Original Article

Sociodemographic Patterns of Spinal Tuberculosis Patients from a Tertiary Care Teaching Hospital: A 5-Year Cross-sectional Study

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Abstract

Background: The distribution of spinal tuberculosis (STB) differs due to variations in lifestyles, socio-economic conditions, geographical locations, available medical services, and other factors. In the literature, very few studies have been done on demographic profile and morphological distribution of tuberculosis (TB) spine. We conducted this study to identify the disease distribution and various parameters affecting the disease in our area which caters to populations from both plains and hills. **Materials and Methods:** This was a cross-sectional study using 5-year retrospective data retrieved from medical records, Department of Orthopaedics of a tertiary care teaching hospital, from April 2015 to October 2020. The patient distribution was studied according to the different variables. **Results:** A total of 286 patients were enrolled in the study. Females amounted to 54.96% (n = 159) of the total and 46.1% (n = 127) were males. The mean age of the demographic group was 36.9 years (2.5–80 years) (±SD = 17.63). The majority (46.5%) of the patients were young adults in the age group (21–40 years). The majority of deficits were seen in the dorsal spine (n = 27) followed by multifocal contiguous lesions (n = 22). Among the patients having single-segment disease, 33.9% (n = 61) involved the lumbar spine and 28.7% (n = 52) involved the dorsolumbar spine. Multifocal Potts disease amounted to 36.25% (n = 105) of the total patients. **Conclusions:** Female preponderance was observed in our study. Involvement of the lumbar spine was the most common form involving single-segment disease followed by dorsolumbar, dorsal, and cervical spine. The multifocal contiguous type of affection of STB was found to be the most common type of STB.

Keywords: *Demography, socioeconomic factors, spinal tuberculosis*

Introduction

The epidemiology and clinical patterns of spinal tuberculosis (STB) are changing throughout the world due to various reasons. The number of patients affected by STB are slowly increasing every year in both developing and industrialised countries.[1] STB accounts for nearly 50% of all osteoarticular tuberculosis cases.[2] STB is also associated with high morbidity and mortality which makes it a major public health concern.[3] The usual presentation of STB is persistent back pain with or without deformity in the back. The systemic constitutional symptoms such as low-grade fever, loss of weight, and loss of appetite may be present in 30%–40% of the patients.[4] Disabling back pain and neurologic deficit may be seen in 10%–40% of patients.[3]

Though anti-tubercular drugs are the most important component of treating any form of tuberculosis, surgery is required in STB in case of complications.[5,6] Untreated STB in later stages may cause spinal deformity and neurological injury which seriously affect the quality of lives of the patients and are difficult to treat by chemotherapy alone.[7,8]

Involvement of more than two vertebrae, evidence of dural compression, and delay in diagnosis affect the outcomes of STB.[9] There is a lot of literature on the clinical-epidemiologic factors affecting pulmonary tuberculosis, but there is very little literature regarding the demographic profile, morphology, and disease distribution of STB.

We in our institution conducted this study to identify the disease distribution, factors associated with neurological deficits, recovery from deficits, and various parameters affecting the disease in our area.

Materials and methods

This was a cross-sectional study conducted by retrieving the medical records

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retrospectively from the tuberculosis OPD (special OPD) register from April 2015 to October 2020. Ethical clearance was taken from the institute's ethics committee.

All those cases of STB were included in the study whose diagnosis was confirmed by radiographs, and MRI of the involved region and supplemented by histopathological studies (evidence of caseous necrosis/CBNAAT positivity from the diseased part). The records which did not have all the above investigations were excluded. Pyogenic spondylodiscitis was excluded from the study.

The variables studied were distribution of age, gender of patient, number of affected spinal segments, neurological status, socioeconomic status as per modified Kuppuswamy scale,[10] family structure as per Desai's definition (nuclear vs. joint family),[11] presence or absence of overcrowded living conditions as per Mendhe and Hanumanth,[12] distribution on the basis of residence in hills or plains and residence in urban or rural areas as per government census definition.[13] All the patients were given a trial of conservative treatment failing which surgery was offered. Anti-tubercular drugs were administered to all the patients according to the protocol of the institute for the full duration of 1 year. Frankel scoring was used to document neurological deficits. The distribution of neurological deficits according to involved segments was charted out and an attempt was made to find out if these neurologic deficits were common to a specific segment of the spine.

The different segments defined in the study were, cervical spine C1-C6, cervicodorsal spine C7-D2, dorsal spine D3-D9, dorsolumbar spine D10-L2, lumbar spine L3-L5, involvement of sacrum was taken as lumbosacral involvement. The intermediate disc space involved was attributed to the lower vertebra. For example, if L2-L3 disc is involved, it is counted as tuberculosis of the L3 vertebra. Multifocal contiguous disease is defined as the involvement of at least three consecutive vertebrae and two intervertebral discs, non-contiguous disease is defined as the involvement of two levels with at least two healthy vertebrae in between the involved levels.[14]

All the data were analysed using IBM, SPSS version 23.0(SPSS Inc., Chicago, IL). Descriptive statistics such as mean, standard deviation, and tabulations were used for baseline characteristics. To analyse the quantitative data, an independent *t* test was used and to analyse categorical data,non-parametric tests like Chi-square test were used.

Results

A total of 286 patients were enrolled in this study, out of which 54.96% (n = 159) were females and 46.1% (n = 127) were males. The mean age of the demographic sample group was 36.9 ± 17.63 years (2.5–80 years). According to age group, 17.05% (n = 49) of the patients were between 1–20 years, 46.5% (n = 134) of the patients were in the age group of 21–40 years, 24.5% (n = 70) of the patients were in the age group 41–60 years and 11.2% (n = 33) of the patients were in the age group 61–80 years. The patient population that was living in nuclear families was 60.7% (n = 174) whereas 39.1% (n = 112) were living in joint families. Overcrowded conditions were seen in 63.6% (n = 182) of patients while 36.19% (n = 104) did not have overcrowding in their homes. The patient population from rural areas was 37.4% (n = 109) while 62.4% (n = 177) belonged to urban areas.

Most of the patients belonged to lower middle and lower socioeconomic classes (40.3% and 21.2%) (n = 116 and 61) respectively according to the modified Kuppuswamy scale.[10] The upper middle class constituted 11.6% (n = 33) of the total patients whereas 6.24% (n = 18) of patients were from the upper class and 20.3% (n = 58) of the patients belonged to the upper lower class. Most of the patients, that is, 76.96% (n = 220) were from plains while 22.88% (n = 66) patients were from mountains. The majority of patients 63.5% (n = 181) had single-segment disease while 36.5% (105) patients had multifocal disease. Out of patients having single segment disease, 33.7% (n = 61) patients had involvement of lumbar spine, 28.7% (n = 52) patients had dorsolumbar involvement, 25.9% (n = 47) patients had involvement of dorsal spine, 6.6% (n = 12) patients had lumbosacral involvement, 3.4% (n = 6) patients had cervicodorsal involvement and 1.6% (n = 3) patients had cervical spine involvement. [Figure 1] Out of patients having multifocal disease, 70.47% (n = 74) patients had multifocal contiguous disease while 29.5% (31) patients had multifocal non-contiguous form of STB. In overall disease distribution, 25.79% (n = 74) patients had multifocal contiguous STB, 21.43% (n = 61) patients had lumbar spine involvement, 17.42% (n = 52) patients had dorsolumbar spine involvement, 15.94% (n = 47) had involvement of dorsal spine, 11.38% (n = 31) had multifocal non-contiguous type of involvement, 4.02% (n = 12) had lumbosacral, 2.01% (n = 6) had cervicodorsal and 1.02% (n = 3) patients had cervical STB. [Figure 2] Out of 286 Patients, 269 patients (94.01%) had paradiscal type lesions, 11 patients had central types of lesion (3.74%), and 6 (1.2%) patients had involvement of posterior elements. 197 patients (68.6%) out of 240 did not have any neurological deficits whereas, 89(31.2%) patients among the study population had some sort of neurological deficit at presentation [Table 1]. The majority of deficits were seen in the dorsal spine(n = 27) followed by multifocal contiguous lesions (n = 22). Frankel grade A lesions were also present mostly in the dorsal spine and multifocal lesions. Figure 3 represents the distribution of patients in the study and Figure 4A-F shows the MRI images, representative of various types of STB affection.

Discussion

Pott's disease mostly affects young adults and children in developing countries.[15] In advanced disease, the patient

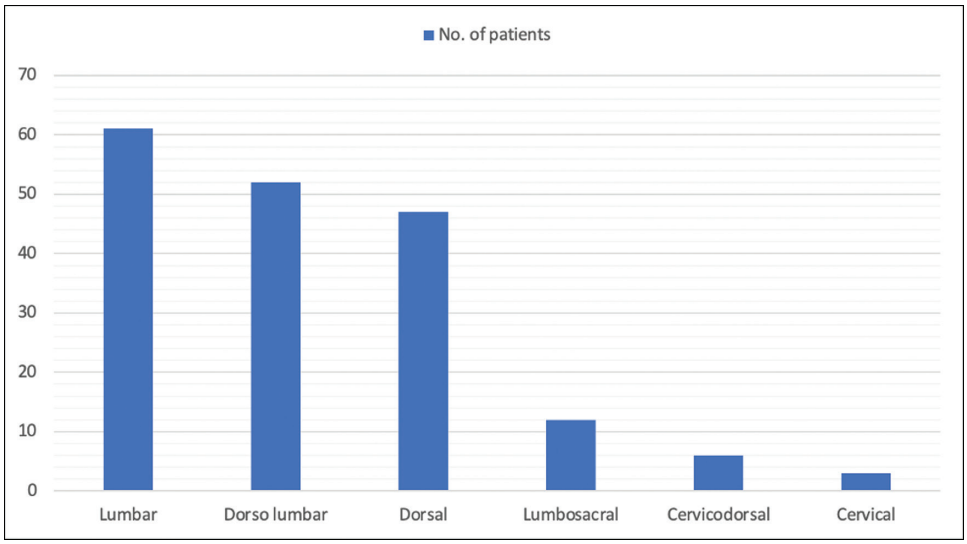

Figure 1: Distribution of single segment disease

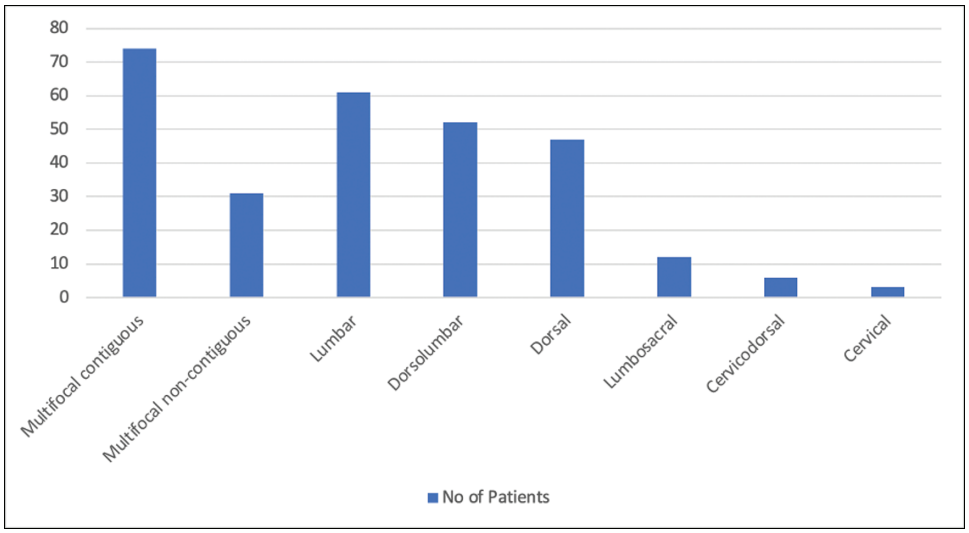

Figure 2: Overall disease distribution in patients with STB

can present with severe spinal deformity and associated paraparesis. We conducted this study to investigate the socio-epidemiological and clinical distribution of STB in a tertiary institute of the hilly region and to observe for changes from routine presentation patterns if any. The gender distribution in our study showed a difference from other studies as in our study female population was predominantly affected by STB, that is, (54.96%). Ferrer *et al.*,[16] Ramos *et al.*,[17] and Sharma *et al*.[18] studied the socio-epidemiological distribution of STB in their regions and found that the male population was affected more as compared to the female population.

The mean age group of our study population was 36.9 years. Godlwana *et al*.[19] studied the incidence and profile of TB spine patients and found maximum incidence in an even younger age group, with a mean age of 28 years, while Ramos *et al*.,[17] Sharma *et al*.,[18] Alavi *et al*.,[20] and Weng *et al*.[21] reported mean age groups of 43.7, 68, 51, and 46.63 years, respectively. The studies from the developing nations had a low mean age of affection whereas the studies from developed nations had higher mean age of affection. This difference in the age of affection between the developed and developing nations may be due to the differences in immunity, nutritional status, health facilities, and overall awareness of the disease in the developed countries. In our study, most of the patients (62.4%) were from urban areas. In similar studies done by Godlwana *et al*.[19] similar results were presented where the majority were from urban areas (61/104 patients), and rural (43/104 patients). A study by Wang *et al.*[22] was also favouring incidence of STB to be more in urban than rural but a study done by Ibrahim *et al.*[23] showed it to be more in people living in rural areas. Since overcrowding is seen in urban areas and tuberculosis is known as the disease of overcrowding which spreads through droplet infection, the increased prevalence of the disease in urban overpopulated areas may be well explained.

In our study, 60.7% of the patients belonged to nuclear families while 39.1% were from joint families. This contrast may be because of the increased migration of the population in search of jobs and better acceptability of nuclear families in the present times. Godlawana *et al.*,[19] Merino *et al.*,[24] Dunn *et al*.[25] in their respective studies suggested tuberculosis to be more prevalent in people with lower socioeconomic strata. In our study majority of the patients belong to lower class and lower middle socioeconomic scales according to the Kuppuswamy scale.[10] This explains the epidemiology of tuberculosis which is a disease of an undernourished population living in areas of overcrowding. In the above studies, 75% of patients were living in overcrowded conditions while 25% did not. Studies by Tuli,[4] Ansari *et al.*,[26] Patel *et al.*,[27] Abbas *et al*.[28] gave similar findings that overcrowding is a predisposing factor and is a definite association with the spread of disease.

Table 1: Distribution of the patients according to neurology and spinal level

Spinal segment affected	Number of patients with neurological involvement	Frankel grade (A, B, C, D, E)
Cervical	2	C-2
Cervico-dorsal	4	A-2
		B-2
Dorsal	27	A-14
		B-7
		C-4
		D-2
Dorso-lumbar	17	A-6
		B-1
		C-2
		D-8
Lumbar	6	C-2
		D-4
Lumbosacral	1	C-1
Multifocal contiguous	22	A-16
		B-3
		C-2
		D-1
Multifocal non-contiguous	10	A-6
		B-2
		C-2

Neurological deficit and kyphotic deformity are the two feared complications of untreated spinal tuberculosis. There are studies which have demonstrated the prediction of neurological deficits based on the segment of the spine affected and also the radiological characteristics.[29] Mittal *et al*.[29] studied 105 patients where the study group found the location of disease as an important parameter in predicting the neurological deficit. Though other parameters like kyphosis, cord oedema, and degree of canal compromise were also significant, the segment of the disease affected, plays an important role in predicting the neurological deficit of the patient. Our study showed the majority of the neuro deficits in the dorsal spine and multifocal contiguous lesions. Frankel A neurology where the complete cord is involved was also seen mostly in the dorsal spine and multifocal contiguous lesions. This may be due to the anatomical differences of the dorsal spine where the space available for the cord is less when compared to the other parts of the vertebral column. Sharma *et al*.[18] did a demographic study wherein he also found similar affection of neurological deficits which showed good recovery in the post-surgical period.

There are very limited studies that compare the incidence of musculoskeletal tuberculosis in mountains and plains.

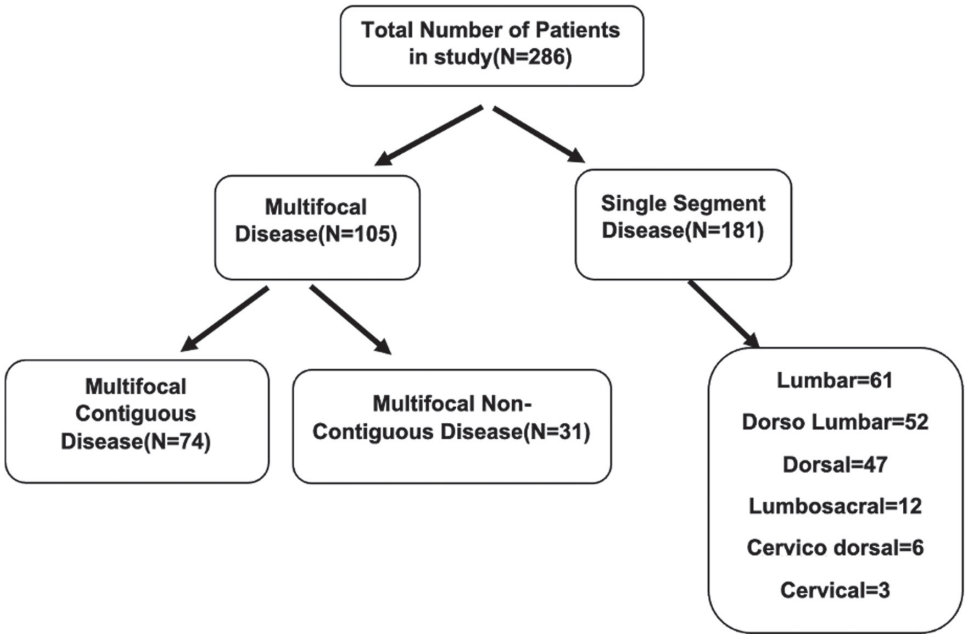

Figure 3: Distribution of patients in the study

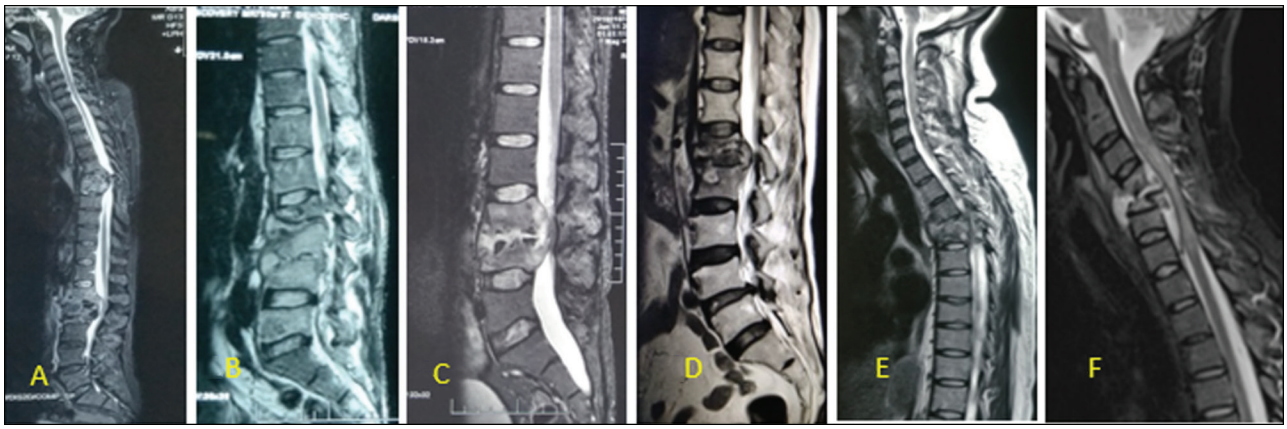

Figure 4: Case example of (A) multifocal non-contiguous STB, (B) multifocal contiguous STB, (C) lumbar STB, (D) dorso-lumbar STB, (E) dorsal STB, and (F) cervical STB

Table 2: Studies showing the comparison of the most common site of involvement in STB

	Most common site	Mean age	Neurological deficit
Ansari *et al*.[26]	Dorsal > Lumbar	–	–
Garg *et al*.[3]	Dorsal > Lumbar	–	–
Tuli[4]	Dorsal > Lumbar	–	–
Ramos *et al*.[17]	Dorsolumbar > Lumbosacral	51 years	8.1%
Gehlot *et al*.[31]	Lumbar > Dorsal	–	21.4%
Abbas *et al*.[28]	Lumbar > Dorsal	33.9 years	–
Sharma *et al*.[18]	Dorsal > Dorsolumbar	46.63 years	64.5%
Our study	Multifocal contiguous > Lumbar	36.9 years	31.25%

Our study showed the majority of the affected population to be from plains (76.96%) though our hospital caters to populations from both the hilly areas and plains. Kakchapati *et al*.[30] studied the incidence of overall tuberculosis in Nepal. The results of this study showed the incidence of disease was higher in mountains than in plains. This variation in the distribution may be due to the actual ratio of the population representing the mountains and plains. The incidence of non-contiguous STB is approximately 1.1% to 16.3% in the literature.[14] With the advent of advanced diagnostic imaging like MRI routinely for diagnosis, the incidence is as high as 71.4%.[32] This indicates tuberculosis may affect the spine at multiple non-contiguous sites more frequently than thought previously.[14,33] In our study overall, 25.79% of patients had multifocal contiguous STB, and 11.38% of patients had multifocal non-contiguous STB. Our study suggests that single-segment disease is more common than multifocal TB spine, however, when overall cases were considered multifocal contiguous STB was the commonest form of affection in our patients followed by lumbar and dorsolumbar STB. In recent literature, there are inconclusive results with some studies reporting dorsal spine to be the most affected region of the spine followed by the lumbar spine, while others report the lumbar spine to be the most common site followed by the dorsal spine. A comparison is shown in Table 2.

The limitation of our study is that it is an institute-based study and has a relatively smaller sample size, and further studies with a much larger sample size and larger catchment area are warranted to overcome the shortcomings of institute-based study. There can be a selection bias in our study due to differences in the baseline population living in hills and plains.

Conclusion

Female preponderance, involvement of the lumbar spine in the majority of cases, and overall increase in multifocal disease are the findings in our study which are different from other studies. The majority of neuro deficits were seen in STB affecting the dorsal spine and multifocal contiguous lesions. The factors like residing in overcrowded families, and lower middle and lower socioeconomic status continue to be associated with STB thereby increasing the overall burden on society.

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Conflicts of interest

There are no conflicts of interest.

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