Se mostró presencia de protuberancia, protrusión, extrusión y secuestro discal en 116 (53 %), 90 (41,1 %), 52 (23,7 %) y 4 (1,8 %) pacientes, respectivamente. La edad de inicio >65 años (p=0,035), la edad de inicio ≤55 años (p=0,004) y el antecedente de impacto directo en la región del cuello (p=0,017) se asociaron con prolapso discal a nivel L2-L3, L4- Nivel L5 y nivel C5-C6 respectivamente, entre pacientes con compromiso discal en un solo sitio. Se encontró que el riesgo de afectación del disco en múltiples niveles aumenta después de 35 años (p<0,001). Se vio más involucradas las vértebras cervicales (p=0,0068). La afectación de las vértebras lumbares (p<0,0001) y lumbosacras (p<0,0001) se observó más entre los pacientes con afectación del disco en un solo sitio. Los fármacos anti-inflamatorios no esteroideos (AINE) [155 (70,8 %)] fueron los medicamentos más utilizados. La microdiscectomía se realizó en 35 (76,1 %) de los 46 pacientes que se sometieron a manejo quirúrgico.
Conclusiones: Es necesario fomentar hábitos de ejercicio entre las personas para la prevención de los TDI. Los diversos grupos de alto riesgo identificados en este estudio deben someterse a pruebas periódicas de IDD.

Palabras clave: trastornos de los discos intervertebrales; factores de riesgo; características clínicas; tratamiento; estudio hospitalario.

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Introduction

Intervertebral disc disorders (IDDs) are being commonly observed nowadays among the young and middle aged population in India.[1] This is probably due to increased incidents of wear and tear in their day to day activities. Patients with prolapsed lumbar intervertebral disc (PLID) commonly complain of lower back pain. This has been reported to be a major cause of disability and socio-economic burden among the working population.[2]

A previous study done in a developing country reported awareness of disc herniation to be poor among 91% of the general population.[3] Moreover 25 to 40% of patients with disc abnormalities, identified on imaging, are asymptomatic.[4,5] Hence it becomes important to study its risk factors and educate people about its preventive measures in the current setting.

The presenting features of disc disorders are variable, demanding individualized nature of care, making its management complicated. A treatment approach that relieves discomfort for one patient may not work for other patients.

Most previous studies in this field focussed only on LID disorders. Hardly any study researched disc disorders involving other vertebrae.[6] This study was therefore done to study the risk factors, clinical presentation, imaging findings and management practices among patients with all types of disc disorders.

Methods

This study was conducted at a Government and Private tertiary care hospital affiliated to a private medical college in January 2020. Institutional ethics committee approval was taken prior to the conduct of this study. Permission was taken from the medical superintendents of the above mentioned hospitals.

The medical records of patients confirmed with IDDs over the past three years from January 2017 till December 2019 at the above mentioned hospitals were examined by the investigators.

The socio demographic details of patients, history of direct impact to the lower back or neck region, usage of substances of abuse, family history of disc disorders, clinical presentations, findings from clinical examination and imaging studies, conservative and surgical management measures given to these were recorded in a validated proforma. Exercising habits were considered adequate if its duration was at least 150-300 minutes per week for moderate-intensity, or at least 75–150 minutes per week for vigorous-intensity aerobic physical activity as per WHO guidelines.

Data entry and analysis were done using IBM SPSS for Windows version 25.0, Armonk, New York. Chi square test and Fisher's Exact test were used to test association. p value <0.05 was used as the criterion for significance.

Results

Out of the 219 patients, 113(51.6%) were from the Private hospital and 106(48.4%) were from the Government hospital.

Mean age of the patients was 45.9±14.0 years. The mean age at onset was 44.7±14.2 years and the mean age at diagnosis was 45.1±14.3 years. The age at onset ranged from 15 years to 85 years. Majority of the patients [130(59.4%)] were males (Table 1).

Table 1 - Socio-demographic distribution of patients with inter vertebral disc disorders

Characteristics	Number	Percentage
Age group (years)		
15-25	17	7.8
26-35	37	16.9
36-45	55	25.1
46-55	50	22.8
56-65	39	17.8
66-75	18	8.2
76-85	3	1.4
Age at onset (years)		
15-25	19	8.7
26-35	49	22.4
36-45	44	20.1
46-55	55	25.1
56-65	32	14.6
66-75	17	7.7
76-85	3	1.4
Age at diagnosis (years)		

15-25	19	8.7
26-35	46	21.0
36-45	46	21.0
46-55	53	24.2
56-65	34	15.5
66-75	18	8.2
76-85	3	1.4
Gender		
Males	130	59.4
Females	89	40.6
Marital status		
Unmarried	49	22.4
Married	166	75.8
Widow/widower	4	1.8
Occupation (n=23)		
House wife	10	43.5
Unskilled worker	5	21.7
Skilled worker	5	21.7
Semi-professional	2	8.7
Student	1	4.4
Place of residence		
Urban	167	76.3
Rural	52	23.7
Total	219	100.0

History of poor exercising habits were present among 72(32.9%), history of direct impact to the lower back or neck region was present among 29(13.2%), history of lifting heavy weights among 24(11%), history of alcohol consumption among 10(4.6%), history of cigarette smoking among 3(1.4%) and of tobacco chewing among 2(0.9%) patients. However, there was no family history of disc disorders in any of the patients.

Cervical, lumbar, and both cervical & lumbar vertebrae were involved in 17(7.8%), 199(90.8%) and 3(1.4%) patients respectively. The most common site of disc involvement among all patients was at L4-L5 [151(68.9%)] followed by L5-S1 [86(39.3%)] level (Table 2).

Table 2 - Characteristics of inter vertebral disc disorders among patients (n=219)

Characteristics	Number	Percentage
Type of vertebrae involved		
Cervical	17	7.8
Lumbar	114	52.0
Lumbosacral	39	17.8
Lumbar and Lumbosacral	46	21.0
Cervical and Lumbar	2	0.9
Cervical and Lumbosacral	1	0.5
Site of disc involvement*		
C2-C3	2	0.9
C3-C4	5	2.3
C4-C5	6	2.7
C5-C6	17	7.8
C6-C7	9	4.1
L1-L2	5	2.3
L2-L3	11	5.0
L3-L4	41	18.7
L4-L5	151	68.9
L5-S1	86	39.3
Single site disc involvement	143	65.3
Distribution of location of single site disc involvement (n=143)		
L4-L5	88	61.5
L5-S1	39	27.3
L3-L4	8	5.6
C5-C6	5	3.5
C6-C7	1	0.7
L1-L2	1	0.7
L2-L3	1	0.7
Multisite disc involvement	76	34.7
Distribution of vertebrae involved in multisite disc disorders (n=76)		
Lumbar vertebrae	63	82.9
Cervical vertebrae	10	13.2
Both	3	3.9

*Multiple responses

Out of the total 219 patients, 76(34.7%) had multisite disc involvement. The most common site of disc involvement out of 143 patients with single site involvement was again at L4-L5 [88(61.5%)] level.

The most common clinical symptom was lower back ache (LBA) [180(82.2%)] followed by pain radiating along the course of the sciatic nerve with or without paraesthesia also known as sciatica [129(58.9%)]. Emergency conditions like cauda

equinae syndrome [7(3.2%)], urinary incontinence [6(2.7%)] and bowel incontinence [5(2.3%)] were present in few patients. Nerve root compression was present among 154(70.3%) patients. Disc bulge, protrusion, extrusion and sequestration were present among 116(53%), 90(41.1%), 52(23.7%) and 4(1.8%) patients respectively (Table 3).

Among medications, NSAIDs [155(70.8%)] and among non-pharmacological methods physiotherapy [219(100%)] were most commonly used among the patients (Table 3).

Table 3 - Clinical presentation and management practices among patients with intervertebral disc disorders (n=219)

Characteristics*	Number	Percentage
Clinical symptoms		
Lower back ache	180	82.2
Sciatica	129	58.9
Forward bending posture	53	24.2
Numbness in the limbs	38	17.3
Restricted trunk flexion	37	16.9
Radiating pain to upper limb	16	7.3
Leg pain aggravating with cough	14	6.4
Radiating pain to the neck	12	5.5
Complications*		
Cauda equinae syndrome	7	3.2
Urinary incontinence	6	2.7
Bowel incontinence	5	2.3
Lumbar spinal stenosis	4	1.8
Foot drop	2	0.9
Compensatory scoliosis	2	0.9
Co-morbidities		
Diabetes mellitus	23	10.5
Hypertension	23	10.5
Tuberculosis	2	0.9
Epilepsy	2	0.9
Clinical examination findings		
Straight leg raising test positive for disc lesions at L4,L5,S1	176	80.4
Femoral stretch test positive for disc lesions at L1,L2,L3	41	18.7
Lumbar spasm	26	11.9
Investigation findings		
X - ray findings*		
Narrowing of intervertebral space	28	12.8
Spondylosis	12	5.5

Sacralisation of L5 vertebra	4	1.8
Straightening of spine	2	0.9
MRI findings*		
Nerve root compression	154	70.3
Disc bulge	116	53.0
Disc protrusion	90	41.1
Disc extrusion	52	23.7
Indentation of thecal sac	10	4.6
Sequestrated disc	4	1.8
Spondylolisthesis	2	0.9
Compression of thecal sac	1	0.5
Neural foraminal stenosis	1	0.5
Management practices		
Medical management*		
NSAIDs	155	70.8
Neuropathic pain relievers	43	19.6
Trans foraminal epidural steroid injection	21	9.6
Oral corticosteroids	18	8.2
Surgical management (n=46)		
Microdiscectomy	35	76.1
Laminectomy and discectomy	10	21.7
Endoscopic discectomy	1	2.2
Non pharmacological management*		
Physiotherapy	219	100.0
Spinal traction	76	34.7
Transcutaneous electrical nerve stimulation	62	28.3
Heat compression	22	10.0
Back brace usage	3	1.4

*Multiple responses

Eleven (5%) patients in the past had taken Ayurvedic treatment for disc disorders. Forty six (21%) patients underwent surgical management. Among them, 35(76.1%) underwent microdiscectomy.

Age at onset >65 years (p=0.035), age at onset ≤55 years (p=0.004) and history of direct impact to the neck region (p=0.017) were associated with disc prolapse at L2-L3 level, L4-L5 level and C5-C6 level respectively, among patients with single site disc disorders (Table 4).

Table 4 - Association between risk factors and level of disc disorder among patients with single site disc disorders

Age at onset (years)	L2-L3 disc disorders (%)	Others (%)	Total
≤65	0 (0)	138 (100)	138
>65	1 (20)	4 (80)	5
Total	1	142	143
	-	-	p=0.035
Age at onset (years)	L3-L4 disc disorders (%)	Others (%)	Total
≤55	5 (4.1)	117 (95.9)	122
>55	3 (14.3)	18 (85.7)	21
Total	8	135	143
	-	-	p=0.0942
Age at onset (years)	L4-L5 disc disorders (%)	Others (%)	Total
≤55	81 (66.4)	41 (33.6)	122
>55	7 (33.3)	14 (66.7)	21
Total	88	55	143
	-	-	X^2=8.273, p=0.004
Age at onset (years)	L5-S1 disc disorders (%)	Others (%)	Total
≤55	30 (24.6)	92 (75.4)	122
>55	9 (42.9)	12 (57.1)	21
Total	39	104	143
	-	-	X^2=3.014, p=0.0825
History of direct impact to the neck region	C5-C6 disc disorders (%)	Others (%)	Total
Present	3 (15.8)	16 (84.2)	19
Absent	2 (1.6)	122 (98.4)	124
Total	5	138	143
	-	-	p=0.017

There was no association of gender, marital status, history of smoking/tobacco chewing, history of alcohol consumption, history of lifting heavy weights and type of occupation with level of disc involvement among patients with single site disc disorders.

Risk of multisite disc involvement was found to increase significantly when age at onset was above 35 years (p<0.001). Exclusive involvement of intervertebral disc of cervical vertebrae were seen in multisite disc disorders (p=0.0068). Exclusive involvement of intervertebral disc of lumbar (p<0.0001) and lumbosacral vertebrae (p<0.0001) were seen in single site disc disorders (Table 5).

Table 5 - Association of age at onset and vertebrae involved with single or multisite disc disorders among patients

Age at onset (years)	Single site disc disorders (%)	Multisite disc disorders (%)	Total
≤35	55 (80.9)	13 (19.1)	68
36-45	34 (77.3)	10 (22.7)	44
46-55	33 (60)	22 (40)	55
56-65	16 (50)	16 (50)	32
>65	5 (25)	15 (75)	20
Total	143	76	219
	-	-	X^2=28.4, p<0.001
Exclusive involvement of intervertebral disc of cervical vertebrae			
Present	6 (35.3)	11 (64.7)	17
Absent	137 (67.8)	6 5(32.2)	202
	-	-	X^2=7.322, p=0.0068
Exclusive involvement of intervertebral disc of lumbar vertebrae			
Present	98 (86)	16 (14)	114
Absent	45(42.9)	60 (57.1)	105
	-	-	X^2=44.823, p<0.0001
Exclusive involvement of intervertebral disc of lumbosacral vertebrae			
Present	39 (100.0)	0 (0)	39
Absent	104 (57.8)	76 (42.2)	180
	-	-	p<0.0001
Total	143	76	219

There was no association between single or multisite disc disorders with gender (p=0.541), marital status (p=0.261), type of occupation (p=0.439), history of direct impact to the lower back or neck region (p=0.979), history of lifting heavy weights (p=0.29), alcohol consumption (p=0.1704) and smoking/tobacco chewing (p=0.1662) among the patients.

Discussion

The main findings in this study were poor exercising habits being observed among close to one-third of the patients. L4-L5 involvement was seen most commonly among patients with single site involvement and it was significantly seen more among patients with age at onset ≤55 years.

In this study majority of the patients had onset and were diagnosed with disc disorders in the age group 46 to 55 years. In a study done in Varanasi, India the

most common age of presentation (33.3%) was 31-40 years.[7] In a study done in Germany, majority of patients were diagnosed at the age ≤35 years and the overall mean age at diagnosis was 41.6 years.[8] The age at onset and diagnosis in the current setting were therefore much delayed compared to the findings of other studies.

In the present study majority of patients were males as also reported in other studies [53.1%,[9] 57%,[10] 65.6%,[7] 68%,[2] 70.2%[11]]. However in few studies proportion of males were reported to be 35.3%[6], 41.4%[12] and 48%.[13]

More than three quarter of patients in this study were from urban areas. This could be probably because urban population are more exposed to sedentary life style. Added to this their unhealthy diet and poor exercising habits might be the other reasons why they are more vulnerable to IDDs than rural population.

History of poor exercising habits were present among one-third of the patients. This results in weakening of the core stability muscles of the back making the person more prone to IDDs. Exercising habits therefore need to be encouraged among people for the prevention of various disc disorders

History of direct impact to the lower back or neck region was present among 13.2% patients in this study and among 24.4% patients in a study done in Varanasi, India.[7] A study done in Finland reported history of back accidents to be associated with disc lesions.[14]

History of lifting heavy weights was present among 11% patients in this study. In a case-control study, lifting objects >11.3 kilograms at a frequency >25 times per day were associated with lumbar disc herniation. Risk of disc herniation was found to be most while lifting weights by twisting the trunk with minimal flexion at the knees.[15]

History of alcohol and tobacco usage were present among few patients in this study. In a study done in Sweden, history of alcoholism was present among 4.4% patients with IDDs.[9] In the study done in Warangal, India history of alcohol consumption was present among 28.4%, smoking among 1.5% and tobacco chewing among 0.9% patients with disc lesions.[6] Nicotine present in tobacco is known to reduce blood flow and hasten disc degeneration.[16] A Finnish study too reported, disc disorders were more among men who smoke.[17]

Family history of disc disorders were not seen among patients in the present study. However, in previous studies genetic factors were found to influence

structure and metabolism of disc thereby making certain people more prone to disc disorders.[8,18]

The present study observed L4-L5 disc lesions to be most common. Similarly in other Indian studies, L4-L5 was the most common lesion seen in 34.4%[7] and 53.2%[11] patients. However, in studies done outside India, L5-S1 involvement was seen more commonly and it was reported among 57.3%[2] and 59%[12] patients. These studies reported L4-L5 as the next most common site of involvement [30.7%[2], 37%[12]] among patients.

Single site disc disorders were present among 65.3% patients in the present study and among 89.3% patients in the Ranchi, India based study.[11]

In this study, 82.2% and 58.9% patients presented with LBA and sciatica respectively. In the Ranchi, India based study, 91.5% presented with LBA and 93.6% with sciatica.[11] The patients with sciatica experience burning, tingling and numbness as a consequence and the pain radiates from the buttock into the leg or the foot. The discomforts aggravate with standing, walking or sitting positions.[19] The Swedish study reported that sciatic pain aggravated by walking and coughing among 31.9% and 51.9% patients respectively with disc abnormalities.[9]

Cauda equinae syndrome was present among 3.2% patients. This occurs due to herniated disc compressing on nerve roots of the cauda equinae resulting in problems like impotence and bowel/bladder incontinence. In the study done in Varanasi, India, bladder/bowel involvement was present among 9.4% patients which was more than the observations of this study.[7] In such patients, immediate referral for emergency surgery is required to prevent loss of function permanently.[20] On clinical examination, straight leg raising test (SLRT) was positive among 80.4% patients in this study and among 89.7% patients in the study done in Ranchi, India.[11] In the evaluation of suspected patients for disc lesions, nerve root tension signs are periodically used for assessment. SLRT though commonly used is subject to various interpretations in relation to the variations in the way it is performed. In a study done in Brunei, it was observed that there was a lack of understanding of the mechanism of SLRT, large variation in its interpretation and poor use of its variation among orthopaedic surgeons, neurosurgeons and physiotherapists.[21]

In the present study, Magnetic resonance imaging (MRI) was done among all patients. It is a sensitive imaging study for the assessment of disc disorders.[22] It is recommended when symptoms persists for at least 6 weeks.[19] However when patients present with symptoms of significant sensory or motor deficit or bowel

and bladder incontinence, urgent evaluation by MRI becomes essential.[19] MRI studies can identify abnormalities in more than a third of asymptomatic patients.[23] Therefore, decisions for management should be based on clinical examination findings supported with imaging results.[23]

Among medications, NSAIDs due to their pain relieving and anti-inflammatory effects were the most commonly used drug for management among patients in this study.

Steroid injections were given among 9.6% patients in this study. These are beneficial to provide extended pain relief among patients.[20]

Among non-pharmacological methods, physiotherapy was recommended to all patients. This helps in strengthening the back and abdominal muscles, relieves symptoms, and reduces weight, anxiety and depression. Initially extension exercises are performed among patients. Gradually after patients get pain relief and gain in muscular strength, the flexion exercises are introduced among them with utmost caution.[20]

Spinal traction was used among 34.7% patients in the present study. This is known to give only symptomatic benefit against para spinal spasms. In a randomized double-blind controlled trial done in Thailand, lumbar traction as not found to benefit patients with acute herniated disc syndrome.[24]

Usage of various conservative treatment methods comprising pharmacological and non-pharmacological types has helped to resolve symptoms among 90% of sciatica patients.[19] These non-operative treatment methods are generally recommended as the first line of management.[25] Complete bed rest more than two days is however not recommended.[26]

The study done in Switzerland observed that conservative methods were more beneficial than surgical methods in midterm and long-term follow-up among patients with lumbar disc herniation.[10]

As many as 21% patients in this study and 14.2% patients in the study done at Warangal, India[6] underwent surgical management. Surgical decisions are based on clinical symptoms and findings of diagnostic testing. It is recommended in patients with progressive or profound neurologic deficit, cauda equina syndrome or spinal deformities or when pain is not subsiding even after 6 weeks of conservative management.[20]

Microdiscectomy was the most common surgical procedure performed among the patients. In this procedure, the intervertebral disc portion compressing the nerve roots is removed. Lumbar discectomy has been reported to be the most popular surgical procedure among patients with sciatica.[27,28]

The study done in Bangladesh reported that, surgical outcome after primary discectomy was satisfactory in terms of pain and disability reduction among the patients.[2] Shorter duration of symptoms before surgery was associated with excellent results.[11,29] While longer duration of sciatica with poorer results post operatively, among the patients.[30] Hence it becomes important to diagnose disc disorders early and manage it appropriately so as to obtain maximum benefit with treatment. Laminectomy and discectomy was the next common surgical procedure performed among 21.7% patients. Here the lamina, the attached ligaments and part of the spinous process is removed followed by discectomy, thereby relieving compression on a nerve root or spinal cord. The study done in Warangal, India, concluded that laminectomy and discectomy, were the most recommended management for prolapsed intervertebral disc, as it resulted in relief from disability and also improved the quality of life of the patients.[6]

Risk of multisite disc involvement was found to increase significantly after 35 years of age at onset among the patients in this study. This is because with advancing age, spinal discs begin to lose water content, become brittle and develop tears.

Age at onset was found to be a determinant in certain types of lumbar disc disorders and direct impact to the neck region in C5-C6 disc disorders among patients with single site involvement. Hence patients of certain age groups and those with a history of direct impact to the neck region need to be periodically screened for IDDs during clinical examination.

Conclusions

From the findings of this study we conclude that, the mean age at onset of disc disorders was found to be delayed among patients in this study. History of poor exercising habits were present among almost one-third of the patients. Exercising habits therefore need to be encouraged among people for the prevention of various disc disorders. Age at onset was found to be a determinant in certain types of lumbar disc lesions and direct impact to the neck region in C5-C6 disc lesions among the patients with single site disc involvement. Thus patients of these age groups and those with a history of direct impact to the neck region need to be periodically screened for disc disorders by clinical examination.

Limitations

Weight and height of the patients were found missing in the records and hence the role of body mass index in disc lesions could not be analysed. Similarly, there were other variables with missing information in several medical records.

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Conflict of interest

None declared

Contribution of authors

Nitin Joseph: Guarantor of this research work, concept, design, literature search, proforma preparation, revising the work critically for important intellectual content, manuscript preparation.
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Sreeja Shenoy, Pallempati Bhanu Thejaswi, Haroon Aslam, Vikash Kumar, Arushi Bhargava: Data collection.
Sreeja Shenoy, Pallempati Bhanu Thejaswi, Haroon Aslam: Data entry.
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Sreeja Shenoy, Vikash Kumar, Arushi Bhargava: Literature search.

- This manuscript has been read and approved by all the authors, the requirements for authorship as stated earlier in this document have been met, and each author believes that the manuscript represents honest work. The authors are also accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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