Spinal Brucellosis from a Tertiary Care Hospital, South India

Authors:
Sabina Sharma, Manipal College of Nursing, Manipal Academy of Higher Education, Manipal,
Caroline Noronha, Manipal College of Nursing, Manipal Academy of Higher Education, Manipal,
Latha T, Assistant Professor - Senior Scale, Manipal College of Nursing Manipal, Manipal Academy of Higher Education, Manipal,
Shyamsundar Bhat N, Professor and Head of the Department, Department of Orthopaedics, Kasturba Medical College, Manipal, Manipal Academy of Higher Education, Manipal.

Address for Correspondence
Dr. Latha T,
Assistant Professor - Senior Scale,
Manipal College of Nursing, Manipal,
Manipal Academy of Higher Education,
Manipur,
E-mail: latha.tbhat@manipal.edu.

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Abstract: Spinal brucellosis is the most common osteoarticular complication of brucellosis. It can affect any part of the spine with or without neural involvement. The objective of this study was to identify the clinical manifestations, diagnostic measures and treatment modalities of adult patients with spinal brucellosis. The data were collected from medical records of spinal brucellosis. In three years, 107 patients were treated for spinal brucellosis, of which 28 (26.17%) patients had spinal brucellosis. Backache (p=0.0001), feeling of mass or lump along the spine (p=0.0335), pain while walking (p=0.0204) and altered sensation of lower limb (p=0.0011) were the significant clinical manifestations. Other symptoms were fever (75%), weight loss (42.86%) and night sweats (35.71%). Type 2 Diabetes mellitus was identified as a co-morbidity (p=0.0187). Nineteen patients had abnormal magnetic resonance imaging and lumbar (L4-L5) vertebrae were the most commonly infected area. Patients have received symptomatic management along with appropriate antibiotics.

Key Words: Spine, brucellosis, discitis, spondylodiscitis, epidemiology, low back pain

Introduction:
Brucellosis, also called undulant fever or Malta fever, is one of the zoonotic diseases. It is caused by gram-negative coccobacilli of the genus Brucella (1,2). The bacteria primarily affect the cattle. However, it has the ability to cause disease in humans as a secondary infection (3). Bacteria enter the human body by ingesting animal products such as unpasteurised milk or uncooked meat (4). It is predominantly transmitted through the alimentary tract, respiratory tract, skin and mucosa (5). The blood, aerosols and body fluid of the infected person is the source of infection and contact with these substances can transmit the disease (6). Osteoarticular involvement is the most frequently presented complication in brucellosis (6). The osteoarticular manifestations include arthritis, osteomyelitis, discitis, bursitis, tenosynovitis and spondylodiscitis (7). Sacroiliac and spinal joints are commonly affected areas (6,7). Spinal brucellosis is an inflammation of the spine. It usually begins at the disco-vertebral junction and starts spreading to the entire vertebrae and nearby vertebrae (6,8,9). It can affect any part of the vertebrae. The severe form of spinal brucellosis can result in motor weakness or paralysis (10). The identification of spinal brucellosis is challenging, as it resembles other spinal diseases such as tuberculosis, pyogenic osteomyelitis, malignancy and intervertebral disc herniation (6). Spinal brucellosis can affect any parts of the vertebrae, disc space or spinal cord itself (7,10). The spinal cord or nerve root may be involved because of spondylitis, vasculitis, and arachnoiditis resulting in difficulty in movement and/or paralysis in lower limbs (6,7). Harboring Brucella bacteria in the lymphatic or reticuloendothelial system results in chronicity or relapsing of the brucellosis than untreated or mistreated patients (11). The incubation period of brucellosis ranges from one to three weeks (12). Patients with spinal brucellosis usually present with fever and back pain (5,7,9). Other nonspecific clinical manifestations include malaise, profuse night sweats, weight loss, headache, pain in multiple joints and myalgia (5,7,9). These vague manifestations delay the patient seeking medical help in the early stage of the disease. Incidence of morbidity and mortality is directly proportional to the time of diagnosis (8,12). Long-term antibiotics with six weeks to 6 months duration are recommended to treat spinal brucellosis (13–15). Surgical decompression is reserved for persistent or progressive neurologic deficits (11,16). Brucellosis is diagnosed by Agglutination titers of 1:160 or 1:80 for patients with or without a history of animal contact, respectively (13). Magnetic Resonance Imaging (MRI) is a promising test for detecting and following up on spinal brucellosis (7,11,16). Additionally, elevated erythrocyte sedimentation rate (ESR), positive enzyme-linked immunosorbent assay for IgG and IgM antibodies for Brucella and isolation of Brucella are valuable information (7,15,17).
Although plentiful evidence on epidemiology and clinical characteristics of brucellosis is presented in general, there is a dearth of information on spinal brucellosis. Therefore, this study aims to recognize the clinical characteristics of spinal brucellosis in a tertiary care center.

**Methods**

**Setting and participants**

The study adopted a retrospective cohort design with a quantitative approach. The study was conducted at a tertiary care hospital, southern India that has more beds. The hospital has almost all super-specialties catering to the health needs of patients from Karnataka, Kerala and Goa. The hospital is certified by the International Organization for Standardization (ISO) 14001: 2015, ISO 50001:2011 and accredited by National Accreditation Board for Hospitals & Healthcare Providers (NABH). Adult patients (≥ 18 years) of both genders treated in orthopedic wards as in-patients, from 1 January 2014 to 31 December 2016 (3 years) were included.

The data were collected from the medical records of these patients.

**Diagnosis**

The spinal brucellosis was diagnosed based on the presenting history and physical examination, microbiological confirmation through Standard Agglutination Test (SAT), or blood culture growing *Brucella* spp. Patients also have undergone routine blood investigations such as complete blood counts, serum electrolytes, renal and liver function, ESR, C-reactive protein (CRP) and procalcitonin and urine analysis. Additionally, most of the patients have undergone MRI studies.

**Ethical consideration**

The study was approved by Institutional Review Board and Institutional Ethics Committee. Patient consent was waived as it was a retrospective record review. However, administrative permission was sought from concerned authorities.

**Data collection**

The data were collected from medical records of patients using structure data collection tolls. Demographic proforma and a dichotomous checklist on presenting clinical manifestations, diagnostic measures and treatment modalities were included. Experts validated the tools and the validation index was 0.96.

**Statistical analysis**

The collected data were coded and entered in SPSS 16.0 version. The statistical analysis was done using the same SPSS software. The data were categorized into spinal brucellosis and other brucellosis. Chi-square or Fisher’s exact test was used to compare these groups. The reports of blood investigations are given in mean and standard deviation.

**Results**

**Patients’ characteristics**

During the study period, 107 brucellosis patients were treated in the hospital and among them, 28 (26.17%) had spinal brucellosis. The mean age of patients with brucellosis was 41.39±18.04 years and 57 (53.3%) were men. Among 28 spinal brucellosis patients, the mean age was 44.68±16.8 years and 23 (82%) were men.

**Clinical manifestations**

The history, comorbidities and clinical manifestations are compared between brucellosis in general and spinal brucellosis (Table 1). Fever was the presenting symptom in patients with brucellosis (75% Vs. 59.8%). Backache was more common in patients with spinal brucellosis (75%, p=0.0001). Weight loss presented by spinal brucellosis patients was slightly higher (42.85%) than patients with brucellosis in general (32.7%) though there was no statistical significance (p=0.89). Spinal brucellosis also resulted in pain while walking (p=0.02) and altered sensation of lower limbs (0.001). Although patients had co-morbidities such as diabetes mellitus, pulmonary tuberculosis, hypertension, patients with spinal brucellosis had diabetes as significant co-morbidity (p=0.018). No patients gave a history of immunosuppression therapy. The other notable symptoms were night sweats and muscle spasms. However, none of the patients with spinal brucellosis experienced dysphagia and bladder disturbances.

**Diagnostic workup**

**Blood investigations**

Some of the important blood investigations retrieved are presented in Table 2.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Spinal Brucellosis (N=28)</th>
<th>Brucellosis in general (N=79)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>History</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug abuse</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Previous surgical history</td>
<td>10.71</td>
<td>10</td>
<td>9.35</td>
</tr>
<tr>
<td>Weight loss</td>
<td>42.86</td>
<td>32.71</td>
<td>0.8946</td>
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<tr>
<td><strong>Comorbidity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malignancies</td>
<td>0</td>
<td>2</td>
<td>1.87</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>28.57</td>
<td>7.48</td>
<td>0.0187</td>
</tr>
<tr>
<td>Pulmonary tuberculosis</td>
<td>3.57</td>
<td>1.87</td>
<td>1</td>
</tr>
<tr>
<td>HIV</td>
<td>2</td>
<td>1.87</td>
<td>0.2798</td>
</tr>
<tr>
<td>Hypertension</td>
<td>17.86</td>
<td>7.48</td>
<td>0.282</td>
</tr>
<tr>
<td><strong>Clinical manifestations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin infection</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Respiratory tract infections</td>
<td>14.29</td>
<td>11</td>
<td>10.28</td>
</tr>
<tr>
<td>Muscle spasm</td>
<td>28.57</td>
<td>12.15</td>
<td>0.1654</td>
</tr>
<tr>
<td>Back pain</td>
<td>25</td>
<td>22.43</td>
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<tr>
<td>Feeling of lump or mass along the spine</td>
<td>12</td>
<td>11.21</td>
<td>0.0335</td>
</tr>
<tr>
<td>Irritability</td>
<td>18.62</td>
<td>0.5855</td>
<td>0.4988</td>
</tr>
<tr>
<td>Fever</td>
<td>64</td>
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<tr>
<td>Pain while moving</td>
<td>9</td>
<td>3.57</td>
<td>7</td>
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<tr>
<td>Loss of bladder control</td>
<td>1</td>
<td>6.54</td>
<td>0.6776</td>
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<tr>
<td>Paralysis of the extremities - complete/incomplete</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Altered sensation of lower limbs/ upper limbs</td>
<td>25.00</td>
<td>1</td>
<td>1.87</td>
</tr>
<tr>
<td>Spinal deformities - Kyphosis/ Scoliosis</td>
<td>7</td>
<td>3.74</td>
<td>4</td>
</tr>
<tr>
<td>Night sweats</td>
<td>30</td>
<td>28.04</td>
<td>0.8318</td>
</tr>
</tbody>
</table>

*p-statistically significant (p<0.05)*
MRI studies
Among 28 spinal brucellosis patients, 19 (67.86%) had abnormal MRI studies showing infective spondylodiscitis (figure 1 and figure 2). According to MRI reports, four (14%) patients had cervical vertebrae involvement (2 cervical and 2 cervical & lumbar) and the most commonly affected area in the cervical spine was C4-C5 level. Eight (29%) patients had infective signs in the lumbar region, predominantly at the L4 and L5 level. Another six (21%) patients had lumbar sacral (L5-S1) involvement. MRI also showed nerve root compression in eight (29%) patients. Furthermore, two (7%) patients had degenerative changes in their spine. A total of 35 intervertebral discs involvement was noted from 28 patients indicating multiple areas affected in some patients. The disease was presented in 11 cervical, 17 lumbar, six lumbosacral and one in sacral area. No patients had thoracic vertebrae involvement.

Treatment
All (100%) patients received antibiotics. The other pharmacological therapy for symptom management is given in figure 3. One-fourth of the cohort had undergone a decompression procedure.

Discussion
Spinal brucellosis is an important source of morbidity and mortality, predominantly in endemic regions (11). Spinal brucellosis was identified in 28 (26%) patients in three years and 82% of men were affected. Spinal involvement in brucellosis is not homogenous across the globe and the recorded rate is 2% to 65% (18). Previous reports also show that men are affected more frequently than women (11,18). The lumbar spine is the most frequently affected area, particularly at the L4 and L5 levels. A similar trend is noticed in the previous studies (6,7). The lumbar region has a rich blood supply and a greater probability of endplate degeneration. Involvement of cervical vertebrae is highly dangerous since it can cause life-threatening impediments, such as tetraplegia. Another affected location is the thoracic spine (6,19,20). However, the present study did not find thoracic involvement.

Destructive brucellar lesions of the spine are generally described in adults and can develop in any spinal area at single or multiple levels (11,19,20). In the present study, 35 discs were infected from 28 patients, which suggests multiple vertebral involvement.

Plain radiography has low sensitivity, specifically in the initial phases of Brucella spondylitis (7,11). Low sensitivity is because of the slow progression of Brucella spondylitis. MRI is considered the best imaging device for diagnosis and follow-up among patients with any spinal infections (4,18,21). MRI has higher sensitivity and specificity (20–22). MRI helps identify the soft tissue components, including intervertebral discs, epidural space, paraspinal soft tissues, nerve roots, spinal cord and spinal canal. Nineteen patients had abnormal findings in MRI.

Patients with Brucella spondylitis present in focal and diffuse forms, generally in patients aged above 50 years, specifically in endemic areas (23). Contradicting to this, it occurred in early ages in the current study setting. Besides, degenerative spinal changes were identified in MRI in two patients. Though the history of animal contact or consuming unpasteurized dairy products was missing in our study, most of our patients are from rural areas and animal contact and consuming non-pasteurized milk is possible.

Conclusion
Fever and backache were the predominant clinical manifestations presented by the patients with spinal brucellosis. The other symptoms such as weight loss and night sweats are common in brucellosis, affecting any part of the body. The diagnosis of spinal brucellosis is difficult. Yet, it is essential to provide proper treatment. Radiologic evaluations have increased significantly in the diagnosis, evaluation, and treatment monitoring of spinal brucellosis.

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References