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Disseminated Tuberculosis Prevalence among Tuberculosis Patients at Jinja Regional Referral Hospital's Tuberculosis Unit

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ABSTRACT

Concurrent pulmonary and extrapulmonary tuberculosis (PTB/EPTB) is associated with poor treatment outcomes, however the prevalence of this disease in Jinja remains unknown. The goal of this study was to find out the prevalence and risk factors for concurrent PTB and EPTB among patients at Jinja Regional Referral Hospital's (JRRH) tuberculosis (TB) treatment center. The research was conducted at JRRH's TB unit in Uganda. I reviewed charts for persons with tuberculosis who were enrolled in care between January 2017 and November 2022. People with pulmonary bacteriologically proven TB who were enrolled in care during the trial period were eligible for eligible charts. PTB with bacteriological, histological, and/or radiological signs of TB at another non-contiguous location was described as concurrent PTB and EPTB. 119 patient charts were eligible, of whom 71 (60.0%) were aged 15 – 34 years and 61 (51.3%) were female. The frequency of concomitant PTB and EPTB was 7.6% (9/119). People who had both PTB and EPTB had at least one comorbidity (82.4% vs 37.2%), with HIV being the most common. Furthermore, persons who had PTB and EPTB at the same time had a higher mortality rate (26.5% vs 6.37%) and a poorer cure rate (41.2% vs 64.8%). These findings underline the need of early identification of tuberculosis before it spreads, particularly among patients living with HIV.

Keywords: prevalence, disseminated tuberculosis, tuberculosis**,** HIV

INTRODUCTION

Tuberculosis (TB), caused by Mycobacterium tuberculosis (Mtb), remains a major public health problem [1]. According to WHO, the disease is spread when people who are sick with TB expel bacterial bacilli into the air. It typically affects the lung parenchyma (pulmonary TB), but can also affect other sites (extrapulmonary TB). Tuberculosis remains a major threat to humanity despite improvements in health-care systems and the widespread implementation of TB control programs [2, 3, 4]. According to World Health Organisation, tuberculosis is one of the top ten causes of death worldwide with an estimated 10 million new cases in 2017 of which majority of them are

in Asia [2]. In Uganda alone, there is an estimate of 87,000 new TB cases annually and a prevalence of 253 per 100,000 persons [5, 6]. Disseminated TB is defined as tuberculous infection involving the blood stream, bone marrow, liver, or 2 or more non-contiguous sites, or miliary TB [7, 8, 9, 10]. DTB presents in form of lymph node tuberculosis, bone and joint tuberculosis typically 3–5 years after the initial respiratory infection, renal tuberculosis, pericardial TB, skin TB and gastrointestinal tuberculosis. Miliary tuberculosis occurs when tuberculous bacilli are spread through the blood stream resulting into meningeal, pancreatic and liver tuberculosis. The incidence of extrapulmonary and disseminated tuberculosis (TB) cases is increasing worldwide, and this growth significantly impacts TB-related morbidity and mortality. Little is known about the host risk factors for extrapulmonary and disseminated TB. [11, 12, 13, 14]. Unlike PTB which has a treatment success rate of 84.2%, disseminated TB disease has a treatment success rate of 70.1% and more specific risk factors for developing it [15, 16, 17, 18, 19, 20]. The purpose of this study therefore is to determine the prevalence and associated factors of disseminated TB among patients at Jinja Regional Referral hospital.

METHODOLOGY

Study Design

This study will be a retrospective study.

Study Site

The study will take place at the tuberculosis unit of Jinja Regional Referral Hospital.

Study Population

Target population: Case files of patients diagnosed with tuberculosis.
Eligible population: Case files of patients diagnosed and bacteriologically confirmed with TB from January 2022 to December 2022.

Sample Size Calculation

Using sample size calculation by Kish Leslie for cross-sectional studies:

$$N = \frac{Z_\alpha^2 \, P(1-P)}{\delta^2}$$

Where;
N= sample size estimate
P= assumed true population prevalence of one outcome (disseminated TB) which can be estimated to be 8.5% due to previously published national prevalence of dTB
1-P= the probability of not having disseminated TB, so 1-P= 91.5%
Z_α= Standard normal deviate at 95% confidence interval corresponding to 1.96
δ= Absolute error between the estimated and true population prevalence of disseminated TB of 5%
The calculated sample size therefore is:

$$= 119.51 \text{samples} \sim 119 \text{ samples}$$

However, using the modified Kish Leslie formula for available sample size

$$= \frac{N}{1+(N-1)/K}$$

K= available number of TB patient files that were opened between January 2022 to December 2022 at the TB unit of Jinja Regional Referral Hospital
Hence K = 52
The calculated sample size therefore is = $\frac{119}{1+\frac{119-1}{52}}$

= 36.4 ~ 36 patient files

Inclusion criteria

TB patients' records from January 2022 to December 2022 kept in the TB unit records office
Cases with bacteriologically confirmed PTB through sputum ZN stain, culture and sensitivity, Gene Xpert

Exclusion criteria

TB patients' files with incomplete information i.e files that may have missed critical information like; missing occupation, co-morbidity, patients with MDR TB

Study Procedure

A data abstraction retrospective chart review will be done.
Patient files from January 2022 to December 2022 will be accessed.
After accessing the patient's information, a check list will be used to record down any of the study-relevant data.

Data Analysis and Data Management

Raw data collected from the chart review, be converted into electronic data by being entered in Microsoft excel spreadsheets. Using statistical formula's, percentages and estimates will be computed.
Frequency distribution will be used to describe prevalence further. The data will further be described categorically i.e., the data will be accordingly divided groups.

Ethical considerations

This research will only commence after approval by Kampala International University Teaching Hospital, Faculty of Clinical Medicine and Dentistry and JRRH Institutional Review Board. A consent waiver will be employed to obtain permission to access the records. Patients' names will not be recorded anywhere on the checklist to maintain confidentiality. Data obtained from patients' files will be safely stored to avoid unauthorised access by any other third parties [21]. Any change in either the study procedure or use of obtained data will first be communicated to the IRB to seek for their approval.

Statistical Analysis

Raw data was entered in Microsoft Spreadsheets and using statistical formulars, percentages and estimates were computed.

RESULTS

Sociodemographic and clinical characteristics of patients with and without concurrent PTB and EPTB
A total of 301 TB case files were reviewed and only 119 cases met the eligibility criteria (figure 1). Of all cases, 71 (60.0%) were aged 15 – 34 years and 61 (51.3%) were female. 75(63%) were casual laborers and comorbidities were found in 62(52%) of cases. HIV co-infection was observed among 48(40.3%) cases.

Table 1 summarizes sociodemographic characteristics while figure 2 & 3 show clinical characteristics of the study participants with and without concurrent PTB and EPTB.

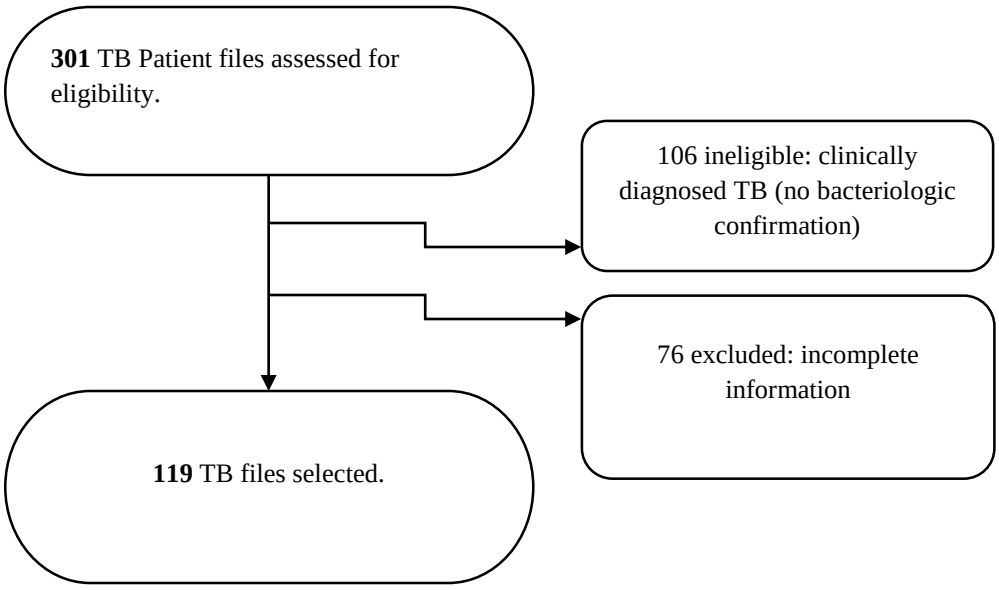

FIGURE 1: STUDY FLOW DIAGRAM

As shown in table 1 and 2, people with concurrent PTB and EPTB were more likely to report alcohol use (30.0% vs. 13.2%) and had at least one comorbidity (82.4% vs 37.2%), of which HIV was the most frequent. Notably 19 (100%) cases with concurrent PTB and EPTB had HIV co-infection.

Table 1: Sociodemographic Characteristics of People with TB Stratified by having concurrent PTB and EPTB

Characteristic	Total n(%)	With concurrent PTB and EPTB n(%)
Age (years)	**(N=119)**	**(n =19)**
<15	1(0.84)	0 (0)
15-34	71(59.6)	15(78.9)
35-60	30(25.2)	3(15.8)
>60	17(14.3)	1(5.3)
Sex	**(N=119)**	**(n =19)**
Male	58(48.7)	11(57.9)
Female	61(51.3)	8(42.1)
Occupation	**(N=)**	**(n=19)**
Formal Work	9(7.6)	1(5.26)
Causal Work	80(67.2)	15(65.55)
Unemployed	30(25.2)	3(15.79)
Marital status	**(N=67)**	**(n=10)**
Married	50(71.6)	2(20)
Divorced	1(1.5)	0(0)
Single	16(23.9)	8(80)
Education status	**(N=32)**	**(n=19)**
Tertiary	0(0)	0(0)
Secondary	8(25)	0(0)
Primary	24(75)	19(100)

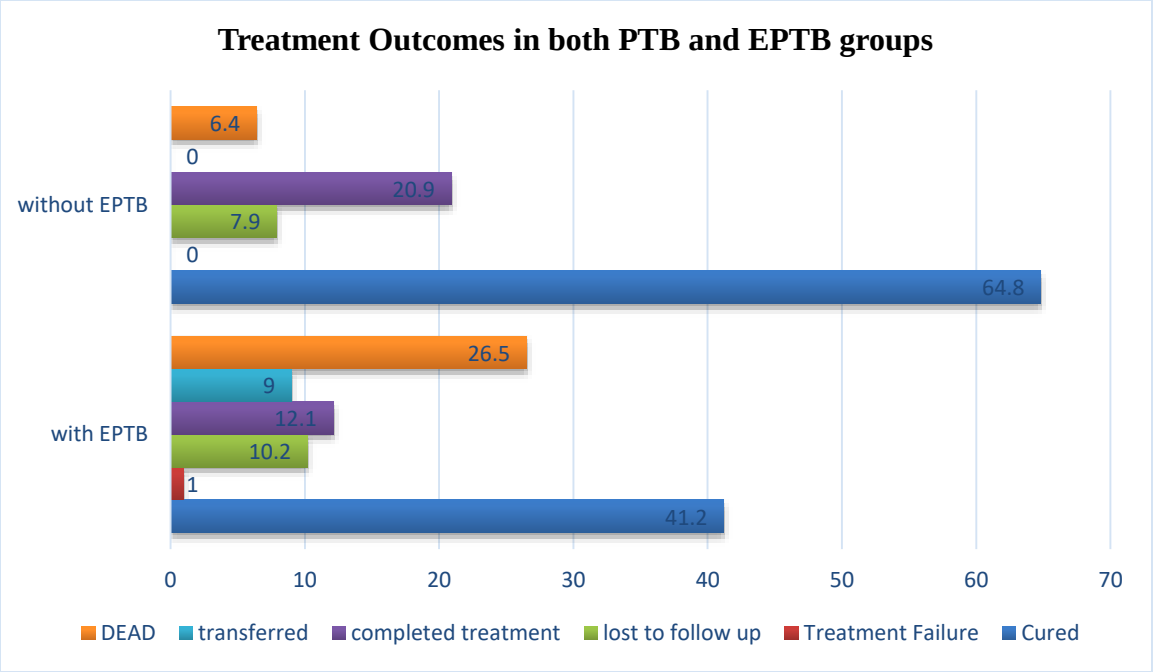

Figure 1: showing treatment outcomes in both PTB and EPTB group

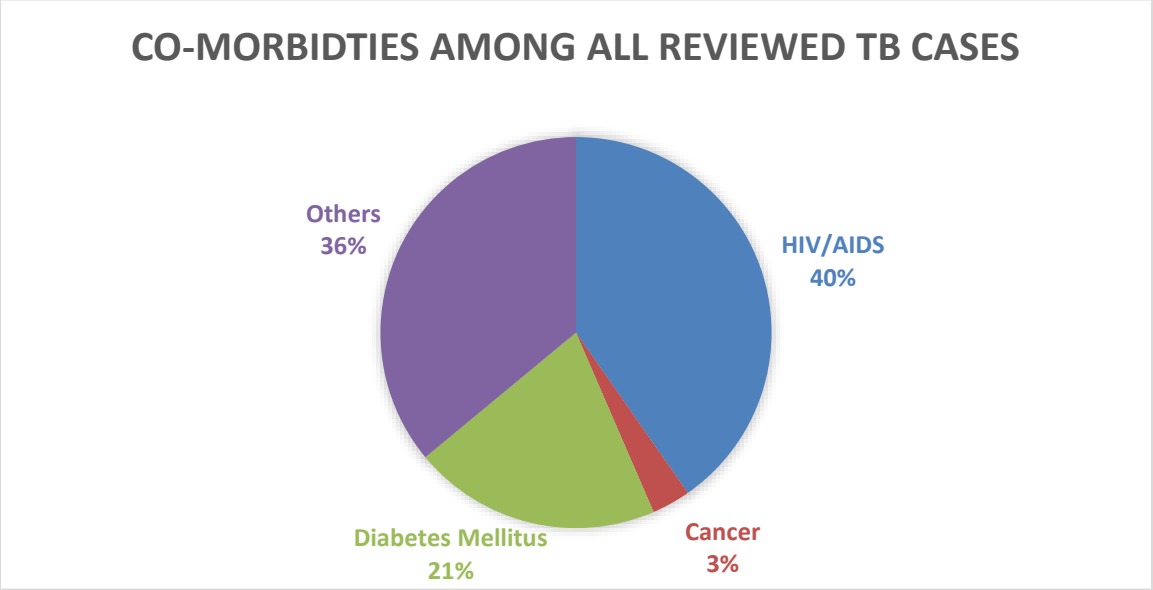

Figure 2: Showing co-morbidities among all reviewed TB cases

DISCUSSION

Concurrent PTB and EPTB is a potentially lethal form of TB that affects other organs, alongside the lung parenchyma, through lymphohematogenous spread to lymph nodes, pleura, genitourinary tract, bones and joints, meninges, peritoneum and pericardium. Concurrent PTB and EPTB has been increasingly observed in immunocompromised hosts, especially in developing countries, due to higher rates of TB-HIV co-infection [7]. However, despite knowing the national burden, little is known about the risk factors and treatment outcomes of this condition in different cities. In this study, the modal age was 15-34 years, which is consistent with the most frequent age group affected by TB [22]. The prevalence of concurrent PTB and EPTB was found to be 7.6%, which is comparable to that reported in the national study (8.5%) but still lower. This difference is likely to be due to the location of the national TB centre serving the capital city which is larger with higher population density as well as its role as the national referral centre for all cases from all around the country. It is often difficult to establish the diagnosis of concurrent PTB and EPTB because the clinical presentation is often non-specific, with symptoms varying according to the affected organs [23]. In this study, the commonest site of dissemination was the abdomen. Similarly, this was the case in the national study but however differing in a study in the United States by [24] where they found lymphatic TB to be the commonest and pleural TB in Ghana [15]. Ultrasound scan services are more readily available in Uganda than other advanced diagnostic methods such as pleural and lymph node biopsy and histology. This may have influenced the frequency of abdominal TB that I observed due to higher diagnostic capability for abdominal TB than other sites. It is possible that some sites of TB dissemination were not encountered due to lack of readily available diagnostic resources and if suspected, they were referred to the national referral center for further tests.

Similar to previous reports by [25, 26], I found concurrent PTB and EPTB to be associated with comorbidities of which HIV was the most predominant (100% of patients with concurrent PTB and EPTB had HIV co-infection). This should be expected because HIV globally impairs immune responses against *Mtb* resulting in TB dissemination [27]. The findings about the treatment outcomes are consistent with other studies that found disseminated TB to be highly fatal [28]. I found that people with concurrent PTB and EPTB had a fourfold mortality rate as compared to those with PTB. In Portugal, [25] found a mortality rate of 36% among patients with DTB but was not significantly higher than that among patients without DTB (21%). However, many patients in their study had other comorbidities and HIV was prevalent in only 47% (cf. 100% in our study) of patients with DTB. The rate of cure was lower in the people with concurrent PTB in our study. This is expected since patients with predominantly extrapulmonary forms of TB may be unable to produce sputum during treatment follow up to enable confirmation of TB cure. From this study, it is evident that patients with concurrent PTB and EPTB were more likely to be assigned "treatment completion" as opposed to cure. The study had limitations. I had a small number of cases with concurrent PTB and EPTB which limited my ability to construct a robust model for predictors of concurrent PTB and EPTB. I also did not evaluate some biomedical differences such as anemia, organ dysfunction, and clinical symptoms. These were not consistently documented in the charts.

CONCLUSION

Concurrent PTB and EPTB are common in Jinja, particularly among TB/HIV co-infected persons. Concurrent PTB and EPTB were associated with a greater mortality rate. These findings emphasize the need of detecting tuberculosis early in persons with comorbidities before it spreads. More research is required to determine the diagnostic accuracy of chest imaging in cases of concurrent PTB and EPTB.

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