

Influential Factors in TB/HIV Co-Infection Among HIV-Positive Patients at Jinja Regional Referral Hospital, Uganda

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ABSTRACT

Tuberculosis (TB) is a highly infectious disease caused by *Mycobacterium tuberculosis*, predominantly affecting the lungs and leading to a range of debilitating symptoms. It is a global health concern, with a significant impact on mortality. This study aimed to assess the prevalence of TB among HIV-positive patients attending the ART clinic at Jinja Regional Referral Hospital, Uganda. A cross-sectional study involving quantitative and qualitative data collection methods was conducted. The study found that over half of the participants tested positive for TB. Additionally, ART adherence was suboptimal, with various factors, including transportation challenges and lack of support from immediate contacts, influencing adherence levels. These findings highlight the importance of addressing the co-epidemics of HIV and TB in Uganda, emphasizing the need for improved healthcare infrastructure and social support for HIV-positive individuals.

Keywords: Tuberculosis, HIV infection, ART, *Mycobacterium*.

INTRODUCTION

Tuberculosis (TB) is an infectious disease of humans and animals caused by a species of *Mycobacterium*, usually *Mycobacterium tuberculosis*, mainly infecting the lungs where it causes tubercles characterized by the expectoration of mucus and sputum, fever, weight loss, and chest pain, and transmitted through inhalation or ingestion of the bacteria [1, 2]. It is the most common cause of infectious disease-related mortality worldwide [3]. *Mycobacteria* such as *Mycobacteria tuberculosis* are aerobic, non-spore-forming, non-motile facultative, curved intracellular rods measuring 0.2-0.5 micrometres by 2-4 micrometres. Their cell walls contain the mycolic, acid-rich long-chain glycolipids and phospholipoglycans (macrolides) that protect *mycobacteria* from cell lysosomal attack and also retain red basic fuchsin

dye after acid rinsing- acid-fast stain [4-6].

Globally, more than 1 in 3 individuals is infected with TB [7]. According to WHO, there were 8.8 million incident cases of TB worldwide in 2010, with 1.1 million deaths from TB among HIV seronegative persons and an additional 0.35 million deaths from HIV-associated TB [8]. Also, Risk factors of tuberculosis include alcoholism, diabetes mellitus (DM), Human Immunodeficiency Virus (HIV) infection, age below 5 years, and immunosuppressive therapy [9]. According to Wang and Shen. [10] who conducted a study in China, smoking is one of the risk factors and Smokers who develop TB should be encouraged to stop smoking to decrease the risk of relapse. In African, Sub-Saharan immunocompromised persons; the pulmonary lesion healed in 90% of the

cases, but in 10%, patients develop active TB. Also, Chai et al. [11] found out that after contamination, *M. tuberculosis* multiplies slowly in the lungs and this represents primary infection. This is due to the ability of Mycobacterium tuberculosis to survive and proliferate within the mononuclear phagocytes, which ingest the bacterium, Mycobacterium tuberculosis is able to invade the local lymph nodes and spread to the extra-pulmonary sites causing TB meningitis, TB adenitis, spinal TB, gonadal TB, gastrointestinal TB, among others. [12-15]. In Uganda, the World Health Organization (WHO) estimates of TB mortality, prevalence and incidence rates in the country have declined from 50,492 and 624 per 100,000 Population in 1990 to 13, 175 and 179 per 100,000 Population, in 2012 [16]. However, an accurate estimate of TB prevalence or mortality is not available due to weaknesses in surveillance and vital registration limiting the certainty of firm conclusions. Nonetheless, by 2016; about 1.4 million Ugandans were living with HIV and about 28000 died of AIDS-related sicknesses[7]. Human Immunodeficiency Virus (HIV) is a blood-borne, mainly sexually transmitted virus that progressively destroys the body's immune system and can lead to Acquired Immunodeficiency Syndrome-AIDS [17, 18]. HIV can be transmitted through unprotected sexual intercourse (vaginal or anal), oral sex with an infected person, transfusion of contaminated blood and sharing contaminated sharp instruments [19, 20]. It may also be transmitted between a mother and her infant during pregnancy, childbirth and breastfeeding (Mother-To-Child-Transmission, MTCT)[21-23]. According to the some studies, co-infection with other viruses which share similar routes of transmission such as Hepatitis B, Hepatitis C, and Human Herpes Virus 8 (HHV8), also known as Kaposi Sarcoma Herpes Virus (KSHV) is common[24]. HIV is found in the body fluids of infected persons such as semen and vaginal fluids, blood and breast milk [25]. Two distinct species of HIV (HIV-1 and HIV-2) have

been identified and each is composed of multiple sub-types or clades [26, 27]. HIV-1 probably originated from one or more cross-species transfers from chimpanzees in central Africa. HIV-2 is closely related to viruses that infect the sooty Magabeys in West Africa [27].

The HIV/AIDS pandemic has caused a resurgence of TB, resulting in increased morbidity and mortality worldwide [28]; HIV and Mycobacterium tuberculosis have a synergistic interaction; each increases the progression of the other. According to the recent estimates by the WHO and Joint United Nations Program on HIV/AIDS (UNAIDS), nearly 39.4 million people are living with HIV/AIDS, worldwide; more than half of them in sub-Saharan Africa and nearly a fifth in South and South-East Asia [29]. In Uganda though there has been a decline in TB- HIV co-infection from 54% in 2011 to 49% in 2013, HIV infection rates remain seven times higher among TB patients (49%) than in the general population (7.3%). An estimated 1.4 - 7% of adults and up to 9.5% of children living with HIV had prevalent TB [15]. The WHO estimates that in 2012 there were about 1,000 (660-1,300) cases of Multi-Drug Resistant TB (MDR-TB) in Uganda and that about 19% of retreatment patients notified in 2012 were tested for Drug Sensitive TB (DSTB); 89 confirmed MDR-TB cases were notified to the NTL. WHO estimates of MDR are based on a recent national survey which showed that the proportion of new and retreatment cases that were MDR-TB was 1.4% and 12.1%, respectively [30]. In Jinja Regional Referral Hospital, information accessed from the medical records shows since March 2015, the incidence of TB in HIV-seropositive patients is on the rise. There exists no comprehensive study documenting the prevalence of TB among HIV-seropositive persons attending the facility and the cause of the increasing number despite the interventions in place. This study therefore intends to determine the prevalence of TB among the HIV sero-positive patients attending the ART clinic at Jinja Regional Referral Hospital (JRRH), Jinja District to aid in

METHODOLOGY

Study Design

A descriptive cross-sectional study design using both quantitative and qualitative data collection methods was employed in this study.

Area of Study

The proposed study took place in JRRH HIV/Tuberculosis Clinic-Jinja Municipality. Jinja is one of the cities in Eastern Uganda. The City is approximately 56 kilometres west of Mukono City. This is approximately 230 kilometers (140 mi), by road, east of Kampala, Uganda's capital and largest city. The coordinates of the town are 0°41'34.0"N, 34°10'54.0"E (Latitude: 0.692780; Longitude: 34.181655). The coordinates of the hospital are 0°41'42.0"N, 34°11'16.0"E (Latitude: 0.695000; Longitude: 34.187766). The study is to be carried out in the JRRH ART clinic. The institution is a public government aided. The hospital facilities include general surgery diagnostics, obstetrics/gynaecology, medicine, and paediatrics. There are operating theatres but not all of them may be functioning at any given time. The facility also has administrative departments and quarters for the staff.

Study Population

Jinja district had a population of about 471,242 with 230,189 males and 241,053 females. (The National Population and Housing Census 2014-Area specific profile series, 2014). The predominant population is Basoga. However other tribes include, Baganda, Banyankole, Bakiga, Bagishu, Indians and others. The study population included the patients receiving ART at Jinja Regional Referral Hospital.

Inclusion criteria

HIV patients on ART who attended the ART clinic at JRRH and had consented to participate in the study.

Exclusion criteria

All HIV patients were absent even after they consented, especially critically. HIV-positive patients who had not yet been initiated on ART.

Determination of sample size

Kish Leslie's formula[31] was used since the catchment population of the art clinic at JRRH was not known.

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where;

n = minimum sample size required.

Z = standard normal deviation set at 95% confidence level corresponding to 1.96

P = expected prevalence (portion)

d = acceptable marginal error.

In a study conducted about poor adherence among adolescents in Kabale Hospital, (Ignatius Wadunde, 2018), the prevalence of poor adherence was at that facility found to be 21%. And being a related study, p was estimated to be 21% Z is 1.96,

d is 5%

$$n = \frac{(1.96)^2(0.21)(1-0.21)}{(0.05)^2} = 160 \text{ patients}$$

Sampling technique

A simple random sampling method was used to get respondents to avoid bias. Small covered papers with yes and no were given to the members of the study population. Those whose papers bear 'yes' upon opening and have consented will actively participate in the study. For health workers to be interviewed, a purposive sampling technique was used where workers on duty were selected to take part in the study. All health workers present had a chance to take part in the study.

Data collection method

A standard structured and semi-structured questionnaire was designed and pre-tested for validity and reliability at Jinja Regional Referral Hospital HIV/Tuberculosis clinic before being used for data collection. Respondent bias and researcher bias would be checked by comparing data with the one summarized in the literature review, documented in chapter two.

Proofing and Data Analysis

All data collections were reviewed at two levels prior to data entry into the research database and upon entry prior to analysis.

The data collection and entry process is planned in such a way that all data collection sheets completed in a day are reviewed and entered on the same day. Data was analyzed using a statistical package of social scientists (SPSS), a Microsoft Excel spreadsheet and information summarized in the form of graphs and tables to give descriptive statistics as per the theme of the study in one way or another.

Quality assurance and quality control

Quality assurance started with the recruitment of a qualified research assistant, appropriate training and orientation of the interviewers before the survey for example when reading the questions:

Questions are to be read exactly as they were written.

Questions are to be read at normal speed (not too fast nor too slow).

Only questions relevant to the respondents would be asked (skip rules are to be followed)

The exact answers of the respondents are to be coded, interviewers are not allowed to interpret responses. Where the respondents had difficulty understanding the questions: the question or part of it is repeated, and probing is used according to the general instructions that are given.

The appearance and behaviour of the interviewers were professional; none showed any reactions to the respondents' answers. Pre-testing of the tools was done and data management is to be executed professionally. Respondent bias and researcher bias were checked by random selection of eligible patients.

Ethical considerations

Patients were included in the study upon giving informed consent for participation. Patients below 18 years, if any; had their consent obtained from their parents/guardians or by proxy.

RESULTS

Table 1: Socio-demographic characteristics of the Study Participants

Variables	Frequency (n=160)	Percentage (%)
Patient's Age		
15-20 yrs	18	11.3
21-25yrs	18	11.3
25-30yrs	19	11.9
31-40yrs	45	28.1
41-50yrs	60	37.5
Gender		
Male	75	46.9
Female	85	53.1
Marital Status		
Married	90	56.2
Single	32	20.0
Widow/widower	19	11.9
Divorced	19	11.9
Education Level		
≤Primary level	75	46.9
≥Secondary	85	53.1
Occupation		
Employed	111	69.3
Unemployed	49	30.7
Religion		
Muslim	70	43.8
Christian	90	56.2

The prevalence of tuberculosis among HIV seropositive patients attending the ART clinic at Jinja Regional Referral Hospital (JRRH), Jinja District

According to the study findings, the majority 56.9% of the study participants

had a positive TB test as reflected on patient documentation (test results) with someone while 43.1% had never.

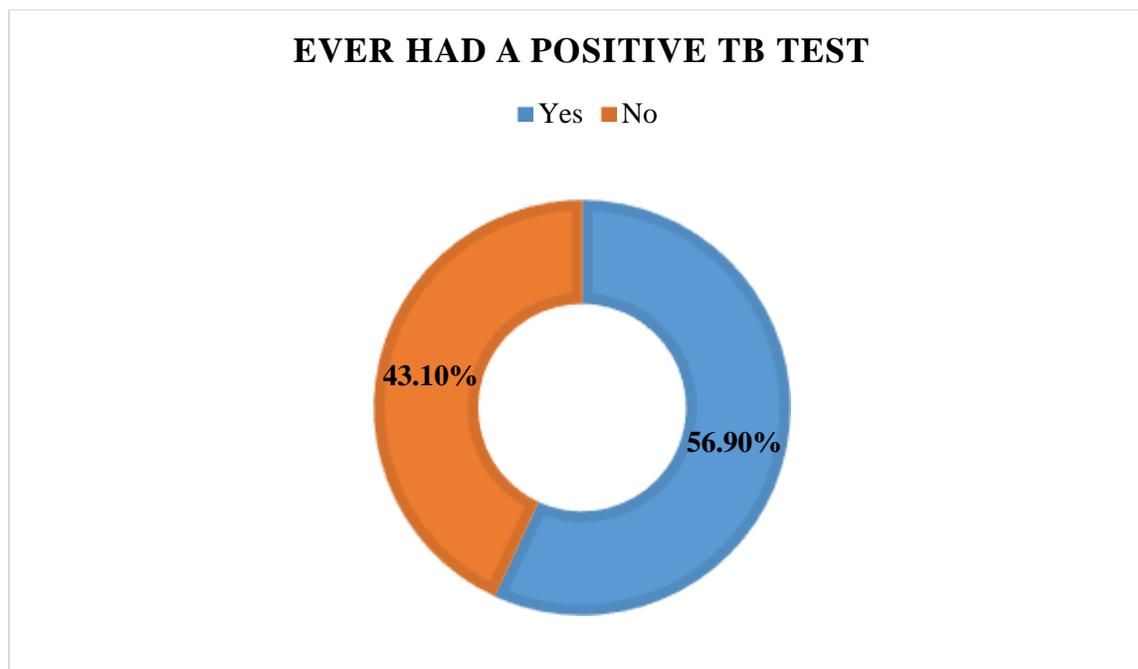


Figure 1: The prevalence of tuberculosis among HIV seropositive patients attending the ART clinic at Jinja Regional Referral Hospital (JRRH), Jinja District.

The Level of ART Adherence among HIV Seropositive Patients Attending ART Clinic at Jinja Regional Referral Hospital (JRRH), Jinja District

The majority 138(86.3%) of the Respondents report taking their medicine once daily compared to 22(13.8%) who are supposed to take it twice a day. Of these, 95(59.4%); the majority reported following the timing and other recommendations like taking the medicine after eating food every time they take them compared to 29(18.1%) who only do it sometimes but not always. The majority 48(30%) reported having never missed taking their drugs

within the last two weeks whereas a considerable number, 47(29.4%), 43(26.9%) and 22(13.8%) have missed taking their drugs (ART) twice, once and \geq times within the last two weeks prior to the study. These gave reasons ranging from; the majority 46(28.8%) who forgot, whereas 44(27.5%) and 40(25%) who lacked transport to go for refill and missing drugs respectively compared to 7(4.4%) who were busy enough to take drugs. However, the majority 107(66.9%) realized it was wrong to miss taking their drugs.

Table 2: The level of ART adherence among HIV seropositive patients attending the ART clinic at Jinja Regional Referral Hospital (JRRH), Jinja District

Variables	Frequency(n=160)	Percentage(%)
How often are you supposed to take your drugs?		
Once a day	138	86.3
Twice a day	22	13.8
Do you follow the timing and other recommendations like take after eating food?		
YES Every time	95	59.4
Most times	36	22.5
Sometimes	29	18.1
For the past two weeks, how many times have you missed taking your drugs?		
Non	48	30.0
Once	43	26.9
Twice	47	29.4
Four Times	7	4.4
Six Times	7	4.4
Seven Times	8	5.0
What was the reason for missing your doses?		
No refill due to lack of transport.	44	27.5
I was busy	7	4.4
I forgot.	46	28.8
Other reasons	23	14.4
Missing	40	25.0
Is it wrong to miss taking your drugs?		
Yes	107	66.9
No	53	34.2

The social demographic factors affecting ART adherence among HIV seropositive patients attending ART clinic at Jinja Regional Referral Hospital (JRRH), Jinja District

According to the analysis, the Majority 80(50%) of the study participants, a considerable number of 31(19.4%) and 23(14.4%); stayed >10km and 8-10 km from JRRH respectively and the minority 8(5.0%) come from 4-6km from the hospital. Therefore, the majority 88(55%) use a taxi, and only 14(8.8%) walk from home to the hospital; and the majority 108(67.5%) spend between 1000 to 2000

ugx compared to Only 13(8.1%) who spend more than 10,000 to access the hospital. Furthermore, 91(56.9%) failed to get a refill due to lack of transport but the majority 143(89.4%) reported that friends, spouses and relatives are all aware that they are on and take ART and most of them 107(66.9%) reported encouraging contribution from these people around them compared to 18(11.3%) discouragement from their immediate persons towards taking ART/medicine. And a considerable number 35(21.9%) report a lack of care from their immediate persons.

Table 3: The social demographic factors affecting ART adherence among HIV seropositive patients attending the ART clinic at Jinja Regional Referral Hospital (JRRH), Jinja District

Variables	Frequency (n=160)	Percentage (%)
Distance between where you stay and JRRH		
1-2km	80	50.0
2-4Km	18	11.3
4-6km	8	5.0
8-10km	23	14.4
>10 km	31	19.4
Means of transport do you use from home to JRRH		
Walkable	14	8.8
Bodaboda	58	36.3
Taxi	88	55.0
Expenditure on transport from home to JRRH		
1,000-2,000	108	67.5
2,000-5,000	11	6.9
5000-10,000	28	17.5
more than 10,000	13	8.1
Failed to get a refill because of lack of transport		
Yes	91	56.9
No	69	43.1
Friends, spouse, & relatives are aware you take ART		
Yes	143	89.4
No	17	10.6
Their contribution toward taking ART		
ENCOURAGE	107	66.9
DISCOURAGE	18	11.3
DON'T CARE	35	21.9

DISCUSSION

According to the study findings, the majority 56.9% of the study participants had a positive TB test as reflected on patient documentation (test results). This is a bit lower but complements previous studies in some parts of sub-Saharan Africa, up to 70% of TB patients are co-infected with HIV. Similarly, it adds to the reports that estimated that up to 33% of all AIDS deaths worldwide can be directly attributed to TB. In sub-Saharan Africa, this increases to 50% [32]. The prevalence of HIV among TB patients notified to the national TB program has stabilized around 50% since 2009 [32]. Nonetheless, a few studies conducted in limited settings in Uganda, showed that the prevalence of TB among people living with HIV ranged between 5.5%-7.2%[33, 34]. Likewise, Birlie et al.[35] findings showed that TB-related deaths among people living with HIV were three times

more than those in non-HIV-infected persons. This increased proportion of coinfection diagnosed could be due to improved campaigns and testing services availability and affordability by the patients at the facility. The level of ART adherence among HIV seropositive patients attending the ART clinic at Jinja Regional Referral Hospital (JRRH), Jinja District. According to the study findings, adherence stands at 86.3%. This is a low level of adherence compared to the Achappa et al., [36] recommendation of ≥95% adherence and slightly comparable to the 87.1% reported by Nabukeera, et al., [37] among adolescents in Uganda found out that adolescents. Similarly, as reported by Adegoke & Nkosi, [38] adherence < 95% in ART has been associated with treatment failure and the risk of developing resistance is also as high as 80 to 90%. And 59.4%; the

majority reported to follow the timing and other recommendations like taking the medicine after eating food every time they take them compared to a few (18.1%) who only do it sometimes but not always. This is also better than that in a study by Kardas et al, [39] who reported drug adherence of greater than 55-77% to be a good one compared to the general public ranging from 30 to 50% adherence. On the contrary, 30% reported having never missed taking their drugs within the last two weeks a considerable number, 47(29.4%), 43(26.9%) and 22(13.8%) have missed taking their drugs (ART) twice, once and \geq times within the last two weeks prior to the study. These gave reasons ranging from; the majority 46(28.8%) having forgotten, whereas 44(27.5%) and 40(25%) lacked transport to go for refill and missing drugs respectively compared to 7(4.4%) who were busy enough to take drugs.

The social demographic factors affecting ART adherence among HIV seropositive patients attending ART clinic at Jinja Regional Referral Hospital (JRRH), Jinja District

According to the study findings, the majority (37.5%) of the study participants are aged between 41-50 years, with the least being those between the age groups of 15-20 years and 21-25 years each with at least 11.3%. More so, 53.1% were females, and males were 46.9%. also, 56.2% were married, 20%, and the rest were either divorced (11.9%) or widowed (11.9%). This agrees with a study by Eyassu et al., [40] who reported that women had better adherence than males. It was found that women had better healthcare-seeking behaviour than males including attending voluntary testing and counselling thus a better adherence. Furthermore, Despite Half (50%) of the

participants staying 1-2km from the hospital, 19.4% and 14.4% stay >10km and 8-10 km from JRRH respectively and the majority 55% use a taxi, and only 18.8% walk from home to the hospital; 67.5% spend between 1000 to 2000 ugx every refill. This could be the reason for some of the patients failing to refill owing to distance and the associated fees, as reported by other studies including Eyassu et al., [40] that Even though ART is accessed free of charge in Uganda, distance to health centres is an important barrier to adherence as it takes extra time and cost to access ART; which is a problem commonly faced by patients living in rural areas. However, a study showed no relationship between distance from the health centre to home and ART adherence thus more than half of the study participants (56.9%) failed to get a refill due to lack of transport. Despite 89.4% reporting that friends, spouses and relatives are all aware that they are on and take ART. This is in congruence with a study, by Peltzer et al., [41] in which a positive association between optimal adherence and social support. Most of the patients (66.9%) reported encouraging contributions from the people around them compared to 11.3% who reported discouragement from their immediate persons towards taking ART/medicine as well and a considerable number (21.9%) reported a lack of care from their immediate persons. This could be the reason for the observed <95% adherence to ART which complements Mengwai, et al., [42] in which patients who failed to disclose their status to friends, colleagues their sexual partners as a measure to secure their lively hood, couldn't take their medications in their presence hence poor adherence.

CONCLUSION

The study revealed a significant prevalence of TB among HIV-positive patients in the ART clinic at Jinja Regional Referral Hospital, indicating the ongoing burden of these co-epidemics in Uganda. Moreover, ART adherence among these patients was found to be suboptimal,

which raises concerns about the effectiveness of treatment and the potential for drug resistance. To combat these challenges, a comprehensive approach involving better access to healthcare facilities, improved transportation options, and increased

social support is crucial. The study underscores the importance of ongoing

efforts to reduce the impact of HIV and TB in Uganda.

RECOMMENDATIONS

The Ugandan healthcare system should prioritize early and accurate diagnosis of tuberculosis (TB) among HIV-positive individuals, focusing on strengthening diagnostic services and promoting regular screening. Improved transportation accessibility should be provided to reduce barriers to treatment, especially in remote areas. Social support programs should be implemented to educate and motivate patients to adhere to their ART regimens, improving health outcomes. Public health campaigns should educate the community about the risks of TB and HIV, highlighting the importance of timely testing and treatment adherence. Continuous monitoring and research are

crucial to track TB prevalence and adherence to ART, guiding policy decisions and targeted interventions. Integrating TB and HIV services can lead to more efficient diagnosis and treatment strategies. Policymakers should review existing policies and guidelines related to HIV and TB co-infection management to reflect current challenges and opportunities for improvement. Addressing the co-epidemics of TB and HIV requires a concerted effort from healthcare providers, policymakers, and the community to reduce the burden of these diseases and improve the quality of life for affected individuals.

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