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Original Reseach Article

A study of risk factors for Pott's disease

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ABSTRACT

Background: Pott's spine is caused by Mycobacterium tuberculosis, a slow growing gram-positive, acid-fast bacillus which becomes lodged in the bone via Batson's venous plexus and lymphatic from primarily infected lung, lymph nodes, mediastinum and viscera, forming granulomatous inflammation and caseation necrosis. Pott's spine accounts for 2% of all cases of TB, 15% of extrapulmonary, and 50% of skeletal TB. The paradiscal, central, anterior subligamentous, and neural arch are the common vertebral lesions. Thoracic vertebrae are commonly affected followed by lumbar and cervical vertebrae. Predisposing factors for tuberculosis include poverty, overcrowding, illiteracy, malnutrition, alcoholism, drug abuse, diabetes mellitus, immunosuppressive treatment, and HIV infection. These are also predisposing factors for spinal tuberculosis. Older age, female gender, chronic peritoneal dialysis, household crowding and previous tuberculous infection were identified as risk factors for Pott's spine. (10G) Additionally, vitamin D deficiency has been linked to an increased risk of spinal bone loss and an increased risk of spinal fractures in individuals with Pott's spine.

Aims & Objectives: To identify and evaluate the risk factors for Pott's spine.

Materials and Methods: Present study was prospective in nature conducted among 441 patients of Pott's spine. All patients fulfilling inclusion criteria and exclusion criteria were taken up for the study. Study was carried out over a period of 3 years. Serum Vitamin D was assessed.

Results: Majority of the patients was in the age group of 41-50 years and most of them were male. In this study, we found that age, socioeconomic status, employment, presence of comorbidities and BMI(<18) were associated with increased risk of pott's spine.

Conclusion: This cross-sectional study investigates 441 cases of intervertebral disc degeneration leading to disc bulge/protrusion/extrusion, focusing on demographic, socioeconomic, and health-related factors. The majority of cases (31.82%) occurred in individuals aged 41-50 years, with females accounting for a larger proportion (54.55%) than males. Religious demographics revealed a prevalence of Muslims (45.57%) and Hindus (42.17%), with bilateral involvement common. A substantial portion of patients resided in slum areas (60.09%), reflecting socioeconomic disparities, with the majority (60.31%) belonging to the lower socioeconomic status. Most patients reported symptoms lasting less than 6 months (61.36%) and came from families with 5 or more members (85.48%). Addiction history (78.45%) and pre-existing co-morbidities (65.75%) were prevalent. Notably, no significant associations were found between serum Vitamin D levels and demographic factors. Among the employed, a significant proportion were unemployed (31.97%), underscoring socioeconomic challenges. These findings provide comprehensive insights into the multifaceted nature of intervertebral disc degeneration, crucial for informing targeted interventions and management strategies.

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1. Introduction

Tuberculous spondylodiscitis (Pott's spine or Pott's disease) is caused by Mycobacterium tuberculosis, a slow growing gram-positive, acid-fast bacillus which becomes lodged in the bone via Batson's venous plexus and lymphatic from primarily infected lung, lymph nodes, mediastinum and viscera, forming granulomatous inflammation and caseation necrosis.[1] It is the most common gorm of skeletal tuberculosis. It is a serious form of extra pulmonary TB which if left untreated can be fatal.[2] The treatment of it can be chemotherapy alone or surgery in addition to chemotherapy.

Thoracolumbar region is the most commonly affected site while the cervical and sacrum regions are less commonly involved. Usually more than one vertebra is affected because of its segmental arterial distribution and subligamentous spread of the disease. The bacilli reach the disc space causing disc destruction, spreads to adjacent vertebral bodies leading to vertebral collapse, anterior wedging, characteristic kyphotic angulation (Gibbus deformity), which may compress the spinal cord and nerve roots producing functional impairment.[1,3,4]

Magnetic resonance imaging (MRI) makes the early diagnosis of spinal TB easier and a considerable number of patients with spinal TB are diagnosed earlier and treated more effectively before significant neurological deficits develop. However, patients can still present late with considerable spine deformity.[5] IL-1 plays many different roles, from mediating the immune response to infection[6] to regulating vascular permeability and angiogenesis.[7] Deregulated IL-1 responses have been associated with the development and progression of cancer[8] and also with autoimmune diseases such as rheumatoid arthritis.[9] But there is paucity of studies evaluating the risk factors for the Pott's disease and relationship clinical severity or prognosis. Predisposing factors for tuberculosis include poverty, overcrowding, illiteracy, malnutrition, alcoholism, drug abuse, diabetes mellitus, immunosuppressive treatment, and HIV infection. These are also predisposing factors for spinal tuberculosis. Older age, male gender, chronic peritoneal dialysis, household crowding and previous tuberculous infection were identified as risk factors for Pott's spine. (10G)Additionally, vitamin D deficiency has been linked to an increased risk of spinal bone loss and an increased risk of spinal fractures in individuals with Pott's spine. Hence, we have undertaken this study with the aim to assess the risk factors for Pott's spine.

2. Objectives

To identify and evaluate the risk factors for Pott's spine.

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3. Materials and Methods

This was a facility based cross-sectional observational study, protocol of which was approved by the Institutional Ethical committee of the medical college and is consistent with all the ethical standards. Written informed consent was taken from all study subjects.

Patients with back pain with features of Pott's spine such as pain, numbness, loss of sensation, loss of power, loss of tone or bowel/bladder involvement & willing to participate in the study were included. All consecutive patients fulfilling inclusion and exclusion criteria were taken up for the study until the required sample size was fulfilled. Sampling method used was universal. Study was carried out over a period of 3 years from September 2020 to September 2023. Exclusion criteria were Patients with diagnosed neurological dysfunction such as stroke leading to monoparesis/monoplegia/paraparesis/paraplegia/quadriparesis /quadriplegia, peripheral neuropathies, Guillain-Barré syndrome-ataxia, patients with traumatic cervical spine injury, patients with congenital spine deformities, spinal tumours, patients with fractures in upper limb and known psychological dysfunction.

Detailed history regarding demography, onset and progression of symptoms, previous medical and surgical history, personal history, family history and socio-economic history was taken. Detail neurological examination was done following which X-ray lumbar spine AP and LATERAL view and MRI spine with whole spine screening was carried out. Degree of the spinal cord compression was classified into one off our groups:

Level 0 – no pressure on thecal sac

Level 1 – mild compression on thecal sac

Level 2 – the degree of thecal sac compression is <1/3

Level 3 – the degree of thecal sac compression is >1/3

Then all the patients were subjected to lab investigations such as vitamin D levels [normal range: 30-100ng/mL].

Batirel et al[10] in their study titled, the course of spinal tuberculosis (Pott disease): results of the multinational, multicentre Backbone-2 study, found that the most common presenting feature amongst spinal TB cases was paraspinal abscesses in 69%, considering this proportion, at 95% confidence interval and 15% allowable error, the sample size came out to be 441. (Sample size was calculated with the formula n = [DEFF*Np(1-p)]/ [(d2/Z21- α/2*(N-1)+p*(1-p)], using Epi info version 3.0).

Data was collected in pre-structured proforma which was pilot tested and after ensuring it's validity. Quantitative data was then tested by Mean and Standard Deviation, difference between more than two means tested by 'ANOVA' test. P value <0.05 was considered significant.

4. Results

In the present cross sectional study, we have initially planned to include 441 cases of degeneration of intervertebral disc leading to disc bulge /protrusion /extrusion. Total such 441 cases presented, included in the study and we could analyse all of them giving the response rate of 100%, important observations and results of which are presented in Table 1.

Table 1: Distribution of cases according to age groups

Age group (years)	Cases	
	No.	Percentage (%)
<20	50	11.36
21-30	71	15.91
31-40	69	15.91
41-50	141	31.82
51-60	72	15.91
>60	38	9.09
Total	440	100
Mean ± S.D.	41.8 ± 13.9 years.	

In the present study, majority 141 (31.82%) of the cases were from the age group of 41-50 years followed by 15% from the age group of 21-30, 31-40 & 51-60 years age group each, 50 (11.36%) from <20 years and least i.e. 38 (9.09%) from the age group of >60 years. Mean age of the patients was 22.34 + 12.88 years.

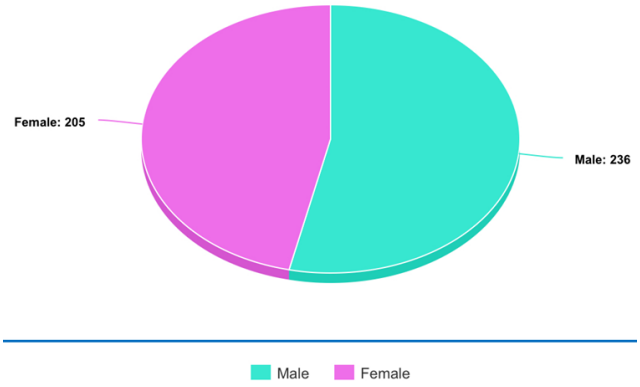

Figure 1: Gender wise distribution of cases

In the present study, majority i.e. 236 (54.55%) of the cases were of male gender and 205 (45.45%) were females. (Figure 1)

In the present study, in most i.e. 201(45.57%) of the cases affected side Muslims followed by 186(42.17%) Hindus. (Figure 2)

In the present study, majority 265(60.09%) of TB Spine patients were staying at slums. (Figure 3)

Figure 4 shows majority (60.31%) belong to lower socioeconomic status.

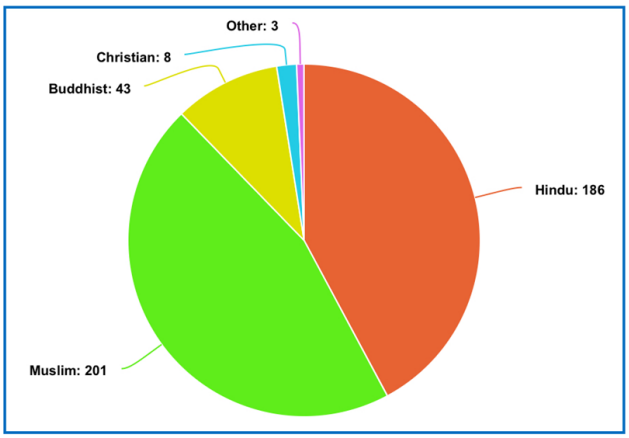

Figure 2: Religion wise distribution of cases

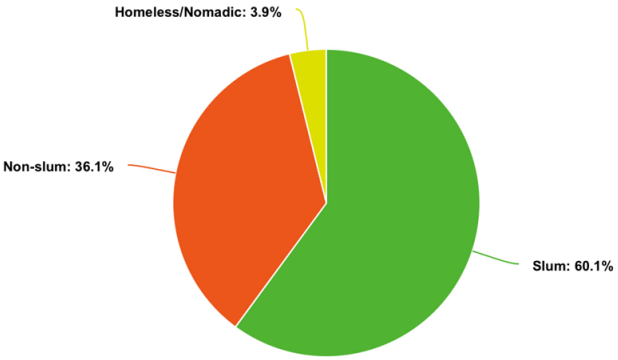

Figure 3: Distribution of patients according to residence

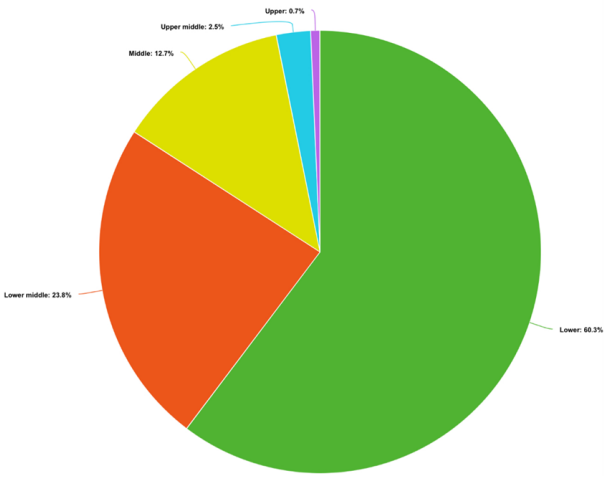

Figure 4: Distribution of patients according to socioeconomic status

In the present study, among most i.e. 274 (61.36%) of the cases duration of symptoms was <6 months and >6 months among 166 (38.64%).

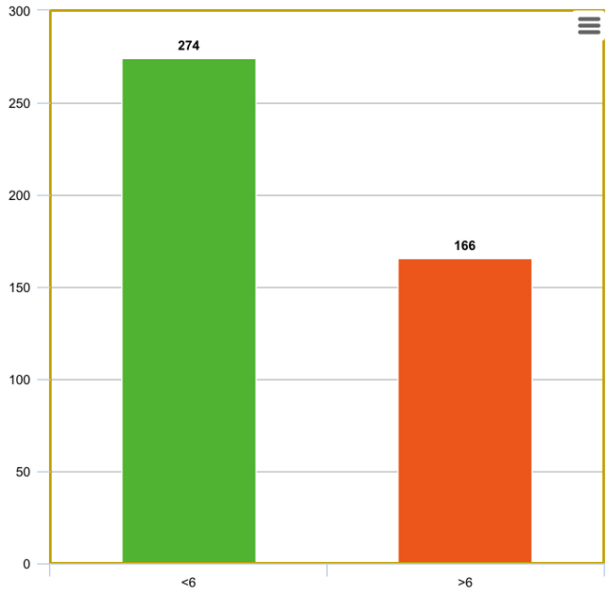

Figure 5: Distribution of patients according to duration of symptoms

Table 2: Distribution of patients according to area of housing (n=441)

Area of housing (sq. ft.)	Number	Percentage (%)
>110	22	4.98
110-90	105	23.80
<90	297	67.34
Homeless/Nomadic	17	3.85
Total	441	100

Table 3 shows Occupation of employed TB Spine patients. It shows (31.97%) were unemployed and only (00.45%) were professional.

Table shows that maximum number of patients came from families of 5 members or more (85.48%). (Table 4)

Majority of the patients have history of addiction (78.45%). (Table 5)

Table shows majority of patients had per-existing co-morbidities (65.75%).(Table 6)

In the present study, serum Vitamin D level did not differ according to age. So, it was not associated with age group of cases (p>0.05). (Table 7)

In the present study, serum Vitamin D level did not differ according to gender. Hence, it was not associated with gender of cases (p>0.05).(Table 8)

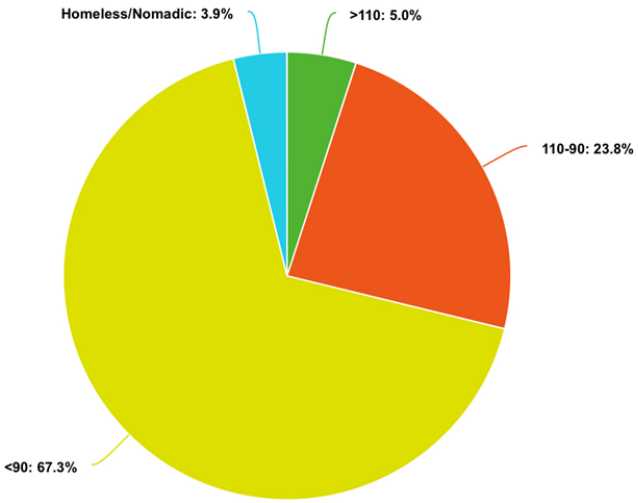

Figure 6: Distribution of patients according to area of housing

5. Discussion

Based on the cross-sectional study conducted on 441 cases of degeneration of intervertebral discs leading to disc bulge/protrusion/extrusion, the following key observations and results were obtained:

1. Age distribution: The majority of cases (31.82%) fell within the age group of 41-50 years, followed by 15% in the age groups of 21-30, 31-40, and 51-60 years each, with the least cases (11.36%) observed in individuals younger than 20 years. The mean age of the patients was 41.8 ± 13.9 years.
2. Gender distribution: Male patients accounted for the majority (54.55%) of the cases, compared to females (45.45%).
3. Religion and laterality: The majority of affected individuals were Muslims (45.57%), followed by Hindus (42.17%). Most cases exhibited bilateral involvement.
4. Residence and socioeconomic status: A significant proportion of patients (60.09%) resided in slum areas, and the majority (60.31%) belonged to the lower socioeconomic status.
5. Duration of symptoms: The majority of cases (61.36%) reported symptoms lasting less than 6 months.
6. Area of housing and family size: The majority of patients resided in housing areas with less than 90 sq. ft., and most came from families with 5 or more members (85.48%).
7. Addiction history: A significant percentage of patients (78.45%) had a history of addiction, including alcohol, smoking, and tobacco.

Table 3: Distribution of patients according to literacy status and association of employment

Education	Number	Percentage	Employment status	Number	Percentage
No schooling	98	22.22	Unemployed	141	31.97
elementary	179	40.58	Unskilled worker	94	21.31
10th pass	110	24.94	Semi-skilled worker	88	19.95
Diploma	43	09.75	Skilled worker	63	14.28
Batchelors or higher	11	02.94	Semiprofessional	8	01.81
			Professional	2	00.45
			Farmer/Clerical worker	45	10.20
Total	441	100		441	100

Table 4: Distribution of patients according to total members in family

Total members in family	Number	Percentage
>4	4	00.90
4	43	09.75
5	148	33.56
6	99	22.44
7 / more than 7	130	29.47
Separated from family	17	03.85
Total	441	100

Table 5: Distribution of patients according to addiction

Status		Number	Total
Addicted		346	
	Alcohol	233	78.45
	Smoking	171	
	Tobacco	261	
Not addicted		95	21.54
Total		441	100

Table 6: Association of pre-existing co-morbidities in patients with Pott's spine

Pre-existing co-morbidity	Number	Percentage
Yes	290	65.75
No	151	34.24
Total	441	100

Table 7: Association of age and serum level of Vitamin D in patients with Pott's spine

Age	Sr. Level of Vitamin D.			P
	>30 (optimal) No. (%)	20-30 (insufficient) No. (%)	<20 (Deficient) No. (%)	
<20	01 (6.25)	02 (16.67)	02 (12.5)	0.8
21-30	03 (18.75)	02 (16.67)	02 (12.5)	1
31-40	04 (25)	02 (16.67)	01 (6.25)	0.3
41-50	05 (31.25)	01 (8.33)	08 (50)	0.05
51-60	02 (12.5)	04 (33.33)	01 (6.25)	0.19
>60	01 (6.25)	01 (8.33)	02 (12.5)	1
Total	16 (100)	12 (100)	16 (100)	–

Table 8: Association of gender and serum level of Vitamin D in patients with Pott's spine

Gender	Sr. Level of Vitamin D.			P
	>30 (optimal) (n=16)	20-30 (insufficient) (n=12)	<20 (Deficient) (n=16)	
Male	07 (43.75)	07 (58.33)	06 (37.5)	0.6
Female	09 (56.25)	05 (41.67)	10 (62.5)	
Total	16 (100)	12 (100)	16 (100)	

8. Pre-existing co-morbidities: The majority of patients (65.75%) had pre-existing co-morbidities. Association with Vitamin D Levels: There was no significant association observed between serum Vitamin D levels and age, gender, or occupation of the patients.
9. Occupation: Among employed patients, a substantial proportion were unemployed (31.97%), followed by unskilled workers (21.31%) and semi-skilled workers (19.95%).

These findings provide valuable insights into the demographic, socioeconomic, and health-related characteristics of individuals affected by degeneration of intervertebral discs, aiding in the understanding and management of this condition.

Present study was prospective observational study, done on 441 cases of Pott's spine to consider and perform holistic demographic socioeconomic disease severity assessment of spinal TB in Indian population, which suggest high prevalence of spinal tuberculosis in lower socioeconomic group which is comparable with study conducted by Ismiarto et al[11] in which lower socioeconomic group involved predominantly Spinal tuberculosis affects population in productive age group leading to significant socioeconomic burden to individual family and in turn to society as shown in our study and is comparable with the findings of Ismiarto et al,[11] who also reported that young and middle-aged adults (20-64 years) were most commonly affected. Singh et al reported that the age group with the highest number of patients was 41-50 years (31.82%), followed by the age group of 21-30 years (15%). Similarly, Alavi et al[12] reported a mean age of 43.7 ± 18.3 years among their patients. There is relative neglect towards female sex in society and our study highlights vulnerability of female towards development of spinal TB which is Similar to study conducted by Mittal et al[13] and differs from the studies conducted by Ismiarto et al,[11] Singh et al, Alavi et al[12] and Wang et al in which males are predominant. Contrary to our expectation we found that undernutrition as a risk factor for development for spinal TB, was not statistically significant. Another point to note is relative rarity of obesity in our study indicating TB being poor man disease. Our study shows how socioeconomic dynamics play a significant role in predisposing individual towards spinal TB in Indian society which shows that majority belong to lower socioeconomic scale, majority of TB Spine patients were employed. The findings of our study suggest that overcrowding, large family size, and poor living conditions are significant risk factors for spinal TB in the Indian population which is similar and comparable to study conducted by Gibson et al. Similar to Kiwuwa et al,[14] our study shows there is a delay in treatment due to unavailability of medical facility. Our study highlights the need to improve access to healthcare services and increase awareness about spinal TB among the general public in India and need of highquality healthcare services, particularly in rural areas, and implement targeted health education programs to improve case detection and reduce delays in diagnosis and treatment initiation. Sheuly et al[15] and Naidoo et al[16] studied the co infection of HIV, Immunosuppressive therapy and dual therapy of ART with anti-AKT combination is risk factor for spinal tuberculosis. Alemie et al,[17] Manjareeka et al[18] and Yone et al[19] studies reported similar results. Present study highlights the prevalence of comorbidities such as diabetes and HIV among TB patients, as well as the impact of socioeconomic factors such as poverty and alcohol misuse on treatment adherence. Neurological deficits are linked to both the level of vertebral involvement and the presence of an epidural abscess. Greater emphasis should be placed on tuberculosis of the spine that affects the dorsal and dorsolumbar level. Kiran Belur et al[20] in their study observed vitamin D deficiency, vitamin D insufficiency, and optimum vitamin D among 55%, 41%, and 3.89% tuberculosis cases, respectively.

6. Conclusion

The comprehensive analysis of 441 cases of intervertebral disc degeneration provides valuable insights into the epidemiological, demographic, and socioeconomic factors associated with this condition. Our findings highlight the substantial burden of intervertebral disc degeneration, particularly among middle-aged individuals, with a higher prevalence in females.

Advancing age 41-50 years (31.82%) female patients most at risk of Pott's spine with the mean age of 41.8 + 13.9 years. The study highlights the importance of considering socioeconomic status, as a significant proportion of affected individuals reside in slum areas and belong to lower socioeconomic strata. Furthermore, the high prevalence of addiction history and pre-existing co-morbidities among patients emphasizes the need for holistic approaches to treatment and management. While no significant associations were observed between serum Vitamin D levels and demographic factors, the study sheds light on the diverse factors contributing to intervertebral disc degeneration.

These findings have important implications for healthcare providers and policymakers in developing targeted interventions and strategies aimed at addressing the multifaceted challenges posed by intervertebral disc degeneration and improving patient outcomes. Further research is warranted to explore additional factors influencing the development and progression of this condition, ultimately enhancing our understanding and management of intervertebral disc degeneration.

Tuberculosis of the spine is a medical condition that often requires surgical treatment. If left untreated, the patient may experience neurological deficits. In some cases,

these complications can be more severe than the primary disease itself. Therefore, it is crucial to identify the clinic-radiological risk factors that may predict the worsening of the patient's neurological condition. This will allow for timely surgical intervention to be added to their medical treatment plan.

Identifying and minimizing the risk factors associated with spinal tuberculosis can help in early diagnosis and treatment, thereby reducing the incidence of complications such as neurodeficit and deformity progression. Thus this study bursts various myths like BCG or BMI etc correlated with spinal TB. This study highlights that rather than one factor in isolation it is combination of multiple factors are responsible for occurrence of spinal TB.

7. Source of Funding

There was no source of funding in our study.

8. Conflict of Interest

None.

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