Review Article

Human Immunodeficiency Virus and tuberculosis infection: A review of prevalence of associated factors

*Emmanuel Ifeanyi Obeagu[1] and Getrude Uzoma Obeagu[2]

[1]Department of Medical Laboratory Science, Kampala International University, Uganda.
[2]Department of Nursing Science, Kampala International University, Uganda.
*Corresponding author: Emmanuel Ifeanyi Obeagu, Department of Medical Laboratory Science, Kampala International University, Uganda, emmanuelobeagu@yahoo.com, 0000-0002-4538-0161

Abstract

Tuberculosis is a serious health threat, especially for people living with HIV (PLHIV), and is the leading cause of death among PLHIV. Someone with latent TB infection and HIV infection is much more likely to develop TB disease during his or her lifetime than someone without HIV infection since the immune system is already weakened, and without treatment, TB disease can progress from sickness to death. Optimal medication adherence is defined as the patient`s ability to take at least 95% of the prescribed medication in the correct way, according to the healthcare provider's instructions. Adherence greater than 95% has been considered the optimal level of adherence required to maintain adequate viral suppression. Medication adherence is a major challenge for chronic diseases such as HIV. Adherence is a known challenge in chronic diseases, including HIV. Good or optimal adherence is important if we want to reduce viral load. It is also important in preventing virus resistance to ARV treatment. In the case of ART, compliance of 95% or more is considered optimal. Below that level, this is considered suboptimal compliance. Adherence is important in determining patient adherence to evaluate the effectiveness and efficiency of ARV treatment regimens.

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 [1-4]. It is the most common cause of infectious disease-related mortality worldwide [5-8]. Mycobacteria

such as Mycobacteria tuberculosis are aerobic, non-spore forming, nonmotile facultative, curved intracellular rods measuring 0.2-0.5 micrometer by 2-4 micrometer. Their cell walls contain the mycolic, acid-rich long chain glycolipids and phospholipoglycans (mycolides) that protect mycobacteria from cell lysosomal attack and also retain red basic fuchsin dye after acid rinsing-acid fast stain [9-11].

Globally, more than 1 in 3 individuals is infected with TB [12]. According to WHO, there were 8.8 million incident cases of TB worldwide in 2010, with 1.1 million deaths from TB among HIV sero-negative persons and an additional 0.35 million deaths from HIV-associated TB. Similarly, factors such as alcoholism, diabetes mellitus (DM), Human Immunodeficiency Virus (HIV) infection, age below 5 years, immunosuppressive therapy, among other; increase the risk for TB morbidity and severity [13].

In Africa, Sub-Saharan immune-compromised persons; the pulmonary lesion healed in 90% of the cases, but in 10%, patients develop active TB. Also, Albajar et al. [14] found out that after contamination, M. tuberculosis multiplies slowly in the lungs and this represents primary infection. This is due to the ability of the 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 [14].

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 populations in 1990 to 13, 175 and 179 respectively per 100,000 populations in 2012 [15]. 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 [16].

Prevalence of Tuberculosis Among HIV Sero-Positive Patients

Worldwide, the prevalence of TB and HIV co-infection stands at 14.8% and as many as 5080% have TB and HIV co-infection in the Sub-Saharan Africa [15]. According to a study done by Zwang et al., in South Africa the incidence of TB associated with HIV is believed to have peaked at 1.39 in 2005 and is now decreasing. However globally, TB remains the most common cause of death among patients with AIDS, killing 1 of 3 patients (Raviglione et al., 2011).

In parts of sub Saharan Africa, up to 70% of TB patients are co-infected with HIV. It is estimated that up to 33% of all AIDS deaths worldwide can be directly attributed to TB. In sub- Saharan Africa this increases to 50% [15]. Tuberculosis and HIV together are responsible for the deaths of over 4 million people annually [15]; TB is one of the most common infections that threaten people living with HIV in the developing world. Of the over1.7 million deaths from TB in 2015, almost one-third were people co infected with HIV or AIDS.

In Uganda the number of HIV positive people screened for TB increased between 2006 and 2015 (27% in 2006 to >90% in 2015). The number of TB patients diagnosed through this screening however remains very low (1.5% of those screened versus the expected 5-7%) [17]. According to the same document, in recent years, Uganda has made significant strides in diagnosing and treating patients with TB and HIV co-infection. NTLP data shows that while the number and proportion of all registered TB cases with a known HIV status, a proxy for HIV testing, has increased, the overall proportion of cases that are HIV positive has declined. The use of Co-trimoxazole Preventive Therapy (CPT) (91% in 2013) and Antiretroviral Therapy (ART) for co-infected TB patients while on TB treatment have both increased over time, although the number and overall proportion of cases receiving ART remains low (65% in 2013).

The prevalence of HIV among TB patients notified to the national TB program has stabilized around 50% since 2009 [15]. 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%.

The level of ART adherence among HIV Sero-Positive Patients

Adherence is defined as the extent to which a patient coincides with the prescribed health care regimen as agreed through a shared decision-making process between the healthcare provider and the patient. The ability to maintain this pattern is described as 100% drug adherence. Optimal drug adherence is defined as ability of the patient to take at least 95% of the prescribed medicine in the right way as instructed by the health provider. Levels below 95% are regarded as suboptimal [18].

Adherence of greater than 95% was established to be the optimal level of adherence necessary to maintain adequate viral suppression. It was reported that there was virology failure in 22% of patients whose adherence was 95%. 61% virology failure in patients with 80- 94% adherence. 80% virology failure in patients with less than 80% adherence. Adherence which is less than 95% in ART has been associated with treatment failure. The risk of developing resistance is also as high h80 to 90%. [19].

Drug adherence is serious challenge in chronic diseases like HIV. Levels of adherence change over time, the longer the patient stays on drugs the poorer the adherence to the medication. Adherence level usually starts falling after six months of initiation.

Adherence is a known challenge in chronic diseases including HIV. Good or optimal adherence in very important if viral load is to be suppressed. It's also important in the prevention of resistance of the virus to ART regimen. A certain concentration of drug (ART) to suppress

the virus below which there was increased viral multiplication and increased viral load [20-22].

Persistently low level of drug in blood was tolerated by the virus causing resistance to that drug even if it's at its therapeutic concentration in blood. For the case of ART, adherence of 95% and above is regarded as optimal. The patient has to take more than 95% or more his ART medicine. Below this it's regarded as sub optimal adherence. Adherence is important in determining compliance of patients so as to assess the efficiency and effectiveness of ART regimen [23-24].

According to the World Health Organization globally, especially in the sub-Saharan Africa where the level of literacy is still low, Community knowledge and beliefs about TB and HIV co-infection have had significant impact on health seeking behaviour and treatment outcomes of the two diseases [15].

The socio-demographic factors affecting Tuberculosis patients

Tuberculosis (TB) is the leading cause of death in HIV positive people, and HIV infection is a significant risk factor for TB [15]. Despite all this, TB is treatable even in HIV positive individuals. In one study, up to 20% of the HIV-seropositive patients on thiacetazone developed skin rashes, compared with 1% of the sero-negative cases, the case fatality rate was 14% in the HIV sero-positive persons suffering these reactions. These reports prompted WHO to abandon thiacetazone in the treatment of HIV-related TB (Raviglione et al., 2011). The WHO estimates that in 2012 that there were about 1,000 (660–1,300) cases of Multi-Drug Resistant TB (MDRTB) 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 NTLP. 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 [25].

Level of Education/Knowledge

According to the World Health Organization globally, especially in the sub-Saharan Africa where the level of literacy is still low, Community knowledge and beliefs about TB and especially with HIV co-infection have had significant impact on health seeking behaviour and treatment outcomes of the two diseases [15]. Also, a South African community survey, respondents believed that TB would be caused by low level of knowledge on its transmission thus many ended up having sex after spontaneous abortion, or caused by environmental pollution, smoking, or drinking. However, some of the mere beliefs influenced presentation to health services and adherence.

Area of Residence/ Distance from the Health facility

Even though ART is accessed free of charge in Uganda, distance to health centers is an important barrier to adherence as it takes extra time and cost to access ART. This problem is commonly faced by patients living in rural areas. However, a study showed no relationship between distance from the health center to home and ART adherence [26].

Similarly, another study in Zambia showed that the people living in rural areas had achieved optimal drug adherence despite the expenses involved [27].

Social Support

Adherence to ART can greatly be affected by members of the individual's social support. A good relationship with friends reduces stigma and ensures support and motivation to ART adherence. A study by Ingid, et al. [28] showed that patients failed to disclose their status to friends, colleagues their sexual partners as a measure to secure their lively hood. This meant they couldn't take their medications in their presence hence poor adherence. It is also put that Positive relationship with family could increase health seeking by giving participants a sense of

purpose and belonging as a tool of support to improve ART adherence.

Another study in South Africa by Melaku *et al.* [26] where 290 participants were involved, it was showed that level of adherence had a significant association with level of education. The level of adherence increased with increasing level of education from primary to tertiary level. Widespread inequities in access to HIV and TB services and uptake across geographical regions, gender, and high-risk groups have persisted over the years [15].

The 2016 Joint Annual AIDS Review (JAAR) and other previous reviews have highlighted limited attention to behavioral interventions and drivers of the epidemic including Gender Based Violence (GBV), alcohol, substance abuse, and multiple sexual partnerships, and decline in condom use and limited safe male circumcision (SMC) coverage [17].

Sex/Gender

According to a study by Melaku *et al.* [26] showed that women had better adherence to the treatment regimen than males. It was found out that women had better health care seeking behavior than males including attending voluntary testing and counseling [26]. However, another study by Nyambura and Wanjohi [29] showed contradicting findings about the same issue; in which the men had better ART adherence and care for their health.

Age

It has previously been reported that adults are generally more conscious with their life and health than younger people. This increases their likelihood of having good adherence to their medications like ART. However, a study by Melaku *et al.* [26] showed no significant relationship between age and adherence to ART. The old and the young all had similar patterns of adherence. On the contrary, a study in South Africa showed that only 28% of the youth took all

their medication; implying a poor adherence to ART compared to those of old age.

Another survey done in India also showed poor adherence among participants aged below 40 years. It was thought that older people are used to taking drugs for treatment of other conditions they suffer [19]. Thus; could easily find it easy and important to take medication for a genuine cause than the young ones.

Conclusion

Optimal medication adherence is defined as the patient`s ability to take at least 95% of the prescribed medication in the correct way, according to the healthcare provider's instructions. Adherence greater than 95% has been considered the optimal level of adherence required to maintain adequate viral suppression. Medication adherence is a major challenge for chronic diseases such as HIV. Adherence is a known challenge in chronic diseases, including HIV. Good or optimal adherence is important if we want to reduce viral load. Adherence is important in determining patient adherence to evaluate the effectiveness and efficiency of ARV treatment regimens.

References

1. WHO. Global tuberculosis control: surveillance, planning and financing- Word Health Organization. 2016; Available at http://who.int/topics/tuberculosis. Accessed 30th January 2017.
2. Chinedu K, Takim AE, Obeagu EI, Chinazor UD, Eloghosa O, Ojong OE, Odunze U. HIV and TB co-infection among patients who used Directly Observed Treatment Short-course centres in Yenagoa, Nigeria. IOSR J Pharm Biol Sci. 2017;12(4):70-5.
3. Odo M, Ochei KC, Obeagu EI, Barinaadaa A, Eteng UE, Ikpeme M, Bassey JO, Paul AO. TB Infection Control in TB/HIV Settings in Cross River State, Nigeria: Policy Vs Practice. Journal of Pharmaceutical Research International. 2020 Sep 18;32(22):101-9.
4. Igwe CM, Obeagu IE, Ogbuabor OA. Clinical characteristics of people living with HIV/AIDS on ART in 2014 at tertiary health institutions in Enugu, Nigeria. J Pub Health Nutr. 2022; 5 (6). 2022;130.
5. Asensio J, Arbnes A, Perez E, Gicquel B, Martin C (2008). Live tuberculosis vaccines based on phoP mutants: a step towards clinical trials. Expert Opin Biol Ther. 8(2):201.
6. Obeagu EI. A Review of Challenges and Coping Strategies Faced by HIV/AIDS Discordant Couples. Madonna University journal of Medicine and Health Sciences ISSN: 2814-3035. 2023 Jan 1;3(1):7-12. https://madonnauniversity.edu.ng/journals/index.php/medicine/article/view/91.
7. Obeagu EI, Okwuanaso CB, Edoho SH, Obeagu GU. Under-nutrition among HIV-exposed Uninfected Children: A Review of African Perspective. Madonna University journal of Medicine and Health Sciences ISSN: 2814-3035. 2022 Nov 23;2(3):120-7. https://www.journal.madonnauniversity.edu.ng/index.php/medicine/article/view/85.
8. Madekwe CC, Madekwe CC, Obeagu EI. Inequality of monitoring in Human Immunodeficiency Virus, Tuberculosis and Malaria: A Review. Madonna University journal of Medicine and Health Sciences ISSN: 2814-3035. 2022 Sep 24;2(3):6-15. https://madonnauniversity.edu.ng/journals/index.php/medicine/article/view/69.
9. Verhagen L, van den Hof S, van Deutekom H (2011). Mycobacterium factors relevant to transmission of tuberculosis. J Infect. Dis. 203(9):1249-55.
10. Odo M, Ochei KC, Obeagu EI, Barinaadaa A, Eteng EU, Ikpeme M, Bassey JO, Paul AO. Cascade variabilities in TB case finding among people living with HIV and the use of IPT: assessment in three levels of care in cross River State, Nigeria. Journal of Pharmaceutical Research International. 2020;32(24):9-18.
11. Ifeanyi O, Uzoma O, OMTB O, Felix E, Stella E, Chinedum O. Evaluation of Some

Cytokines, CD4, Hepcidin, Iron Profile and Some Haematological Parameters of Pulmonary Tuberculosis Patients Coinfected with HIV in Southeast of Nigeria. Journal of Pharmaceutical Research International. 2020 Aug 5;32(13):118-30.

12. CDC. Tuberculosis data and statistics, available at http://www.cdc

13. Menzies D, Joshi R, Pai M. Risk of TB infection and disease associated with work in health care settings. Int J Tuberc Lung Dis, 2007; 11(6):593-605.

14. Albajar P, Balkan S, Barel P, Baron E, Baubet T, Blot M, Buillot F, Bonte L, Hiffler L, Stassijus J, Thompson J, Varaine F, Vasset I, Zuniga. Clinical guidelines for curative Programs in hospitals and dispensaries. Chapter: tuberculosis. medecins Sans Frontieres, 2016; 85.

15. WHO. Pathogenesis of Human Immune Virus accessed online at http://www.who.int/features/ga/71/en on 23rd Jan 2017. 2016.

16. AVERT. Imenukuliwa O4 20, 2016 kutoka Avert, HIV around the world: htt://www.avert.org/professionals/hiv-around the world/subsaharan-africa. 2016.

17. MoH. HIV Sureviellence program. HIV Sureviellence program. kampala, Uganda: ministry of health. 2012.

18. WHO. The challenges of Antiretral viral Treatment-studies from Botswana, Tanzania and Uganda. 2006.

19. Adegoke AO, Zerish NZ. The Complex Nature of Adherence in the Management of HIV/AIDS as a Chronic Medical Condition. Disease 2013.

20. Igwe MC, Obeagu EI, Ogbuabor AO. Analysis of the Factors and Predictors of Adherence to Healthcare of People Living With HIV/AIDS In Tertiary Health Institutions in Enugu State. Madonna University journal of Medicine and Health Sciences ISSN: 2814-3035. 2022 Sep 29;2(3):42-57. https://madonnauniversity.edu.ng/journals/index.php/medicine/article/view/75

21. Obeagu EI, Obeagu GU, Paul-Chima UO. Stigma Associated with HIV/AIDS: A Review. Newport International Journal Of Public Health And Pharmacy (NIJPP). 3 (2): 64-67. links/649c60ceb9ed6874a5e3e17e/Stigma-Associated-With-HIV-AIDS-A-Review.pdf

22. Igwe MC, Obeagu EI, Ogbuabor AO, Eze GC, Ikpenwa JN, Eze-Steven PE. Socio-Demographic Variables of People Living with HIV/AIDS Initiated on ART in 2014 at Tertiary Health Institution in Enugu State. Asian Journal of Research in Infectious Diseases. 2022 Aug 1;10(4):1-7.

23. Visanou H, Pattara S, Durham J, Vanphanom S, kngmany C, Suwanna B, Frank PS. Adherence to Antiretroviral Therapy (ART) among people Living with HIV (PLHIV); a cross-sectional survey to measure in Lao PDR. BMC Public Heath. 2013.

24. Ifeanyi O, Uzoma O, Nonyelum E, Amaeze A, Ngozi A, Stella E, Chukwu O. Studies on Some Cytokines, CD4, Hepcidin, Iron, and Some Haematological Parameters of Pulmonary Tuberculosis Patients Co-infected with Human Immunodeficiency Virus on Chemotherapy for 60 Days in Southeast, Nigeria. Journal of Pharmaceutical Research International. 2020 Sep 11;32(22):11-22.

25. Lukoye D, Adatu F, Musisi K, Kasule G, Were W, Odeke R, Kalanya J, Awor A, Date A, Joloba M. Anti-tuberculosis drug resistance among the previously treated sputum smear-positive tuberculosis patients in Uganda. PLoS One.2013; 8(8):e70763.

26. Melaku EA, Tebogo MM, Nonceba MKP. Adherence to antiretroviral therapy among HIV and AIDS patients at the Kwa-Thema clinic in Gauteng Province, South Africa. Afr j prim care fam. 2016.

27. Ikuma N, Christophe RD, Kazuhiro K, Norio Y, James SB. Ikuma Nozaki, Christopher Dube, Kazuhiro Kakimoto,Social factors affecting ART adherence in rural settings in Zambia , . AIDS Care. 2011; 23, 831-838.

28. Ingid KT, Annemarie RE, Afiachukwu OG, Christina P, Sheri WD, David BR, Alexander TC. Impact of HIV related sigma on treatment adherence. 2013.

29. Nyambura WA. Factors that influence non adherence to Antiretroviral therapy among HIV and AIDS pateints in central province Kenya. kenyata university instituitional reposistion.2011.

Access this Article in Online	
  Quick Response Code	Website: www.ijarm.com
	Subject: Medical Sciences
DOI:10.22192/ijamr.2023.10.10.005	