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Full Length Research Paper

Trends and characteristics of patients admitted with musculoskeletal tuberculosis to a referral hospital from 2003 to 2008

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Tuberculosis (TB) remains the most common cause of death from infectious disease world-wide. Extrapulmonary diagnosis remains challenging especially in developing countries such as Botswana. The increasing global burden of tuberculosis is linked to HIV-infection and sub- Saharan Africa is the hardest hit by tuberculosis epidemics due to the high incidence and prevalence of HIV-infection. This study evaluated the prevalence and trends of musculoskeletal tuberculosis in Nyangabgwe Referral Hospital in the Northern part of Botswana. A descriptive retrospective study was performed whereby all patients admitted with musculoskeletal TB to the Nyangabgwe Referral Hospital, Botswana between 1st January, 2003 and the 31st December, 2008 were reviewed. A total of 744 TB cases were reported between 2003 and 2008. A review of the reports showed that 53 cases were diagnosed with mTB. Seventy-seven percent of the patient files reviewed showed a decline in the prevalence of mTB cases from 10.3% in 2003 to 3.9% in 2008. Prevalence of HIV-infection among the TB cases was 39%, and 81% of these had $CD4^+$T-cell counts of less than 200cells/ul. This decline in mTB prevalence may be related to an increased provision of isoniazid preventive therapy (IPT) and highly active antiretroviral therapy (HAART) in Botswana over the past 5 years.

Key words: Musculoskeletal tuberculosis, patients, Africa, prevalence, human immunodeficiency virus (HIV), Botswana.

INTRODUCTION

Tuberculosis (TB) remains a major cause of morbidity and mortality worldwide especially in sub-Saharan Africa and South-east Asia (Blumberg and Leonard, 2000). TB is most common in areas with crowding, poor sanitation and malnutrition and there has been an increase in TB infection which is associated with the increased prevalence of HIV/AIDS. While a small number of patients with tuberculosis will have osteoarticular involvement, about half of them will have spinal disease, with others exhibit some effects on the hips, knees and finger and toes joints (Golden, 2005; David et al., 2005; WHO, 2008).

The increasing global burden of TB is linked to HIV-infection and the HIV pandemic presents a massive challenge to global TB control. The trends in the burden of TB indicate an increased prevalence in developing countries whilst a stabilisation and decrease in developed countries that have very good TB and HIV control and treatment programme has been reported. Africa is facing the worst TB epidemic since the advent of HIV/AIDS as HIV prevalence has increased and populations have become more immuno-compromised, hence the susceptibility to TB has grown significantly (David et al., 2005).

According to the WHO Report (2008), there were an estimated 8.3 million new TB cases in 2000 (137/100,000 population with a range of 121 per 100,000-151/100,000). In 2006, there were an estimated 9.2 million new cases of

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TB in 2006 (139 per 100 000 population), including 4.1 million new smear-positive cases (44% of the total) and 0.7 million HIV-positive cases (8% of the total). This is an increase from 9.1 million cases in 2005, due to population growth. India, China, Indonesia, South Africa and Nigeria rank first to fifth respectively in terms of absolute numbers of TB cases. The African region has the highest incidence rate per capita (363 per 100 000 population) (WHO, 2008).

Tuberculosis incidence rates were highest in the WHO African region (290 per 100,000 per year with a range of 265 per 100,000-331/100,000), as was the annual rate of increase in the number of cases (6%). Nine percent of all new TB cases in adults aged 15-49 years were attributable to HIV-infection but the proportion was found to be much greater in the WHO African region (31%) and some industrialized countries, notably the United States (26%). There was an estimated 1.8 million deaths from TB, of which 12% (226 000) were attributable to HIV-infection. Tuberculosis was described as the cause of 11% of all adult AIDS deaths (WHO, 2008). The prevalence of TB-HIV co-infection in adults was 0.36% (11 million people) and co- infection prevalence rates were equal or exceeded 5% in 8 African countries. In South Africa alone, it was reported that there were 2 million co-infected adults. There was an estimated 14.4 million prevalent cases of TB in 2006 and an estimated 0.5 million cases of multidrug-resistant TB (MDR-TB) (David et al., 2005; WHO, 2008).

Musculoskeletal tuberculosis (TB) is a type of extra-pulmonary TB which affects the joints and bones usually the spine, hip and knee in that order (Golden, 2005). The disease is caused by *Mycobacterium tuberculosis* which is carried to the bones and joints via the bloodstream usually from a latent site of primary focus in the lung or occasionally in the intestinal tract. In the joints, the organism causes swelling and eventual destruction of the synovial membrane and the articular cartilages, resulting in surrounding soft tissue degeneration and gross wasting of surrounding muscles with eventual clinical presentation like pain, tenderness, restriction of movement, deformity with associated general complaints like weight loss, fever, anorexia and night sweats (Golden, 2005).

Whereas the disease had always been common in developing countries and rare in developed countries like the United States of America (USA), there is now a resurgence which coincides with the rising HIV/AIDS epidemic (Golden, 2005) . Extra pulmonary involvement can be seen in more than 50% of patients with concurrent AIDS and TB. The risk of extra-pulmonary TB and mycobacteremia increases with advancing immunosuppression. The interaction between HIV and mycobacterium TB is synergistic, each increasing the pathogenicity of the other (Golden, 2005; David et al., 2005). HIV infection increases the susceptibility to developing active disease after infection with mycobacterium TB, and immune activation by mycobacterium TB increases HIV plasma viraemia which appears to increase the rate of HIV disease progression and mortality.

In South Africa, TB is the most common disease and leading cause of death in people living with HIV/AIDS. While about 85% of people with TB in South Africa have pulmonary TB, the remaining presents with extra pulmonary TB with TB of the bones and joints accounting for about 35% (Golden, 2005).

In the United States of America (USA), TB of the joints and spine (part of extrapulmonary TB) is commonly found in immigrants especially from sub-Saharan Africa and among patients with a previous history of exposure to TB (David et al., 2005). This finding is corroborated by a study in France where results showed that apart from immigrants and patients with a previous history of TB, patients living in unfavourable social conditions were found to be more affected with extra-pulmonary TB (with musculoskeletal TB accounting for 22.7% of the 141 cases studied) (Mulleman et al., 2006). The HIV epidemic and changes in population demographics also contribute and are often more frequently diagnosed in women and young patients (Lowieke et al., 2006).

With regard to immunosuppression, the frequency of musculoskeletal TB and all other extra-pulmonary TB infections depend on the degree of decreased cellular immunity (David et al., 2005; Mulleman, 2006, WHO, 2008). People with HIV and latent TB are also far more likely to develop active disease, with 8 to 10% chance of developing active disease each year, compared to a total lifetime reactivation risk of about 5% in an HIV-negative population (Blumberg and Leonard, 2000). As damage to the immune system worsens, people living with HIV are more likely to develop extrapulmonary TB (Mulleman, 2006).

The aim of this study was to investigate the trends of musculoskeletal tuberculosis (mTB) and identify and describe the characteristics of patients admitted with mTB to the Orthopaedic Ward of the Nyangabgwe Referral Hospital (Botswana) between 2003 and 2008.

METHODOLOGY

Study design

This was a descriptive retrospective study in which the records of all patients admitted with musculoskeletal TB to the Nyangabgwe Referral Hospital, Botswana between 1st January, 2003 and the 31st December, 2008 were reviewed.

Description of study setting

This record review was done in Nyangabgwe Referral Hospital in Francistown which is in the North West of Botswana. Francistown is the second largest city in Botswana, with a population of about 113, 315 and is often described as the "Capital of the North" (Chandrashekhar et al., 2008). It is located in eastern Botswana, about 400 kilometres north-northeast from the capital, Gaborone. Francistown is located at the confluence of the Tati and Inchwe

Rivers, and near the Shashe River (tributary to the Limpopo) and 90 kilometres from the international border of Zimbabwe. Francistown was the centre of southern Africa's first gold rush and is still surrounded by old and abandoned mines. The Bakalanga, the second largest ethnic group in Botswana is traditionally centred around the town and the surrounding area and recently, the city has seen a large influx of illegal immigrants from neighbouring Zimbabwe. Incidence of HIV-infection in Francistown is estimated to be as high as 40 percent in pregnant women attending antenatal clinic (ANC).

Study population

The study populations include all the patients admitted to the Orthopaedic Ward of the Nyangabgwe Referral Hospital with mTB from 1st January, 2003 to the 31st December, 2008. There were 744 recorded cases of TB in Nyangabgwe Hospital between 2003 and 2008 and a total of 53 mTB cases documented during this period were included for this study.

Inclusion and exclusion criteria

All patients admitted with musculoskeletal TB were included in the study whether HIV positive or not. Case notes where patients had just pulmonary or any other type of extra pulmonary TB were excluded from the study.

Diagnosis of musculoskeletal tuberculosis

The diagnosis of musculoskeletal tuberculosis remains a challenge to clinicians and requires a high index of suspicion. The diagnosis of mTB was made by using the combination of symptoms, positive tuberculin skin test and compatible radiographic findings and diagnosed confirmed by positive culture and/or histological proof from the aspiration of synovial fluid or biopsy of the bone or synovium.

Data collection tool

The age, sex, occupation, family structure, nationality, residence, lifestyle, other clinical problems and $CD4^+$T- cell counts at the time of diagnosis of HIV and time of diagnosis of bone or joint TB were obtained from the case notes (such as the bio-data, past medical history, investigation history and laboratory findings). A checklist form was used to collect the information from the records.

Data collection

A total of 744 TB cases were recorded between 2003 and 2008. A review of the records revealed that 53 of these were diagnosed with mTB. Of the 53 cases, 41 (77%) files were available for review and were all included in the study.

The patients' case note numbers were traced from discharge records in the different wards and outpatient records. Then, using the patient's case file numbers, each of the case notes were retrieved from the records department, starting from those admitted from 1st January, 2003 to 31st December, 2008. Data were captured using the data collection tool (the checklist form). The required results and other information were retrieved from the hospital intranet system using a patient's hospital number. The period of data collection was approximately two weeks and any additional data on the number of TB cases within the study period were obtained.

Statistical analysis

Data were captured and entered into Microsoft Excel and exported to SPSS version 13 (SPSS Inc, Chicago, Illinois) for statistical analysis. Descriptive statistics were calculated for selected variables to describe the characteristics of the musculoskeletal TB patients. Student's t-test was used to compare changes in $CD4^+$T-cell count from time of diagnosis. The demographic features, lifestyle and pre-morbid clinical status and characteristics such as risk factors for developing musculoskeletal TB were assessed using the logistic regression model.

Ethical considerations

The research was approved by the University of Limpopo, Research and Ethics Committee and Health Research Unit of the Botswana Ministry of Health. Permission to conduct the study was also obtained from the Nyangabgwe Reference Hospital and information obtained from patients' files was kept confidential.

RESULTS

Socio-demographic characteristics

Table 1 presents a summary of the socio-demographic characteristics of the participants. The age ranged from 2 to 88 years, with 56% of the participants older than 40 years of age; 24% between 21–40 years and 20% less than 21 years of age. Only 17% of the participants were married. One (1) participant was not a citizen of Botswana (non-Motswana). Most of the participants had at least primary level education (59%) and 12% secondary level education) and most of them were unemployed (78%).

Prevalence of mTB

A total of 53 mTB cases were documented between 2003 and 2008 and a comparison made with the recorded cases of TB. Table 2 shows the distribution of the total number of cases reported in Nyangabgwe Hospital between 2003 and 2008. There was an increase in the number of cases from 2003 to a peak 2006 and a drop in 2008. There was a general decline in the prevalence of mTB from 2003 to 2008. The prevalence dropped from 10.3% in 2003 to 3.9% in 2008 (Figure 1a and b).

Site of musculoskeletal TB infection

The most common sites for musculoskeletal TB infection is the lumbar (48.8%) and thoracic (29.3%) regions as observed in the case files reviewed (Figure 2).

HIV status and $CD4^+$T-cell count at the time of mTB diagnosis

Of the 41 cases reviewed, 16 (39%) had confirme

Table 1. Socio-demographic characteristics of the participants.

Variable	Category	Frequency	Percentage
Age	< 10	5	12.2
	11 – 20	3	7.3
	21 – 30	5	12.2
	31 – 40	5	12.2
	> 40	23	56.1
Gender	Male	23	56.1
	Female	18	43-9
Nationality	Non-Motswana	1	2.4
	Motswana	40	97.6
Marital status	Married	7	17.1
	Single	34	82.9
No. of children	No children	18	43.9
	1 - 4 children	15	36.6
	> 4 children	8	19.5
Employment status	Unemployed	32	78.0
	Employed	9	22.0
Educational level	No formal education	12	29.3
	Primary	24	58.5
	At least secondary	5	12.2

Table 2. Frequency of prevalence trend in mTB.

Year	Cases reported	Cases of mTB reported	Reviewed cases mTB	% Prev	% reviewed
2003	78	8	2	10.3	25
2004	115	10	7	8.7	70
2005	125	10	8	8.0	80
2006	122	11	10	9.0	91
2007	176	9	9	5.1	100
2008	128	5	5	3.9	100
Total	744	53	41	7.1	77

HIV-positive status at the time of mTB diagnosis. Of the HIV-positive cases, 81% had a very low $CD4^+$T-cell count (< 200 cells/ul) (Figure 3).

Table 3 shows the distribution of the outcomes (consequences) of TB infection. The interval between first diagnosis of mTB and first recorded symptoms of mTB is summarised in Table 4.

Table 5 shows primary history of TB and other illness reported among the patients. Table 6 indicates interval between HIV diagnosis and HAART initiation among patients reviewed while Table 7 shows history of non-adherence to HAART medication among the patients. High alcohol and drug use was found to be prevalent among the participants (61%); however, very few participants had drug use reported in their files (Table 8).

Past medical history reported and HIV status

Most of the cases (76%) did not present with any abnormal discovery. Seventeen (17%) of the cases had a history of pulmonary TB and 7% had other systemic

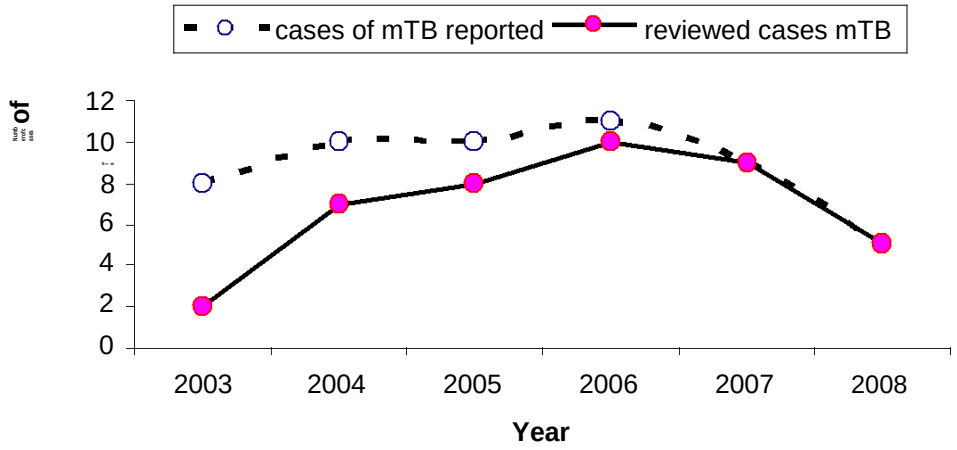

Figure 1a. Trends in total number of cases of musculoskeletal TB identified in Nyangabgwe hospital between 2003 and 2008.

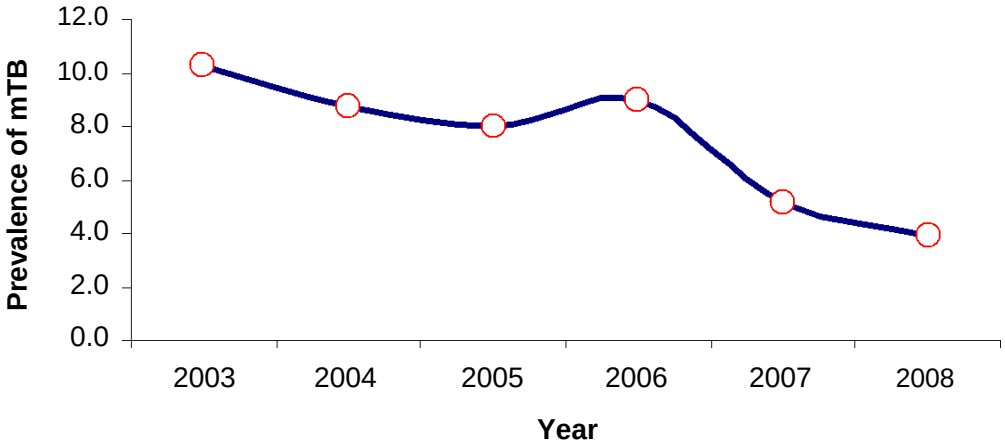

Figure 1b. Trends in prevalence of mTB in Nyangabgwe Hospital between 2003 and 2008.

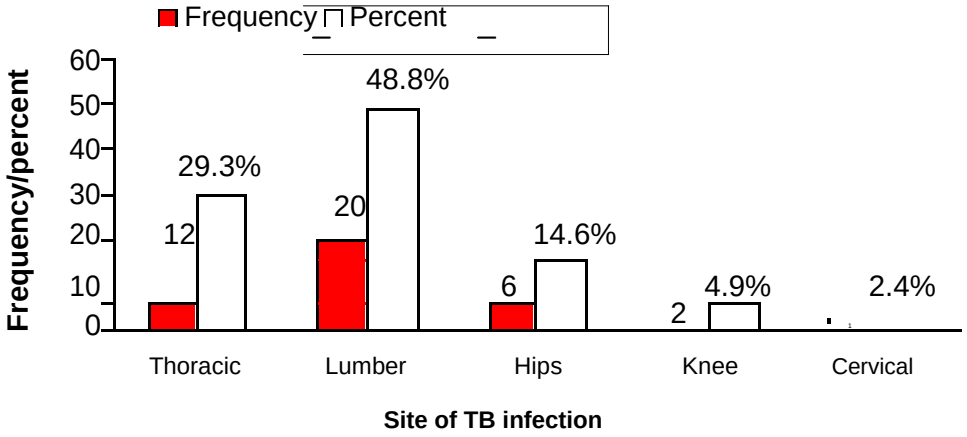

Figure 2. Site of mTB infection.

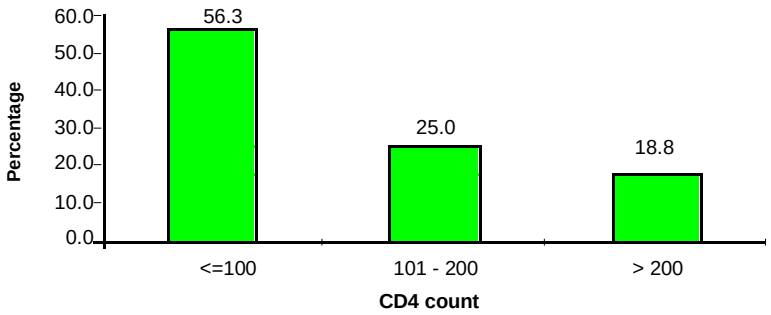

Figure 3. Distribution of the $CD4^{+}$T-cell counts among HIV-positive musculoskeletal TB patients.

Table 3. Distribution of the outcomes and the site of TB infection.

TB site	Outcome				Total
	Treated and discharged with no consequence	Paraplegic/ paraparesis	Bony deformity	Died	
Thoracic	7	4	0	1	12
Lumbar	5	10	4	1	20
Hips	4	0	2	0	6
Knee	2	0	0	0	2
Cervical	0	0	1	0	1
Total	18	14	7	2	41

Table 4. Interval between first diagnosis and recorded symptoms.

Interval btw first diagnosis of mTB and first recorded symptoms	Frequency	Percent
Within one year	11	26.8
>1 year	14	34.1
2-3 years	16	39.0
Total	41	100.0

Key: btw, between; freq, frequency.

Table 5. Primary medical history reported

PMHx	Frequency	Percent
No abnormal discovery	31	75.6
Hx of pulmonary TB	7	17.1
other systemic illness	3	7.3
Total	41	100.0

illness. There was no relationship between past medical history and HIV status (P>0.05).

HAART, IPT and Adherence

All the participants were initiated on highly active antiretroviral therapy (HAART) within 1 year of HIV diagnosis indicating that they tested late and probably as a result of sickness and TB. Eight out of 16 (50%) on HAART had a history of non-adherence to HAART medication. It was also noted that only 50% (8 out of 16) had received isoniazid preventive therapy (IPT) since being diagnosis of HIV.

Alcohol, smoking and drug use

There was a high alcohol intake (61%) among the participants and very few participants had drug use (7%) reported in their files. There was a significant use of cigarette among the participants (61%; P<0.005) . All 3 cases that reported drug use were HIV positive. There

Table 6. Interval between HIV diagnosis and HAART initiation.

	Frequency	Percent	Valid percent	Cumulative percent
N/A	25	61.0	61.0	61.0
Within 1 year	16	39.0	39.0	100.0
Total	41	100.0	100.0	

Key: N/A-not applicable.

Table 7. History of non-adherence to HAART medication.

Adherence	Frequency	%	Valid %	Cumulative %
No	8	19.5	19.5	19.5
Yes	8	19.5	19.5	39.0
N/A (HIV-neg)	25	61.0	61.0	100.0
Total	41	100.0	100.0	

Table 8. Alcohol, smoking and drug use.

Variable	No/%	(p-value)
Alcohol intake	25(61)	0.195
Smoking	25(61)	0.008**
Drug use	3(7)	0.053

**P-values significant using Fischer's exact for association.

was a significant association between smoking and HIV status. This may be an artefact of the data (confounder) by virtue that all these cases are TB cases.

Outcomes and predictors of outcome of mTB

Most of the participants (44%) were treated and discharged. 34% experienced paraplegic/paraparesis while 17% experienced bone deformities. There were 2 deaths reported. No significant predictors of outcomes were observed using logistic regression. Outcomes were independent of socio-demographic variables.

DISCUSSION

The prevalence and deaths due to TB continue to place a burden on society worldwide and account for most HIV-related deaths in southern Africa. It is a major public health problem in Southern African countries and the TB epidemic is likely to be further exacerbated over the next few years due to HIV/AIDS. TB-HIV co-infection rates are high, with as many as 60 percent of adult TB patients being HIV-positive (USAID, 2008).

In 2006, Botswana showed an estimated tuberculosis incidence of 10230 with 551 per 100,000 populations and prevalence of 454 per 100,000 population (including HIV-positive people). TB mortality that year was 91 per 100000 population including HIV-positive people). HIV prevalence in TB cases was 54% indicating that the TB-HIV co-infection rates in Botswana are high (Mazonde et al., 2004; USAID, 2008).

Of the 744 TB notifications from 2003 to 2008 in Nyangabgwe Hospital, 53 of them had musculoskeletal involvement, that is 7.12%. A nearly similar observation was noticed in a study in Bradford, UK from 1999-2004, where out of 729 TB notifications, 61 cases (8.4%) had musculoskeletal involvement despite the fact that mTB is not a very common extra- pulmonary type of tuberculosis compared to others such as tuberculous lymphadenitis (Talbot et al., 2007). The rates of mTB in this study were found to be declining over time that is from 8 reported cases in 2003 to 5 in 2008. This may be attributed to the intervention strategies applied for the treatment of TB (which includes IPT in HIV-positive patients) and scale up in the antiretroviral therapy (ART) in Botswana as IPT was introduced in Botswana in 2004 and as at 2006, 35,000-40,000 patients were on IPT while up to 65,000 patients were on ART (Smart, 2006; Samandari et al., 2006).

A possible explanation for this observed decline in the cases of mTB in Nyangabgwe Hospital (which coincided with the introduction and acceptance of IPT) is that IPT could be helpful in the reduction of the acquisition of tuberculosis including musculoskeletal tuberculosis in immune- compromised patients including HIV- positive patients. This was also observed in South Africa (Hausler, 2000).

Results from the study showed that mTB is more common (56%) in people older than 40 years. This is in contrast with observations in TB endemic areas as reported by Peter and Mark (2007) and David and Horowitz (1970). The reasons could be due to the fact

that the prevention of mother-to- child transmission (PMTCT) has been very successful in Botswana and that very few children were HIV -infected as well as those who receive quick opportunistic preventive measures of which the IPT is one.

Only 17% of the participants were found to be married. This observation may not be unconnected with the general finding among people in the country who are often found to be single (but maybe cohabiting).

Most of the participants had at least primary level education and most of them were unemployed (78%). This observation indicates that many of them were of low socio- economic class which is considered to be a risk factor for developing TB or musculoskeletal TB and is similar to the observation of Karim et al. (2006).

The thoracolumbar site was the commonest site involved as found in this study accounting for 77.1% (with the lumbar accounting for 48.8% and thoracic accounting for 29.3%) of the cases. A description of a spectrum of radiographic findings of musculoskeletal Tb in India (Priya, 2006) revealed similar observations of a higher percentage of thoracolumbar involvement in musculoskeletal TB but in contrast to our finding, the thoracic region was more affected in the thoracolumbar region in Chudgar's study as well as in another study in Iran (Sharifi-Mood et al., 2006). This could be due to the fact that many files were not available for data collection as some of the files were missing.

The study revealed 50% of patients with lumbar TB spine had paraplegia after medical treatment (and so awaiting surgical intervention) and 25% of them were treated without sequalae while 20% had bony deformity such as gibbus or kyphosis. While it is generally true that many patients do well on antituberculous therapy, presentations and complications depend much on the site of lesion and especially the stage of the disease at presentation (Lukhele, 2005; Abhay and Shekhar, 2005; Hidalgo and Alangaden, 2008). Our study showed that 71% of patients had diagnosis made after more than one year since complaint of first symptom which is usually low back pain for thoracolumbar TB and joint pains in other TB arthritis cases (WHO, 2008). This observation contrasts with a study done in France where the mean time from symptom onset to diagnosis was found to be 4.3 months (range, 1–12 months) (Mullenan et al., 2006). A possible explanation for the observation in this study is that some cases may have been presented late because the patients were being treated for general low back pain syndrome which is common in the elderly while others may have preferred traditional medication and finally, a not too high index of suspicion which could happen because of the relative low prevalence of mTB (Hidalgo and Alangaden, 2008).

Of the 41 cases reviewed, 16 (39%) had a confirmed HIV diagnosis at the time of TB diagnosis. Of the HIV positive cases, 81% had a very low $CD4^{+}$ Tcell count (< 200 cells/ul). These patients probably tested late for HIV (and perhaps only tested after they had symptomatic HIV disease) and as such could have presented with more advanced stage of the disease leading to more complications like paralysis and severe bony deformity that may only be corrected by surgery. A nationwide study in Botswana in 2004 revealed some reasons for delay in testing and such reasons included fear of knowing one's HIV status, lack of perceived HIV risk and fear of having to change sexual practices after a positive HIV test has become known (Tore et al., 2007).

Most of the cases (76%) did not present with an abnormal discovery in a patient's past medical history. A similar observation was observed in a study in the UK where most of the patients (85.7%) did not show a significant past medical history (Cormican et al., 2006). Seventeen (17%) of the cases in this study had a history of pulmonary TB and 7% reported other systemic illness. A relatively similar observation was noted in a study conducted in a French teaching hospital where 25% of the patients had a past history of pulmonary tuberculosis (Mulleman et al., 2006).

It was also noted that only 50% (8 out of 16) had received IPT since being positively diagnosed for HIV. Reasons for this observation could be deduced from the findings of a study by Motsamai (2005) which revealed that certain eligibility criteria were used to commence people on IPT which meant that although HIV positive, not all patients commenced the IPT. Some patients who were eligible declined while others who had started discontinued from the IPT programme (Motsamai, 2008). Our data collection material did not include recording the reasons for not taking IPT.

High alcohol and drug use was found to be prevalent among the participants (61%); however, very few participants had drug use reported in their files (Table 7). The 3 cases that reported drug use were HIV-positive. A similar observation was noted in a study by Opara et al. (2007) in Britain where they found heavy alcohol intake to be a risk factor for a patient who had tuberculous arthritis with a simultaneous superimposed bacterial infection.

Finally, most of the participants (44%) were treated and discharged. 34% experienced paraplegic/paraparesis while 17% experienced bone deformities. The bone deformities and paraparesis were however present prior to surgical intervention. These findings correlate with the findings of other studies in Bradford (Talbot et al., 2007). Ohio (Dass et al., 2002) and Riyadl, Saudi Arabia (Salman et al., 1998). However, the deaths reported were not caused by the musculoskeletal tuberculosis as these patients had other systemic infections.

Conclusion

Our study shows that there is a decline in mTB prevalence in the area under study from 2003 to 2008 and that the decline may be related to the use of IPT. It is most commonly found in elderly people, that is those above 40 years of age and the spine constitutes the

majority of the anatomical sites with back pain being the commonest presentation.

Recommendations

1. There is a need to increase the awareness among physicians in the referral centres and local clinics of the presence of musculoskeletal TB in order that they could make a prompt diagnosis.
2. There is a need to increase the awareness of elderly people in society of the need to report symptoms early as time could be the factor between developing complications and treatment.
3. Further prospective studies are needed to better understand the role of IPT in preventing musculoskeletal TB or if it poses a risk of causing multi drug resistant strains of mycobacterium that could also cause mTB.

Limitations of the study

Using hospital records was challenging as some files were missing. An integrated electronic patient management system (IPMS) by MEDITECH was introduced sometime in 2006 but it was still found to be difficult to retrieve some of the files of earlier years. Files from 2002 were very difficult to find. We therefore excluded files of 2002 from the study. For example, no mTB file for the year 2002 could be recovered for data collection (so we started our data collection from 2003). Also, some of the wards such as the male surgical wards (where many orthopaedic patients including those with mTB are admitted) had no records of discharged patients for some of the years. All this limitations affected the sample size.

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REFERENCES

Blumberg HM, Leonard MK (2000). Infectious Disease, II Tuberculosis, ACP Medicine Online. Dale DC, Federman DD, Eds. WebMD Inc., New York, (http://www.acpmedicine.com) (accessed March 18th, 2008).

Golden MP (2005). Extrapulmonary Tuberculosis: An Overview Am. Fam. Physician, 72(9): 1761-1768.

David AS, Girish KS, Banskota AK (2005). Tuberculosis of the Musculoskeletal System. Techniques in Orthopaedics, 20(2): 167-178.

WHO (2008). Global Tuberculosis Control: Surveillance planning and financing. Geneva, Switzerland.

Mulleman D, Saloua-Mammou IG, Agbessi PG, Jean-Valat JP (2006). Characteristics of patients with spinal tuberculosis in a French teaching hospital; Joint Bone Spine J., 73(4): 24-427.

Lowieke AM, Te-Beek MJ, van der Werf M, Richter C, Borgdorff MW (2006). Extrapulmonary tuberculosis by nationality, the Netherlands, 1993–2001. Emerg. Infect. Dis., 12: 187-198.

Chandrashekhar T, Sreeramareddy KV, Panduru SC, Verma, HSJ, Bates MN (2008). Comparison of pulmonary and extra-pulmonary tuberculosis in Nepal: A hospital-based retrospective study. BMC Infect. Dis., 8: 8.

USAID (2008). Infectious diseases and TB: South African Profile. http://www.usaid.) (accessed January 30th, 2009).

Talbot JC, Bismil Q, Saralaya D, Newton DA, Frizzel RM, Shaw DL (2007). Musculoskeletal tuberculosis in Bradford-a 6-year review. Ann. Roy. Coll. Surg. Eng., 89(4): 405-409.

Smart T (2006). Botswana IPT trial screens out large numbers of people who are already ill; AIDS Map News; (http://www.aidsmap.com) (accessed February 25th, 2009).

Samandari T, Mosimaneotsile B, Nyirenda S, Agizew T, Motsamai O, Kilmarx PH, Talbot EH, Wells CD (2006). Characteristics of people living with HIV-1 (PLWH) screened for isoniazid preventive therapy (IPT) – MOH, Botswana.

Hausler H (2000). Tuberculosis and HIV and AIDS; Clinical Guidelines; South African Department of Health and TB/HIV Policy Task Group.

Peter L, Mark RA (2007). Teaching atlas of musculoskeletal imaging. Teaching Atlas Series-Thieme, pp. 378-380.

David PT, Horowitz I, Skeletal TB (1970). A review with patient presentations and discussion. Am. J. Med., 48: 77-84.

Karim MM, Chowdhury MM, Hussan SA, FAIZ MA (2006). A clinical study on extra-pulmonary tuberculosis. J. Bangla Coll. Physicians Surg., 4: 1.

Priya DC (2006). Spectrum of MRI findings In musculoskeletal tuberculosis: pictorial Essay. Internet J. Radiol., 8(2): 1-5.

Sharifi-Mood B, Metanat M, Parsi M (2006). Pott's disease: one of the most common manifestation of extra-pulmonary tuberculosis in the Southeast of Iran. J. Med. Sci., 6(4): 674-677.

Lukhele M (2005). Tuberculosis of the lower lumbar spine-is there a need for radical surgery. J. Bone Joint Surg., 283(Suppl): B87.

Abhay N, Shekhar B (2005). Results of non-surgical treatment of thoracic spinal tuberculosis in adults; Spine J., 5(1): 79-84.

Hidalgo JA, Alangaden G (2008). Pottis disease (*tuberculous spondylitis*). Infectious Diseases; E-medicine specialties: http://emedicine.medscape.com) (accessed 2nd February, 2009).

Tore WS, Khumo S, de la Hoz GF, Anderson MG, Kejelepula M, Keapoletswe K, Howard JM (2007). Two and a half years of routine HIV testing in Botswana. JAIDS, 4: 484 – 488.

Cormican L, Hammal R, Messenger J, Milburn HJ (2006). Current difficulties in the diagnosis and management of spinal tuberculosis. Postgrad. Med. J., 82: 46-51.

Motsamai OI (2005). About 48% of eligible ARV candidates in Botswana are receiving treatment. Medical News Today 2005: (www.medicalnewstoday.com) (accessed February 25th, 2009).

Mazonde P, Fantan T, Darkoh E (2004). Botswana ARV national Roll-out complete in all hospitals. HIV/AIDS News; Medical News Today: www.medicalnewstoday.com) (accessed February 20th, 2009).

Motsamai OI (2008). IPT Botswana experience-Ministry of Health, Botswana; 2008.

Opara TN, Gupte CM, Liyanage SH, Poole SMC (2007). Beverly tuberculosis arthritis of the knee with Staphylococcus super infection. J. Bone Joint Surg. Br., 89: 664-666.

Dass B, Puet TA, Watanakunakorn C (2002). Tuberculosis of the spine (Pott's disease) presenting as 'compression fractures'; J. Spinal Cord., 40(11): 604-608.

Salman Al, Al -Arfaj A, Naddaf H, Haddad Q, Memish Z (1998). Tuberculosis Arthritis: A Review Of 27 Cases; Ann. Saudi Med., 18(4): 368-369.