Pattern and clinical Presentation of Spondylodiscitis at Kenyatta National Hospital

A thesis submitted in Partial Fulfillment of the Requirements for Award of the Degree of

Master of Medicine in Orthopaedic Surgery of the University of Nairobi

By

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H58/80297/2012

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I declare that this thesis is my original work and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work or my own work has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.

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DEDICATION

I dedicate this study to my wife for her support throughout my education.

TABLE OF CONTENTS

ABBREVIATIONS

AIS…… American Spinal Injury Association Impairment Scale.

HOB……. Hotness of the Body

HIV…… Human Immunodeficiency Virus

IVBL……. Initial Vertebral Body Loss.

KNH …… Kenyatta National Hospital

MRI…….. Magnetic Resonance Imaging

ST…… Spine Tuberculosis.

TB…….. Tuberculosis

PTB……. Pulmonary Tuberculosis

WHO…… World Health Organization.

LBP…….. Low Back Pain

UoN…… University of Nairobi

ABSTRACT

Background: Spondylodiscitis is rare, often diagnosed late and can present with devastating complications. Spondylodiscitis accounts for 2%–4% of all cases of bone infection. To date there is limited local data that describes the patterns and clinical presentation of spondylodiscitis.

Study Objective: To determine the pattern and clinical presentation of patients with spondylodiscitis at Kenyatta National hospital.

Study Duration: November 2018 to January 2019

Study population: Patients diagnosed with spondylodiscitis at Kenyatta National hospital.

Study Design: Cross-sectional study.

Methodology: Forty-two patients with MRI diagnosis of spondylodiscitis were recruited in this study. Information on presenting symptoms, examination findings and radiological features (number and level of vertebrae involved and presence or absence of abscesses) were collected.

Data Processing: The collected data was coded and analysed using the SPSS v. 25 for windows. Data was analysed for frequencies, means and variances. A student T test was used to compare means in different gender and age groups.

Results: The age of the participants ranged from 16 to 72 years with a mean age of 39.7±13.4 years. The male female ratio of the participants was 2: 1. Risk factors for spondylodiscitis included smoking, HIV infection, positive history of PTB and DM in 45.2% (n=19), 17% (n =

7), 11.9% (n=5) and 4.8% (n=2) respectively. Most patients presented with back pain, localized around the thoraco-lumbar (28.6%), lumbar (26.2%) and thoracic (50%) spine. The mean duration of the pain was 5.7±2 months. Most (97.6%) of the patients presented with limb weakness, and a sensory level in 76.2%. Eight patients (19%) had open biopsies with subsequent histology. In these eight patients, 5 were cultured and stained positive for mycobacterium tuberculosis. Using the MRI, the lesion was located in the cervical, thoracic, thoracolumbar and lumbar spine in 4, 21, 9 and 8 of the participants respectively. None of the patients presented with skip lesions. Most (n=36) of the patients presented with a single level lesion. Six patients presented with multilevel contiguous lesions. Nine patients had features of scoliosis (Cobbs angle $>10^0$). Seven participants had lumbar while two had thoracic spine scoliosis.

Conclusions: In this setting, spondylodiscitis is diagnosed late, with significant neurological deficits, predominantly affects males, and is localised in the thoracic region. Smoking is an important risk factor.

Recommendations: A high index of suspicion is recommended for all middle-aged patients with isolated back pain, with additional risk factors such as smoking, diabetes mellitus, pulmonary TB or HIV.

CHAPTER ONE: INTRODUCTION AND LITERATURE REVIEW

INTRODUCTION

Spondylodiscitis is a primary infection which is usually associated with destruction of the intervertebral disc, with secondary infections of the vertebrae, starting at the level of the endplates. Spondylodiscitis characterize 2%–4% of all cases of musculoskeletal infection. Radiological diagnosis of spondylodiscitis is based on the showing the involvement of the vertebral body and adjacent disc. Several non-infectious ailments look like this illness (1). It is a rare but serious infection, with possible devastating outcome including osteomyelitis of the spinal column (2).

This infection starts in the anterior part of the vertebral body because of its abundant arterial blood supply, and spreads through the medullary spaces, to affect the adjacent intervertebral disc by contiguity, most often including the lumbar and dorsal sections of the spine (3). The presentation of this condition is generally nonspecific. Symptoms include back pain, fever, nausea and weight loss. About 10% to 45% of patients are febrile at presentation. Neurological deficits have been reported in about one-third of patients. These nonspecific symptoms often lead to a delay in diagnosis (4). Spondylodiscitis is often diagnosed using imaging studies. This diagnosis is based on the demonstration of the involvement of the vertebral body and adjacent intervertebral disc (3,4). Spinal biopsy followed by histology, microscopy, culture and sensitivity is not routinely done in many low resource settings. The often-isolated pathogen in biopsy samples of patients with spondylodiscitis is Staphylococcus aureus (4, 5).

There is paucity of information on the pattern and presentation of spondylodiscitis among Kenyans.

LITERATURE REVIEW

Spondylodiscitis can endanger the quality of the patient's life, either locally because of severe tissue destruction, often with attendant neural deficits, or systemically as a consuming disease (6 - 8).

Epidemiology

Spondylodiscitis can affect anyone in the population. However, among adults, the reported male female ration is 3 to 1 (9,10). Spondylodiscitis is often reported in the fifth to seventh decades of life (9). Children and those under the age of 20yrs only account for 3% of patients, with no difference in distribution by sex (7). Further to this, among children, the average age of onset of this condition is 6 to 7 years. Estimates of its incidence in industrialized nations range from 4 to 24 per million per year (11). Some studies suggest that this incidence is rising, possibly due to an increase in the rate of nosocomial infections associated with vascular devices and other forms of instrumentation and to an increasing prevalence of intravenous drug abuse (7). There is limited published information on pattern and incidence of spondylodiscitis in the African settings at large and specifically in Kenya.

Pathogenesis of spondylodiscitis

Spondylodiscitis results from either haematogenous, direct inoculation or contiguous spread. Haematogenous spread is the leading cause in children (60—80% of cases) because of the highly vascularised discs, but it is less common in adults (10, 11). The spread of spondylodiscitis in adults is largely by contiguous spread (11). The main causative organisms are staphylococci (pyogenic) and mycobacterium tuberculosis (tuberculous). Pyogenic spondylodiscitis often involves the lumbar (55%) and the thoracic spine (34%). These lesions usually involve only one vertebral. Most frequently, Staphylococcus aureus is the causative agent implicated in the infection and is responsible for 55% – 90% of the individuals. Other pertinent causative agents include Streptococcus, Pneumococcus, Enterococcus, E. coli,

Salmonella, Pseudomonas aeruginosa and Klebsiella (3), which occur only in very special circumstances.

Tuberculous spondylodiscitis is the next common form of this condition. The causative bug in this case is the mycobacterium tuberculosis. Tuberculous spondylodiscitis usually affects patients aged between 30 to 40 years and is often localised in the thoracic spine (2, 12). Tuberculous lesions are more likely to involve more than two contiguous (sometimes non-contiguous) vertebrae (11). Kenya has been classified as the 10th of the 22 high TB burden countries worldwide. The current burden of tuberculous spondylodiscitis in Kenya is unknown.

In general, therefore spondylodiscitis is a chronic bacterial or mycobacterial infection that is attended to with massive inflammatory reactions with resultant intervertebral and vertebral destruction. Markers of chronic inflammation such as erythrocyte sedimentation rate (ESR), C – reactive protein (CRP) and elevated white blood cells are also hallmark spondylodiscitis. The most common level of involvement of all forms of spondylodiscitis is in the lumbar, followed by the thoracic, cervical and sacral levels of the spine (7). Involvement of the cervical spine occurs in 6.5% of spinal infections, whereas thoracic involvement has been reported to occur in 35% of cases (7). The GATA system of classification has been advanced to classify spondylodiscitis according to the spinal level of involvement (37). Other contributory factors that may influence the emergence of spondylodiscitis include the HIV-epidemic, the growing number of venous drug abusers, the currently increased use of aspiration and catheter techniques, and the recurrence of tuberculosis in developed nations (13). Previous research has highlighted the burden of spine TB in HIV negative patients in Kenya (14). The general pattern of spondylodiscitis in the same population has not been described.

Clinical presentation of spondylodiscitis

Spondylodiscitis presents with multiple symptoms that are not limited to back pain, fever, nausea, malaise, weight loss, spine deformity, muscle weakness and inability to walk. These symptoms vary according to the magnitude of the condition and are worsened by other antecedent conditions. While chills or fever spikes are rare, back pain is and low grade fewer are present in 90% and 52% of the cases respectively. Pain, which is the principal symptom, is usually localized to the spine, aggravated by motion and may radiate to the abdomen, lower limbs, scrotum, groin or perineum (7). In many set ups, these symptoms are usually present more than four weeks prior to presentation to health facilities. Initially, the clinical course is characterized by nonspecific back pain, before the entry of other symptoms (13). Physical findings are often limited and non-specific. Sapico and Montgomerie documented that 50% of patients had symptoms lasting longer than 3months before the diagnosis is established (7).

Back Pain

Ross and Fleming reported pain as the primary symptom in 85% of patients with spinal infections. Pain occurs primarily with changes in body position, ambulation, and other forms of movement (1).

Fever

Fever can be the second or third most commonly reported symptom. It occurs in only about half of patients. Fever is less common in patients with TB spondylitis when compared to the pyogenic types (15). Fever like in many other slowly progressive infections is non-specific for spondylodiscitis. Many studies have verified that fever is present in only 52-68%.

Neurological deficits

Neural losses occur in about a third of the patients. This can manifest with weakness, paralysis, sensory deficit, radiculopathy and sphincter loss. Neural loses occur in late presentation of spondylodiscitis where the complications are overt. These are more likely to be associated with epidural abscess, delayed diagnosis, cervical lesions and TB. Risk factors for paralysis also include diabetes mellitus, advanced age and steroid use (15).

Studies report an incidence of neurological compression in 33-59% of patients. This most commonly is apparent as radicular compression with consequent uni- or bi-lateral weakness, parenthesis or paralysis, neurological symptoms should raise the clinician's suspicion of mass effect from an abscess in the epidural space (16, 12).

Diagnosis of spondylodiscitis.

The diagnostic tools most often used are Magnetic resonance imaging (MRI) scans and vertebral biopsies. MRI scan has proven to be the modality of choice with high sensitivity even in the early phase of the disease process (4). MRI is the method of choice because of its high sensitivity and specificity, as well as good tissue resolution and multiplanar capacity. MRI can be useful to suggest the origin of the infection; however, this is not always possible, aiding in the differentiation between tuberculous and pyogenic infections, thus allowing efficacy in the treatment of the patient.

Main MRI findings in spondylodiscitis include hyposignal on T1-weighted and hypersignal on T2-weighted images from the vertebral bodies and adjacent endplates, as well as enhancement after intravenous paramagnetic contrast medium injection. In the vertebral body, the inflammatory reaction leads to an increase in the extracellular component of trabecular bone, resulting in the normal high signal intensity from the vertebral bodies being replaced by low

signal intensity on T1-weighted images (17). MRI images can present with paravertebral masses/abscesses which are nonspecific (3).

The diagnostic yield for detecting infection from percutaneous spinal biopsy samples can be variable at 30 to 40% and biopsy is not always contributory to further management (38). Besides CT-guided core biopsy, fine-needle aspiration and surgical biopsy are used. However, all those techniques are compromised by false negative results which may be due to inadequate sampling, antibiotic therapy administered before biopsy, or insufficient numbers of infectious organisms within the biopsy tissue (18). Pathogen detection is 19%–30% when using CT-guided fine-needle biopsy due to the small amount of tissue available (19). Since MRI is the most sensitive technique for the diagnosis of spondylodiscitis in the acute phase (20), it is often used in many centres without the vertebral biopsy for histology. Its specificity and sensitivity are extremely high at 96% and 92%, respectively. Gadolinium-enhanced MRI can increase sensitivity to as much as 95.4% (19). The positive predictive value of MRI is 85% and 90% respectively for tuberculous and pyogenic spondylodiscitis respectively (17).

Thus, MRI findings which lead to the suspicion of pyogenic spondylodiscitis include segmental involvement, presence of poorly defined paravertebral mass, early intervertebral disc involvement, and homogeneous enhancement/alteration of signal of affected vertebral bodies (3). Characteristic features of pyogenic spondylodiscitis include involvement of the lumbar spine, ill-defined paraspinal abnormal contrast enhancement, diffuse/homogeneous

contrast enhancement of vertebral bodies, low-grade destruction of vertebral bodies, hyperintense/homogeneous signal from the vertebral bodies on T2 TIRM images. Prevailing features of tuberculous spondylodiscitis included: involvement of the thoracic spine, involvement of 2 or more adjacent vertebral bodies, severe destruction of the vertebral body,

focal/heterogeneous contrast enhancement of vertebral bodies, heterogeneous signal from the vertebral bodies on T2 TIRM images, well-defined paraspinal abnormal contrast enhancement, paraspinal and epidural abscesses (17).

Inflammatory markers are also typically elevated in cases of spondylodiscitis. The leukocyte count itself is rather non-specific. An increased CRP has, however, been found to be typical of spondylodiscitis, with a sensitivity of 84% and a specificity of 71%. (5).

Management of spondylodiscitis

Spinal infections are an uncommon but important clinical problem that often requires aggressive medical and surgical management. Recommendations for treatment of spondylodiscitis remain controversial. Various authors recommend conservative treatment with immobilization and antibiotics in cases with minor destruction, aiming at a spontaneous fusion of the vertebral bodies or at least fibrous stiffness. Another treatment option is minimally invasive abscess reduction with local antibiotic instillation and subsequent immobilization by brace or external fixator. Radical surgery with debridement, autologous bone grafting and stable stabilization with the possibility to correct deformities is increasingly recommended. By that, in addition, representative tissue specimen can be gained for histological and microbiological examinations. (6, 10).

The majority of patients with spondylodiscitis can be treated medically with antibiotics based on organism sensitivity as identified in blood or tissue biopsy cultures. Surgery is usually indicated in patients with neurological compromise, mechanical Instability, or failed conservative treatment (8).

STUDY JUSTIFICATION

Spondylodiscitis is relatively common in our setting. It is often diagnosed late with devastating complications. Currently there is limited local data on the pattern and clinical presentation of spondylodiscitis. Such data would be of great use in directing the best diagnostic approach and anticipating training needs of health professionals handling these cases.

STUDY QUESTION

What is the pattern and clinical presentation of spondylodiscitis at Kenyatta National Hospital?

PROBLEM STATEMENT

Spondylodiscitis is common in our settings. We are not aware of its pattern of clinical presentation.

OBJECTIVES

Broad objective:

To study the pattern and clinical presentation of patients with spondylodiscitis at KNH.

Specific objectives:

1. To determine the demographic features of patients with spondylodiscitis at Kenyatta National Hospital.
2. To determine the clinical features of patients presenting with spondylodiscitis at Kenyatta National Hospital.
3. To determine the radiographic features of patients with spondylodiscitis at Kenyatta National Hospital.

CHAPTER TWO: PATIENTS AND METHODS

3.1: STUDY DESIGN

Cross Sectional Study.

3.2: STUDY SETTING

The study was conducted at the medical and orthopaedic wards at Kenyatta National Hospital. Other patients were assessed at the orthopaedic clinic at KNH. KNH is a metropolitan, tertiary, referral and teaching hospital situated at Upper Hill area along Hospital Road about 5km from Nairobi city Centre. It has a 600-bed capacity and is one of the two main referral hospitals in Kenya, also serving the greater East and Central African region.

3.3: STUDY DURATION

November 2018 to January 2019.

3.4: STUDY POPULATION

Patients with spondylodiscitis at Kenyatta National Hospital.

3.5: INCLUSION CRITERIA

1. Patients with MRI diagnosis of spondylodiscitis presenting at KNH clinics and needing admission to the orthopedic surgery and medical wards.
2. Those who gave consent for the study.
3. Aged 16 years and above.

3.6: EXCLUSION CRITERIA

1. Patients who had surgical decompression or stabilization and these may alter the clinical features and radiological findings.

3.7: SAMPLE SIZE ESTIMATION

The sample size was determined by the use of Eng et al., (2003) statistical formula for descriptive studies (21):

$$N = \frac{4\sigma^2(z_{crit})^2}{D^2}$$

Where

N = Desired sample size

σ = is the assumed SD for the group, which is 10, based on the study by Lee et al., 2014 on the MRI diagnosis of pyogenic and tuberculous spondylodiscitis (1).

Zcrit = The standard normal deviate set at 1.96 which corresponds to 95% confidence level.

D = The total width of the expected confidence interval. Which is 6.

Therefore, in substitution:

$N = \frac{4*10^2*1.96*2}{6^2} = 42$

Forty-two patients with MRI features of spondylodiscitis were purposively sampled and recruited into this study to determine their clinical patterns and presentations.

3.8: SAMPLING PROCEDURE

Consecutive sampling technique was used to recruit patients into the study. Forty-two patients who met the inclusion criteria and gave consent were recruited.

3.9: DATA COLLECTION METHODS

Biodata of patients with MRI features with spondylodiscitis were recorded in the data sheet (Attached in the appendix). The MRI was done using the standard Phillips *Ingenia 3.0T* MR. The presenting symptoms, their duration, examination findings were also recorded in the data sheet. Using the patients' lateral spine radiographs, the cobb's angle was determined and recorded. Morphological changes of the spine were also noted and recorded. The specific MRI findings were also recorded, this included the level of the lesion, number of lesions, the type of the lesion, number of involved vertebra and magnitude of the deformity. The laboratory assay of white blood cells, hemoglobin, CRP and ESR were recorded. This were assayed using Phillips© hematology analyser.

3.10: DATA MANAGEMENT AND ANALYSIS

Data was entered and managed in Microsoft Excel 2013 data entry spreadsheet. The data set were exported into SPSS version 25.0 statistical software for statistical analysis. The study population was described by summarizing demographic characteristics into percentages and means/medians for categorical and continuous variables respectively. Clinical features, patterns and radiographic features of spondylodiscitis were presented as percentages. Table and graphs were used to present the study findings.

3.11: ETHICAL CONSIDERATIONS

Approval to conduct the study was sought from the Department of Orthopaedic Surgery, University of Nairobi as well as Kenyatta National Hospital, Ethics and Research Committee (KNH/UoN-ERC). Data collection commenced once this approval was granted. Participants were recruited by convenient sampling. Participants in this study or their next of kin were required to give a written informed consent. The consent enabled the principal investigator to take the patient's bio-data details as well as history related to the presenting illness. Participants were also informed that they would not benefit directly in this research but that the results

obtained may help improve on the spondylodiscitis management in KNH. There were no financial costs to the patients involved in this study except for the few minutes they spent answering to the questions in the questionnaire.

Participation in this study was purely voluntary in nature and as such, it was clarified to the participants that they were free to participate or even withdraw their participation at any point during the study without any explanation. Withdrawal of participation did not

affect the participant's treatment or management in any way whatsoever. Some questions such as patient's immune status would have been considered invasive by some participants. As such, participants were free to answer or to decline to answer such questions without any prejudice or any consequences whatsoever. All information obtained was treated with utmost confidentiality. All participants were allocated a study serial number linking them to their bio-database accessible only to the principal investigator. Patients' names were not used.

All the data obtained was kept in the principal investigator's possession at all times and subsequently entered into a password protected Microsoft Excel document after data coding.

CHAPTER THREE: RESULTS

3.1 Demographic features

This was a study on 42 spondylodiscitis patients with age ranging between 16 and 72 years and a mean age of 39.7±13.4 years. Majority (69%) of the patients were males. The male female ratio was 2:1. A third (33.3%) were formally employed, about a half (52.4%) were in informal or casual employment.

3.2 Clinical features

i. Comorbid conditions

Predisposing factors were reported in two thirds of the clients. These included a history of smoking, positive history of PTB, HIV reactivity and DM in 45.2% (n=19), 11.9% (n=5), 4.8% (n=2) and 4.8% (n=2) respectively (Figure 1).

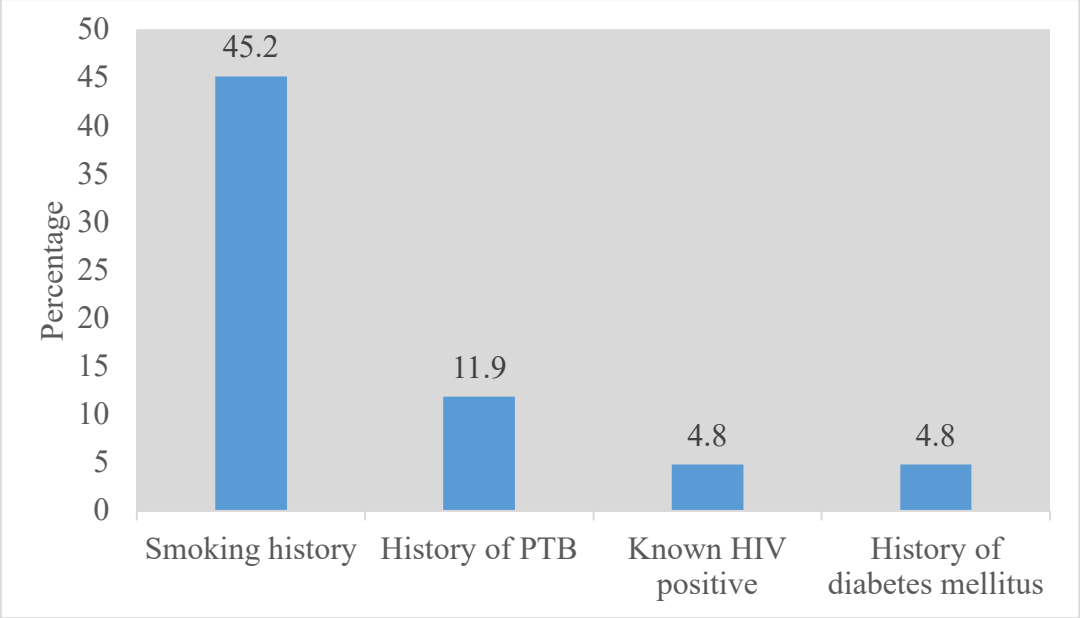

Figure 1: A chart showing the comorbid conditions of the patients with spondylodiscitis. N = 28.

ii. Presenting features

Most patients (88.1%) presented with backpain which had lasted an average of 5.7 months and was mainly localized around the thoraco-lumbar (28.6%), lumbar (26.2%) and thoracic (21.4)

spine. The other prominent features included limb weakness in 97.6% of the patients, sensory level in 76.2%, weight loss (38.1%) and paraspinal masses (38.1%) [Table 1].

3.3 Radiological and laboratory features

3.3.1 Laboratory investigations

Thereafter on laboratory investigation, 61.9% of the participants had HIV test results. Of these 7 patients were HIV positive which accounted for 17% of the participants. The HIV status of the rest of the participants was unknown.

Table 1: Presenting features

Variable	**Frequency (%)**	**Mean duration in months (SD)**	**Localization**	
			Site	**n (%)**
Backpain	42 (100.0)	5.7 (2.4)	C spine Lumbar Lumbar sacral Thoracic Thoraco-lumbar	3 (7) 13 (31) 2 (5) 10 (24) 14 (33)
HOB	7 (16.7)	4.8 (1.5)	-	-
Weight loss	16 (38.1)	3.9 (1.4)	-	-
Malaise	2 (4.8)	2.5 (2.1)	-	-
Night sweats	1 (2.4)	1	-	-
Anorexia	5 (11.9)	1.3 (0.5)	-	-
Gibbus deformity	2 (4.8)	5 (1.4)	Thoracic	5
Muscle wasting	10 (23.8)	3.2 (1.4)	Lower limb Upper limb Upper/lower limb	8 1 1
Paraspinal masses	16 (38.1)	2.7 (1.0)	Right	16
Limb weakness	41 (97.6)	4.8 (1.2)		
Sensory level	32 (76.2)		Intact L1 T4 T9 T10 T11 T12	7 1 3 1 9 2 1
Decubitis ulcer	7 (16.7)	2.3 (1.0)	Sacrum Trochanteric	3 4

Full hemogram and ESR was done in all the participants. The mean haemoglobin, WBC, platelets and ESR of all the participants was 10 g/dl, 6.7 cells per litre, 198.3 $*10^9$, 55.5mm/hr respectively. Sputum was done in 6 patients with 5 having negative results, one had a positive sputum for AAFB. In addition, 8 patients (19%) had an open biopsy with subsequent histology. In these eight patients, 5 were cultured and stained positive for mycobacterium tuberculosis (Table 2).

3.3.2 Radiological features

Plain radiographs and MRI scans were done in all the participants. The lesion was located in the cervical, thoracic, thoracolumbar and lumbar spine in 4, 21, 9 and 8 of the participants respectively. None of the patients presented with skip lesions. Most (n=36) of the patients presented with a single level lesion. Six patients presented with multilevel contiguous lesions. Features included paraspinal masses, bone marrow edema and spinal edema in 17, 30 and 10 participants respectively. Additionally, 9 participants had features of scoliosis (Cobbs angle $>10^0$). Seven participants had lumbar while two had thoracic spine scoliosis. A CT scan was done for 1 of the patients.

Table 2: Laboratory investigations

Variable	**Number done**	**Result**
HIV test	26	Positive n= 7 (26.9%) Negative n=19 (73.1%)
Haemogram	42	Mean Hb (SD) - 10.0±1.4 g/dl Mean WBC (SD) - 6.7±1.7 * 10^9 Mean platelets (SD)198.3±45.6 * 10^9
ESR	42	Mean ESR (SD)- 55.5 (12.2)
Sputum	6 (14.3)	Negative – n= 5 Positive – n=1
Open biopsy	8 (19%)	Staph aureus – n= 2 Mycobacterium tuberculosis – n= 5 No growth -n= 1

Table 4: Radiological findings

LOCATION OF THE LESION		**FREQUENCY (%)**
Cervical		4
Thoracic	Lower (Below T6)	11
	Upper (Above T6)	10
Thoracolumbar	T12/L1	6
	T12/L2	3
Lumbar		8

CHAPTER FOUR: DISCUSSION

4.1 Demographic features of patients with spondylodiscitis

Spondylodiscitis is not uncommon in our setting. Within three months, fourty-two newly diagnosed patients with spondylodiscitis were randomly identified and recruited into this study from a national teaching and referral hospital in Kenya. Most patients in this setting were male, with a male female ratio of 2:1. This is in agreement with reports from previous studies which suggest that this is a predominantly male condition (9, 10, 22, 23). Sporadic reports have documented female dominant spondylodiscitis (29). The reasons for male predilections of this disease are largely unknown. However, considering TB as one of the causes of spondylodiscitis, previous studies have documented a higher disease burden among men when compared to women (23). And in his meta-analysis, Horton et al (2016) found that men are disadvantaged when it comes to seeking or accessing TB care, because most promotive programmes focus on women [23]. In concurrence to reports from other settings, most of the patients in this study were informally employed, from low income settings [9, 22]. This could largely be attributed to the nature of the facility from which the data was collected. Kenyatta National Hospital largely serves the general public, among which individuals with low income informal jobs predominate.

4.2 Clinical features of patients presenting with spondylodiscitis.

The most important comorbid condition in patients with spondylodiscitis in this setting was smoking. Almost half of the patients were smokers. It is unclear if this was simply an incidental finding. No other study has documented a strong association between smoking and primary spondylodiscitis. The other risk factors documented among patients in this study included a positive history of PTB, HIV and DM in 45.2% (n=19), 11.9% (n=5), 4.8% (n=2) and 4.8% (n=2) respectively. Multiple studies have documented DM as the single most significant risk

factor of primary spondylodiscitis in patients in non-TB endemic areas (39). DM was documented in two of the forty-two cases. It is however of note that Kenya, like many countries in sub-Saharan Africa are facing a dual epidemiological challenge, whereby both infective and non-communicable diseases such as DM are on the rise (25). And therefore, the incidence of spondylodiscitis is likely to rise.

In agreement with previous reports, back pain was the principal symptom and was observed in all the patients (7). This pain was mainly localized around the thoraco-lumbar (28.6%), lumbar (26.2%) and thoracic (21.4) spine. Insidious onset back pain is reported in about 85% of patients with spondylodiscitis and has been attributed to spine stiffness and spasms of the paravertebral muscles (16). This pain is often localised in the lumbar spine (26). The mean duration of pain at presentation in this study was about 6 months. This generally means that patients presented late from the point of disease inception, increasing the chance of presenting with complications. Delayed presentation in a tertiary hospital is partly related to delayed diagnosis of the condition. Delayed diagnosis of spondylodiscitis is common and takes 2 to 6 months in many settings (7, 27, 28). This is because spondylodiscitis remains a diagnostic challenge and in its early phase mimics the many possible causes of back pain (28). None of the patients in this study presented with fever. However, fever is among the early symptoms of spondylodiscitis, although it is reported to occur in only about half of these patients (15, 29). As seen in the present study it is important to note that the absence of fever should not dissuade the healthcare provider from the considering and appropriately working up spondylodiscitis (12). Because both pain and low back pain are non-specific symptoms, it is agreeable therefore that the diagnosis of spondylodiscitis based on symptoms alone is challenging. Therefore, a high index of suspicion should be maintained to reduce the time of diagnosis of spondylodiscitis.

And as anticipated in this study, patients presented with late disease, with complications such as limb weakness in 97.6% of the patients, sensory deficits in 76.2%, weight loss (38.1%) and paraspinal masses (38.1%). Lower limb weakness recorded among 97.6% of the participants of this study is high. Neurological deficits are usually recorded in 30 to 60% of patients with spondylodiscitis and are attributed to epidural abscess, delayed diagnosis, cervical lesions and TB (12, 15, 16).

4.3 Radiographic features of patients with spondylodiscitis.

The lesion was located in the cervical, thoracic, thoracolumbar and lumbar spine in 4, 21, 9 and 8 of the participants respectively. Previous studies have shown that the location of the lesion is based on the mode of spread and type of the infection. It has been suggested that hematogenous pyogenic spondylodiscitis affects mostly the lumbar spine followed by the thoracic, cervical and sacral regions (30). Tuberculous spondylodiscitis is often localized in thoracolumbar spine (31-34). In as much as the histological and microscopic assessment of the lesions was not possible in all the cases, we can suggest that, based on the localization of the lesion, most of the cases of spondylodiscitis seen in this setting are tuberculous. It is to be noted that TB involvement of the cervical and lumbosacral spine is less common, whereas TB of the cranio-vertebral junction is rare (35).

Most (n=36) of the patients in this study presented with a single level lesion. While six patients had multilevel contiguous lesions. None of the patients presented with skip lesions. Previous reports have suggested that pyogenic infection mostly present with isolated lesions, involving one or two adjacent vertebrae. In contrast, most of the patients suffering from TB spondylodiscitis present with more than two infected vertebrae and about 25% of them with

multifocal skip lesions (36). Based on this definition, it could be argued that most of the patients in this study had pyogenic lesions. However, because the cases were localized in the thoracic region, it is plausible that the thoracic isolated single level disease was tuberculous. While the lumbar and cervical isolated lesions were pyogenic.

Some of the limitations of this study were anchored on diagnosis. Diagnosis of spondylodiscitis was made using MRI only, without the support of histological or microbe isolation. Additionally, the elements of clinical history depended on the patients' recall which could have introduced recall bias.

Conclusions

In this setting, spondylodiscitis is diagnosed late, with significant neurological deficits, predominantly affects males, and is localised in the thoracic region. Smoking is an important risk factor.

Recommendations

A high index of suspicion is recommended for all mid aged patients with isolated back pain, with additional risk factors such as smoking, diabetes mellitus, pulmonary TB or HIV.

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APPENDICES

Appendix A: Data collection sheet

Case Number Age Yrs Gender Male Female

Occupation _____

Cormobid conditions

1. Smoking History YES NO
2. Known HIV status YES NO Positive Negative
3. Known IV drug usage Yes No
4. Previous history of PTB Yes No
5. Duration of treatment of PTB ____ Months
6. History of Diabetes Mellitus YES NO

Presenting features

Back Pain	Yes	No	Duration	Localization _____
HOB	Yes	No	Duration	
Weight loss	Yes	No	Duration	
Malaise	Yes	No	Duration	
Night sweats	Yes	No	Duration	
Anorexia	Yes	No	Duration	
Gibbus deformity	Yes	No	Duration	Localization _____
Muscle wasting	Yes	No	Duration	Localization _____
Inguinal Masses	Yes	No	Duration	Localization _____
Paraspinal masses	Yes	No	Duration	Localization _____
Limb weakness	Yes	No	Duration	ASIA Score_____
Sensory level	Yes	No	Duration	Localization_____
Decubitus ulcer	Yes	No	Duration	Localization_____

Investigations done

1. Laboratory
   - HIV Test Yes No Positive Negative
   - Haemogram Yes No Hb WBC Plt
   - ESR Yes No _____mm/hr
   - Sputum Yes No Result_____

- Mantoux test Yes No Result_____
- Anti TB serology Yes No Result_____
- Biopsy Yes No Result_____
- Gene X pert Yes No Positive Negative

2. Radiological assessment
   - MRI Lesion _____
   - _____
   - Plain lumbar spine x-ray Yes No Lesion Cobbs angle ___^{0}
   - Plain thoracic spine x-ray Yes No Lesion Cobbs angle ___^{0}
   - CT Scan Yes No Lesion _____
   - Bone scan Yes No Lesion _____

APPENDIX B (i): CONSENT FORM
INFORMED CONSENT TO PARTICIPATION IN STUDY

Participant number……

This is a kind request for your participation in a medical research. The principal investigator will explain this research to you. Please take your time to make your decision before participating. If you have any questions feel free to ask the investigator.

Aim of study: This study aims at documenting presentation and features of patients with spondylodiscitis (spine infection).

Benefits: Data on spine infection will help in early diagnosis of future patients with this condition. This data will help in training medical workers in this field.

Risks: This is an observational study, there will be no intervention. You will bot be exposed to any risks.

Ethics: Your consent will be highly appreciated. Your consent to this study will be to allow us to interview you before and after the care as well as take some data concerning the procedure you are to undergo in your treatment plan. We will not intervene in anyway during your care, meaning, you will receive treatment as planned according to the hospital protocol. Your participation in this study is voluntary. Participating in this study does not put you at any risk. You will not be compensated to participate in this study.

Confidentiality: The identities of the subjects will be concealed by use of participant numbers instead of names and no information concerning them will be published except that which is directly related to the research. Moreover, no information will be disclosed to any unauthorized persons.

Humble request: Therefore, I humbly request you to participate and allow us to collect data concerning your procedure. Participation will be entirely on a voluntary basis and there will be no coercion nor any financial compensation whatsoever to the participants. The choice of the patients to participate will be highly respected regardless of their decisions.

Even when you choose not to participate, this decision will not affect your subsequent care. Data will be collected within the time approved by Kenyatta National Hospital/ University of Nairobi Ethics and Research Committee (KNH/UoN- ERC). The investigator can be reached through mobile phone number 0729859057 and the chairperson of KNH/UoN-ERC can be reached through 020-7264009.

INDEPENDENT CERTIFICATE FORM

I the undersigned have been explained to and have understood the above and willingly accept to participate in the research study.

Signature …….. Date ……..

I the investigator, having explained in detail the purpose of this study, hereby submit that confidentiality of the data collected will be maintained and only details relevant to the study will be revealed.

Signature …….. Date ……..

INVESTIGATOR

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APPENDIX B (ii): FOMU YA IDHINI

FOMU YA IDHINI YA MSHIRIKA KWENYE UTAFITI

Jina langu ni Dkt. Mohammed Rashid Mohammed, mwanafunzi wa shahada ya juu katika Upasuaji wa Mifupa katika chuo kikuu cha Nairobi. Ninafanya utafiti kuhusu kutokea kwa maambukizi ya pini baada ya kuwekewa chuma cha nje cha kushikilia mifupa. Utafiti huu nitaufanya kwa kutazama hizo sehemu za pini za chuma ulichowekea na kuangalia ikiwa kuna usaha ama uchafu wowote unaotoka na pia kwa kutazama picha zako za x-ray.

Ningependa ushiriki kwa huu utafiti na haki zako zitalindwa, habari utakayotoa au ile itakayopatikana kukuhusu itakuwa siri wakati wote na utatumika kwa huu utafiti pekee yake.

Ni muhimu kuelewa ya kwamba ushiriki ni wakujitolea, sio lazima kushiriki katika huu utafiti, na pia waweza kubadili nia yako wakati wowote kuhusu kuendelea kushiriki, bila ya kuathiri huduma zako za kiafya.

Asante sana kwa ushirikiano wako.

Nimekubali kwamba nimeelezwa kikamilifu kuhusu utafiti huu na nakubali kushiriki.

Sahihi..... Tarehe.....

Ninathibitsha ya kwamba nimetoa maelezo sahihi kwa mhusika kuhusu pana ya utafiti na yale yote yaliyomo kwa ustadi, naye mhusika ametoa uamuzi wa kushiriki bila ya kushurutishwa.

Sahihi ya mchunguzi……. Tarehe……

Ukiwa na maswali yeyote kuhusu utafiti huu, wasiliana na:

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