

# Determinants Of Complications Arising From Tuberculosis Of The Spine In Jos University Teaching Hospital.

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## Abstract

### Background

Tuberculosis of the Spine (Potts disease) is a chronic, debilitating form of extrapulmonary disease. The pattern and distribution of clinical complications from Pott's disease is well documented. While the disease is rare in the developed climes it has remained a burden to the low- and middle-income countries with the ability to cause paraplegia, deformities, functional disabilities, decubitus ulcers and other adverse complications to the patient. However, there is paucity of knowledge regarding the predictors of these complications. We aimed to determine the factors associated with the clinical complications in patients with tuberculosis of the spine.

### Methods

The retrospective study involved reviewing patients' medical records treated for Pott's disease in Jos University Teaching Hospital (JUTH) between September 2013 to October 2023. The patients were evaluated, investigated and the diagnosis of Pott's disease and complications were ascertained from the Orthopedics and Trauma Out-patient department, records in the theater and on the wards.

The medical records of clients treated for TB spine were analyzed using STATA version 17. Pearson Chi-square statistics was used to explore for associations with a significant p-value set at 0.05.

### Results

A total of 432 patients treated for Pott's disease within a 10-year period were recruited for the study with a mean age of 47.1 (SD +/-15.5) years. There were 279 (64.6%) male and 153 (35.4%) female with male: female ratio of 2.7:1. About 55 (12.7%) of the patients had Pott's disease/HIV and AIDS co-infection. The mean duration of most common symptom (back pain) at presentation was 10.9 +/-5.9 months. A total of 54 patients had gibbus among which the young adults (18-44) years were 30 (6.9%), middle aged (45-64) years were 18 (4.1%) and older adults were (65 and above) years 6 (1.3%).

A larger proportion of the patients 255 (59.0%) were treated in the Out-patient department (OPD, and in 2019 (87). The majority 186 (43.1%) of the patients presented with symptoms lasting 6-11 months. The leading complication was paraplegia, accounting for 83 (19.2%) followed by pressure sore 58 (13.4%). There was a significant association between the age, hospital stay, and development of paraplegia and decubitus ulcer in Pott's diseased patients. However, no association was found between sex, HIV status and the occurrence of Pott's disease complication.

There was relationship between the date of first presentation and both Pressure sores ( $P=0.022$ ) and Paraplegia ( $P=0.000$ ). There was an association between age and paraplegia ( $p=0.002$ ), and HIV status and pressure sores ( $p=0.000$ ). However, no relationship between both age and duration of symptoms, and pressure sores ( $p=0.09$ ) ( $p=0.877$ ) respectively.

### Conclusion

The COVID-19 pandemic was a predictor for the development of both paraplegia and pressure sores. The age was associated with paraplegia, and HIV status with pressure sores. Pandemic preparedness is key to reducing the risk of developing complications among patients with chronic debilitating diseases like Pott's disease.

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## I. Introduction

Tuberculosis has remained a public health issue, with 10.6 million people infected and 1.3 million deaths globally in 2022, over two-third of the mortality occurring in developing countries.<sup>1</sup> In 2023, Nigeria had 361000 people infected with tuberculosis, a 26% increase compared with the previous year's data.<sup>2</sup> A review of tuberculosis cases in two local government council of Plateau state (North Central Nigeria) over a 15 years

(2001-2015) period revealed an increase in prevalence from 22-39.6%, and TB/HIV co-infection from 2.3-57.7%.<sup>3</sup>

About two-thirds of all tuberculosis cases are pulmonary infections, one-fourth extrapulmonary disease, with the remaining a combination of the two forms coexisting.<sup>4</sup> Extrapulmonary tuberculosis (EPTB) appears to be on the increase in both developing and developed countries.<sup>5,6,7</sup> The cause of this increase varies in the two settings but common to both are retroviral disease, malnutrition and life style. The burden of EPTB varies across countries and regions of the world. While the prevalence of EPTB in Europe rose from 22.6% in the 2016 to 27.9% in 2021,<sup>6</sup> it ranges from 16 to 32% in Africa.<sup>7</sup> A lower EPTB prevalence rate of 12.9% and 8.3% were recorded in South-south Nigeria and Plateau state respectively.<sup>8,3</sup> Although cases of EPTB in developing countries appear to be low, it has been suggested to be underdiagnosed in the region due to the difficulty in diagnosis and non-availability of sophisticated diagnostic equipment.<sup>7</sup> About 15-41% of extrapulmonary TB affects the musculoskeletal system,<sup>9,10</sup> of which 20-89% are tuberculosis of the spine (Pott's disease), commonly affecting the thoracolumbar vertebrae.<sup>9-12</sup>

The Mycobacterium tuberculosis can destroy both bony, surrounding soft and neural tissue of the spine causing gibbus and paralysis manifested as loss of sensation and muscle function predisposing to the development of decubitus ulcers on body pressure surfaces such as the sacral, trochanteric, heel and malleolar area.<sup>13</sup> About 27- 33% of patients with tuberculosis of the Spine present with gibbus, 16-33% paraparesis, 66.7% paraplegia, and 87.4% sphincter dysfunction.<sup>13,14</sup> Tuberculosis of the spine disease accounts for 27% of all pressure sores in south-south Nigeria,<sup>15</sup> while 44% of patients with tuberculosis of the spine developed bed sores at some point of the disease.<sup>13</sup> The pattern and distribution of clinical complications from Pott's disease is well documented; however there seems to be paucity of knowledge regarding the predictors of these complications. There is also the difficulty in obtaining other long term complications of Pott's disease due to loss to follow up. Therefore, we aimed to determine the factors associated with the clinical complications in patients with tuberculosis of the spine.

## **II. Methods**

### **Study Design/Setting**

The single hospital-based retrospective study involved reviewing patients' medical records treated for tuberculosis of the spine in Jos University Teaching Hospital (JUTH) between 2013 to 2023. The Jos University Teaching Hospital is a Tertiary facility located in the capital of Plateau state with 500 bed capacity. It is a multidisciplinary center with Orthopedic surgeons, infectious disease consultants and other specialties providing medical and surgical care to patients in the North-central part of Nigeria.

### **Study Participants**

The patients with signs and symptoms suggestive of tuberculosis of the spine at the Orthopedics and Trauma Out-patient department or Emergency room were evaluated and investigated to ascertain the diagnosis of pott's disease. The assessment of the complications was made clinically; gibbus as a step in the spinal cord region, decubitus ulcers as sores located on the pressure surfaces at risk (Sacral, trochanteric, heel and malleolar region) and paraplegia or paraparesis determined by neurological physical examination. The assessment for complications was done at first presentation and during follow-up visits for those treated as out-patients or during ward rounds for in-patients and documented in their medical record. Preventive measures were instituted to avert the development of complications in patients without them at presentation and re-enforced during subsequent visits or ward rounds.

### **Data Collection and Analysis**

The paper medical records of all the clients treated for tuberculosis of the spine were retrieved and information transferred into a developed proforma on Microsoft Excel 19 version. The data in Microsoft Excel was then imported into STATA version 17 for analysis. Descriptive statistics was used to analyze the socio demographic, HIV status, duration of symptoms, and complications in frequency and percentages, and presented in a tabular form. Pearson Chi-square statistics was used to explore for association between the outcomes and demographics with a significant p-value set at 0.05.

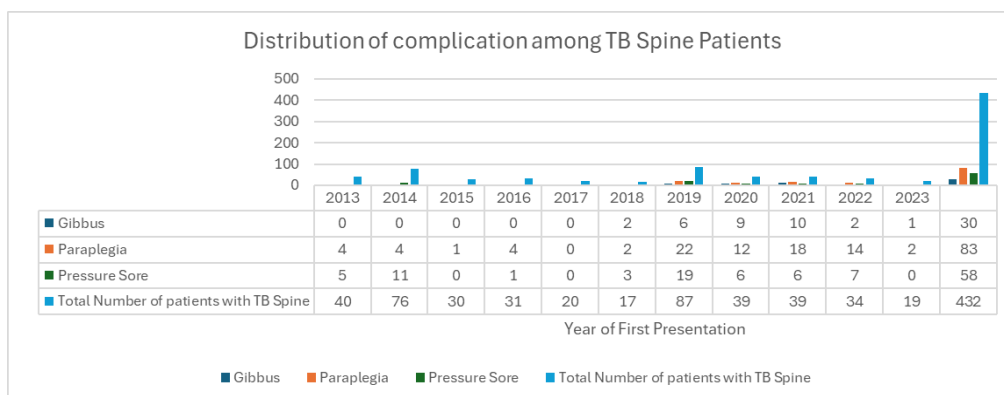


Figure 1: The yearly distribution of TB Spine and complications

### III. Results

A total of 432 patients treated for TB spine within a 10-year period (2013 to 2023) were recruited for the study with a mean age of 47.1 (SD+/-15.5) years. Ages 18-44 years accounted for 42.8% (185) of the patients, followed closely by 45-64 years (42.4%; 183), and 65 years and above (14.81%; 64). There were 279 males (64.6%) and 153 (35.4%) females. About 12.7% (55) of the patients had TB spine/HIV and AIDS co-infection, while 87.3% (377) tested negative for HIV infection. Figure 1 show the yearly number of patients with TB Spine; most of the cases occurred in 2019 (87), 2014 (76), 2013 (40), with 2020 and 2021 have 39 cases each. (Table 1)

A larger proportion of the patients 255(59.0%) were treated in the out-patient department (OPD), and 41.0% (177) admitted in the ward. There were only 5 patients (1.16%) whose duration of symptoms at presentation was less than 6 months, while the majority 186 (43.1%) of the patients' symptoms lasted 6-11 months, and 25.9% 12-17 months. The leading complication developed by the patients was paraplegia, accounting for 83(19.2%) followed by pressure sore 58(13.4%), and 30(6.9%) had gibbus. (Table 1)

Table 2 reveals the statistical correlation between the variables and outcomes. We found a relationship between the date of first presentation and both Pressure sores (P=0.022) and Paraplegia (P=0.000). There was an association between age and paraplegia (p=0.002), and HIV status and pressure sores (p=0.000). The gender of the patient had no relationship with both pressure sores (p=0.0667) and paraplegia (p=0.240). Considering the age of the patient and pressure sores, we did not find an association (p=0.09). Similarly, there was no association between the duration of symptoms with both pressure sores (p=0.877) and paraplegia (p=0.728).

Table 1: Characteristics of Patients with TB Spine

Variable	Frequency	Percentage	Mean	STD
<b>Age</b>			47.12	15.49
18-44	185	42.82		
45-64	183	42.36		
65 above	64	14.81		
<b>Sex</b>				
Males	279	64.58		
Females	152	35.42		
<b>HIV Status</b>				
Negative	377	87.27		
Positive	55	12.73		
<b>Duration of symptom</b>			2.12	1.30
<6months	5	1.16		
6-11	186	43.06		
12-17	112	25.93		
18-23	36	8.33		
24-29	69	15.97		
30 above	24	5.56		
<b>Point of Treatment</b>				
Out-patient	255	59.03		
Admitted	177	40.97		
<b>Gibbus</b>				
Absent	402	93.06		
Present	30	6.94		
<b>Pressure Sore</b>				
Absent	374	86.57		
Present	58	13.43		
<b>Paraplegia</b>				

Non	349	80.79		
Present	55	19.21		

**Table 2: Correlation between Variables and Outcomes**

Variables	Sore		Paraplegia	
	Pearson Chi <sup>2</sup>	P-value	Pearson Chi <sup>2</sup>	P-value
Age	4.8169	0.09	12.4276	0.002
Sex	0.1852	0.667	1.3821	0.240
HIV status	28.5281	0.000	2.6376	0.104
Duration of symptoms	1.7948	0.877	2.8182	0.728
Date of first presentation	20.8932	0.022	57.8999	0.000

#### IV. Discussion

Tuberculosis of the spine has remained a public health concern in developing countries and appears to be re-emerging in the western nation.<sup>6,7</sup> The disease presents debilitating morbidities and mortality, some of which can be prevented by early diagnosis and use of predictors to identify patients at risk of developing complications. Preventing tuberculosis of the spine and its complications will result in a significant economic benefit to individuals and the health system, especially in the low and middle income countries (LMIC) where tuberculosis is endemic, and resources are not readily available.<sup>7</sup>

Most of our patients presented with symptoms of tuberculosis of the spine 6 months after the onset of illness but would have been evaluated at other primary or secondary health centers before being referred to our facility. The difficulty in making diagnosis of tuberculosis of the spine and the non-availability of sophisticated diagnostic modalities, especially in our setting where both CT-Scan and MRI machine were non-functional during a part of the research period, and other climes where individuals cannot afford together with late presentation to the hospital contributes to delayed treatment and hence, the development of complications.<sup>12,16</sup> Although we did not find a significant association between duration of symptoms and paraplegia or pressure sores, early referral systems need to be strengthened in the states to aid timely diagnosis and treatment of tuberculosis of the spine.

There were a significant of our patients with tuberculosis of the spine whose disease coincided with the emergence of COVID-19. Similarly, the number of participants with gibbus, paralysis and pressure sores were significantly associated with the COVID pandemic period. In spite of this, the majority were treated as out-patient due to the anxiety and stretch on the health system by the effect of COVID-19 in our setting. Considering that pressure sores are preventable,<sup>17</sup> our finding may suggest the impact of COVID-19 on patient care due to work-related pressure that health workers experienced in our hospital like other centers during the pandemic.<sup>18</sup>

The commonest complication in our study was paraplegia which is a risk factor for the development of pressure sores.<sup>17</sup> However, not all patients with paraplegia had decubitus ulcers in our research, similar to a finding in Northwestern Nigeria,<sup>12</sup> and may indicate the quality of nursing care received by this group of patients in preventing pressure sores. Although not significantly associated with paraplegia, HIV was another factor other than the date of first presentation associated with Pressure sore in our research. HIV has been known as a risk factor for bed sores with an incidence of 3.33 per 100 patients and 2.31 per 100 admissions.<sup>19</sup> The utilization of a pressure sore risk assessment tool which is not available in our center can further reduce the rate of this medical and economically debilitating complication.<sup>17</sup>

While age was significantly associated with paraplegia, we did not find a relationship between it and pressure sore. The increasing loss of skin elasticity with age has been known to predispose the older age to pressure sore, with patients aged 65 years and above at greatest risk<sup>20</sup>. The predominant younger population (<65 years) in our study may be responsible for the contrary finding. Similarly, most of our patients were incomparable with the discovery by Owolabi and colleagues in Northwestern Nigeria<sup>12</sup> but contrary to the report in South Africa.<sup>21</sup> Despite the male preponderance, gender was not a determinant of either paraplegia or pressure sore among our patients. There seems to be paucity of research regarding association between gender and pressure sore among tuberculosis of spine patients; however, the association is conflicting among patients with paraplegia due to spinal cord injury from other causes- high among male gender in some,<sup>22, 23</sup> the opposite in another,<sup>24</sup> and no gender difference found by Anthony and colleagues.<sup>25</sup> Hence this remains a research gap requiring more studies.

Being a retrospective study, our research was limited by missing information from the patient's medical record and registers. Incomplete documentation in the patient's file also impeded our ability to critically analyze the outcome of care among patients with tuberculosis of the spine. The nonfunctioning MRI and CT-scan machine in our facility during the period of review puts us under duress to limit our diagnostic modality to clinical sign and plane radiographs which is usually not sufficient in making the diagnosis of tuberculosis of the spine. Tracking the outcome of patients who did not return for follow-up was difficult,

considering the absence of a mobile phone line and wrong phone numbers of patients and next of kin encountered during the process.

## V. Conclusion

The COVID-19 pandemic contributed to the development of complications resulting from Tuberculosis of the spine. The HIV status of the and age of the were predictors of pressure sores and paraplegia respectively. The client's sex and duration of symptoms were not associated with the development of either pressure sores or paraplegia. Epidemic preparedness will aid in the improvement of the quality of care received by patients during pandemics.

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