Section: Neurosurgery

Original Research Article

BURDEN OF TUBERCULOSIS SPINE IN A TERTIARY CARE CENTRE WITH RURAL POPULATION

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ABSTRACT

Background: Tuberculosis once thought to be a tropical disease in Indian subcontinent was linked to poor socio- economic / demography. There seemed to be clear decline in incidence and prevalence with effective ATT. The incidence started increasing again from late 1990 with occurrence of new diseases like HIV, other immune-deficiency conditions. Also, the incidence in west also started increasing with HIV / immunosuppression. Now with more prevalence of retroviral burden, the incidence of tuberculosis is on rise. This is reflected in CNS Tuberculosis, both cranial and spinal (tuberculosis meningitis / meningoencephalitis). Off late the Pott's spine also increasing in incidence and prevalence. In the GGH, KKD which is the referral Centre for many adjacent districts, cases come regularly with spinal tuberculosis. In the last 18 months a total of 32 cases were admitted in Neurosurgery Department, GGH out of which 11 were managed conservatively with ATT and 21 with surgical drainage of tuberculosis abscess + spinal fusion along with ATT. The primary objective is to identify the burden of Pott's spine in the Neurosurgery Department of Government General Hospital, Kakinada and the secondary objective is to analyse the clinico-radiological and pathological correlation.

Materials and Methods: The epidemiology of Pott's spine is analysed from retrospective data for 18 months. The demographics including age, sex, socio-economic status, family history, immuno suppression, associated Pulmonary Tuberculosis or extra Pulmonary Tuberculosis. The spectrum of disease, with presentation in mild cases ranging from fever, malaise, other constitutional symptoms, in moderate cases as low back ache, paraesthesia to paraplegia or quadriplegia in severe cases. Radiological findings included destruction of two adjacent vertebral bodies and opposing end plates; destruction of intervening disc; vertebral body edema; and occurrence of prevertebral, paravertebral, and epidural abscesses and mode of treatment (Medical versus Surgical) and outcome were analysed.

Results: 32 cases were analysed, All cases were radiologically confirmed as Potts spine. out of which 21 cases were treated with both medical and surgical management (ATT + Spinal Fusion). Out of which 9 were biopsy positive, 11 cases were managed conservatively.

Conclusion: Potts's spine cases are also seen by departments of Orthopaedics and pulmonary medicine, though referred from there, patients not turning up in neurosurgery OPD, Clearly suggest more burden of the disease than documented. This incidence mandates for more understanding of the co-relating clinical, radiological features. Spinal tubercular lesion and other non-tubercular lesion may have similar clinical and radiological features; also, there is high susceptibility to false-positive and false-negative result in clinico-radiological diagnosis of spinal TB. Therefore, pathological diagnosis by biopsy (HPE, CBNAAT, and culture) in all cases of suspected spinal TB is must to get the accurate diagnosis. Doing so with less invasive means of a pathological diagnosis, will improve the Detection and Outcome in Patients.

Keywords: GGH, KKD, HIV.

INTRODUCTION

Tuberculosis Spine also known as Potts Spine or vertebral tuberculosis, represents a severe extrapulmonary manifestation of tuberculosis that specifically affects the vertebral column. This debilitating condition carries a significant global burden,[1,2] particularly in regions with high tuberculosis prevalence, and poses a substantial threat due to its potential for neurological complications. Untreated or delayed diagnosis can lead to severe spinal deformity, neurological deficits, and even permanent paralysis.[3-5] The insidious nature of its onset often makes early diagnosis challenging, contributing to the progression of the disease before intervention.

In this study, we a studied a set of 32 cases over a span of 18 months, who presented with pain, lower or upper back with tenderness on examination and radiologically diagnostic of Pott's spine.[4] They were assessed with respect to demographic features, evaluated with Chest X-ray, CT chest, Sputum CBNAAT. Those with spinal instability and abscess were treated surgically, rest managed with ATT. On Follow up there was no progression of the disease, in some cases there was regression of the disease, both symptomatically & also evident radiologically.

This study aims to illustrate key demographic, clinical, and pathological characteristics of these patients with spinal tuberculosis. The objective is to derive actionable understandings that can enhance clinical comprehension of Potts Spine, inform diagnostic strategies, and potentially guide public health interventions aimed at mitigating the impact of spinal tuberculosis.[6-9]

MATERIALS AND METHODS

Study Site: Department of Neurosurgery, Government General Hospital, Kakinada

Study Duration: January 2024 – June 2025

Sample Size: 32 Patients presenting with symptoms or signs or investigations suggestive of Potts spine in the above study period.

Inclusion Criteria

All Patients presenting with symptoms or signs or investigations suggestive of Potts spine in the above study period.

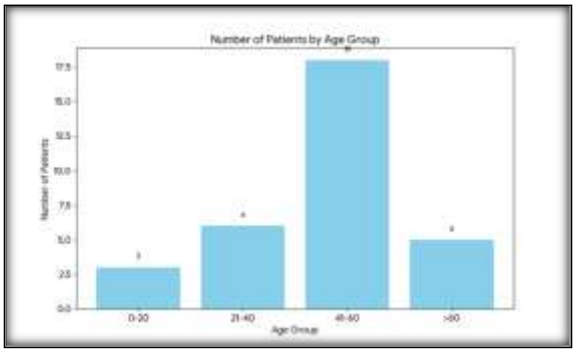
Exclusion Criteria

Patients with multiple pathologies in addition to Potts spine.

Statistical Analysis

A. Age Distribution

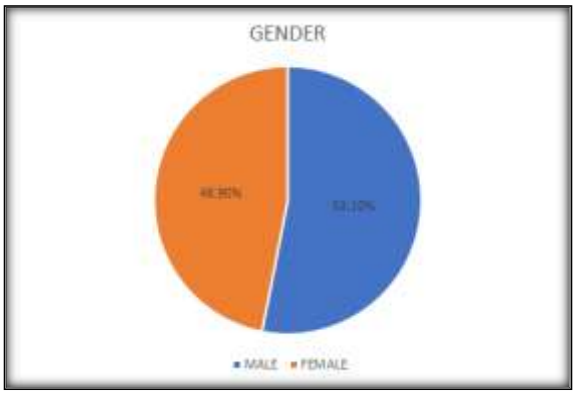
The Age distribution reveals that among the 32 patients, The wide age range suggests considerable variability in the age at which individuals present with Potts Spine.



A bar diagram illustrating the frequency distribution of patients across different age groups showing the following: 3 patients are under 20 years of age, 6 patients fall within the 20–39-year bracket, the largest group comprises 18 patients aged 40-59 years, and 5 patients are 60 years and older. Most of the patients are affected in 5th and 6th decade (46.8%) which signifies the disease has a clear predilection in this age group.

B. Gender Distribution

Analysis of the Gender reveals that the cohort consists of 17 male patients and 15 female patients.



A pie diagram representing these proportions, showing a nearly balanced distribution between genders. This observation suggests that, within this specific dataset, there is no strong gender predilection in the incidence of Potts Spine.

Unlike some diseases that exhibit clear disparities in prevalence or severity between genders, the near-equal representation here indicates that the factors contributing to spinal tuberculosis in this population are likely gender-neutral.

This could relate to similar exposure risks or equitable access to diagnostic and treatment services for both men and women.

C. Socio-economic Status

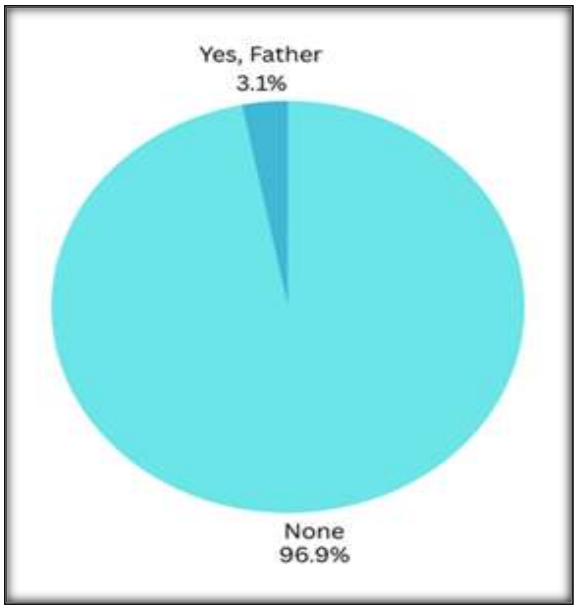
A striking and critical observation from the Socio-economic Status column is that all 32 patients are having "Poor" socio-economic status.

This uniform socio-economic status strongly indicates a profound and direct correlation between poverty and the incidence of Potts Spine within this dataset. Poverty is a well-established major determinant of health, particularly for infectious diseases like tuberculosis6.

Factors such as overcrowded living conditions, inadequate nutrition leading to compromised immunity, limited access to clean water and sanitation, and delayed access to quality healthcare are all exacerbated by poverty and contribute significantly to tuberculosis transmission and progression.

D. Family History

The Family History indicates that 31 out of 32 patients had no member in family of having diagnosed as Tuberculosis, pulmonary or extra pulmonary. Only one patient (Patient 13) had a positive family history.



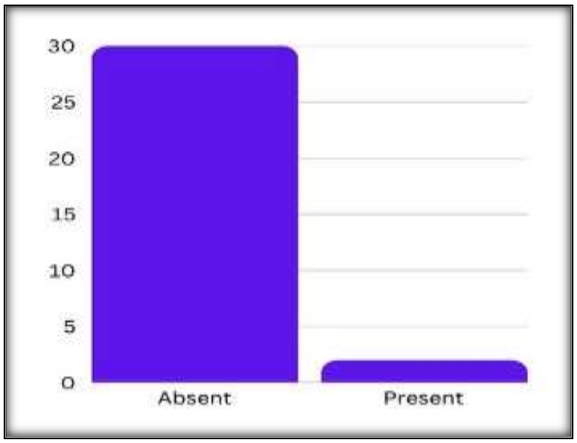
A pie diagram illustrating this highly skewed distribution.

The overwhelming majority of patients reporting no family history suggests that, within this specific cohort, direct familial transmission appears to be a very minor contributing factor to Potts Spine incidence.

While familial contact is a recognized risk factor for transmission, this observation implies that the primary mode of tuberculosis acquisition leading to spinal involvement in these patients is either through broader community-level transmission or environmental exposure, rather than direct, prolonged household contact with an active tuberculosis case, or there might be chance of under reporting from patient side due to social stigma in rural population.

E. Immunosuppression Status

The Immunosuppression status shows that 29 patients had no other immunosuppressive condition, while 3 patients (Patients 12, 13, and 29) were “HIV +VE."

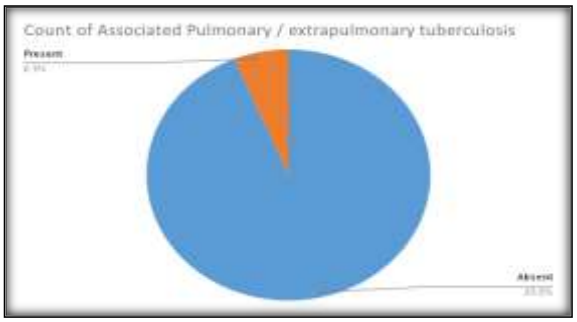


A bar diagram representing this distribution.

The presence of HIV in these three patients, is not merely a co-occurrence but a likely direct causal factor. HIV severely compromises the immune system, significantly increasing an individual's susceptibility to developing active tuberculosis, including its severe extrapulmonary forms like Potts Spine. This highlights a critical comorbidity that directly influences disease progression and potentially treatment outcomes.

F. Associated Pulmonary / Extrapulmonary Tuberculosis

This analysis reveals that 30 patients had no such association while only 2 patients (Patient 3 and Patient 21) had associated pulmonary tuberculosis.



A pie diagram depicting this distribution.

This suggests that for most patients in this dataset, Potts Spine is the primary and perhaps only clinically evident site of tuberculosis infection at the time of data collection.

This observation is a crucial diagnostic consideration, as it implies that spinal tuberculosis can occur in isolation, without overt signs of pulmonary disease, which is typically the most common and transmissible form of tuberculosis. This can make diagnosis challenging if clinicians primarily focus on respiratory symptoms or systemic signs of tuberculosis. It highlights the need for a high index of suspicion for spinal involvement3 even in the absence of generalized tuberculosis symptoms.

IV. Sputum CBNAAT Results

The Sputum CBNAAT follows a predictable pattern, with two patients of pulmonary tuberculosis testing positive.

Sputum CBNAAT (Cartridge-Based Nucleic Acid Amplification Test) is a rapid and sensitive test for pulmonary tuberculosis.

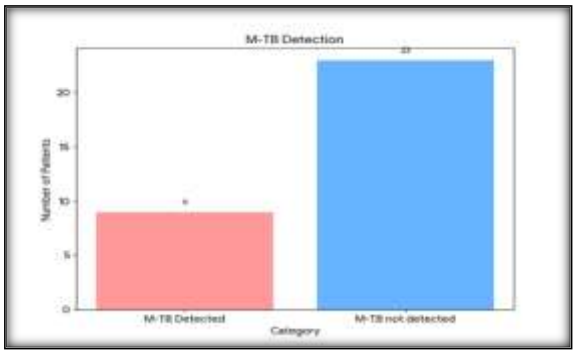
Negative sputum CBNAAT unfortunately doesn't rule pulmonary involvement, it raises the possibility that subclinical pulmonary involvement might be missed. For patients with spinal tuberculosis, even if it appears localized, a thorough respiratory evaluation is crucial.

V. Fluid at Pathological site for CBNAAT

CBNAAT was performed on sample (e.g., tissue biopsy from the spinal lesion, pus from an abscess), which would still detect Mycobacterium tuberculosis.

A notable observation is that not all patients of the cohort tested positive as generally predicted considering the sample taken from local site.

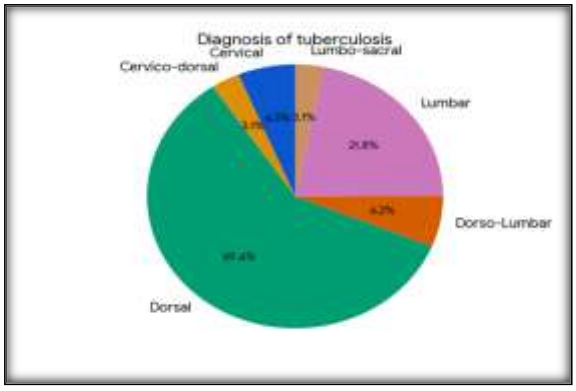
Only 9 patients out of 32 (e.g., Patient 1,3, 12, 13, 21, 26, 29, 30, 32) were tested positive (28%). This apparent discrepancy could highlight the complexity of clinical disease versus laboratory findings and the need for better test to diagnose with greater sensitivity and specificity.



A bar diagram representing the Fluid CBNAAT Results

VI. Diagnosis

The pattern reveals a variety of affected spinal levels. These can be grouped into major regions: Cervical (C-levels), Cervico-Dorsal, Dorsal (D-levels), Dorso-Lumbar, Lumbar (L-levels), and Lumbosacral (L/S-levels).



A Pie Diagram showing Distribution of diagnosis.

It shows that the thoracic spine is most commonly affected, in 59.4% (19 patients out of 32), followed by the lumbar spine in 21.8 % (7 patients out of 32), followed by Dorso-Lumbar in 6.2% (2 out of 32), followed by cervico-dorsal, and lumbosacral involved in 1 patient each. the cervical spine in 3 patients, and the lumbosacral region in 1 patient.

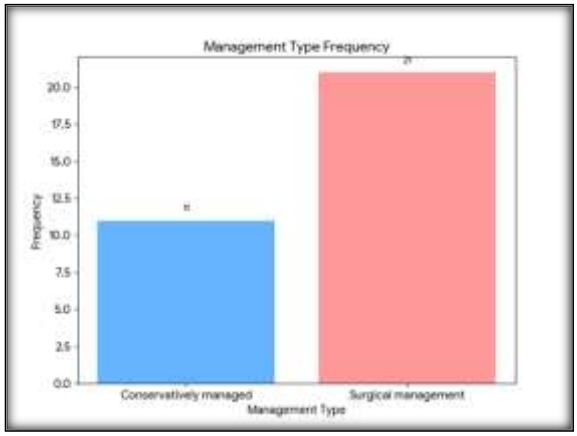
14 patients (43%) have involvement from D10-L2 Level, corresponding to literature of involvement of vertebra in proximity to cisterna chyli.

The predominance of thoracic spine involvement (70% of cases) aligns strongly with established medical literature on Potts Spine tuberculosis due to its anatomical characteristics, including a rich vascular supply and mechanical stress. This consistent finding in the dataset reinforces the typical presentation of the disease and can guide diagnostic imaging and clinical suspicion, directing attention to this region when spinal tuberculosis is suspected.

While thoracic involvement is dominant, the presence of cervical, lumbar, and lumbosacral diagnoses underscores that Potts Spine can affect any segment of the vertebral column. This necessitates a comprehensive clinical and radiological assessment of the entire spine when tuberculosis spondylitis is suspected, rather than focusing solely on the thoracic region.

VII. Treatment

The Treatment Given includes two main categories of management: "Conservatively Management" for 11 patients and various surgical procedures for 21 patients.

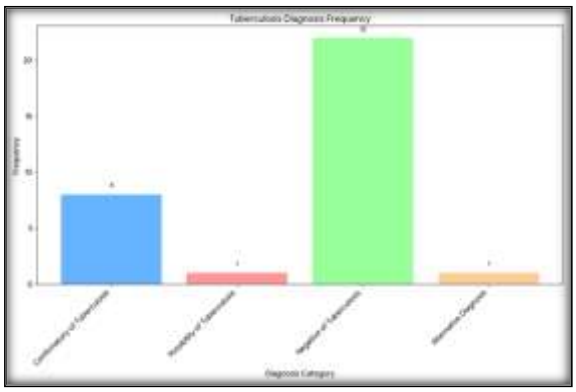


A bar diagram showing the proportion of patients managed conservatively versus surgically.

The distribution of treatment modalities, with approximately 37% of patients managed conservatively and the majority undergoing surgical interventions, indicates that not all cases of Potts Spine require surgery. This distribution aligns with modern clinical guidelines for Potts Spine, which advocate for conservative management (primarily anti-tubercular chemotherapy) in stable cases without neurological deficits, severe spinal deformity, or large abscesses. Surgical intervention is typically reserved for cases with neurological compromise, spinal instability, intractable pain, or large abscesses requiring drainage.

VIII. Histopathological Examination (HPE) Findings

The HPE contains a wide range of findings.



A bar diagram categorizing these findings.

22 Patients HPE, there was no evidence of granuloma or malignancy, in 8 patients the pathological findings were consistent with tuberculosis. 1 patient reported as possibility of tuberculosis, 1 patient turned out to be malignancy (squamous cell carcinoma).

Histopathological examination is often considered the gold standard for definitive diagnosis of tuberculosis, especially in extrapulmonary sites.[7]

DISCUSSION

The analysis of this patient cohort with Potts Spine reveals several critical observations that collectively enhance the understanding of disease presentation and management. The most striking finding is the uniform "Poor" socio-economic status across all 32 patients. This observation strongly aligns with global epidemiological patterns of tuberculosis8, where poverty and its associated factors (e.g., malnutrition, overcrowding, limited healthcare access) are well-established determinants of disease incidence and severity. This emphasizes the definitive need for social interventions alongside medical treatment to effectively combat tuberculosis in vulnerable populations.

The presence of HIV in a subset of patients highlights immunosuppression as a significant predisposing factor for severe tuberculosis manifestations like Potts Spine. This reinforces the critical importance of integrated HIV/TB care programs, advocating for routine screening for tuberculosis in HIV-positive individuals and vice versa, particularly in high-burden settings.

The data also confirms the typical anatomical predilection of Potts Spine, with the thoracic spine being the most frequently affected region. This consistent finding reinforces clinical expectations and can guide diagnostic imaging and examination strategies. While thoracic involvement is predominant, the presence of cervical, lumbar, and lumbosacral diagnoses underscores the importance of a comprehensive assessment of the entire vertebral column when spinal tuberculosis is suspected.

Regarding treatment, the balance between conservative and surgical management reflects established clinical decision-making processes based on disease severity and complications, with surgery reserved for cases presenting with neurological deficits, spinal instability, or significant abscess formation, while neurologically stable cases are managed conservatively.

Challenges in Diagnosis

The Non detection rate of Mycobacteria Tuberculosis in either sputum, local pathological fluid, also raises the possibility of missed subclinical pulmonary involvement, or sampling errors during surgery, which could have implications for disease progression and public health.

Furthermore, the discrepancies noted in HPE findings, such as "No evidence of Granuloma or Necrosis" in patients despite a diagnosis of Potts Spine or positive M-TB detection, further highlight diagnostic complexities. These discrepancies could stem from again sampling errors during biopsy, early disease stages where granulomas have not fully formed, or pathological changes occurring after the initiation of anti-tuberculosis treatment. This underscores the necessity of a multi-modal diagnostic approach, where clinical, radiological, microbiological, and pathological findings are carefully correlated for an accurate diagnosis.

The "Squamous Cell Carcinoma" Outlier: A Critical Case for Diagnostic Rigor

The most significant outlier and potential contradiction in the dataset is the HPE finding of "Squamous cell carcinoma deposits" for Patient 19, who was diagnosed with "L3 Potts Spine". This finding fundamentally challenges the initial diagnosis of Potts Spine for this specific patient. It suggests either an exceedingly rare co-existence of malignancy and tuberculosis, or, more plausibly, a primary misdiagnosis of the spinal lesion. The patient was transferred to radiotherapy department for adjuvant therapy, in addition to continuation on ATT. This case powerfully emphasizes the absolute necessity of definitive histopathological confirmation for all spinal lesions, especially when clinical and radiological findings are ambiguous or atypical. A misdiagnosis of a malignant condition as tuberculosis carries profound and potentially fatal implications for patient management and prognosis, emphasizing the need for meticulous diagnostic rigor to ensure appropriate and timely treatment.

Broader Implications and Future Directions

The findings from this analysis have several broader implications for public health and clinical practice. Public health interventions must continue to focus on addressing the social determinants of health, particularly for populations in poor socio-economic conditions, as these factors are deeply intertwined with tuberculosis incidence. Integrated HIV/TB care programs are essential to manage the complex interplay between these two diseases.

For clinical practice, the report stresses the importance of a comprehensive diagnostic workup for Potts Spine. This includes thorough clinical assessment, advanced imaging, microbiological

testing, and, crucially, histopathological examination. Individualized treatment planning, based on disease severity and patient-specific factors, remains paramount.

Future research could investigate the reasons behind the identified diagnostic data gaps, analyze the long-term outcomes of conservative versus surgical management in similar cohorts, and explore the prevalence of co-morbidities or alternative diagnoses in patients presenting with spinal lesions initially suspected to be tuberculosis.

CONCLUSION

This report provides a detailed analysis of a cohort of 32 patients diagnosed with Potts Spine, drawing upon a specific dataset. The study highlights a strong and consistent association between Potts Spine and "Poor" socio-economic status across the entire cohort, underscoring the critical role of social determinants in the epidemiology of tuberculosis. The analysis confirmed the typical anatomical predilection for thoracic spine involvement and revealed a balanced approach to treatment, encompassing both conservative and surgical modalities, consistent with current clinical guidelines.

The presence of HIV in a subset of patients further emphasizes the importance of integrated care for co-morbid conditions.

In conclusion, this detailed data analysis offers valuable insights into the complex patterns of Potts Spine, informing evidence-based clinical practice and guiding public health policy in the ongoing fight against tuberculosis, particularly its severe extrapulmonary manifestations. The findings advocate for comprehensive diagnostic protocols, individualized patient management, and sustained efforts to address the socio-economic factors that perpetuate the disease.

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