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Pott's disease in twenty first century: A three-year study from an orthopaedic teaching institute of Himalayan region and a mini review

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Original Article

Abstract

BACKGROUND: Tuberculosis (TB) of the spine if neglected can give rise to deformities and neural compromise. Early diagnosis and management can prevent these complications. In this series, we study the clinical-radiological presentation and present trends of spinal involvement in spinal TB (STB) in our Himalayan population.

METHODS: This study was conducted from March 2017 to February 2020. Patient demography, clinical signs, and radiological parameters of the disease were recorded.

RESULTS: 80 diagnosed patients with a mean age of 37.6 ± 19.1 years were included. Para-discal variety was the most common type (86.25%) with the lumbar region the most common region involved (46.9%). Cold abscess, deformity, and neural deficit were present in 11.25%, 36.25%, and 21.25% of patients, respectively.

CONCLUSION: The results of this study and the world literature suggest a global trend of the lumbar spine being involved more often in the twenty-first century than the thoracic spine. Besides, our Himalayan belt population had a lower incidence of clinically evident cold abscesses, discharging sinuses, spine deformities, and associated neural deficits, which is suggestive of the early presentation of our patients to the healthcare facilities.

KEYWORDS: Tuberculosis; Spine; Pott's Disease

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Introduction

Tuberculosis (TB) is an infectious communicable disease that has haunted mankind from time immemorial. It is a leading cause of mortality from infectious diseases worldwide. According to the global TB report 2019 of the World Health Organization (WHO), in the year 2018, there were 10.0 million estimated incident cases and 1.45 million deaths from TB globally. Forty-four percent of this burden was from South-East Asia with India ranking number one with an estimate of 27% of the global cases.[1] TB has been categorized into pulmonary and extra-pulmonary TB. Lymph nodes are the most common site of extra-pulmonary involvement followed by the musculoskeletal system, with spinal TB (STB) contributing to 3% to 5% of all cases of TB, 15% of cases of extra-pulmonary TB, and 50% of cases of osteoarticular TB.[2,3] STB is a slowly progressive disease which can

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give rise to spinal deformities and neurological compromise due to compression of the neurological structures in the spine. Hence, early diagnosis and treatment are key to preventing these complications and morbidity.[4] In this study, we have observed the characteristics of the patients, the clinical picture, and the distribution of the lesions along the spine and also compared our data with those of other institutes around the globe. This study aims to see the changing trends of TB of the spine concerning its spinal distribution and complications.

Methods

This descriptive cross-sectional study was conducted over a period of three years from March 2017 to February 2020 at a teaching orthopaedic institute in the Himalayan region of India. All the diagnosed cases of TB of the spine and the sacroiliac joint were included in this study. Cases whose diagnosis was in doubt or in whom the diagnosis was changed at any time in the follow-up or the follow-up duration was less than two years were excluded from the study. A total of 80 cases qualified for this study. A proforma was formulated for data collection. Patient demographics which included gender and the age of the patients at the time of presentation were recorded. Type of the STB (para-discal, central, anterior, posterior element, and sacroiliac), site of the spine involved, the total number of vertebrae involved, multifocal spine involvement, presence of a cold abscess, discharging sinus and type of spinal deformity (if present) on clinical examination, neurological involvement and its Kumar's grade, presence of multifocal musculoskeletal lesions, and associated pulmonary TB (healed or active) were also recorded. The collected data were analyzed by appropriate statistical tests and the results were expressed as mean ± standard deviation (SD) and proportions as appropriate using SPSS software (version 22.0, IBM Corporation, Armonk, NY, USA). The results were also compared with the available literature from different institutes around the world.

Results

The age of 80 patients suffering from STB ranged from 4 months to 85 years (mean ± SD = 37.6 ± 19.1 years). 13.6% of the patients were of paediatric age (≤ 15 years) (Figure 1a). The third decade of life was the most common vulnerable age group (Figure 2). Men were affected 1.22 times more than women.

Para-discal type of STB was the predominant type of involvement seen in 86.25% of the patients followed by the central type in 8.75% (Figure 1b, 1c, 1d). Anterior type and sacroiliac involvement each was seen in 2.5% of cases (Figure 1e, 1f). There was no patient with involvement of posterior elements of the spine. Out of 81 STB lesions involving different spine segments, the lumbar spine was the most common site involved followed by the thoracic spine, thoracolumbar junction, and cervical spine (Figure 3). Out of 175 spine segments affected in 80 cases, 46.9% were lumbar and 41.41% were thoracic (Figure 3). 75% of the cases had two-segment involvements and 8.75% had involvement of only one segment. The involvement of more than two segments was seen in 16.25% of the patients, with the maximum number of segments involved being seven (Figure 1g). On average, 2.2 spine segments were involved per case. Two cases (2.5%) had multiple levels of STB.

A cold abscess was apparent on clinical examination in 11.25% of cases. The retropharyngeal abscess was noted in three patients. Iliopsoas abscess clinically presenting as swelling in the iliac fossa was seen in two of the patients and the other two presented in the lumbar triangle. Besides, two patients had a para-spinal cold abscess. Radiologically, some forms of the abscess were seen in most of the patients (Figures 1b, 1d, 1e, 4a, 4b, 4c, 4d).

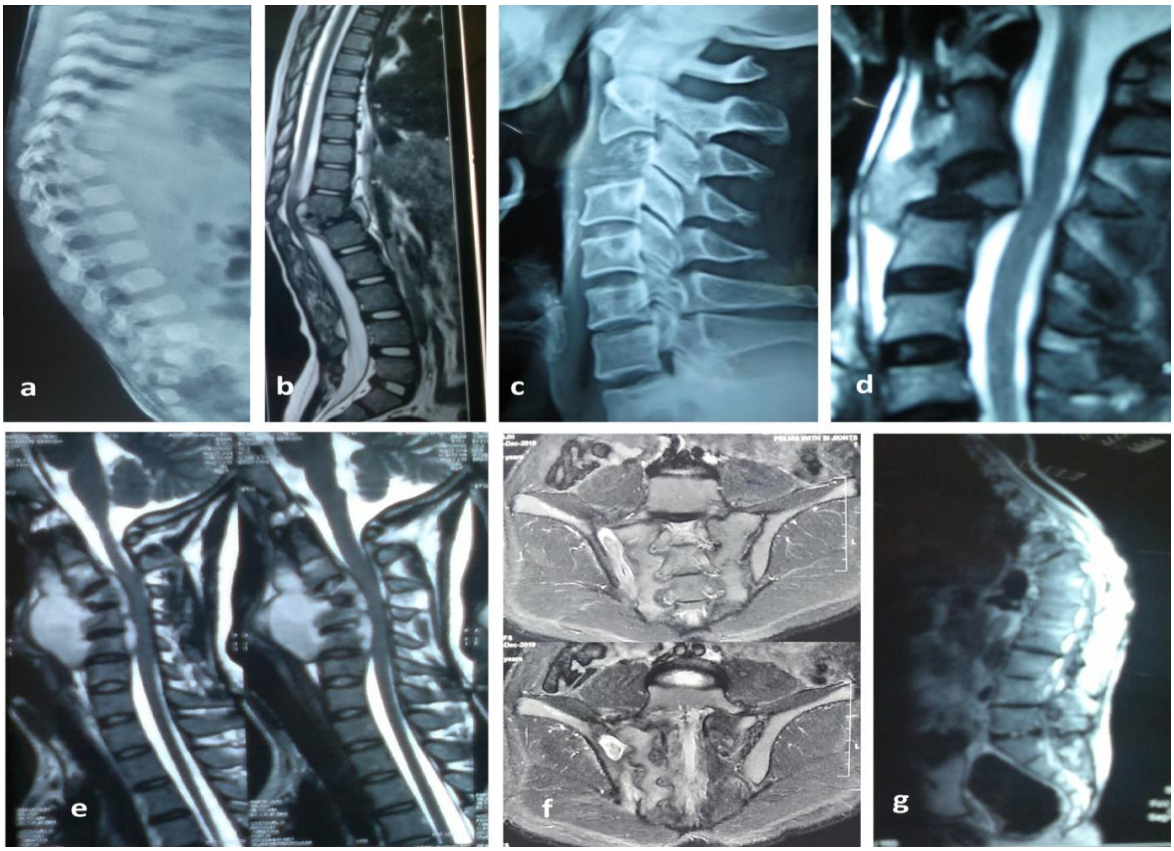

Figure 1. a) Radiograph of spinal tuberculosis (STB) in a four-month-old baby; b) Sagittal cut magnetic resonance imaging (MRI) section showing para-discal type STB with an epidural abscess; c, d) Radiograph and MRI showing central type STB of the cervical vertebra; e) MRI of the cervical spine with the anterior type of STB with a retropharyngeal abscess; f) MRI picture of right sacroiliac joint tuberculosis (TB); g) Multiple vertebral involvements in STB at the thoracolumbar junction

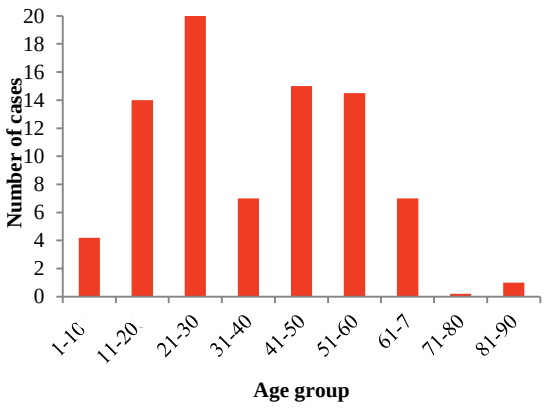

Figure 2. Bar chart showing decade wise (age wise) distribution of spinal tuberculosis (STB) cases

None of the patients presented with a draining sinus. 36.25% (n = 29) of the patients had spine deformity on clinical examination. In 27.5% (n = 22), the deformity was severe of which the patient was aware and at rest, it was revealed only on physical examination by the examiner. The majority (n = 19) had a kyphotic deformity, four had kyphoscoliosis, one had scoliosis, four had to flatten off the lower back with a loss of lumbar lordosis, and one had a reversal of lordosis of the cervical spine (Figures 1a, 2e, 2f, 2g). 21.25% (n = 17) of the patients had some kind of neurological deficit and as per Tuli's system of grading was of Grade I (n = 6), Grade II (n = 4), Grade III (n = 3), and Grade IV (n = 4).

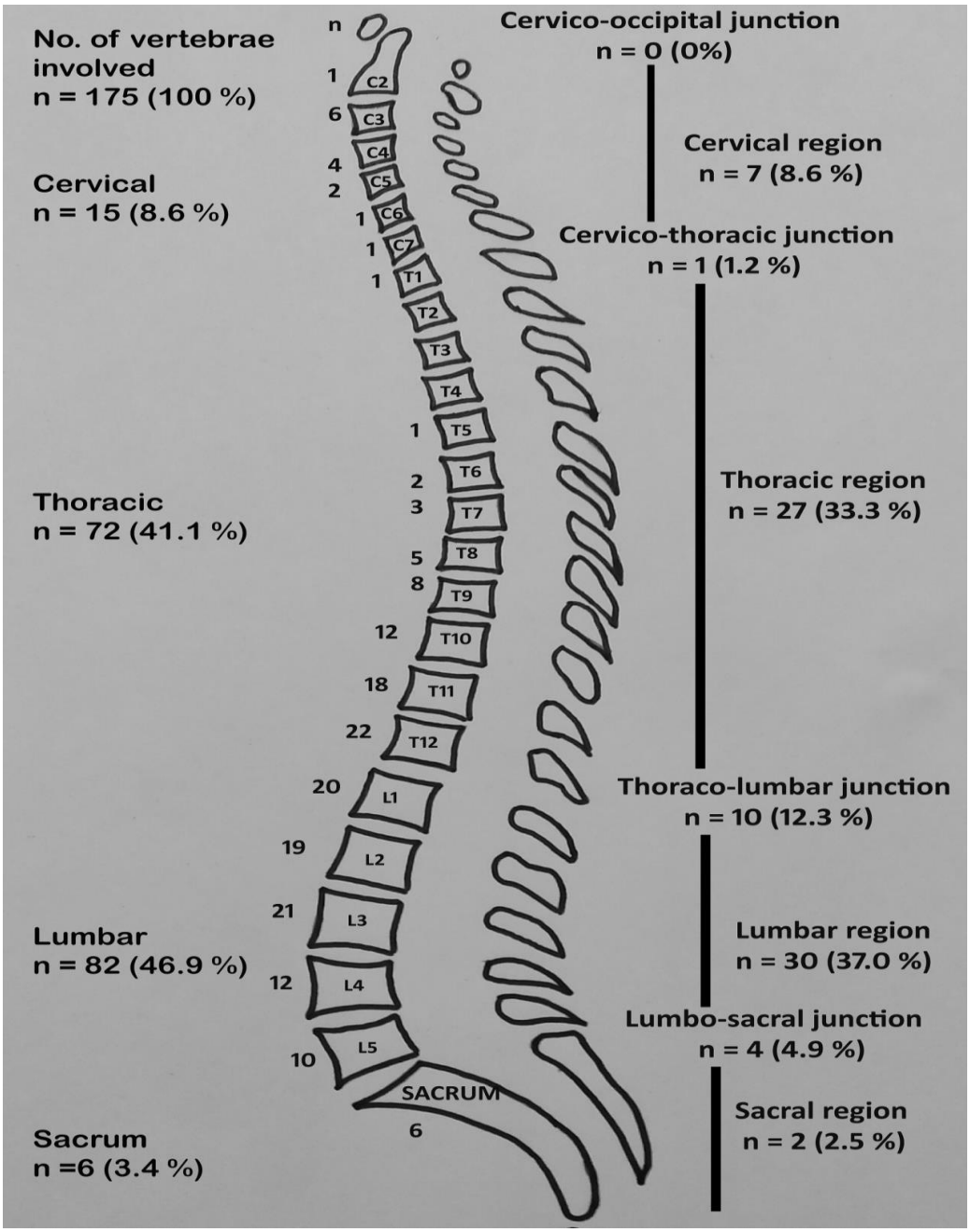

Figure 3. Diagrammatic representation of the distribution of spinal tuberculosis (STB) lesions and frequency of different vertebral involvement

Multifocal musculoskeletal TB was seen in four (5%) patients, out of which two had multifocal lesions in the spine itself (Figure 4h). Pulmonary TB was associated with 18 (22.5%) patients, of whom 8 had active pulmonary TB and the rest had healed pulmonary lesions (Figure 2i).

Discussion

TB of the spine is an age-old disease with evidence of lesions even in Egyptian mummies.[5] It is also known as Pott's disease after an English surgeon, Sir Percival Pott, first described the involvement of the spine by TB in the year 1779.[6]

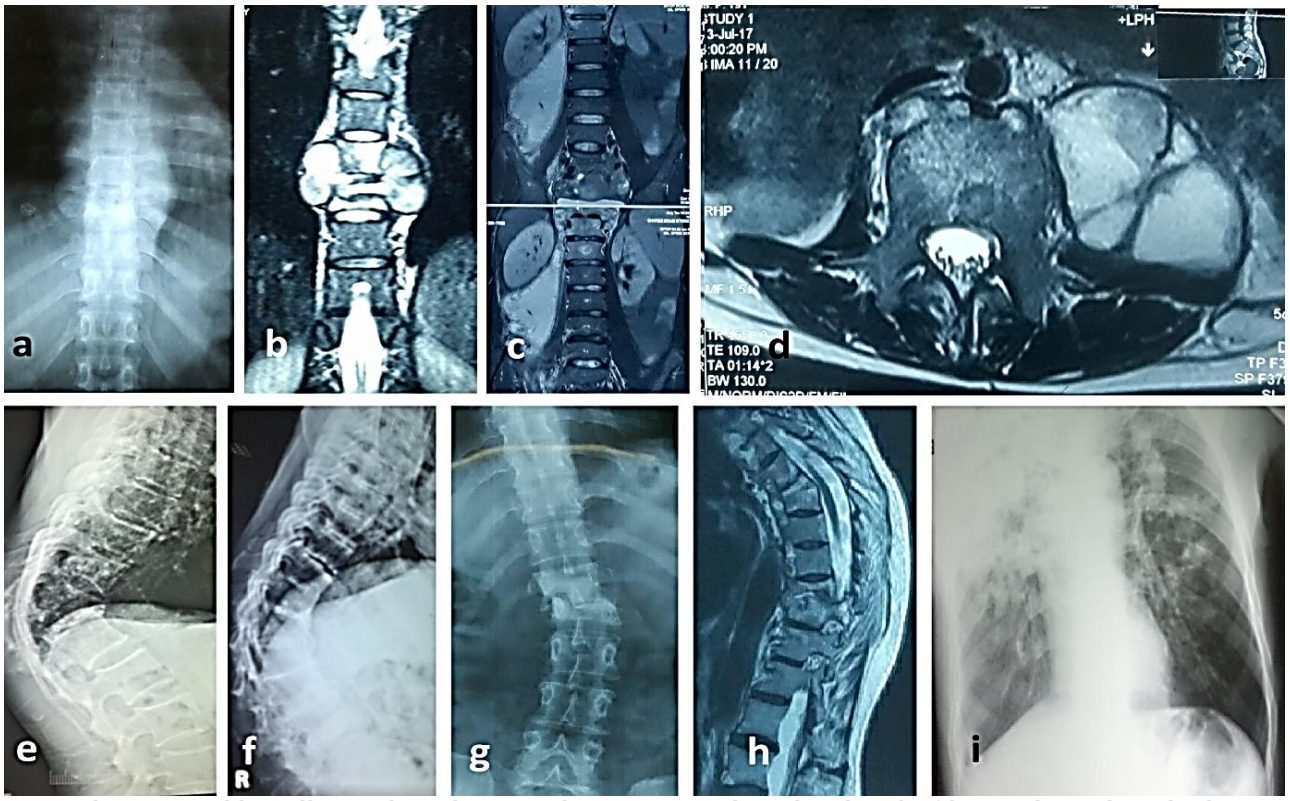

Figure 4. a, b) Radiograph and magnetic resonance imaging (MRI) of lower thoracic spinal tuberculosis (STB) with a para-vertebral cold abscess; c) MRI showing psoas abscess on the right side in STB of the lower thoracic spine; d) MRI cross-section showing iliopsoas abscess in case of an STB; e) Radiograph showing an angular kyphotic deformity in lower thoracic region in a case of para-discal STB; f) Multiple vertebral involvements in STB with a round kyphotic deformity at thoracolumbar region; g) D-12, L-1 para-discal STB with a scoliotic deformity; h) Multifocal STB (lesions at upper thoracic and lower thoracic region); i) Chest radiograph with associated pulmonary tuberculosis in a case of STB

Involvement of the spine in TB is usually secondary to some primary focus elsewhere in the body which most of the times is lungs or genitourinary system and dissemination to spine can be via haematogenous or lymphomatous route.[7] Any age group can be affected but the literature suggests that older age group is more commonly infected in the developed nations. In the cross-sectional study of Ghosh et al. in Dhaka, Bangladesh, on 107 patients with STB, 19.6% of patients were below 15 years of age.[8] In our study as well, 13.6% of cases with STB were of paediatric age. The average age of the patients with STB in different institutional studies ranges from 32 to 60.3 years (Table 1).

The third decade of life is the most vulnerable age group with 23.75% of our patients in their third decade. Ghosh et al.[8] and Shi et al.[19] in their studies also had STB most common in the third decade of life with 28% and 25.75% of the patients in their third decade, respectively. Overall, STB affects men more commonly than women; however, female predominance has also been seen (Table 1). The para-discal pattern of vertebral body involvement is the most common pattern followed by the central body type of involvement. Sindhwani et al. in their magnetic resonance imaging (MRI) study on the tubercular spine in 60 patients had a para-discal pattern in 75% and central type in 6.7%,[21] which is comparable to that of ours.

Table 1. Patient demographics and distribution of spinal tuberculosis (STB) lesions in different institutional studies

Author	Place	Total cases (n)	Age (year), Range (mean ± SD)	Sex (male/female)	Regional distribution (%)						Average number of segments involved	Multiple focal spine lesions (%)
					Cervical	Thoracic	Thoraco-lumbar	Lumbar	Lumbo-sacral	Sacral		
Tuli et al.[9]	India	270	- (-)	1:1.18	14.0	43.7	-	39.3	3.0	-	-	9.2
Chung et al.[10]	Korea	244	1.6-70.0 (-)	1:1.09	2.0	43.0	17.0	34.0	4.0	0	2.5	2.4
Rodriguez-Gomez et al.[11]	Spain	37	24-82 (60.3 ± 14.4)	1.06:1	2.0	58.0	4.0	32.0	4.0	0	-	0
Godlwana et al.[12]	South Africa	104	- 28	1:1.38	11.0	42.0	10.0	30.0	5.0	2.0	-	-
Ehsaei et al.[3]	Iran	58	5-80 (41.4 ± 12.5)	1:1.07	7.0	46.0	10.0	33.0	-	-	-	-
Dunn[13]	South Africa	82	1.5-73.0 (32.0 ± 21.1)	1:1.3	11.0	66.0	6.0	13.0	0	4.0	-	15.0
Khalequzzaman & Hoque[14]	Bangladesh	46	11-69 (33.3 ± 5.2)	2.5:1	-	-	-	-	-	-	-	14.2
Yasaratne et al.[15]	Sri Lanka	32	8-76 48	1.46:1	6.0	41.0	-	53.0	-	-	-	6.2
Sezgi et al.[16]	Turkey	23	17-69 (38.4 ± 5.6)	1.56:1	0	32.0	44.0	24.0	0	0	2.5	91.3
Ibrahim et al.[17]	Sudan	100	-	1:1.5	4.0	100	-	12.0	-	0	-	-
Faried et al.[18]	Indonesia	12	17-56 (34.3 ± 9.9)	1.4:1	8.3	66.7	-	25.0	-	-	-	-
Shi et al.[19]	China	967	2-89 (35.8 ± 15.7)	1.04:1	6.4	47.5	-	59.6	-	8.5	2.5	3.4
Liu et al.[20]	China	1378	1-88 43.7	1.40:1	6.4	35.7	7.9	38.2	8.0	0.8	-	-
Present study	India	80	0.33-85 (37.6 ± 19.1)	1.22:1	8.6	33.3	12.3	37.0	4.9	2.5	2.2	2.5

SD: Standard deviation

In our series, the tubercular lesions most commonly involved the lumbar region of the spine followed by the thoracic region. In literature, both the lumbar, as well as thoracic region, have been labelled as the most common sites of affliction (Table 1). Shi et al. in their series of 967 patients had lumbar region involvement in 59.6% of their cases.[19] Over the last decade, the trend of regional involvement of the spine is in fact shifting from the thoracic spine to the lumbar spine (Table 1). Batirel et al. in a multinational multicentre Backbone-2 study from 35 centres on 314 patients with STB had lumbar region involved in 57% of cases.[22] The average number of vertebral segments involved in most series is around 2.5 per patient while Sindhwani et al. on average had 3.2 segments involved.[10,16,19,21] The classical pattern in STB is the involvement of the para-discal part of two adjacent vertebral bodies which is attributed to the common blood supply to adjacent para-discal portions of two adjoining vertebral bodies. This explains why the two-segment disease is more common than single and multiple-segment involvement. Multiple-segment involvement (≥ 3 segments) may result from the spread of the pus along with anterior or posterior longitudinal ligaments or may be a result of multiple-site haematogenous inoculations.[7,23] In literature, the multiple-segment (≥ 3 segments) involvement ranges from 10% to 53.3%.[10,15,19,20,22] Multiple-level segment involvement is an index of late presentation to the medical facility. Considering that in our study, 16.25% of patients had multiple-segment involvement at the presentation, our cases reported early during the course of the disease. Multifocal STB of 2.5% in our series is one more indicator of early presentation as the incidence in the world literature ranges from 0% to 91.3% (Table 1).

The pus in STB can present in the vicinity of the spinal column as a pre-vertebral or a para-vertebral abscess or it may track along the myofascial planes and present far away from the site of the origin as seen in iliopsoas abscess. Besides, the tubercular pus may track along the neurovascular structures and again present far away from the source in the occipital region, neck, axilla, arm, gluteal region, thigh, or chest wall depending on the region of the spinal column involved.[7,23] Tuli et al. in their series had a cold abscess on clinical and radiological examination in 27% of cases only,[9] while, as in the different series published over last ten years, 46.9% to 82.6% of cases had radiological evidence of cold abscess (Table 2). This discrepancy can be explained by the advent of MRI and its routine use in the evaluation of STB. About 90% of cases of STB have a well-defined abnormal para-vertebral signal and an abscess on MRI.[4] Presence of clinical cold abscess in only 11.25% of our patients at the presentation is a sign of early presentation to the medical facility. One more such an index of early presentation of STB to the health care system is the absence of a discharging sinus in our cases. Tuli et al. had discharging sinuses at presentation in 14.8% of their patients. In China, Shi et al. had a draining sinus in 2.07% of patients on clinical examination.[19]

Deformity of the spine is a known sequel in STB. Most of the patients with STB will have a radiologically measurable deformity. Clinically obvious deformity of the spine is an indicator of long-lasting disease. Tuli et al. had some degrees of kyphotic deformity at presentation in 94% of their cases.[9] In other studies, the incidence of clinical spinal deformity ranged from 7.5% to 94% (Table 2). Our incidence of 36.2% in the Himalayan terrain is comparable to that of other countries. Neurological involvement is a well-known complication of STB and inactive disease involvement may result from neural compression due to pus, granulation tissue, sequestrated discs, bony chips, or spinal instability. Compromise can also be secondary to cord ischemia due to

endarteritis or thrombosis of the blood vessels as a result of granulomatous inflammation. The neurological presentation is variable and depends on the site of involvement of the spine as well as the degree of compression of the neurological elements.[24] Neurological deficits in STB at presentation show a lot of variation in different studies with deficits ranging from 17.4% to 77.6% (Table 2). Neurological involvement is a sign of long-standing disease. In our series, only 21.2% of patients had a neurological deficit at presentation. Different classification systems have been used to grade the neurological compromise in STB which include Frankel classification, American Spinal Injury Association (ASIA) scale, and Konstam and Blesovsky classification, but Tuli's grading is regarded as the gold standard especially in the Asian subcontinent.[24,25] 12.5% of our patients had negligible (Grade I) to mild (Grade II) neural involvement while only 8.75% had moderate (Grade III) to severe (Grade IV) involvement at presentation. These figures are consistent with those of Liu et al. who had severe deficits (ASIA Grade A and Grade B) in 10.9% of their patients.[20]

As STB usually is a sequel to some primary focus elsewhere and the route is hematogenous, the possibility of seeding at other sites in the skeletal system is always there giving rise to multifocal lesions. 2.5% of our cases had multifocal involvement and 9.2% of STB cases of Tuli et al.[9] study had multifocal lesions (Table 1). In literature, associated healed or active pulmonary lesions have been seen in 3% to 100% of cases (Table 2).[10] Incidence in our series was 22.5%. The major limitation of this study is that it is a single institutional study and includes cases from a small region of the Himalayan belt and hence, it may not be appropriate to generalize the findings for the entire Himalayan belt. This warrants a similar type of multi-center study from the Himalayan region.

Conclusion

In our population, the lumbar region of the spine was more commonly affected by TB than the thoracic region. The same changing trend has been seen in the last decade worldwide. This has a bearing on the clinical practice of the orthopedic and spine surgeons not to take low back pain easy and always have tubercular spondylitis as an entity in their minds. The incidence of multiple-segment involvement, associated clinical cold abscess and discharging sinus, spine deformity, neural deficits, and multifocal skeletal TB in our study was on the lower side when compared to the world literature.

Table 2. Incidence of complications and associated pulmonary disease in different institutional studies

Author	Cold abscess (clinical/radiological) (%)	Spine deformity (%)	Neuro-deficit (%)	Associated pulmonary TB (%)
Tuli et al.[9]	27.0 (clinical & radiological)	94.0	21.1	5.0
Chung et al.[10]	-	43.0	25.0	47.5
Rodriguez-Gomez et al.[11]	37.8 (radiological)	-	46.0	30.0
Godlwana et al.[12]	-	-	56.0	100
Ehsaei et al.[3]	67.2 (radiological)	22.4	77.6	-
Dunn[13]	-	-	73.0	-
Khalequzzaman & Hoque[14]	80.9(radiological)	11.9	-	-
Yasaratne et al.[15]	46.9 (radiological)	18.7	28.1	3.1
Sezgi et al.[16]	82.6 (radiological)	13.0	17.4	4.3
Ibrahim et al.[17]	-	-	-	36.0
Shi et al.[19]	63.8 (radiological)	39.9	33.3	-
Liu et al.[20]	65.5 (radiological)	7.5	49.9	26.6
Present study	11.2 (clinical)	36.2	21.2	22.5

TB: Tuberculosis

This is an index that the majority of the patients from the Himalayan region with STB presented to the health care facility at a very early stage, before the crippling complications set in.

Conflict of Interests

Authors have no conflict of interests.

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