Evolution of Occurrence and Factors associated with Tuberculosis amid HIV Positive Adults Attending ART Clinic in Amuria District

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ABSTRACT
The prevalence of TB is increasing in many countries and is the leading infectious cause of death worldwide. Infection with HIV likewise, has emerged as the most important predisposing factor for developing TB in people co-infected with Mycobacterium tuberculosis. The objective of study was to determine the prevalence and factors associated with Tuberculosis among HIV positive adults attending ART clinic in Amuria health Centre IV in Amuria district. A cross sectional study design, descriptive in nature was used in which a total of 150 clients participated. Majority of participants were aged 30-40 with 36%, of this patients, 97(64.67%) were female and 53(35.3%) were males. TB incidence was 7.33% males were sputum positive and sputum positive females were 5.33% which totaled to 12.66% positive respondents. Among the social exposure characteristics, exposure characteristics, 60.67% responded yes to asked questions and 39.33% replied no to the questions with 28% in smoking cigarettes. Environmental factors, overcrowding showed highest percentage (16%), followed by non-permanent housing (15.33%). The findings highlight, occupation, age (31-50), low education level, smoking status, alcohol intake, and overcrowding, unemployment associated with TB co infection. There is need for on-going educational, informational and other interventions to address the risk factors of tuberculosis in HIV Adults in order to decrease the rate of TB co-infection.

Keywords: Mycobacterium tuberculosis, co-infection, HIV, ART.

INTRODUCTION
Globally, it is estimated that 9.6 million people had Tuberculosis (TB) by 2014 and about 1.5 million death resulted from TB [1; 2; 3; 4; 5]. This infection with mycobacterium is very high with about 9 million new cases of active TB [6]. HIV has contributed to a significant increase in the worldwide prevalence of TB by producing a progressive decline in cell-mediated immunity [7; 8; 9; 10; 11], which has led to high prevalence of 14.8% of TB- HIV co-infection and as many as 50-80% having HIV co-infection in parts of sub-Saharan Africa [6]. According to 2012 roundup, the sum of 8.6 million prevalent cases of Tuberculosis (TB) globally, and 9400000 deaths worldwide in 2012 indicate burden of tuberculosis [12].

In sub-Saharan Africa, it is estimated that the highest burden of TB falls in 22 countries and contributes 80% of the world’s TB burden and this includes Uganda with an estimate of 65,000 cases [12]. TB cases make up 25/100,000 in HIV positive patients [12]. These have been ranked as the leading cause of death in HIV patients with high morbidities [13; 14; 15; 16; 17], many of whom die before TB is confirmed by laboratory methods [18; 19; 20; 21; 22]. According to research by WHO, South Africa has the third highest burden of disease in the world, after India and China, with an estimated prevalence of 450 000 cases of active TB in 2013, with an increase of 400% over the last 15 years [23; 24; 25; 26; 27; 28]. An estimated 60-73% of the 450 000 cases have both HIV and TB infection. Various literatures indicate that, being in bed ridden condition of the functional status among TB/HIV co-infected patients’ demonstrated
unsuccessful TB treatment outcome [29; 30; 31; 32; 33]. However, Uganda is ranked as 18th out of 22 tuberculosis high burdened countries in the world and is the major health problem in Uganda with an annual risk of TB infection 3% [34; 35; 36; 37]. Uganda’s TB prevalence rate was 179/100,000 in 2012 and 54% of TB patients were HIV positive [12].

The fight to end TB endemic is one of the main components of the global strategy to fight TB is the World Health Organizations’ (WHO) DOT Short-course regimen. The five central tenants of DOTS are; political commitment with increased and sustained funding, case detection through quality assured bacteriology, standardized treatment with supervision and treatment support, a continuous drug supply and management system, monitoring and evaluation system and impact measurement [6]. Uganda’s National TB Control Program officially follows WHO recommendations on DOTS (Western Zone National TB/Leprosy programme Uganda-Annual TB/Leprosy report, 2009), however the high prevalence and mortality discussed above suggest that the program is not working well, likely because of underfunding leading to gaps between official TB program guidelines and implementation in the districts. This has made TB control an ongoing challenge for Uganda and the MDGs has not been reached [12].

Mycobacterium tuberculosis typically affects the lungs (pulmonary tuberculosis) but can also affect other sites (Extra pulmonary tuberculosis) as well in the body [12]. TB interaction with HIV among HIV positive adults has been documented as the most public health challenges in sub-Saharan Africa [38]. Studies across regions have consistently documented high TB prevalence in the first months of ART [39; 40; 41]. By bacillus Mycobacterium tuberculosis (MTB) and Pulmonary tuberculosis (PTB) being the most common form of TB in humans occurring in over 80% of cases [42]. Done researches found out that even in HIV patients, PTB is still the commonest form of TB and presentation depends on the severity of immune suppression and clinical picture often resemble post primary PTB and later resemble primary PTB [43]. Sputum often appears positive for both early and late stages of HIV infection, chest x-ray appears early as cavities and late as infiltrations. Extra-pulmonary TB (EPTB) in HIV is usually pleural effusion, lymphnodes, pericarditis, military, meningitis and disseminated TB with mycobacteremia and these implies severe HIV disease according to WHO classification stage 4 [43]. Diagnosis of TB in HIV infected patient methods involves several methods which include sputum microscopy, Montoux skin test, and chest x-ray, culture [43]. And Microscopy can be used for TB diagnosis except in priority (risk) groups like; HIV positive patients, children < 14 years, pregnant and breastfeeding mothers, health workers, contacts with drug resistant TB patients, retreatment cases, patients from prisons or refugee camps, diabetics [44].

Several studies indicate that most drug regimen for co –TB and ART are based on rifampicin during the initial and continuation phase of TB treatment. The patient is put on an efavirenz-based ART regimen if it is started during TB treatment (NTLP., 2011). And examples of regimens include; AZT+3TC+EFV or AZT or d4T+3TC+NVP for adults and AZT+3TC+ABC for children.

**Problem Statement**

Tuberculosis (TB) infection in HIV positive adults remains a global health problem, causing morbidity and mortality which has greatly lowered life expectancy, reduced agricultural outputs and increased food insecurity [34]. This is indicated by a high prevalence rate with around 1.2 million cases of tuberculosis amongst people who are HIV-positive and about 400,000 people who die of HIV-associated tuberculosis [45]. In 2010, a higher estimate of 68% (22.9 million) were HIV cases yet it’s greatest predisposing co-factor to TB and
among this, 5% were adults cases despite control measures [6].
In Uganda, 2.3 million people are HIV infected [46]. TB prevalence rate which made up to 79/100,000 and 54% were TB-HIV co-infected [12]. However, Uganda as whole has set up programmer bodies (TASO, NTLP) which distribute free ARVs medications, Condons, TB drugs and preventive services to its citizens [47]. Despite the notable progress by government in providing free drugs, immunization policies in the last decades, tuberculosis is still a public health concern in most of the countries(WHO, 2014). The target by the SDGs to end the TB epidemic by 2030 is not yet achieved(G. T. WHO, 2015). Also the drawn plan to reduce TB prevalence for the period of 2016-2020 is not yet accomplished [23]. However, no clear documented studies have been carried out to determine TB prevalence, integrating social-economic and environmental in Amuria health Centre IV which study would help health system put effective control measures and Amuria community.

Aim of the Study
To assess the prevalence and factors associated with Tuberculosis among HIV positive adults attending ART clinic in Amuria health Centre IV in Amuria district.

Specific objectives
1. To determine the prevalence of pulmonary tuberculosis among HIV positive adults attending ART clinic in Amuria health Centre IV in Amuria district.
2. To assess the social factors that predispose to the prevalence of tuberculosis among HIV positive adults attending ART clinic in Amuria health Centre IV in Amuria district.
3. To assess environmental factors associated with TB spread among HIV positive adults attending ART clinic in Amuria health Centre IV in Amuria district.

Research questions
1. What is the prevalence of pulmonary tuberculosis among HIV positive adults attending ART clinic in Amuria health Centre IV in Amuria district?
2. What are the social factors that increase the prevalence of Tuberculosis among HIV positive adults attending ART clinic in Amuria health Centre IV in Amuria district?
3. What are the environmental factors associated with TB spread among HIV positive adults attending ART clinic in Amuria health Centre IV in Amuria district?

Significance
The results of this study will help the ministry of health and other health organizations to identify knowledge gaps on TB incidence and associated factors. To academic body, findings will help Clinicians in the management of HIV patients. The results of this study will be used as reference point for future researches in the medical field. It will also encourage hospital administrators to strengthen health education programs in Amuria health Centre IV.
To the community, Study findings will serve as reference for health sub-district team when planning and for TB/HIV intervention activities.

METHODOLOGY

Study area
The study was carried out in Amuria health Centre IV in Amuria district, Uganda. Amuria health Centre IV is government hospital. Amuria district is located in the Eastern region of Uganda which predisposes dwellers to a number of risk factors, to TB transmission.

Study design
The across sectional study was used, that was descriptive in nature which enabled the researcher to study well the patients attending ART clinic with the help of questionnaire.

Study population
The study included all the HIV positive adults aged 18 and above attending ART clinic on designated ART days of Thursday and Friday according to the health Centre ART program who consented to participate in exercise.
Inclusion criteria.
All the HIV positive adult patients attending and receiving ART in Amuria health Centre IV and all new cases within two month of study were included and recorded. Any clinical suspicion of TB was screened by bacteriology (ZN staining and microscopy).

Exclusion criteria
All patients who declined to participate in the study.

Sample size determination
The sample size was determined by \[ n = \frac{z^2pq}{d^2} \]
When \( n \) = designed sample size.
\( z \)= Standard deviation at the desired degree of accuracy which is 95% \( z = 1.96 \).
\( p \)=proportion of target population estimated to have similar characteristic .50 \%( constant) or 0.5 is to be used therefore \( p=0.5 \) because of unknown incidence of which is being measured.
\( q \)=Standard 1.0 -p =0.5.
\( d \)=Degree of accuracy. 8.0 \% will be used.
On substituting the above formula,
\[ 1.96^2 \times 0.5 \times 0.5 \]
Hence, \( n = 150 \)

Method of Data Collection
A self-administered Questionnaire was filled with pertinent information from the case notes and was screened with laboratory analysis.

Data analysis and presentation plan
The data collected was computed using Microsoft excel. The analysis was made in line with the study objectives so as to achieve the purpose of the study and was summarized inform of tables, pie-charts, and narratives depending on the data analyzed.

Data quality control
To ensure quality control, I conducted a one day training for the two research assistants who there-after did field testing of the study tools. A total of four questionnaires were distributed for the pre-test with my close supervision.

Ethical consideration
Introductory letter was obtained from school of allied health sciences, KIU-WC, Consent was obtained from participants before interviewed, risks and benefits explained, plus confidentiality.

RESULTS
Social Demographic Characteristics
In this study a majority of the respondents Aged range 30-40 with 36%, followed by age group of 18 - 30 years (32.6) 41 - 50 with 16.67%, then 51-60 with 12% and least respondents, 4 (2.67%) were in the age groups of >60 years. Of the 150 respondents interviewed, 97(64.67%) were female and 53(35.3%) were males. A half the number of respondents (37.33%) were married, 49(32.67%) were single, 24 (16%) widowed and 15 (10%) had divorced, others were 4%. Among religion, most of respondents were christens (82.67%), then moslems with 10.67% and others 6.67%. Majority of the respondents were peasants (46%) followed by business persons with 30%. 11.3% were civil servants, 7.3% were students, while others were 3%. The most affected group was 31-40 with 4.67% followed by 41-50 with 4%. Among gender (sex) group, males were more 11 (7.33%) than female 8(5.33%). As in marital status, more cases were identified in the married i.e. 8(5.33%), next was widowed, 5(3.33%), the divorced were 3(2%), then other 2(1.33%) and singles 1(0.67%). In religious beliefs, Christians were more 14(9.33%) than Muslims which were 3(2%), others were only 2(1.33%). Generally, the most affected among occupational basis was business persons with 11(7.33%) followed by peasants with 8(5.33%). Primary education level merged high with 12(8%), followed by secondary level 4(2.67), then tertiary 3(2%).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>TB. Yes</td>
</tr>
<tr>
<td>1. AGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-30</td>
<td>49</td>
<td>04</td>
</tr>
<tr>
<td>31 - 40</td>
<td>54</td>
<td>07</td>
</tr>
<tr>
<td>41 - 50</td>
<td>25</td>
<td>06</td>
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<tr>
<td>51 - 60</td>
<td>18</td>
<td>2</td>
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<tr>
<td>60 and above</td>
<td>04</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>2. SEX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>53</td>
<td>11</td>
</tr>
<tr>
<td>Female</td>
<td>97</td>
<td>08</td>
</tr>
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<td>TOTAL</td>
<td>150</td>
<td></td>
</tr>
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<td>3. MARITAL STATUS</td>
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<td></td>
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<tr>
<td>Married</td>
<td>56</td>
<td>8</td>
</tr>
<tr>
<td>Single</td>
<td>49</td>
<td>1</td>
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<tr>
<td>Widowed</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>Divorced</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>06</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>4. RELIGION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christians</td>
<td>124</td>
<td>14</td>
</tr>
<tr>
<td>Moslems</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>150</td>
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5. Occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>45</td>
<td>30%</td>
</tr>
<tr>
<td>Student</td>
<td>11</td>
<td>7.33%</td>
</tr>
<tr>
<td>Peasant</td>
<td>69</td>
<td>46%</td>
</tr>
<tr>
<td>Civil servants</td>
<td>17</td>
<td>11.33%</td>
</tr>
<tr>
<td>Others</td>
<td>8</td>
<td>5.3%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>150</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

6. education level

<table>
<thead>
<tr>
<th>Level</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>78</td>
<td>52%</td>
</tr>
<tr>
<td>Secondary</td>
<td>45</td>
<td>30%</td>
</tr>
<tr>
<td>Tertiary</td>
<td>27</td>
<td>18%</td>
</tr>
</tbody>
</table>

Table 1: Socio-demographic characteristics of HIV patients attending art-clinic in Amuria health centre IV (Age, Sex, and Marital status and religion, education level, occupation distribution in the study.

The prevalence of TB among respondents in ART clinic of Amuria health center IV.

According to laboratory obtained in this study, 7.33% males were sputum positive and sputum positive females were 5.33% which totaled to 12.66% positive respondents.

Table 2: Table showing prevalence of TB among respondents

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSITIVE TB</td>
<td>19</td>
<td>12.66%</td>
</tr>
<tr>
<td>NEGATIVE TB</td>
<td>131</td>
<td>87.67%</td>
</tr>
</tbody>
</table>

Social factors associated with TB occurrence

In this study, TB showed greater association statically with following social factors (table 4); smoking cigarettes (28%), then alcohol intake (18.67%), and unemployment (14%).

Among the several respondents who were asked about their exposure characteristics, 60.67% responded yes to asked questions and 39.33% replied no to the questions.
Table 3: Social factors associated with TB occurrence (n=150)

<table>
<thead>
<tr>
<th>Social variable</th>
<th>Yes</th>
<th>%</th>
<th>No</th>
<th>%</th>
<th>frequency</th>
<th>Total percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking cigarettes</td>
<td>42</td>
<td>28%</td>
<td>26</td>
<td>17.33%</td>
<td>51</td>
<td>45.33</td>
</tr>
<tr>
<td>Unemployment</td>
<td>21</td>
<td>14%</td>
<td>14</td>
<td>9.33%</td>
<td>29</td>
<td>23.33</td>
</tr>
<tr>
<td>Take other drugs e.g. alcohol</td>
<td>28</td>
<td>18.67%</td>
<td>19</td>
<td>12.67%</td>
<td>32</td>
<td>31.34</td>
</tr>
<tr>
<td>Total</td>
<td>91</td>
<td>60.67%</td>
<td>59</td>
<td>39.33%</td>
<td>150</td>
<td>100%</td>
</tr>
</tbody>
</table>

Environmental factors associated with TB transmission

After performing the interview, overcrowding showed highest percentage (16%), followed by non-permanent housing (15.33%) then living with chronic cough patients (11.33%). However, a majority (18%) had rubbish pit (replied YES) and use borehole water (14%).

Table 4: Environmental factors associated with TB transmission (n=150)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>overcrowding</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>live with chronic cough patients (contact history)</td>
<td>17</td>
<td>11.33</td>
</tr>
<tr>
<td>origin of water used at home</td>
<td>21</td>
<td>14</td>
</tr>
<tr>
<td>Having rubbish pit at home (rubbish collection)</td>
<td>27</td>
<td>18</td>
</tr>
<tr>
<td>Type of housing</td>
<td>23</td>
<td>15.33</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td>100%</td>
</tr>
</tbody>
</table>
DISCUSSION

Socio-demographic characteristics
Among the social demographic characteristics of participants, more males 11(7.33%) were affected than female 8(5.33%), this is similar with other studies by [49] which identified males 7 (58.3%) and 5 (41.7%) females. This may be due to the general attitude of males towards indiscriminate sex especially when they move away from their families to do business. The educational level of most participants was low, as most (78, 52%) had attained only primary level education. This is similar to David et al. 2003 where most (822, 72%) had attained only primary education.

Prevalence of tuberculosis
This study investigated the prevalence of Tuberculosis among HIV/AIDS adults and out of 150 sputa samples examined microscopically with ZN staining, 19 were positive for acid fast bacilli giving prevalence rate of 12.66% which shows strong association between TB and HIV/AIDS in this area. This is similar to a research done in Obafemi Awolowo University Teaching Hospital Complex Oauthc, ILE -IFE where 12 (13%) were spueta positive for ZN staining and microscopy, WHO global TB report 11% per 1000 population and was different from a study carried out by soul city research unit, 2015 in south Africa which was 234.2 per 100 000 in 2012, 364.9 per 100 000 in the Northern Cape and 120.5 per 100 000 in Limpopo Province because of may be large sample size there and level of education. Male were more affected i.e.11 (7.33%) versus 8(5.33%), although no significant difference was highlighted.

Social factors associated with TB occurrence
Among the social factors related to TB-HIV co-infected cases, I assessed the association of TB in HIV individuals being related to smoking (28%), alcohol use (18.67%), this is in line with other studies [50;51;52;53;54;55]. Alcohol intake took 40.3% population that showed strong association between TB and Smoking, alcoholism, which is understandable because cachexia due to alcoholism predisposes individuals to low immunity and smoking destroys lung parenchyma giving chance for tuberculosis invasion.

Environmental Factors among HIV positive adults
Among environmental factors related to co-infection, an association was over crowding 16%, this was similar to a research done by [50] (out of 272 people, 20.2% had overcrowding). This is very true because the density of infected air droplets in the atmosphere, the duration of exposition and the degree of virulence of the particular species of tubercle bacilli increases with population according to [52]. Others identified factors included non-permanent housing (15.33%) then living with chronic cough patients (11.33%).

Strength and weakness
Despite the fact that sputa collected was not the best early morning sputum; however the dependent variable was captured. Bias might affect accuracy of the information related to some risk factors; even though the data were collected using of a structured questionnaire, one cannot discount the existence of social desirability therefore, it may limit the generalizability of results.

CONCLUSION
The study identified marital status, Type of occupation, age (between31-50), and low education level as the higher socio-demographic factors. Smoking status, alcohol intake, and overcrowding, unemployment, poor housing, poor hygiene and Cases that had a history of contact with a known tuberculosis patient were associated with TB/HIV co-infection adults. In general, clinical TB disease, smoking, overcrowding and alcohol
consumption were found to be the main predictors for TB/HIV co-infection.

**Recommendations**

- Amuria health center facility should put more emphasis on TB detection and immediate initiation of ant TB treatment of all cases detected.
- Positive HIV adults should be provided with health education on opportunistic infections like tuberculosis in every health facility and in the community by health professionals.
- The government should focus on improving the educational status of the community as it would greatly helpful in decreasing the emergence of active tuberculosis in HIV patients.
- Smear-positive TB patients are responsible for TB transmission, therefore the MOH, stakeholders should avail equipment’s for TB diagnosis in all health facilities.
- Further studies not included in this study should be carried out in other parts of district including other small health centers to create awareness TB.

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