Musculoskeletal Tuberculosis: Two Year Experience at a Tertiary Care Teaching Hospital of Northern India and Review of Literature

Nadeem Ali¹, Jawed Ahmad Bhat², Akeela Fatima³, Abedullah Bhat⁴, Firdous Ahmad Bangroo⁵, Tahir Ahmad Dar⁶, Naseer Ahmad Mir⁷, Kafeel Khan⁸

Abstract

Background: The aim of this study was to evaluate the present trend of osteo-articular tuberculosis at a teaching hospital in North India.

Methods: All the cases of skeletal tuberculosis that were diagnosed and managed either on outdoor or in-hospital stay basis over a period of two years were evaluated with respect to age, gender, anatomical location of lesion, laboratory parameters (ESR, Mantoux test, HIV screening), concomitant skeletal tuberculous lesions, associated pulmonary tuberculosis, and other associated clinical features.

Results: A total of 84 skeletal tuberculous lesions in 80 patients were enrolled for the study. The age of the patients ranged from 2 to 70 years with a mean of 29.1±19.1 years. 55% patients were in second and third decade of life and 63.7% were males. ESR was elevated in 61.25% and 56.25% tested positive for Mantoux skin test. 21.25% patients had associated active or healed focus of tuberculosis in the lungs. Spine was the most common site involved (58.75%) followed by hip (13.1%), knee (8.3%), foot (4.7%) and shoulder joint (3.5%). Lumbar spine was the most common site affected in the spine followed by lower dorsal spine. 3.75% cases had multifocal skeletal tuberculous lesions.

Conclusion: Prevalence of osteo-articular tuberculosis continues to be high in North India with the disease predominantly affecting young population. Spine is the most common site for skeletal tuberculosis followed by hip, knee, foot and shoulder. Lumbar region followed by lower dorsal spine is much more affected. Multifocal skeletal lesions incidence is lower than expected. And one-fifth of the patients have associated pulmonary tubercular lesion.

Keywords: Tuberculosis, Osteo-articular tuberculosis, Tuberculous osteomyelitis, Tuberculous spondylitis, Musculoskeletal tuberculosis

Introduction

Tuberculosis is an ancient killer disease that continues to be a global public health problem.¹ ² Tuberculosis is the second...
most common infectious disease following malaria and a leading cause of death from infectious disease worldwide.3,4 According to World Health Organization (WHO) report, 8.3 million, 9.2 million and 8.8 million new cases of tuberculosis had been reported annually worldwide in the year 2000, 2006 and 2010 respectively.5,6 The major burden of tuberculosis is seen in the developing countries, especially sub-Saharan Africa and Southeast Asia.7 India ranks first with respect to absolute number of cases of tuberculosis accounting for 20% of the global burden of tuberculosis.5,7

Pulmonary tuberculosis is the most common form of tuberculosis. Extra pulmonary tuberculosis (EPTB) accounts for 10–15% of all the forms of tuberculosis in India.6 In Pakistan, EPTB constitutes one-fourth to one-third of all the cases of tuberculosis. In France, 25% and in Canada, 50% of tuberculosis cases have EPTB.6,8–10 The most common site of EPTB is the lymph node followed by spine, central nervous system, abdomen, extra spinal skeletal system, pleura, pericardium, genitourinary system, skin and others.6,10 Osteo-articular (spinal and extra spinal) tuberculosis represents 1–5% of all cases of tuberculosis and 10–18% of EPTB. Spine is the most common site of skeletal involvement accounting for 50% of osteo-articular tuberculosis.2,11,12

Tuberculosis had been disappearing in the developed nations of the West. But at present there has been re-emergence of tuberculosis in these countries as a result of immigration from nations where tuberculosis is endemic, growing ageing population, population explosion, overcrowding, emergence of multi-drug-resistant (MDR) tuberculosis, and human immuno-deficient virus (HIV) infection.3,4,11,14 EPTB can present late or may be diagnosed late because of absent specific signs and symptoms and absent concomitant pulmonary tuberculosis, thus adding to morbidity, especially in the skeletal tuberculosis, where delay in diagnosis can cause structural damage of the joints and spine causing loss of function, deformity and or paralysis.7,14,15

A lot of studies have been carried out regarding tuberculosis, but studies pertaining to EPTB especially skeletal tuberculosis are scanty.15 The aim of this study was to evaluate the current epidemiological trend with respect to age, gender, anatomical site and other associated features of musculoskeletal tuberculosis at a tertiary care center of North India.

**Materials and Methods**

This prospective study was conducted over a period of two years from August 2013 to July 2015 at a 400-bedded tertiary care teaching hospital of North India. All the patients that were diagnosed and had received treatment for osteo-articular tuberculosis (spinal as well as extra-spinal), either on outdoor or hospital in-stay basis, were evaluated with respect to age, sex, anatomical site of tubercular lesion, associated pulmonary tuberculosis, laboratory parameters (Mantoux test and erythrocyte sedimentation rate (ESR)), and associated clinical features such as presence of cold abscess, neurological involvement in spinal tuberculosis and presence of additional musculoskeletal tubercular lesions. Need for any surgical intervention was also recorded. The data collected was analyzed using Statistical Package for the Social Sciences (SPSS) software and results expressed as mean±SD.

**Results**

A total of 80 patients diagnosed with osteo-articular tuberculosis over a period of two years, with an average of 3.33 patients per month, were included in the study. The age of the patients ranged from 2 to 70 years with mean age of 29.1±19.1 years. More than half of the patients (55%) were in second and third decade of their life (Fig. 1). Males constituted 63.7% of patients in our series.
ESR was elevated above normal in 49 (61.25%) patients with an average ESR of 42.4±23 mm/1 hr and maximum of 112 mm/1 hr. Mantoux test had a reaction of 10 mm and above in 45 patients (56.25%). Human immunodeficiency virus (HIV) screening was done in 68 patients out of which only one (1.47%) was positive and had tubercular osteomyelitis of the distal tibia. Clinical and radiological features suggestive of old or concurrent pulmonary tuberculosis was present in 17 (21.25%) patients. Four (5%) patients had sputum positive for acid fast bacillus (AFB).

There were 84 musculoskeletal tubercular lesions in 80 patients, with three patients (3.75%) having multifocal osteo-articular tuberculosis. One patient of multifocal tuberculosis had tubercular spondylitis with tubercular arthritis of the shoulder joint, another patient had tubercular arthritis of the bilateral shoulder joints and acromio-clavicular joint, and third patient had tubercular spondylitis with tubercular synovitis of the knee joint (Fig. 2). Spine was the most common site of skeletal tuberculosis affecting 58.75% of our patients, followed by hip, knee, foot and shoulder joint in that order (Table 1). Lumbar spine was the most common site of involvement followed by dorsal spine, dorso-lumbar junction and cervical spine (Table 1). In dorsal spine, 91.7% of the lesions were restricted to lower dorsal spine (seventh dorsal vertebra to twelfth dorsal vertebra).

![FIGURE 2A](image1)

![FIGURE 2B](image2)

Figure 2. Multifocal Osteo-articular Tuberculosis. 2A): Paradiscal Tuberculosis of 11th and 12th Dorsal Vertebrae (Black Arrows) and Tubercular Arthritis of Shoulder Joint with Destruction of the Glenoid. 2B) Tubercular Arthritis of Bilateral Shoulder Joints and Left Acromioclavicular Joint

Four (5%) patients presented with cold abscess, out of which one had tubercular arthritis of the acromio-clavicular and shoulder joint and three had spinal caries (Fig. 3). Four (5%) patients required surgical intervention. Three required biopsy of the knee joint and one had biopsy from the cold abscess wall around shoulder for confirmation of the diagnosis. Eleven (23.4%) patients out of 47 with spinal tuberculosis had some neurological involvement in the form of neurological deficit.
Discussion

Tuberculosis is a worldwide public health problem, despite 90% of cases being in the underdeveloped countries. There has been a recent re-emergence of tuberculosis in the industrialized developed countries which has been attributed to increase in life expectancy, immigrations from endemic regions, emergence of multi-drug-resistant tubercular strains and HIV infection. Though musculoskeletal tuberculosis constitutes only 1 to 5% of tuberculosis cases overall, it contributes to significant morbidity, deformity and functional disability. With respect to extra pulmonary form of tuberculosis, skeletal tuberculosis makes up 10 to 18% cases of EPTB. But in some recent studies, it constitutes 27 to 35% of EPTB, suggesting its increasing prevalence or a changing trend of distribution of EPTB. A recent review of EPTB from a teaching hospital in Gujarat (India) had 25.5% cases of EPTB suffering from musculoskeletal tuberculosis including spine.

Our report of 80 cases from a single teaching institute over a period of two years (3.33 cases per month) is indicative of high prevalence of musculoskeletal tuberculosis in North India. A similar study from a teaching institute of India had reported 118 cases of skeletal tuberculosis over a period of 3 years (3.27 cases per month) which is comparable to our study. Another study from North India reported 193 cases over a period of 2 years (8 cases per month). There is a gross difference of reports of musculoskeletal tuberculosis between developed and underdeveloped countries. Only 41, 38, 32, 26, and 19 cases have been reported from teaching hospitals of Korea, Israel, Spain (Lugol), Spain (Madrid), and Romania respectively over a study period of one decade (at the rate of 0.34 cases per month in Korea to 0.16 cases per month in Romania). A hospital based study in Taiwan over a period of 14 years had reported 51 cases (0.30 cases per month) of tubercular arthritis whereas we had 28 cases of tubercular arthritis reported in our study (1.17 case per month).

There has been controversy regarding age group, which is predisposed to develop skeletal tuberculosis. EPTB is most commonly known to affect children. In our study, more than half of the patients were in their second and third decade of life. Most of the studies from underdeveloped countries, where tuberculosis is endemic, had skeletal tuberculosis involving young patients usually in their first three decades of life. However, in industrialized nations, it most commonly affects elderly age group usually above 40 years of age. Studies from developed countries have shown skeletal tuberculosis affects the elderly native population and the young immigrants from endemic regions. Sex distribution in our study revealed a slight predominance of skeletal tuberculosis in males as compared to females, a finding consistent with other similar studies. However, a female predominance has also been seen.

The spine was the most common site of skeletal tuberculosis in our series, accounting for 56% of the skeletal lesions. These findings are consistent with other studies. Most of the studies on osteo-articular tuberculosis have spine as the most common site of involvement, accounting for about half of the cases of osteo-articular tuberculosis (Table I). Lumbar spine was the most common site of spinal tuberculosis followed by dorsal and dorso-lumbar spine in our series. Most of the studies had lumbar spine as the most common site of spinal tuberculosis. However, dorsal spine is also the most common site of spinal tuberculosis in other studies. Bajwa had dorso-lumbar spine as the most common site of spinal tuberculosis in his series. Regarding extra-spinal tuberculosis, weight-bearing joints of the lower extremity are most commonly involved. Hip joint is the most common weight-bearing peripheral joint affected as seen in our series (Table 2). In other studies, however, knee joint was the
most common extra-spinal site involved (Table 2). Overall, tubercular arthritis of the hip and knee joint constituted 48.65% of extra-spinal tuberculosis in our series. In upper extremity, shoulder joint was the most common site and we had no case of tuberculosis of the elbow joint in our series. Tubercular osteomyelitis of the long tubular bones without involvement of the adjacent joints is a very rare entity. 3.57% of the tuberculous lesions in our series were tubercular osteomyelitis of the long tubular bones. In different series, the incidence of 2 to 3% has been reported. Foot and ankle tuberculosis accounts for <5% to about 10% of osteo-articular tuberculosis, with a prevalence of 7.14% in our series. Tuberculosis of hand and wrist comprised 4.76% of the lesions in our study. Benkeddache and Gottesman reported a prevalence of 6.9% of hand and wrist tuberculosis in their hospital-based study. Tuberculosis of short tubular bones of foot and hand, also known as tuberculous dactylitis, is a very rare entity commonly seen in young age group, with 85% cases reported in children less than 6 years of age. We had three cases of tuberculous dactylitis (3.6%) in our series, two involving metatarsals and in one metacarpal affected.

| Anatomical Site           | Number of Osteo-articular Tubercular Lesions |
|---------------------------|---------------------------------------------|
|                           | n  | %   |
| Spine                     | 47 | 55.95 |
| Cervical                  | 4  | 8.5  |
| Thoracic                  | 12 | 25.5 |
| Thoracic-Lumbar           | 9  | 19.1 |
| Lumbar                    | 20 | 42.6 |
| Lumbo-sacral              | 1  | 2.1  |
| Sacral                    | 1  | 2.1  |
| Hip                       | 11 | 13.09 |
| Knee                      | 7  | 8.33 |
| Foot                      | 4  | 4.76 |
| Shoulder                  | 3  | 3.57 |
| Long bones osteomyelitis  | 3  | 3.57 |
| Hand                      | 2  | 2.38 |
| Wrist                     | 2  | 2.38 |
| Ankle                     | 2  | 2.38 |
| Sacro-iliac Joint         | 1  | 1.19 |
| Pelvis                    | 1  | 1.19 |
| Acromio-clavicular Joint  | 1  | 1.19 |
| Total                     | 84 | 100  |

Table 1. Distribution of Osteo-articular Tuberculous Lesions (Anatomical Site-Wise)
Table 2. Comparison of Mean Age, Sex Distribution, Involved Anatomical Site, Associated Pulmonary Lesions and Multifocal Skeletal Lesions with Other Studies Reviewed

| Study                      | Place of Study       | Age (Mean and Range) | Gender Wise Distribution | Anatomical Distribution of the Lesions | Associated Pulmonary Tuberculosis | Multifocal Skeletal Tuberculosis |
|----------------------------|----------------------|----------------------|--------------------------|----------------------------------------|----------------------------------|----------------------------------|
| Present (n=80)             | Mewat (India)        | 29.1±19.1 (2 to 70 years) | M: 63.75% F: 36.25%      | Spine: 55.9% Hip: 13.1% Knee: 8.33% Others: 22.6% | 21.3%                            | 3.7%                             |
| Sharma et al. (n=193)      | Mullana-Ambala (India) | 39 (11 to 82 years)   | M: 55.44% F: 44.56%      | Spine: 50.8% Hip: 19.2% Knee: 10.9% Others: 19.2% | 8.8%                            | 0%                               |
| Sharma et al. (n=118)      | Bhopal (India)       | (2.5 to 85 years)     | M: 58% F: 42%            | Spine: 74.6% Hip: 12.7% Knee: 5% Others: 7.7% | -                               | 0%                               |
| Iredia et al. (n=41)       | Francistown (Botswana) | (2 to 88 years)       | M: 56% F: 44%            | Spine: 80.5% Hip: 14.6% Knee: 4.9% Others: 0% | 17.1%                           | 0%                               |
| Talbot et al. (n=61)       | Bradford (United kingdom) | 42 (13 to 79 years)   | M: 57% F: 43%            | Spine: 47.6% Hip: 6.6% Knee: 8.2% Others: 37.2% | 13.0%                           | 0%                               |
| Huang et al. (n=51)        | Taiwan               | 58.9±11.2             | M: 68.63% F: 31.37%     | Spine: 7.8% Hip: 15.7% Knee: 23.5% Others: 53% | 51.0%                           | 11.8%                            |
| Jutte et al. (n=532)       | Netherlands          | -                    | M: 49% F: 51%            | Spine: 58.0% Hip: - Knee: - Others: - | 15.0%                           | -                                |
| Ruiz et al. (n=26)         | Madrid (Spain)       | 46 (2 to 75 years)    | M: 61.5% F: 38.5%       | Spine: 27.0% Hip: 8.0% Knee: 58.0% Others: 7.0% | 23.0%                           | 3.8%                             |
| Houshian et al. (n=95)     | Denmark              | 50.5 (10 to 92 years) | M: 56.8% F: 43.2%       | Spine: 49.5% Hip: 6.3% Knee: 7.4% Others: 36.8% | 24.2%                           | -                                |
| Gonzalez-Gay et al. (n=32) | Lugo (Spain)         | 60.8±17.5 (17 to 93 years) | M: 62.5% F: 37.5%      | Spine: 50.0% Hip: 0% Knee: 15.6% Others: 34.4% | 19.0%                           | 0%                               |
| Autzen et al. (n=100)      | Denmark              | 49.5 (2 to 96 years)  | M: 49% F: 51%            | Spine: 26.0% Hip: 21.0% Knee: 7.0% Others: 46.0% | 20.0%                           | 0%                               |
| Davies et al. (n=198)      | England and Wales    | -                    | M: 50.8% F: 49.2%       | Spine: 36.5% Hip: 8.9% Knee: 11.3% Others: 43.3% | 22.7%                           | 2.5%                             |
| Farer et al. (n=676)       | United States        | -                    | -                        | Spine: 40.7% Hip: 13.3% Knee: 10.3% Others: 35.7% | -                               | -                                |
3.75% of the cases had multifocal skeletal tuberculous lesions in our case series. Different series have reported different prevalence of multifocal tuberculosis with highest of 11.8% by Huang et al. (Table 2). Multifocal osteo-articular tuberculosis is uncommonly reported despite an incidence of 7 to 10% in Indian scenario.45

Concomitant pulmonary tuberculosis has been reported to be present in less than 30% cases of osteo-articular tuberculosis, with 21.25% cases in our series having features suggestive of active or old focus of pulmonary tuberculosis.46 Concurrent pulmonary tuberculosis in skeletal tuberculosis ranges from 12 to 51%.18 In our review, it ranged from 8.8 to 51% (Table 2). ESR and Mantoux test are non-specific markers of tuberculosis which only aid in diagnosis, with 61.25% and 56.25% patients in our series with elevated ESR and a positive Mantoux test respectively.1 Vohra et al. and Rasool et al. had ESR raised in 88% and 60% patients of extra-spinal osteo-articular tuberculosis respectively.47,48 Ali et al. in their review on tuberculous dactylitis had ESR elevated in 80% cases.44 Mantoux test is of limited value in adults where tuberculosis is endemic; however, it is beneficial in diagnosis of skeletal tuberculosis in children.2,3,49 Mantoux test was positive in 62% cases of extra-spinal osteo-articular tuberculosis in series by Ali et al.18 A series on spinal tuberculosis by Akinyoola et al. had Mantoux test positive in 71.9% cases.24 Only one patient screened positive for HIV in our series. High prevalence of concomitant HIV infection was seen in African countries.5,50 In India, sero prevalence of HIV in new smear-positive pulmonary tuberculosis is estimated to be 4.6%.51

Conclusion

Prevalence of skeletal tuberculosis continues to be high in North India. Young patients in second and third decades of their life, is the most vulnerable group. There is a slight male predominance. Spine is the most common site of tuberculous lesions, followed by hip, knee, and foot in that order. In the upper extremity, shoulder is the most common site of tubercular arthritis. Tuberculosis of foot and ankle is 1.5 times more common than tuberculosis of the hand and wrist. Lumbar spine is the most common site of spinal tuberculosis followed by lower dorsal and dorso-lumbar junction in that order. Prevalence of multifocal skeletal tuberculosis was lower than as expected in India. About one-fifth of the cases had concomitant active or healed focus of tuberculosis in the lungs. More than half of the cases had elevated ESR and a positive Mantoux skin test. Prevalence of HIV infection in musculoskeletal tuberculosis in North India continues to be low.

Conflict of Interest: None

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Date of Submission: 2017-10-21
Date of Acceptance: 2017-11-28