Evaluation 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 940000 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 has 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 as18[th] 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, lympnodes, pericarditis, military, meningitis and disseminated TB with mycobactereamia 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, Monteux 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 regimens for co –TB and ART are based on rifampicin during the initial and continuation phase of TB treatment. The patient is put on an efevarenz-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, Condoms, 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 HIV 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 [48]

$$n = \frac{z^2 pq}{d^2}$$

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,

$$\frac{1.96^2 \times 0.5 \times 0.5}{0.08^2}$$

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%).

Variable	Frequency					Percentage
	Total	TB. Yes	%	TB. NO	%	
1. AGE						
18-30	49	04	2.67	46	30.67	32.67%
31 – 40	54	07	4.67	45	30	36%
41 – 50	25	06	4	19	12.67	16.67%
51 – 60	18	2	1.33	16	10.67	12%
60 and above	04	1	0.67	3	2	2.67%
TOTAL	**150**					**100%**
2. SEX						
Male	53	11	7.33	42	28	35.33%
Female	97	08	5.33	89	59.33	64.67%
TOTAL	**150**					**100%**
3. MARITAL STATUS						
Married	56	8	5.33	48	32	37.33%
Single	49	1	0.67	48	32	32.67%
Widowed	24	5	3.33	19	12.67	16%
Divorced	15	3	2	12	8	10%
Others	06	2	1.33	4	2.67	4%
TOTAL	**150**					**100%**
4. RELIGION						
Christians	124	14	9.33	110	73.33	82.67%
Moslems	16	3	2	13	8.67	10.67%
Others	10	2	1.33	8	5.33	6.67%
TOTAL	**150**					**100%**

5. **Occupation**

Business	45	11	7.33	34	20	30%
Student	11	0	00	11	7.33	7.3%
Peasant	69	8	5.33	61	40.67	46%
Civil servants	17	0	00	17	11.33	11.33%
Others	8	0	00	8	5.33	5.3%
TOTAL	**150**					**100%**
6. education level						
Primary	78	12	8	66	44	52%
Secondary	45	4	2.67	41	27.33	30%
Tertiary	27	3	2	24	16	18%

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

VARIABLE	FREQUENCY	PERCENTAGE
POSITIVE TB	**19**	**12.66%**
NEGATIVE TB	**131**	**87.67%**

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)

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

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)

	frequency	Percentage (%)
• **over crowding**		
Yes	24	16
No	06	04
• live with chronic cough patients (contact history)		
Yes	17	11.33
No	13	8.67
• origin of water used at home		
Borehole water	21	14
Others	09	06
• Having rubbish pit at home (rubbish collection)		
Yes	27	18
No	03	02
• Type of housing		
Non permanent	23	15.33
Permanent	O7	4.67
Total	**150**	**100%**

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. The age distribution reveals highest prevalence to be in the age 31-40yrs (3.4%), which represent sexually active age group and correlates with work done by [49].

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 sputa 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 tubercle 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.

REFERENCES

1. Alejandro Álvaro-Meca., Asuncion Diaz, Javier de Miguel Díez, Rosa Resino, and S. R. (2016). Global, estimates on TB 2015 (9.6 million people had TB).

2. Molloy, S. F., Ross, B., Kanyama, C., Mfinanga, S., Lesikari, S., Heyderman, R. S., and Bicanic, T. (2021, April). Fungal burden and raised intracranial pressure are independently associated with visual loss in human immunodeficiency virus-associated cryptococcal meningitis. In Open forum infectious diseases (Vol. 8, No. 4, p. ofab066). US: Oxford University Press.

3. Chinedum, O. K., Ifeanyi, O. E., Emmanuel, A., Ndidiamaka, E. I., and Stella, E. I. (2018). A review on tuberculosis in human immunodeficiency virus infection. Int. J. Curr. Res. Med. Sci, 4(1), 51-80

4. Loevinsohn, G., Kigozi, G., Kagaayi, J., Wawer, M. J., Nalugoda, F., Chang, L. W. and Grabowski, M. K. (2021). Effectiveness of voluntary medical male circumcision for human immunodeficiency virus prevention in Rakai, Uganda. Clinical Infectious Diseases, 73(7), e1946-e1953.

5. Obeagu, E. I., Scott, G. Y., Amekpor, F., Ofodile, A. C., Edoho, S. H. and Ahamefula, C. (2022). Prevention of New Cases of Human Immunodeficiency Virus: Pragmatic Approaches of Saving Life in Developing Countries. Madonna University journal of Medicine and Health Sciences ISSN: 2814-3035, 2(3), 128-134.

6. WHO, G. (2011). World Health Organization (2011) Guidelines for intensified tuberculosis casefinding and isoniazid preventive therapy for people living with HIV in resource constrained settings.

7. Odo, M., Ochei, K. C., Obeagu, E. I., Barinaadaa, A., Eteng, U. E., Ikpeme, M. and Paul, A. O. (2020). TB Infection Control in TB/HIV Settings in Cross River State, Nigeria: Policy Vs Practice.

8. Ofor, I. B., Obeagu, E. I., Ochei, K. C., and Odo, M. (2016). Evaluation of lipids and protein profiles in tuberculosis (Tb) patients on antituberculosis therapy in general hospital Umuguma, Owerri. Int. J.

Curr. Res. Chem. Pharm. Sci, 3(2), 20-28.

9. Offie, D. C., Obeagu, E. I., Akueshi, C., Njab, J. E., Ekanem, E. E., Dike, P. N., and Oguh, D. N. (2021). Facilitators and Barriers to Retention in HIV Care among HIV Infected MSM Attending Community Health Center Yaba, Lagos Nigeria. Journal of Pharmaceutical Research International, 33(52B), 10-19.

10. Olusola-Falae, B., Obeagu, E. I., Odo, M., Ochei, K. C., Solanke, E. and Idaboh, T. (2016). Impact of community based tuberculosis care interventions on TB Case detection in Nigeria–What works and what does not. Int J Adv Multidiscip Res, 3, 30-39.

11. Obeagu, E. I., and Obeagu, G. U. (2015). Effect of CD4 Counts on Coagulation Parameters among HIV Positive Patients in Federal Medical Centre, Owerri, Nigeria. Int. J. Curr. Res. Biosci. Plant Biol, 2(4), 45-49.

12. WHO. (2013). World Health Organization (2010) Global tuberculosis control: a short update to the 2012 report,.

13. Ifeanyi, O. E., Obeagu, G. U., Ijeoma, F. O., and Chioma, U. I. (2015). The values of activated partial thromboplastin time (APTT) among HIV positive patients in FMC Owerri. Int J Curr Res Aca Rev, 3, 139-144.

14. Obeagu, E. I., Okoroiwu, I. L., Nwanjo, H. U., and Nwosu, D. C. (2019). Evaluation of interferon-gamma, interleukin 6 and interleukin 10 in tuberculosis patients in Umuahia. Ann Clin Lab Res, 7(2), 307.

15. Mercy, O., Ifeanyi, O. E., Vincent, C. C. N., and Prayer, N. (2020). Association of ABO blood group with HIV infection. J Infect Dis Med Microbiol, 1(1), 1-7.

16. Obeagu, E. I., Eze, V. U., Alaeboh, E. A., and Ochei, K. C. (2016). Determination of haematocrit level and iron profile study among persons living with HIV in Umuahia, Abia State, Nigeria. J BioInnovation, 5, 464-71.

17. Obeagu, E. I., Okoroiwu, I. L., Nwanjo, H. U., and Nwosu, D. C. (2019). Evaluation of haematological parameters of tuberculosis patients in Umuahia. Eur. J. Pharm. Med. Res, 6(7), 693-699.

18. Moore, D., Liechty, C., Ekwaru, P., Were, W., Mwima, G., Solberg, P., and Mermin, J. (2010). Prevalence , incidence and mortality associated with tuberculosis in HIV-infected patients initiating antiretroviral therapy in rural Uganda, (September 2009).

19. Obeagu, E. I., Okwuanaso, C. B., Edoho, S. H., and Obeagu, G. U. (2022). Under-nutrition among HIV-exposed Uninfected Children: A Review of African Perspective. Madonna University journal of Medicine and Health Sciences.2 (3), 120-127.

20. Jakheng, S. P. E., and Obeagu, E. I. (2022). Seroprevalence of human immunodeficiency virus based on demographic and risk factors among pregnant women attending clinics in Zaria Metropolis, Nigeria. J Pub Health Nutri. 5 (8), 137.

21. Akandinda, M., Obeagu, E. I., Madekwe, C. C., and Nakyeyune, S.

(2022). A Review On Factors Associated with HPV Vaccination in Africa. Madonna University journal of Medicine and Health Sciences ISSN: 2814-3035, 2(3), 1-5.

22. Ijeoma, O. L., Ifeoma, U. E., Emmanuel, O., Ifeanyi, A. U., and Andrew, A. (2014). Comparative study of Cd8+ T-Cell count and leukopoietin levels in human immunodeficiency virus infection in Umuahia, Nigeria. IOSR J Dental Med Sci, 13, 102-110.

23. WHO. (2014). World Health Organization (WHO) (2014) Geneva: WHO Global TB Report, Ethiopian Tuberculosis Profile.Addis Abeba, Ethiopia.

24. Obeagu, E. I., Esimai, B. N., Obeagu, G. U., Ochiabuto, O. M. T. B., Chukwurah, E. F., Ekelozie, I. S., and Ochei, K. C. (2020). Evaluation of Some Cytokines, CD4, Hepcidin, Iron Profile and Some Haematological Parameters of Pulmonary Tuberculosis Patients Coinfected with HIV in Southeast of Nigeria.

25. Obeagu, E. I., Ogbonna, U. S., Nwachukwu, A. C., Ochiabuto, O., Enweani, I. B., and Ezeoru, V. C. (2021). Prevalence of Malaria with Anaemia and HIV status in women of reproductive age in Onitsha, Nigeria. Journal of Pharmaceutical Research International, 33(4), 10-19.

26. Omo-Emmanuel, U. K., Chinedum, O. K., Michael, O., and Negedu-momoh, O. (2017). Evaluation of laboratory logistics management information system in HIV/AIDS comprehensive health facilities in Bayelsa State, Nigeria. Int J Curr Res Med Sci, 3(1), 21-38.

27. Leticia, O. I., Ugochukwu, A., Ifeanyi, O. E., Andrew, A., and Ifeoma, U. E. (2014). The correlation of values of CD4 count, platelet, Pt, Aptt, fibrinogen and factor VIII concentrations among HIV positive patients in FMC owerri. IOSR Journal of Dental and Medical Sciences, 13(9), 94-101.

28. Eguogwu, F. C., Ugwu, O., Amadi, N. C., Ike, O. C., Ohale, A. C., Okwara, J., and Udeogu, C. H. (2021). Levels of Maternal Serum Alpha-fetoprotein and Beta Human Chorionic Gonadotropin in HIV Seropositive Pregnant Women Attending Antenatal Care at Nnamdi Azikiwe University Teaching Hospital Nnewi, Nigeria. Journal of Advances in Medicine and Medical Research, 33(12), 32-38.

29. Gesesew, H., Tsehaineh, B., Massa, D., Tesfay, A. and Kahsay H, M. L. (2016). The role of social determinants on tuberculosis/HIV co-infection mortality in southwest Ethiopia: a retrospective cohort study. BMC Res Notes.

30. Nwosu, D. C., Obeagu, E. I., Nkwocha, B. C., Nwanna, C. A., Nwanjo, H. U., Amadike, J. N., and Nwankpa, P. (2016). Change in Lipid Peroxidation Marker (MDA) and Non enzymatic Antioxidants (VIT C & E) in HIV Seropositive Children in an Urban Community of Abia State. Nigeria. J. Bio. Innov, 5(1), 24-30.

31. Chinedu, K., Takim, A. E., Obeagu, E. I., Chinazor, U. D., Eloghosa, O., Ojong, O. E., and Odunze, U. (2017). HIV and TB co-infection among patients who used Directly Observed Treatment Short-course

centres in Yenagoa, Nigeria. IOSR J Pharm Biol Sci, 12(4), 70-5.

32. Obiomah, C. F., Obeagu, E. I., Ochei, K. C., Swem, C. A. and Amachukwu, B. O. (2018). Hematological indices o HIV seropositive subjects in Nnamdi Azikiwe University teaching hospital (NAUTH), Nnewi. Ann Clin Lab Res, 6(1), 1-4.

33. Akunueze, E. U., Ifeanyi, O. E., Onyemobi, E. C., Johnson, N. and Uzoanya, E. A. U. (2018). Antioxidants in the Management of Human ImmuodeficiencyVirus Infection. J HIV Retrovirus, 4(2), 1-12.

34. Guwatudde, D., Zalwango, S., Kamya, M. R., Debanne, S. M., Diaz, M. I., Okwera, A. and Whalen, C. C. (2010). Burden of tuberculosis in Kampala, Uganda, 81(3), 799–805.

35. Omo-Emmanuel, U. K., Ochei, K. C., Osuala, E. O., Obeagu, E. I., and Onwuasoanya, U. F. (2017). Impact of prevention of mother to child transmission (PMTCT) of HIV on positivity rate in Kafanchan, Nigeria. Int. J. Curr. Res. Med. Sci, 3(2), 28-34.

36. Izuchukwu, I. F., Ozims, S. J., Agu, G. C., Obeagu, E. I., Onu, I., Amah, H., and Arunsi, M. O. (2016). Knowledge of preventive measures and management of HIV/AIDS victims among parents in Umuna Orlu community of Imo state Nigeria. Int. J. Adv. Res. Biol. Sci, 3(10), 55-65.

37. Obeagu, E. I., Okeke, E. I. and Anonde Andrew, C. (2016). Evaluation of haemoglobin and iron profile study among persons living with HIV in Umuahia, Abia state, Nigeria. Int. J. Curr. Res. Biol. Med, 1(2), 1-5.

38. Belay, M. and Bjune, G, A. F. (2015). Prevalence of tuberculosis, HIV, and TB-HIV co-infection among pulmonary tuberculosis suspects in a predominantly pastoralist area, northeast Ethiopia.

39. Rajasekaran, S, Raja, K. and Jeyaseelan L. (2015). Post-HAART tuberculosis in adults and adolescents with) Global Tuberculosis Report: 2015.Geneva, Switzerland: World Health Organization.).

40. Obeagu, E. I., Alum, E. U. and Obeagu, G. U. (2023). Factors Associated with Prevalence of HIV Among Youths: A Review of Africa Perspective. Madonna University journal of Medicine and Health Sciences ISSN: 2814-3035, 3(1), 13-18.

41. Obeagu, E. I. (2023). A Review of Challenges and Coping Strategies Faced by HIV/AIDS Discordant Couples. Madonna University journal of Medicine and Health Sciences ISSN: 2814-3035, 3(1), 7-12.

42. SANAC. (2009). South African National AIDS Council (SANAC) endorsed integrated TB/HIV services.

43. NTLP. (2011). National tuberculosis and leprosy programme Uganda data.

44. Health, M. O. F. (2016). Uganda Clinical Guidelines.

45. WHO, G. T. (2015). Geneva, Switzerland: World Health Organization. WHO/HTM/TB/2015/22.

46. Observer, W. (2012). About, 2.3 million people are HIV infected.

47. Madraa. (2012). Uganda has set up bodies (NTLP, TASO) to distribute

drugs, condoms and preventive measure to all citizens.

48. Fisher, S. (1962). Body image boundaries and hallucinations. In L. J. West (Ed.), Hallucinations (pp. 249–257).

49. Olaniran, O., Hassan-Olajokun, R. E., Oyovwevotu, M. A. and Agunlejika, R. A. (2011). Prevalence of tuberculosis among HIV/AIDS patients in Obafemi Awolowo University Teaching Hospital Complex Oauthc, ILE-IFE. Int J Biol Med Res, 2(4), 874-877.

50. Mohsin. Sohail Siddiqui, Hafiz Abdul Moiz Fakih, Waqas Ahmed Burney and Razia ftikhar, N. K. (2011). Tuberculosis is a multi-factorial disease in which complex environmental interactions. © J PAK MED STUD., Volume 1,(Issue 1). Retrieved from www.jpmsonline.com

51. Nathália França de Oliveira, M. J. F. G. (2013). No Title, vol.21no. https://doi.org/http://dx.doi.org/10.1590/S0104 11692013000200006

52. Schwander, S., and Dheda, K. (2011). Human lung immunity against Mycobacterium tuberculosis: insights into pathogenesis and protection. American journal of respiratory and critical care medicine, 183(6), 696–707.

53. Funda DM and NO Albert (2023). Assessment of the impact of COVID-19 on access of HIV care and Antiretroviral Therapy at selected health facilities in Bushenyi District, Uganda. *INOSR Scientific Research* 9 (1), 1-12.

54. Shabohurira A. (2023).Incidence of Intestinal Helminthes among HIV Patients at Kampala International University Teaching Hospital, Uganda. *INOSR Experimental Sciences* 11 (1), 87-98.

55. Eze C. E. (2023).Socio-Cultural Factors Responsible for the High Incidence of HIV in Nigeria: A Study of Akwa Ibom State, Nigeria. *IAA Journal Arts and Humanities*,10 (1), 26-31.