

Research Article

HIV and Tuberculosis Co-Infection: Mortality Ratios, Death Ratio and Contributing Factors in Rural Area Sindh

Ubedullah Malik*, Ghulam Qadir Rajput, Paras Tunio and Shumaila Rind

Department of CDC HIV/AIDS, Sindh Peoples Medical University Hospital, Nawabshah, Pakistan

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***Corresponding author:** Ubedullah Malik, Department of CDC HIV/AIDS, Sindh Peoples Medical University Hospital, Nawabshah, Pakistan, E-mail: malikubed3@gmail.com

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Abstract

A major global health concern is the co-infection of HIV/AIDS and TB, which increases rates of morbidity and mortality. The mortality ratios linked to HIV with TB co-infection are examined in this article through an analysis of epidemiological data of one window Service Treatment center in the rural area of Sindh Shaheed Benazir Abad District, This ART Treatment Centre Managed both HIV and TB coinfections in one center called One window Treatment Centre, underlying causes of elevated death rates in PLHIV with TB coinfection, and mitigation techniques. This research Article is based on the mortality ratios & death ratio in HIV with TB Patients of Different genders & age Groups. This research article is Brief Practice Experience research on Patients Living with HIV and having co Infection of TB, The Ratio of TB Co-infection in HIV Positive Clients & their Mortality Ratios, Death Ratio, and Contributing Factors in Rural Areas Sindh among the registered Clints in HIV Treatment & Support Centre Nawab shah. Immunocompetent individuals have a 5% - 10% lifetime risk of tuberculosis, while HIV-positive individuals have a 5% - 15% annual risk of active tuberculosis disease. In the last twenty years, tuberculosis has become a significant opportunistic infection that exacerbates the HIV epidemic globally, especially in Asia and Africa and Poor Countries such as Pakistan. This research is all based on Rural area Pakistan in Sindh province.

Abbreviations

PLHIV: Patients living with HIV; HIV: Human Immunodeficiency Virus; AIDS: Acquired Immunodeficiency Syndrome; TB: Tuberculosis; TPT: TB Preventive Therapy; ATT: Anti TB Treatment

Introduction

Two of the deadliest infectious diseases in the world are HIV and TB. HIV weakens the immune system, making a person more vulnerable to contracting TB, and TB speeds up the course of HIV disease. About 30% of AIDS-related deaths in 2019 were caused by Tuberculosis (TB), according to the World Health Organization (WHO), making it the leading cause of death among individuals living with HIV. In this research article, we analyze the Mortality Ratios & death ratio of PLHIV with TB coinfection in rural areas of Sindh Province where

many marginalized populations are living, and discuss their behavior and their way of living life. An analysis is based on the PLHIV data that is managed & Treated by the HIV Treatment & Support Centre Peoples Medical University Hospital Nawab Shah Shaheed Benazir Abad, which is one window treatment Centre of HIV and AIDS with other coinfections Treatment facilities as shown in the following Figure 1 of this Centre Board of available services [1-3].

Material & methods

This cross-sectional study was conducted at ARV Treatment Centre in the rural area of Sindh province, Pakistan established & started its services on 1st Nov 2020 to till date 19 Dec 2024 is continuing their services & expanding their services as a one Window Centre which Manages HIV Clints (ADULT, Pead's, PPTCT) in one door service also with other Coinfections like (TB, HBV, HCV, STI). A sample of newly Diagnosed 270 cases of



Figure 1: One window center.

HIV/AIDS was registered & enrolled in this year of 2024 at this one window ARV Centre Peoples University Medical Hospital Nawab Shah [4].

This research is through consecutive sampling for TB testing & Data was collected by using close-ended questionnaires & Gyn expert results of these PLHIVs. The variables were gender, age group, and marital status while the research variable was the mode of transmission of HIV. The age grouping of Clint was ordinal, and the other two were nominal data. All data were analyzed for frequency, percentage of TB infections in PLHIV, and their death ratio of HIV with TB co-infections through IBM SPSS V.21 (IBM Corp., Armonk, NY) [5,6].

Results

Out of 253 patients of HIV, 124 (49%) were male; 79 (31.2%) were female and 20 (7.9%) were child male & 24 (9.5%) were Child female & 6 (3.6%) were Transgender Community. The modal age group of Adult PLHIV was of 20–29 years with 74 males and 59 females & 30 above 50 males & 20 females Out of 203 Adult patients of HIV and in Pead's of HIV patients are 1–5 years 11 child males 14 Child female and 5 years above are 9 Child Male & 10 Child female out of total 44 Pead's HIV Patients. 149 (58%) were married (Table 1).

All 253 HIV Patients are tested for TB & 23 (9%) patients are declared TB positive with HIV in 17 males & 6 females. Total 23 TB positive of which 15 were Pulmonary TB & 8 were Extra Pulmonary [5,7].

Death ratio

The 23 HIV with TB Patients are enrolled for ARV with ATT in One Window ARV Centre in which 5 (21%) died. According to this study, 21% of patients who had both HIV and TB died this percentage highlights the deadly synergy in Rural areas of Pakistan between HIV and TB [7,8]

Co-infection epidemiology of HIV/TB in world wide

1.3 million people died from TB in 2021, including 170,000 HIV-positive individuals. In areas where both illnesses are

highly prevalent, such as Southeast Asia and sub-Saharan Africa, the co-epidemic is especially severe. People with HIV are far more likely to get active TB in these places; studies show that their risk is 20 times higher than that of people without HIV [9].

Burden of HIV-TB coinfection

Pakistan is one of the countries with the highest burden Pakistan ranks 5th with an estimated 518000 TB cases, including 15,000 MDR-TB cases and HIV infection (250000 cases). TB occurs in all socio-economic and ethnic groups, but its prevalence is associated with poverty. Malnutrition, HIV, smoking, and diabetes are all estimated to be strong risk factors for TB. TB in HIV-infected women is a risk factor for HIV transmission to their children and is associated with preterm birth, low birth weight, and increased maternal and child mortality. Patients with advanced immunodeficiency are at high risk of developing rifampicin resistance when treated with twice- or thrice-weekly doses. This may be due to poor absorption and low blood levels of anti-TB drugs. Although cure rates with standard TB treatment regimens average 86%, HIV-infected individuals have a worse outcome than non-infected individuals. Although most HIV-infected patients initially respond well to anti-TB treatment, they are at significant risk of developing other opportunistic infections in addition to recurrent TB, leading to high mortality. Timely initiation of antiretroviral therapy has been shown to reduce mortality and improve long-term outcomes in these patients. Several studies have now shown that early initiation of ART (within the first few weeks after ATT) reduces mortality and improves TB results. The choice of ART regimen depends on the interactions between anti-tuberculous and antiretroviral drugs. Rifampicin is an inducer of the cytochrome P450 enzyme system that metabolizes the NNRTI drugs nevirapine and efavirenz. The metabolism of the latter is less affected by rifampicin, so efavirenz in combination with ATT is the NNRTI of choice [10–12].

Table 1: Patients with newly diagnosed PLHIV in 2024.

Month	Male (Age 15 to 65)	Female (Age 15 to 65)	Child male Age 1 to 15	Child female Age 1 to 15	Transgender (Ages 15 to 65)	Total
Jan 24	8	4	3	2	0	17
Feb 24	13	8	1	1	0	23
March 24	14	10	4	1	0	29
April 24	10	8	0	0	0	18
May 24	15	7	3	1	2	28
June 24	13	9	2	2	0	26
July 24	7	7	0	0	0	14
Aug 24	15	5	1	1	0	22
Sep 24	9	8	1	2	1	21
Oct 24	10	7	3	2	0	22
Nov 24	7	5	1	8	3	24
Dec 24	3	1	1	4	0	9
Total year	124	79	20	24	6	253

Death rates in co-infection with HIV/TB worldwide

Patients who have both HIV and TB have significantly greater mortality rates than those who only have one of the diseases. Patients with TB and HIV co-infection have much greater mortality rates than those with TB or HIV mono-infection, according to a comprehensive analysis. According to another study, 5.3% of patients who had both HIV and TB died. These figures highlight the deadly synergy between HIV and TB [13-15].

Discussion

The higher mortality or death ratio seen in people with HIV/TB co-infection in rural areas in Sindh is 21% but in other different studies, 5.3% Patients is the mortality rate. Diagnosing TB in PLHIV is difficult due to the more frequent presentation with atypical symptoms and the increased proportion of both smear-negative pulmonary TB and extra pulmonary TB [14,16,17] Apart from these difficulties, access to health services and treatment in high HIV prevalence resource-constrained settings is restricted due to an increased demand for over-stretched and under-resourced TB services [7], which may also be geographically out of reach for a significant proportion of the affected population [16] These factors may result in late diagnosis, more advanced TB, delay and/or lack of specific TB treatment, and poorer TB treatment outcomes contributing to a pronounced mortality effect of TB in PLWH [14,16,18,19].

The rural area of Sindh high mortality rate is caused by several following factors:

- **Immunosuppression:** The body's capacity to regulate TB infection is compromised by HIV-induced immunosuppression, which results in more severe disease symptoms and consequences.
- **Delayed diagnosis:** Patients with HIV may exhibit unusual TB symptoms, which can cause delays in diagnosis and treatment beginning, which hurts results.
- **Drug interactions and toxicity:** When antiretroviral therapy (ART) and TB treatment are used together, there may be drug-drug interactions and increased toxicity, which can make adherence and management more difficult.
- **Socioeconomic factors:** Poverty, lack of knowledge, and restricted access to healthcare might make it more difficult to receive prompt diagnosis and treatment, which raises death rates.
- Delayed treatment of patients of TB because of No service of one window (HIV with TB at one Centre) in rural areas of Sindh which increases the death ratio in rural areas as compared to the world Wide [20].

Conclusion

Co-infection of TB and HIV raises mortality rates dramatically, creating a difficult public health issue. Developing successful therapies requires an understanding

of the mechanisms behind this higher mortality. To lower the death rate linked to HIV/TB co-infection, integrated healthcare services known as One Window Service Centre One Door Service Centre in which early ART introduction, preventative medicines & TB ATT started & patents are not suffered and tackling socioeconomic determinants are crucial tactics. Lack of One Window Service Centres in Rural areas of Pakistan is increasing the death ratio of HIV with TB patients as compared to the worldwide death ratio.

Recommendation

A diversified strategy is needed to address the high death rate linked to HIV/TB co-infection:

- 1) **Integrated care treatments:** By combining HIV and TB treatments, it is possible to improve patient outcomes by facilitating early detection and coordinated treatment like one Window Service or One door Service for these Diseases for the Patients.
- 2) **Early ART initiation:** It has been demonstrated that prompt antiretroviral medication initiation in co-infected patients lowers mortality by re-establishing immune function.
- 3) **Preventive therapy:** By administering TB preventive therapy to people with HIV, the incidence of active TB and related mortality can be decreased. Every HIV Patient who had Negative TB initiated TPT for 9 months at least.
- 4) **Addressing social determinants:** Improving access to healthcare and socioeconomic circumstances can improve treatment compliance and lower mortality. This can also be the main reason for the increase in the death ratio in rural areas Worldwide.
- 5) Increased case finding, infection control, isoniazid preventive chemotherapy, and the integration of TB and HIV services into antenatal, PMTCT, family planning, and immunization services are all part of a policy to address co-infection of TB and HIV. Given that HIV is now a chronic, treatable illness, the task at hand is to strengthen health systems and offer patients integrated services so that long-term care can be delivered efficiently. Improved and more sensitive point-of-care TB diagnostics, shorter and more efficient TB treatment plans with fewer drug interactions with antiretroviral medications, and an improved TB vaccine that is safe and effective in HIV-infected populations are among the top research priorities [20,21].

Author contributions

Each author declares substantial contributions through the following:

Ubedullah Malik: Conceptualization, Investigation, Resources, Data Curation

Ghulam Qadir Rajput: Methodology, Validation, Project Administration

Dr Shumaila Rind: Visualization, Supervision

Miss Paras: Formal Analysis &, Writing Original draft

Approval of the submitted version of the manuscript

Please check this box to confirm that all co-authors have read and approved the version of the manuscript that is submitted. Signatures are not required.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. The authors declare no financial interests/personal relationships that may be considered potential competing interests.

Ethical statement

This research was conducted under ethical guidelines and principles outlined in the Declaration. Approval for the study was obtained from the Institutional Review Board of HIV Treatment & Support Centre CDC HIV AIDS Sindh. Written informed consent was obtained from all participants, ensuring confidentiality and anonymity throughout the research process.

Participants were made fully aware of the study's objectives, potential risks, and benefits. Measures were implemented to maintain the privacy of sensitive information and ensure that data were securely stored and accessible only to authorized personnel.

Additionally, special care was taken to address the vulnerable nature of the population studied. Ethical considerations were given to minimize any potential stigmatization and discrimination associated with HIV and TB. The study was conducted at the HIV Treatment Centre in Nawab Shah with the utmost respect for human dignity, rights, and well-being.

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