Clinico-Epidemiological Study of HIV-TB Co-Infection In Southern India

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ABSTRACT

This study was aimed at identifying the CLINICO-EPIEMOLOGICAL study of underlying HIV–TB coinfection. A retrospective review of patient records was done from the antiretroviral therapy center (ART) at a government hospital in southern India between June 2018 and April 2019. Secondary data of 10155 patients on ART as well as pre-ART were collected between January 2009 and December 2018 and were analyzed. Wilcoxon signed rank tests were used with SPSS version 15.0 The prevalence of HIV-TB coinfection 0.13% among the sample was taken. HIV–TB coinfection was increased in trend of population from 1.41% in 2009 to 45.3% in 2018 until when the data were included in this study. The proportion of HIV infection among those registering at this particular ART center decreased from 18.7% in 2009 to 6.44% in 2018. The prevalence of HIV infection and HIV-TB coinfection higher in males (3.73% & 33.3%) than females (3.20% & 12.05%) respectively among those registering at this particular ART center. The fatality rate of HIV infection was decreased from 23.4% in 2009 to 2.33% in 2018. The CD4 count (200 cells/µl) lower in co-infected patients than HIV infected patients. The increasing trend of HIV–TB cases observed in this population from 1.41% in 2009 to 45.3% in December 2018. Creating grass root level awareness coupled with aggressive case finding in suspected high-risk population may be key in preventing and early detection of the dual infections.

Keywords: ART, CD4, prevalence, HIV–TB, coinfection.

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INTRODUCTION

HIV/AIDS and tuberculosis (TB) can individually be the major causes for concern as stand-alone public health threats, the combination of the two has proven to have a far greater impact on the epidemiologic progression and consequently on the impact it has on the global health scene. The dual infection has been termed “accursed duet”\(^1\).

Research shows that of the opportunistic infections affecting HIV-infected patients, TB is found to be the most common with high risk for mortality\(^2,3\) and the risk of coinfection with TB is about 20-37 times higher among those infected with HIV according to WHO. A 2010 report by the WHO reported that 360,000 people had died with active TB and HIV infection, indicating an increase from 2010 to 2011.\(^7\)

India has a very high burden of TB according to the WHO, and infection with \textit{M. tuberculosis} ranks foremost among opportunistic infections causing comorbidity with HIV infection.\(^1\)

As evidenced by several research reports globally, susceptibility to TB increases manifold with concurrent HIV infection. It is fast becoming evident that the TB population should be seen as an important cohort to screen for HIV.\(^9,10\) it has been documented that coinfection with HIV and \textit{Mycobacterium tuberculosis} has a synergistic effect on each other, and in later stages of HIV infection, TB may present as extra pulmonary disease.\(^11\)

Research has demonstrated that in resource-constrained settings up to 50\% of patients with HIV without treatment but with concurrent TB would die prior to completion of the 6 to 8 months of treatment for TB, some as early as within the first 2 to 3 months.

With the emergence of TB as a lethal counterpart in the epidemiology of HIV, there is an urgent need to understand possible multifactorial associations to this partnership. This study attempts to do just that in describing the underlying correlates to HIV-TB coinfection.

This study reviews the current epidemiology of HIV infection–associated TB and the global progress in the implementation of these interventions.

MATERIALS AND METHOD

A retrospective review of standardized patient records was conducted at the antiretroviral therapy center (ART) Center of the Tenali Government Hospital in southern India between June 2018 and April 2019. Ethical clearance was duly obtained from the institute ethical committee for conducting the study. HIV–TB co-infected patients accessing services at the ART center including those on ART and pre-ART enrolled between January 2009 and December 2018 were included in the study.
The study aims at describing the sociodemographic and clinical profiles of HIV–TB coinfected patients. Between January 2009 and December 2018, 10155 patients infected with HIV were registered at this ART center located at a Tenali government hospital in Southern India. The Voluntary Counselling and Testing Center (VCTC) now designated as the Integrated Counselling and Testing Centre emerged as the key entry point for patients to this ART center.

RESULTS AND DISCUSSION

This study aimed at drawing out the profile of individuals with dual infection of HIV–TB. A total 10655 HIV/AIDS patients reported in the ART center, Guntur district, between June 2018 and April 2019. Of them, 141 were reported HIV–TB coinfection, which indicates 0.13% prevalence in this sample. From this study, the profile emerged of higher prevalence of coinfection among males in the sexually active age groups with little or no education, being married, working as labours, living in the rural setting and belonging to the lower socioeconomic rung. These sociodemographic findings are comparable to other studies conducted in India. The results of this study also showed that the heterosexual route of transmission was the most common indicating the need for intervention targeted at behavior modification. Data accrued from this study pointed to the fact that VCTC, now designated as ICTC implemented by NACO emerged as an effective entry point for almost high (45.3%), 2018 of those sampled to access ART. The mean CD4 count in this population was observed in this study comparable to a study conducted in Northern India. Coinfection is associated with lower CD4 counts than those with HIV alone, which could translate into increased morbidity and progression of HIV to AIDS. Several other research studies have pointed to the fact that CD4 counts are lower among confected patients as compared to HIV infected alone and severe immune suppression is seen in those with CD4 count below 200 cells/μL. TB therapy is seen to have a positive influence on CD4 counts, and the DOTS initiative has been demonstrated to prevent and even reverse the emergence of MDR-TB.

It is worth noting that an increasing trend in the proportion of HIV–TB cases in this population from 1.41% in 2009 to 45.3% in December 2018 until when data were included in this study. In light of a WHO report in 2009 that only about 4% of individuals in India with TB get tested for concurrent HIV infection, this could be deciphered to mean that the case finding has improved since this last report. The Centers for Disease Control (CDC) has stated that TB is one of the few HIV related opportunistic infections that is both preventable as well as curable. As observed in this study, treatment of HIV and TB comorbid conditions together had a favorable outcome with
reduced risk of death comparable to a study by Cain et al\textsuperscript{27}. Nevertheless, this rising trend needs to be further investigated to identify other underlying factors.

**Figure 1: Prevalence of HIV infection in male and female population**

**Figure 2: Prevalence of HIV Population**
Figure 3: Prevalence of HIV-TB co-infection in population

Figure 4: Prevalence of HIV-TB co-infection in male and female population
Figure 5: Prevalence of HIV infection in pregnant women

Figure 6: Death rate of HIV infection on art Treatment

Table 1: Prevalence of HIV infection in male and female population

| Year | Male | Female |
|------|------|--------|
| 2009 | 1002 | 897    |
| 2010 | 774  | 726    |
| 2011 | 576  | 543    |
| 2012 | 484  | 498    |
| 2013 | 485  | 464    |
| 2014 | 448  | 426    |
| 2015 | 386  | 352    |
| 2016 | 383  | 342    |
| 2017 | 380  | 326    |
| 2018 | 327  | 328    |
Table 1 reveals that, The proportion of HIV infection among those registering at this particular ART center gender wise 9.8%(M) & 8.81%(F) in 2009, 7.9%(M) & 7.1% (F) in 2010, 5.66%(M) & 5.33%(F) in 2011, 4.75%(M) & 4.89%(F) in 2012, 4.76%(M) & 4.55%(F) in 2013, 4.40%(M) & 4.18%(F) in 2014, 3.79%(M) & 3.45%(F) in 2015, 3.21%(M) & 3.36%(F) in 2016, 3.76%(M) & 3.22%(F) in 2017 and 3.73%(M) & 3.20%(F) in 2018 until when data were included in this study. The rate of HIV infection in this study was found to be higher among males comparable to studies across India. The heterosexual route of transmission predominated in this population among both genders (males = 5245 and females = 4902).

Table 2: Prevalence of HIV Population

| Year | Population |
|------|------------|
| 2009 | 1904       |
| 2010 | 1499       |
| 2011 | 1119       |
| 2012 | 982        |
| 2013 | 949        |
| 2014 | 874        |
| 2015 | 743        |
| 2016 | 724        |
| 2017 | 706        |
| 2018 | 656        |

Table 2 reveals that, The proportion of HIV infection among those registering at this particular ART center decreased year wise from 18.7% in 2009, 14.7% in 2010, 11.0% in 2011, 9.6% in 2012, 9.3% in 2013, 8.59% in 2014, 7.32% in 2015, 7.18% in 2016, 6.98% in 2017 and 6.44% in 2018 until when data were included in this study.

Table 3: Prevalence of HIV-TB Co-infection in population

| Year | Total |
|------|-------|
| 2009 | 2     |
| 2010 | 4     |
| 2011 | 6     |
| 2012 | 7     |
| 2013 | 8     |
| 2014 | 10    |
| 2015 | 11    |
| 2016 | 14    |
| 2017 | 15    |
| 2018 | 64    |

The proportion of HIV-TB coinfection among those registering at this particular ART center increased year wise from 1.41% in 2009, 2.83% in 2010, 4.25% in 2011, 4.96% in 2012, 5.6% in 2013.
2013, 7.09% in 2014, 7.80% in 2015, 9.92% in 2016, 10.63% in 2017 to a high of 45.3% in 2018 until when data were included in this study.

**Table 4: Prevalence of HIV-TB Co-infection in male and female population**

| Year | Male | Female |
|------|------|--------|
| 2009 | 1    | 1      |
| 2010 | 2    | 2      |
| 2011 | 3    | 3      |
| 2012 | 5    | 2      |
| 2013 | 4    | 4      |
| 2014 | 5    | 5      |
| 2015 | 7    | 4      |
| 2016 | 6    | 8      |
| 2017 | 8    | 7      |
| 2018 | 47   | 17     |

Table 4 reveals that, The proportion of HIV infection among those registering at this particular ART center gender wise 0.7%(M) & 0.7%(F) in 2009, 1.41%(M) & 1.41% (F) in 2010, 2.12%(M) & 2.12%(F) in 2011, 3.54%(M) & 1.41%(F) in 2012, 4.283%(M) & 2.83%(F) in 2013, 3.54%(M) & 3.54%(F) in 2014, 4.96%(M) & 2.83%(F) in 2015, 4.25%(M) & 0.67%(F) in 2016, 5.67%(M) & 4.96%(F) in 2017 and 33.3%(M) & 12.05%(F) in 2018 until when data were included in this study.

The rate of HIV-TB Co-infection in this study was found to be may equal in both the genders or higher among males comparable to females.

**Table 5: Prevalence of HIV Infection in pregnant women**

| Year | HIV Positives |
|------|---------------|
| 2009 | 58            |
| 2010 | 48            |
| 2011 | 50            |
| 2012 | 46            |
| 2013 | 33            |
| 2014 | 30            |
| 2015 | 22            |
| 2016 | 21            |
| 2017 | 16            |
| 2018 | 14            |

Table 5 Reveals that the proportion of HIV coinfection among the pregnant women those registering at this particular ART center decreased year wise from 17.15% in 2009, 14.20% in 2010, 14.79% in 2011, 13.6% in 2012, 9.76% in 2013, 8.87% in 2014, 6.50% in 2015, 6.21% in 2016, 4.73% in 2017 to a high of 4.14% in 2018 until when data were included in this study.
Table 6: Death rate of HIV infection on ART treatment

| Year | Death rate on treatment |
|------|-------------------------|
| 2009 | 494                     |
| 2010 | 397                     |
| 2011 | 312                     |
| 2012 | 253                     |
| 2013 | 218                     |
| 2014 | 146                     |
| 2015 | 107                     |
| 2016 | 89                      |
| 2017 | 78                      |
| 2018 | 50                      |

Table 6 reveals that the death rate of HIV infection among those registering at this particular ART center decreased year wise from 23.4% in 2009, 18.15% in 2010, 14.55% in 2011, 11.80% in 2012, 10.16% in 2013, 6.80% in 2014, 4.99% in 2015, 4.15% in 2016, 3.63% in 2017 to a high of 2.33% in 2018 until when data were included in this study.

Table 7: ART Regimen Among HIV-TB CO-Infected Patients

| Treatment regimen | Frequency |
|-------------------|-----------|
| A-AL+ATV/r        | 15        |
| A-ALE             | 16        |
| A-TL+ATV/r        | 113       |
| A-TL+PV/r         | 100       |
| A-TLE             | 3659      |
| A-TLN             | 11        |
| AZL+ATV/r         | 72        |
| AZL+LPV/r         | 1         |
| A-ZLE             | 45        |
| A-ZLN             | 728       |
| P-AL+LPV/r        | 4         |
| P-ALE             | 5         |
| P-ALN             | 48        |
| P-ALN adult       | 1         |
| P-TLE adult       | 60        |
| P-ZLPV/r          | 1         |
| P-ZLE adult       | 2         |
| P-ZLN             | 10        |
| P-ZLN adult       | 7         |

Table 7 reveals that the frequency of treatment regimen is more for the brand name of A-TLE medicine. This medicine has combinations of drugs like abacavir, efavirenz, tenofovir and lamivudine. The next frequency of drug is A-ZLN medicine, this has combination of abacavir, zidovudine, lamivudine and nevirapine.
CONCLUSION:
The prevalence of HIV–TB coinfection in this sample was 0.13%. About high (45.3%) of those sampled accessed ICTC as an entry point to the ART center. Coinfection was seen to be associated with reduced CD4 counts, which could hasten the progression to AIDS. It is imperative that physicians treating HIV-infected patients should aggressively identify those with M. tuberculosis in order to reduce the associated comorbidity resulting from the pairing of the infections, notwithstanding the imminent threat of multidrug-resistant and extremely drug-resistant TB on the rise. The increasing trend of HIV–TB cases observed in this population from 1.41% in 2009 to 45.3% in December 2018 is also a cause for concern. Greater focus of health interventions should be on the rural population as 88% of those co-infected were from rural areas in this study. Creating grass root level awareness coupled with aggressive case finding in suspected high-risk population may be key in preventing and early detection of the dual infections.

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