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Prevalence and Determinants of Human Immunodeficiency Virus and Tuberculosis Co-Infection at Kampala International University Teaching Hospital

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ABSTRACT

Worldwide, tuberculosis (TB) was one of the top 10 causes of death, and the leading cause from a single infectious agent above HIV/AIDS. Millions of people continue to fall sick with the disease each year. Not less than one-third of people living with HIV are also infected with TB. At autopsy, studies have found that 30 – 50% of patients have evidence of TB. By the year 2013, about a quarter of all TB deaths occurred in HIV-positive persons and TB was the leading cause of death in those that had HIV. In sub-Saharan Africa, about 41% of HIV patients have TB. TB incidence still being high, especially among the HIV infected and the prevalence of TB/HIV co-infection was largely unknown, particularly in developing countries, including Uganda all but fuels the need for this study. To assess the prevalence and determinants of TB-HIV co-infection among HIV-positive patients attended at KIUTH. A review of the data study that included 500 patient records was included for this study. 37 out of 500 patient records recorded TB-HIV coinfection. This made a prevalence of 7.4%. Sex, marital status, employment status, household income, residence and history of alcohol or smoking were found significant whereas age (p-value: 0.5621) and education (p-value: 0.08180) were found to be insignificant. The prevalence of HIV-TB coinfection was high with sex, patients, marital status, employment status, household income, residence and history of alcohol or smoking found to be significant. In contrast, age and education were found to be insignificant determinants. TB-HIV coinfection was found to have a poorer patient outcome with increased mortality among those who were TB-HIV co-infected. Awareness-creation on the adverse effects of TB-HIV coinfection needs to be up-scaled.

Keywords: Tuberculosis, HIV-positive, TB-HIV co-infection, Marital status, sub-Saharan Africa.

INTRODUCTION

Worldwide, tuberculosis (TB) is one of the top 10 causes of death, and the leading cause from a single infectious agent (above HIV/AIDS); millions of people continue to fall sick with the disease each year [1, 2]. In 2017, TB caused an estimated 1.3 million deaths (range, 1.2–1.4 million) among HIV-negative people, and there were an additional 300, 000 deaths from TB (range, 266 000–335 000) among HIV-positive people. There were an estimated 10.0 million new cases of TB (range, 9.0–11.1 million), equivalent to 133 cases (range, 120–148) per 100,000 Population [3]. TB affects all countries and all age groups. Not less than one-third of people living with HIV are also infected with TB [4]. At autopsy, studies have found that 30 – 50% of patients have evidence of TB. By the year 2013, about a quarter of all TB deaths occurred in HIV-positive persons and TB was the leading cause of death in those that had HIV [3]. In sub-Saharan Africa (SSA), about 41% of HIV patients have TB. In 2011 alone, 400,000 of 1.4 million TB deaths occurred in HIV-infected individuals and the United States of America (USA), there were 10,521 TB cases 7.9% of whom were also HIV positive [5]. Uganda is one of the world's 22 high-burden countries with TB. The country has an estimated annual risk of infection (ARI) of 3% equivalent to 150-165 new smear-positive TB cases per 100,000 Population per year or 300-330 total TB cases per 100,000 per year. Uganda is yet to attain the global case detection and treatment success targets of 70% and 85% respectively. In 2003, the country detected 52% of the expected new smear-positive cases. Of these cases, 67.6% were successfully treated [6]. Studies have shown that HIV kills TB-specific CD4 T- cells impairs macrophage activation and reduces the number of lung-homing CD4 cells [7-10]. Furthermore, there is a resultant defective granuloma formation with subsequent loss of control of the infection. HIV infection is the leading risk factor for TB; HIV promotes the progression of latent or recent infections of Mycobacterium tuberculosis to active disease and also increases the rate of recurrence of TB. People with HIV may also be more susceptible

to TB infection [11-14]. Other problems that have been seen in HIV/TB co-infection include well-studied facts that each disease makes the other worse [15, 16]. This has been attributed to the blow both diseases deal on the patient's immune defences as well as the synergistic adverse effects produced by anti-TB and anti-retroviral (ART) medications [17-20]. For instance, virtually all anti-TB and ART medications are injurious to the liver [21]. TB incidence still being high, especially among the HIV infected and the prevalence of TB/HIV co-infection is largely unknown, particularly in developing countries, including Uganda all but fuels the need for this study. Therefore, this study was designed to assess the prevalence and determinants of TB-HIV co-infection among HIV-positive patients attended at KIUTH.

METHODOLOGY

Study Design

A review of records retrospective study design was employed that made use of both qualitative and quantitative approaches.

Area of Study

The study was conducted at Kampala International University Teaching Hospital (KIUTH) TB and HIV clinics.

Study Population

HIV or TB-infected adults attended the HIV and TB clinics.

Inclusion Criteria

All files/records of adult HIV and/or TB patients attended to at the HIV and TB clinics within the study period.

Exclusion Criteria

All files/records of adult HIV and/or TB patients attended the HIV and TB clinics outside the study period.

Sample Size Determination

The sample size was determined using Fishers et al., [22] formula i.e., $N=Z^2PQ/D^2$:

Where;

N is the desired sample size

Z is the standard normal deviation taken as 1.96 at a confidence interval of 95%.

P is the prevalence of HIV-TB co-infection in Uganda taken as 50% [23]

D is the degree of accuracy= 0.05. Q= (1-P)

Therefore, $N= 1.96^2 \times 0.5\ (0.5) / (0.05)^2= 384.16$

Three hundred and eighty-four was the representative sample for the study but being a prevalence study, all files whose owners met the inclusion criteria were included for the study.

Sampling Procedures

A consecutive enrolment technique was used whereby patient files/records were used as their owners met the inclusion criteria.

Data Collection Methods and Management

Being a study that employed a review of records as its main data collection technique, a special checklist was used that facilitated the achievement of the study objectives. Information collected included age, gender, TB diagnosis, HIV diagnosis, duration since diagnosis, anti-TB and ART regimen currently on, duration since commencement of treatment, latest CD4 count and viral load measurement if available, and any other comorbidities or opportunistic infections present.

Data Analysis

Quantitative statistical data was entered into the EpiInfo software application and both univariate and multivariate analysis was done using SPSS version 17.0. Results were presented in tables, charts, graphs and narratives. Cut-off points were set based on percentage knowledge and attitude distributions and median scores obtained.

Quality Control

Data obtained was scrutinized for consistency and where any uncertainties arose clarifications sought. Only patient records that had been fully and properly filled were used for the study. In case of any gaps, clarifications were sought where possible failure to which that record was excluded from the study.

Ethical Considerations

Approval to conduct this study was obtained from KIU-IREC.

RESULTS

Factors Associated with HIV-TB Coinfection

Table 1: Factors Associated with HIV-TB Coinfection (N=500)

Variable	HIVTB Co-infected	Without Coinfection	P-value at 95% confidence/Odds ratio
1. Age (Years)			
18 – 27	6	45	p-value:0.5621
28 – 37	8	92	(insignificant)
38 – 47	10	222	
48 and above	13	104	
2. Sex			
Female	21	363	Odds ratio: 2.7657
Male	16	100	(significant)
3. Education			
None	13	230	P-value 0.0818
Primary	11	150	(insignificant)
Secondary	9	60	
Tertiary	4	23	
4. Marital Status			
Married	24	363	Odds Ratio 1.96663
Single	13	100	(Significant)
5. Employment			
Formally employed	10	163	Odds ratio 1.467
Unemployed	27	300	(Significant)
6. Household income			
Below 500K UGX monthly	25	374	Odds ratio 2.0171
Above 500K UGX monthly			(significant)
	12	89	
7. Residence			
Rural			
Urban			
	29	375	Odds Ratio 0.8817
8. Alcohol / Smoking	6	88	(significant)
Yes			
No			
	32	196	Odds Ratio 0.1165
	5	263	(Significant)

From the above results, it is evident that females were more affected by HIV than males; 76.8% as opposed to 23.2%. It is evident also that HIV-TB coinfections were more prevalent among females (56.76%) than males. Sex, marital status, employment status, household income, residence and history of alcohol or smoking were found significant whereas age (p-value: 0.5621) and education (p-value: 0.08180) were found to be insignificant. Females were thrice as likely to be TB-HIV co-infected (OR: 2.7657) as their male counterparts, those who were married (OR: 1.9666) were almost twice as likely to be TB-HIV co-infected compared to the singles, and those in some formal employment also almost twice as likely to be TB-HIV co-infected compared to the unemployed (OR: 1.467). This is baffling given the finding that those from households with a monthly income of less than 500K UGX were found to be more than twice as likely to be HIV-TB co-infected compared to those earning a monthly income of more than that. (OR: 2.0171). Furthermore, hailing from a rural area seemed to confer some protection in that they were less than half as likely to be TB-HIV co-infected as their urban counterparts were. (OR: 0.1165). In an also unlikely turn of events, alcohol intake or cigarette smoking also seemed to confer some protection in that those

with a history of indulging in the above were found to be less likely to be TB-HIV co-infected. (OR: 0.1165).

Effect of TB-HIV Co-infection on Overall Patient Outcome

Case mortality was used as a marker of overall disease outcomes among the population under study. Out of the 500 files reviewed spanning the study period, 24 were labelled as deceased. These made for a case-fatality rate of 4.8%. Out of the 24, a staggering 21 (87.5%) were found to have been TB-HIV co-infected. Only three of those who were deceased belonged to the non-co-infected cohort. The relative risk calculated is shown in the table below.

Table 2: Effect of TB-HIV Coinfection on Overall Patient Outcome

	Succumbed	Survived	Totals
TB-HIV Co-infected	21	16	**37**
Non-Coinfected	3	460	**463**
Totals	**24**	**476**	**500**

The TB/HIV co-infected were found to be at an increased risk of succumbing to their disease as compared to their non-co-infected counterparts (RR: 87.5946, 95% CI).

DISCUSSION

Prevalence of TB-HIV Coinfection

The prevalence of TB-HIV co-infection was found to be 7.4%. This value closely reflects the 8% tabled by the WHO [5] among 92 countries back in 2017 and is well within the 0 -15% range recorded among the European Union countries [24]. Though this value appears far lower than the 18.1% recorded in India by Tripathi et al. [25]. Differences in population size and dynamics may be the key contributory factor to this. It is also significantly lower than the 25.59% recorded in Ethiopia by Tesfaye et al. [26] and again this could be attributed to the limitation of the study population size brought about by financial and time limitations surrounding this study. Among bar attendees in the slums of Kampala, Uganda, the prevalence was 11.4% [27], a figure slightly higher than that recorded here. This slight difference could be a result of the differences in the study population and study area in that in our study data was obtained from records of patients attending a health facility whereas, in the Kampala study, primary data was utilized from the community level. This could allude to the number of cases that go unreported in the community since they don't reach the health facilities. Finally, in Bududa district the value of 5.9% [28] again could be a factor of differences in population dynamics and the method of data collection used.

Determinants of TB-HIV Coinfection

From the study findings sex, marital status, employment status, household income, residence and history of alcohol or smoking were found significant whereas age (p-value: 0.5621) and education (p-value: 0.08180) were found to be insignificant. To some degree, these findings mirror those of other studies conducted prior while to some other degree, they disagree with others. For instance, Melkamu et al. [29] found that being widowed/divorced and not attending formal education were strong determinants of TB-HIV coinfection whereas, in this study being married was found to be a significant determinant while education level was insignificant.

Effect of TB-HIV Coinfection on Overall Patient Outcome

From the findings of this study, TB-HIV coinfection had a worse prognosis compared to HIV infection alone. The TB-HIV co-infected had a higher risk of dying from the disease (RR: 87.5) than the non-coinfected. This agrees with so many other studies key among them being that by Sanhueza-Sanzana et al. [30] who reported mortality to be concentrated among the TB-HIV co-infected with increasing mortality being among women and indigenous populations.

CONCLUSION

The prevalence of HIV-TB coinfection was 7.4% with sex, marital status, employment status, household income, residence and history of alcohol or smoking found significant. In contrast, age and education were found to be significant determinants. TB-HIV co-infection was found to have a poorer patient outcome with increased mortality among those who were TB-HIV co-infected.

Recommendations

An upscale of awareness-creation and education on the effect of TB-HIV co-infection on overall patient outcomes as well as increased surveillance and screening to facilitate early recognition and treatment of cases to reduce mortality. More community outreach services are needed since not all cases reach the facility and may not be a true representation of the magnitude of the problem.

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