

A Socio-Epidemiological Study of HIV Patients at a Tertiary Care Hospital in the Ahmednagar District of Rural India

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Abstract

HIV is a disease that created an epidemic in the world in 1981, and has infected 78 million people and left 35 million people dead since its emergence. In 2015, there were 36.7 million people living with HIV around the world, and, of this population, 1.8 million were children. Overall, this equates to global prevalence of 0.8%, with most of these individuals living in resource-challenged communities throughout the world.¹ While the global trend of HIV is holding a steady rate, the rate of incidence in rural communities has been increasing.² There are numerous factors that affect the prevalence of HIV in communities, and of those, the leading factors have been found to be physician density and adolescent fertility rate.³ In India, the HIV epidemic is beginning to slow down as the rate of HIV infection has decreased 32% while the mortality rate of HIV has decreased by 54%. The main factors for the HIV transmission in India has been found to be through sex workers, men who have sex with men, and those using injectable drugs.⁴ This study will focus on factors relating to HIV prevalence in rural India, specifically in the Ahmednagar district in the state of Maharashtra. Social and cultural demographics will be collected via interview and personal patient information. Concurrently, studies of the effects of different HIV treatments on CD4 counts over time, hemoglobin counts, and prevalence of alcohol and tobacco abuse will be taken in order to assess both the socioeconomic conditions and medical results on those that have HIV in rural Indian communities.

Intro

Human Immunodeficiency Virus, or HIV, is a virus that targets the immune system, specifically the T cells, or CD4 cells, of the human body that are a crucial part of the immune system that fights foreign material. HIV reduces the number of CD4 cells in the body and puts people at risk for other diseases. This is significant because individuals with HIV die from these opportunistic infections rather than HIV itself. Once a person catches HIV, the body is unable to get rid of the virus fully, therefore there is no particular “cure” for the disease, but there are treatments that can aid the body in developing CD4 cells and slow the progression of the disease. This treatment can help keep the HIV under control to an extent and is called antiretroviral therapy (ART). When the CD4 count reaches lower than 200 cells per cubic millimeter, acquired immune deficiency syndrome (AIDS) is considered to have set in. This 200 cells per cubic millimeter is considerably lower than the average CD4 count of 500 to 1600 cells per cubic millimeter in average healthy subjects. Once AIDS sets in, life expectancy is about 3 years; however, once a person contracts an opportunistic infection, like tuberculosis, life expectancy drops to 1 year. Treatment is necessary in order to increase life expectancy of the patient.⁵

HIV is contracted only through direct contact of certain body fluids from another individual that has HIV. These body fluids are blood, semen, pre-seminal fluid, rectal fluids, vaginal fluids, and breast milk. Simple contact with these fluids is not enough to contract the virus; however, if these fluids were to get in contact with either mucus or digestive membranes, then the virus could infect the body.⁶

AIDS was first seen in the United States in 1981 when the Center for Disease Control and was first reported as unusual pneumocystis carinii pneumonia and Kaposi’s sarcoma. This was seen and reported for specifically in young homosexual men in Los Angeles and San Francisco.

Another group that was reported in was intravenous drug users in New York. Since then it had risen in number steadily and hit epidemic status in 2010.⁷

It is estimated that 2.4 million individuals with HIV are living in India, which means that India has the largest burden of people living with HIV in Asia and is the third country of the world in terms of HIV infected people.⁸ Anantapur is a district situated in the South border of Andhra Pradesh with 72% of rural population and adult literacy rate of 74.1% in men and 54.3% in women and has the highest burden of HIV in India.⁸ For most rural Indian cultures, HIV transmission is credited to the use of sex workers or through men having sex with men. In India 85% of HIV transmission is through sexual contact.⁹ There is much variation between the subgroups that have HIV. For female sex workers, the number of sex workers that have HIV varies from 832,000 to 2 million. It is believed that anywhere between 106,000 to 223,000 people contracted HIV from drug injection use. 235,000 male sex workers have HIV and about 2.35 million men that have sex with men have contracted HIV.⁹

Another common mode of transmission is husband to his wife, with the wife being unaware of the husband's status. In Indian culture, marriage is considered essential in order for parents to have raised their children successfully; however, faithfulness to a spouse is not as important, and men have relations with sex workers out of wedlock, and can catch HIV. The wives of these men then have sexual relations with their husband, without the use of condoms, and the wife then contracts HIV as well. Condoms are often not used in marriages as they are considered to be unnecessary and inappropriate for a woman to talk about with her husband, and she is therefore unable to "negotiate safe sex."⁹

A survey was performed to a subgroup of patients in order to determine how women in a marriage contract HIV compared to men. In this study, it was found that 81% of women have

acquired HIV from their spouse, whereas 51% of men acquired HIV from commercial sex.⁸

Having said that, the most common transmission route, in India, was heterosexual transmission (88.2%), followed by vertical transmission (5.7%), unknown route of transmission (4.7%), blood transfusion (1.2%) and homosexual transmission (0.17%).⁸ As expected, the most important route of transmission for children was from mother to child, although it was observed that 8% of female children were infected through heterosexual contact.⁸

Mother to child HIV transmission is a risk that often plagues communities with higher HIV prevalence. This becomes an even larger issue in areas of poverty due to the precautions that need to be taken in order for the baby to not contract HIV from the mother during pregnancy and birth. These precautions are treatments for the HIV itself, or cesarean delivery of the baby, or removal of the baby by surgery at the mother's abdomen and uterus. Due to the unwillingness or inability to receive medical attention, or not knowing that one is at risk of transferring the virus to their children, mothers will often not receive the proper medical attention and will then be at higher risk for transferring the virus onto their children.

It has been seen in areas where HIV is prevalent, like sub-Saharan Africa, that there are certain environmental factors that can lead people to be more at risk for contracting HIV. In a study done on women in Mogo, Zambia, age, alcohol use, and poverty were factors studied to determine the correlation between these predispositions and HIV contraction. It was found that age is not related; however, alcohol use and poverty were significant factors. Due to the strict alcohol laws of Maharashtra, India, it is not expected that alcohol use will be a factor for HIV contraction, however, it is expected that tobacco use will be.¹⁰

Study Overview

This study was conducted at the ART Centre of Pravara Rural Hospital in Loni, District Ahmednagar, Maharashtra, India. This centre allows individuals with HIV/AIDS to receive their medication at no cost, get their CD4 levels checked on a regular basis, and receive counseling to help them deal with any difficulties they may have in living with this disease. Another service that the centre provides is the VIHAAN Program. Through this program, individuals with HIV/AIDS are employed by the government and given a stipend to go out into the community to find people who have been defaulting on their treatment and encourage them to take their medications. They do this by explaining the disease and how they can live a long, healthy life if they are compliant with their medications. They also talk about their own struggles with being adherent to medications, as the members of the VIHAAN Program are often those that used to default on their medications as well. All of these services come together to provide a comprehensive treatment centre for the individuals with HIV/AIDS in the area.

The 3 areas of interest during this study at the ART Centre were: sociodemographic, pharmacological, and medical data. Sociodemographic information was studied in order to learn about the typical patient that visits the ART Centre. Major trends seen throughout this data showed a population of individuals with lower education levels and unsteady employment leading to a low monthly income. Pharmacological information was collected to determine the types of treatment regimens commonly used, their effectiveness on CD4 levels, and how the patients' perceived their treatment was going. Overall trends showed that 2 major medications were used, ZLN and TLE, and they showed equal efficacy in increasing CD4 levels. Finally, medical and social history information was collected to determine how having HIV was affecting other aspects of the patients' lives. Overall trends showed that while there was significant

difference between alcohol use and opportunistic infections and each affect blood hemoglobin levels independently, there are factors that take precedence over others on physiological reactions.

Materials and Methods

Data for this observational study was collected at the ART Centre during the time period of January 9, 2017 - January 19, 2017. For this study, both qualitative and quantitative data were collected. The qualitative data was obtained from a 24 question interview through a translator. Before an interview took place, the patient was given information about the study, the interview process, and allowed to ask any questions about the study. After this, verbal consent, in the local language, was obtained from the patient to continue the interview process. The interview questions focused on the patients' social histories, their feelings when diagnosed, treatment perceptions, and experiences with the disease as a whole. The translator would ask the patient the interview questions in the Marathi language, which is the local language of the area, and then repeat the answers in English, which were then recorded on a Word document. Overall, 50 interviews were conducted with patients. There were no exclusion criteria. The first 50 patients to consent to an interview were included.

The quantitative data was collected from the patients' medical charts and recorded on an Excel spreadsheet. Of the 200 charts chosen to be analyzed, 150 were randomly selected from the filing cabinets at the clinic, and the remaining 50 were from the individuals that were interviewed. When analyzing the charts, first, demographic data was collected, this included: age, gender, marital status, number of children, occupation, income, and level of education. Then, pharmacological data was collected, including: treatment regimen, CD4 levels, weight, and WHO clinical status and months 6, 12, 24, 36, and 48. When data was not available for this

entire time period, collection was stopped at the most recent value. Finally, medical and social history information was collected, this included: alcohol and tobacco use, Hb counts, contraception use, TB infections, and opportunistic infections. Overall, 200 patients' quantitative data was collected, and 50 of these patients were also interviewed during the 10 day study period. Statistical analysis was conducted for the data obtained during the study on Excel.

Results

A. Sociodemographic Results

The sociodemographic results analysis revealed that the average age of patients visiting the ART centre was 32.905 years. 57% of the 200 patients included in this study were female, and 43% were males. The most common level of education was secondary, with options including: non-literate, primary, secondary, or college and above. 81.5% of patients were employed, but the average household income per month was only 2,535.27 rupees (~\$38), with 1,000 rupees being the minimum and 20,000 being the maximum. 50% of the patients in this study were married, 30% were widowed, 18% were single, 1% were divorced, and 1% had a live-in partner. The most common route of contracting HIV was through multiple sex partners, but this was denoted on the charts as heterosexual. Therefore, heterosexual contraction accounted for 84% of cases, 13.5% were a result of mother to child transmission, 1.5% were through MSM (men who have sex with men), relationships, and 1% did not know how they contracted the disease.

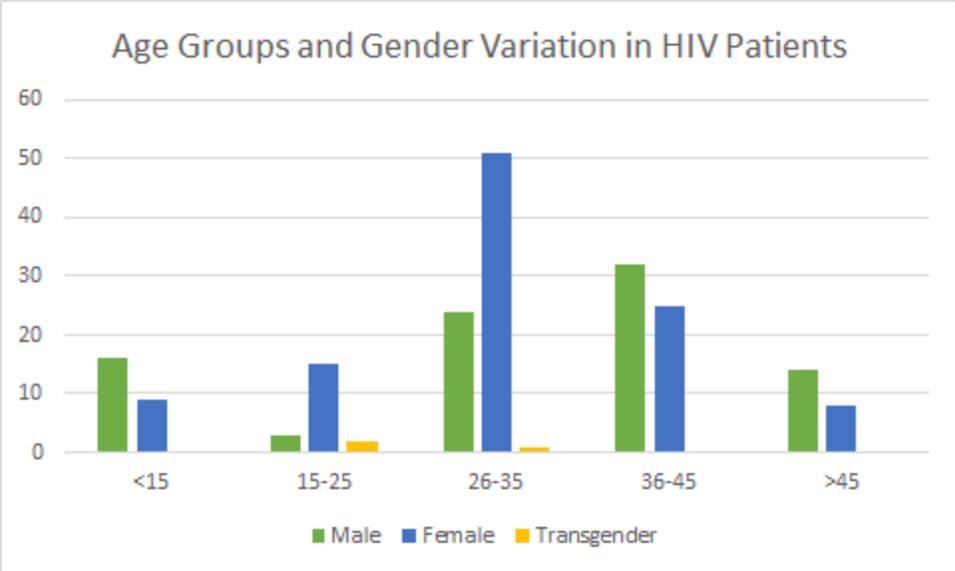


Figure 1: This chart shows the variation in gender among different age groups (n=200).

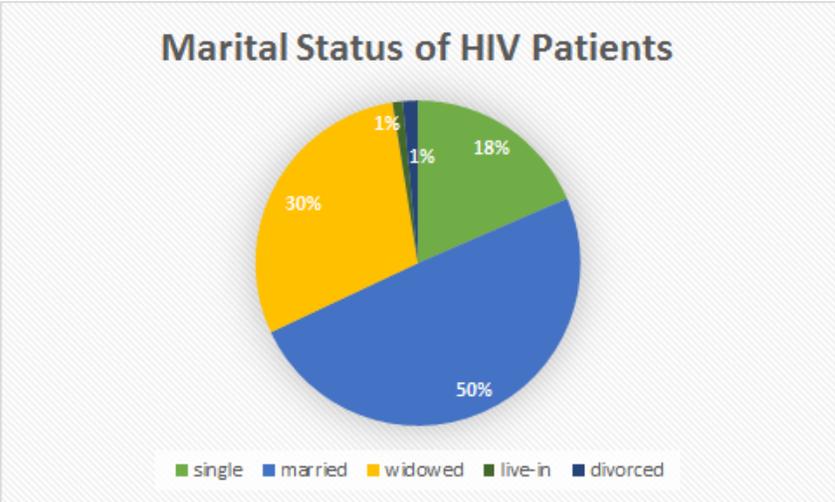


Figure 2: This chart shows the marital status of the 200 patients for whom data was collected during this study.

B. Pharmaceutical Results

Analysis of the pharmacological data showed 30% (60 of 200) of patients on the regimen TLE (Tenofovir + Lamivudine + Efavirenz), 1% (2 of 200) patients on ZLE (Zidovudine + Lamivudine + Efavirenz), and 69% (138 of 200) patients on ZLN (Zidovudine + Lamivudine + Nevirapine). When not taking treatment type into account, there was a significant increase in CD4 counts between months 0 and 6 ($p < 0.001$), 6 and 12 ($p = 0.008$), and 12 and 24 ($p = 0.02$.)

There was no significance in the change between months 24 and 36 ($p=0.759$) or months 36 and 48 ($p=0.801$). However, when looking at specific treatments, ZLN shows a significant change in CD4 counts between months 0 and 6 ($p<0.001$), 6 and 12 ($p=0.004$), 12 and 24 ($p=0.02$), but TLE only shows a significant change between months 0 and 6 ($p<0.001$); however, this is most likely due to the smaller sample size for those on TLE. Therefore, there were no significant differences between treatments. ZLE was not analyzed due to the small sample size.

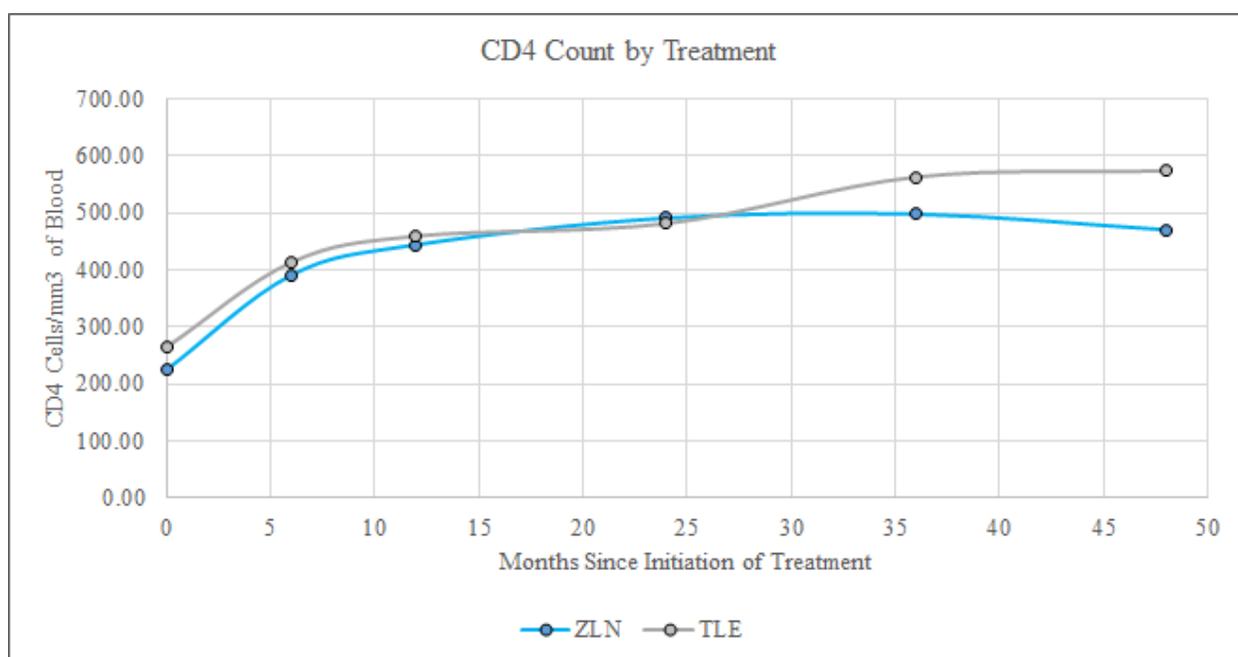


Figure 3: This graph shows the change in CD4 counts throughout time while on either ZLN ($n=138$) or TLE ($n=60$) treatment for HIV. No significant differences exist between treatments.

C. Medical Results

In order to provide the most accurate results as possible, the data used in the following analysis is from the patient interviews due to the shameful stigma behind alcohol and tobacco leading to it not often being recorded on their charts. The data was broken down by each treatment in order to determine if treatment, or substance use, had an effect on hemoglobin count. ZLN and TLE treatment were the most commonly prescribed treatments and therefore will be the only treatments analyzed.

Treatment	Opportunistic Infection Average	Alcohol Use	Severity Average	HB Count Before (dL/g)	HB Count After (dL/g)	Average Change of HB (dL/g)	% Change of HB	TB Rate
ZLN	0.30	0.33	2.78	12.00	13.03	1.03	7.87	0.11
TLE	0.67	0.15	3.00	10.62	10.98	0.36	3.29	0.12

Table 1: This table shows the correlation and outcome of the averages of alcohol use , hemoglobin protein count, and opportunistic infection by tuberculosis, separated by treatment. The data that was recorded from the patient interviews. (n=50)

Treatment	Opportunistic Infection Average	Tobacco Use	Severity Average	HB Count Before (dL/g)	HB Count After (dL/g)	Average Change in HB (dL/g)	%Change in HB	TB Rate
ZLN	0.30	0.48	2.92	12.00	13.03	1.03	7.87	0.11
TLE	0.67	0.52	3.00	10.62	10.98	0.36	3.29	0.12

Table 2: This table shows the correlation and outcome of the averages of tobacco use , hemoglobin protein count, and opportunistic infection by tuberculosis, separated by treatment. The data that was recorded from the patient interviews. (n=50)

Both treatments produced a change in hemoglobin levels after treatment, however, ZLN treatment had the largest change from 12 dL/g to 13.03 dL/g, which was a change of 1.03 dL/g, or a 7.87% change from initial. TLE had a smaller change and starting values as the hemoglobin count went from 10.62 dL/g to 10.98 dL/g, which was a change of .36 dL/g, or 3.29% change from initial. The rate of opportunistic infection was higher in the TLE treatment group with prevalence at 67%, while the ZLN treatment group had a prevalence of 30%. The rate of patients with tuberculosis was similar with the ZLN treatment having 11% and TLE having 12%.

A TTEST was done on the values of hemoglobin count before treatment between ZLN and TLE was .087. This is above the allowed threshold of .05, meaning that the hemoglobin values before treatment were not significantly different. A TTEST done on the results of each

treatments, ZLN and TLE resulted in a value of .0078, which, while it is below the .05, claiming that the difference in the results of the two treatments was significant. TTESTs were done on each hemoglobin count before and after per each treatment. For ZLN, the TTEST gave a value of .064, and for TLE, the TTEST presented a value of .737. The TTEST value between the before and after counts of hemoglobin for ZLN was close to the .05 accepted value, at .064, and points towards implications that ZLN could be the most effective form of treatment for stalling the effects of HIV in rural patients. The TTEST value between the before and after counts of hemoglobin for TLE was .74. This does not prove significant difference between the starting and ending point of the hemoglobin protein count, and therefore there is no effect that the drug has on the amount of hemoglobin produced by the body.

Each patient was asked if they were an alcohol consumer and were then categorized by how much or when they consumed alcohol. If a patient had a 1, then the patient has never consumed, if the patient had a 2, that means they admitted to consuming alcohol in social situations, and if the patient had a 3, then they were an alcohol abuser. Similarly, patients were tobacco users. If the patient had a 1, it indicated they have never used tobacco products.. If a patient had a 2, then they indicated they have used tobacco products, but have quit since. If a patient had a 3, then they were current users of tobacco. In this sample, the ZLN treatment had a tobacco use rate of 48% while the TLE treatment group had a use rate of 52% which is not a significant difference. The percentage of people that admitted to alcohol use was 33% for the ZLN treatment group, and alcohol use was 15% in the TLE group.

Discussion

A. Sociodemographic

One major aspect this study looked at was the sociodemographic and the socioeconomic status of the patients visiting the ART Centre. In general, about 90% of cases of HIV infections are patients aged between 15 and 45.⁷ The majority of the patients visiting the ART Centre in Loni do in fact fit into the age range of 15 to 45 years old. Although most of the patients do fit the general trend, it is estimated that roughly 3.5% of the approximately 2.4 million people living with HIV in India are children.⁸ Unfortunately when a child is infected there are other implications than just the disease itself. In an observational cohort study done previously it was found that almost 46% of HIV positive children are not in school or doing any form of studying.⁸

The data collected from the medical charts showed that a large portion of the patients visiting the ART Centre had either a primary or secondary level education. Adult literacy rate in India are found to be about 73% for men and only 48% for women.⁹ Patients who are HIV positive as well as illiterate often struggle with treatment adherence due to a lack of understanding about the disease, as well as the benefits of the given treatments. Due to limited education most of the HIV patients visiting the ART Centre work unsteady jobs, often hiding their disease from their employer. In an observational study it was found that 25% of men and 28% of women work as unskilled daily laborers, while only 3.6% of adults hold a permanent job.⁸ It is often difficult for HIV patients to make it to the ART Centre due to long commutes, and having to miss a day of work, so one family member is often sent to pick up the treatment for everyone.

Lack of transportation, and long commute times make the ART Centre inaccessible to some. 67% of HIV infected patients in India can be found living in rural areas.⁸ This study

focused on HIV patients at a rural ART Centre so the patients interviewed all lived primarily in rural India. Patients at the ART Centre stated that they are willing to travel the distance to the ART Centre because the treatment is free. Almost all of the patients interviewed could not afford to purchase the treatment from a private hospital. The World Bank categorized India as a “low-income country”, the per capita gross national income being roughly \$720.⁹

Due to long commutes, a trend seen at the ART Centre, when both spouses are positive, is that only one spouse will come to the Centre to collect the treatment. Almost all of the patients visiting the ART Centre of marriageable age were married, widowed, or separated as a result of their disease. In a study that took place in the rural district of Anantapur, it was found that one third of the HIV positive women were widows. When compared to men, the proportion of widowed patients was found to be far more significant in women.⁸ In a study looking at HIV stigma it was found that whether you are a male or female is the only factor that has a significant influence on stigma.¹¹

Throughout this study trends of poor behavior towards women were seen. Female patients that were interviewed expressed concerns of being shunned by their families even though their husbands were the reason for their disease. It was seen that women are generally diagnosed at earlier ages, have lower education levels, have worse employment conditions and opportunities, and are more dependent on their relatives than men.⁸ Many women who came to the ART Centre were with their relatives. Many of the women interviewed expressed gratitude towards their relatives for taking such good care of them, however; some women described the verbal and emotional abuse they suffer from at the hands of their relatives. According to NACO, the population of women infected by HIV is steadily increasing. It was found that, 46% of people living with HIV were women.⁸ With that being said, HIV prevalence is currently highest

among transgender persons, transgender persons are 49 times more likely to be infected with HIV.¹²

B. Pharmacological

The main medication regimens that were prescribed to patients at this ART Centre, according to the data collected from medical charts, were ZLN (Zidovudine+Lamivudine+Nevirapine) and TLE (Tenofovir+Lamivudine+Efavirenz). These medications are antiretrovirals that fight against the disease and work together, through different mechanisms, to slow the progression of the disease to its final stage. This type of combination treatment is commonly used in lower resource areas as it combines three different medications into one tablet, which increases adherence to treatment.¹³ Self-reported adherence among the individuals interviewed was very high, with most saying they rarely forget to take their medications. However, this may be due to the fact that they did not want to admit to being non-adherent. It may also be due to the fact that adherence was only measured through interviews with individuals who came to the clinic; therefore, it is unlikely that those who are non-adherent would have been at the clinic during the 10 day study period. Many currently adherent patients, however, did report difficulty taking the medications when they were first diagnosed with HIV due to the unpleasant side effects, such as nausea, vomiting, weakness, or dizziness, but they have now been on the medications for many years and no longer experience these side effects and have no troubles with adherence. Adherence to ART is an extremely important indicator of how effective the treatment will be. One study concluded that patients with optimal compliance had significantly higher CD4 counts than those with suboptimal compliance. Of those with CD4 counts >500, compliance was 98.84%, and with a CD4 count <100, compliance was 85.73%.¹⁴

In regards to the efficacy of these combination antiretrovirals, their effects on CD4 levels were very similar. The data collected from medical chart showed an increase of CD4 levels in

months 6, 12, 24, and 36, and a decrease in month 48 for ZLN, but an increase for TLE. This is significant because CD4 levels are an important indicator of the progression of the disease. Therefore, the data supported the fact that ART is beneficial in helping patients fight off this disease. A past study also supported the fact that these treatments have equal efficacy in treating HIV.¹³ There was no information present during a literature search that would explain the decrease in CD4 levels among patients in month 48, this is most likely due to inconsistent documentation of CD4 levels, resulting in less data points for month 48.

While all of the patients interviewed during this study expressed positive feelings towards their treatment, the counselors provided additional information about the many individuals who do not feel this way. They stated that some patients believe that because they have been taking this medication for so long, they should be cured. They do not understand that this disease is incurable and they will have to take this medication for the rest of their lives. The counselors stated that because of this view, some patients stop taking their medications and visit “quack” doctors to receive herbal medications in the form of a paste of mashed up leaves to raise their CD4 counts.

C. Medical

Concurrent with HIV onset, it is possible for a patient to contract anemia. This can be due to a number of reasons including “changes in cytokine production with subsequent effects on hematopoiesis, decreased erythropoietin concentrations, opportunistic infectious agents,... administration of chemotherapeutic agents,... muelopthissi, B12 deficiency and autoimmune destruction of red blood cells.”¹⁵ With the destruction or decreased production of red blood cells, the patient is often closer to transitioning to the AIDS condition and can severely decrease the length of time the patient has.¹⁵ In this experiment, it was found that ZLN had double the percentage of hemoglobin increase with the hemoglobin levels after treatment being 7.87%

where the percent of hemoglobin change in TLE treatment was 3.29%. Initially, it can be said that ZLN treatment is the better option for HIV patients at encouraging hemoglobin in the body.

It was found in the random sample across both treatment groups being studied that the incidence of tuberculosis in patients was 11% in ZLN treatment and 12% in TLE treatment. This is lower than the previous studied rates from Pravara Medical ART between June 2011 and May 2012, which was 17% incidence.¹⁶ With significant similarity between both treatment groups, it could imply that the prevalence of tuberculosis has decreased in HIV patients in the Loni area at the ART clinic. This can be implied due to the extensive public health and social medicine curriculum that is taught and displayed within Pravara Medical Institute. The 17% recorded in 2012 was already well below the national average of HIV patients to have contracted tuberculosis, which was 30% in 2008.¹⁷ This shows that the area already had a lower prevalence of tuberculosis than the global average and that the Pravara Medical Institute must have already been treating patients and helping prevention of opportunistic tuberculosis infections.

Of the 50 patients interviewed, about 33% and 15% had admitted to alcohol use across ZLN treatment groups and TLE treatment groups, respectively. Alcohol use combined with treatment for HIV has shown decreased uptake and effectiveness, and therefore, overall decreased virus suppression. While the ZLN would be expected to have lower blood hemoglobin levels than the TLE treatment group due to a decrease in suppression, which would yield lower hemoglobin levels due to greater viral effects, the opposite is true, as the hemoglobin level is higher in ZLN treatment compared to TLE treatment.¹⁸

Of the 50 patients interviewed, about 48% and 52% had admitted to tobacco usage in their lives across ZLN treatment groups and TLE treatment groups, respectively. It has been found that hemoglobin levels are directly affected by tobacco use, as each cigarette that was

smoked had increased hemoglobin levels. For those that had never smoked or used to smoke, the difference between the two was insignificant, and therefore those that have smoked and used to smoke will be assumed as those not having an effect on the outcome of hemoglobin count change.¹⁹ However, despite the effects of tobacco on hemoglobin counts, the two treatment groups had an insignificant difference between tobacco use, excluding use severity. Even if the tobacco had an effect on the hemoglobin levels, it would be indistinguishable between the two treatment groups.

Opportunistic infections between the two treatment groups was found to be significantly different as the ZLN treatment group had prevalence of opportunistic infections at 30%, while the TLE treatment group had opportunistic infection prevalence of 67%. This difference in data provided a TTEST value of .005 which is well below the accepted .05 value. With increase in opportunistic infections, comes a greater risk of immune system compromise. In this case, it can be seen that opportunistic infection rate in patients has more severe consequences on the hemoglobin levels in a patient compared to alcohol or tobacco.²⁰ This can be seen due to the inability for the body's immune system to fight off the new infection and can be due to a number reasons like those mentioned previously about the factors regarding HIV related anemia.

D. Interviews

The final aspect of this study was a qualitative interview with 50 patients about how this disease has affected their lives, and an interview with the head counselor at the ART Centre about his experiences with this patient population. A major trend seen throughout the patient interviews was that men with HIV/AIDS were usually treated better than the women. When the man was positive for HIV/AIDS, the wife would almost always stay with him and his parents would be supportive. Conversely, when the woman was positive, the husband would often leave her, take the kids (if they were negative), and she would be shunned by her in-laws. For example,

one individual who was 8 months pregnant stated that her husband gave her HIV/AIDS, but her in-laws refused to believe that this was true. They tried to force her to get an abortion, and then kicked her out of their house. In cases such as these, the counselors at the ART Centre can connect these women and children with orphanages, NGOs, etc. that would be able to take them in. An additional way in which women with HIV are treated negatively is when her husband, whom she contracted the disease from, forces her to tell people that her diagnosis is because of a doctor with an infected needle. Oftentimes, according to the counselor, the husband will physically beat his wife until she begins to believe this herself. This scenario usually manifests when the husband is unfaithful and got the disease from a female sex worker and then infected his wife. Another trend seen throughout the interviews was individuals keeping their diagnosis a secret. For many, they did not tell their employers or their children due to the stigma surrounding the disease. In one extreme case, a man has been keeping his diagnosis a secret from his wife for 4 years. He stated that he always takes his medication before she wakes up and after she goes to sleep, and he said that he has no intentions of telling her because he does not want her to leave him. The stigma surrounding HIV was a large reason many patients stated that they were having difficulties managing their disease, especially the young patients. For example, one young girl had been trying to get into a school, but was denied entry at all of them because she had HIV, and the schools were afraid she was going to spread it to other students. In response to these stigmas and fear of the disease spreading, individuals with HIV have created marriage institutions in their communities solely for those who have the disease. This allows men and women who are positive to marry each other and not worry about spreading the disease to someone else. In all, the stigma of HIV is still quite prevalent in India. According to the main counselor, there are many misconceptions about the way the disease is spread. For example,

many individuals believe it can be spread through normal touch, sharing food, or mosquitoes. Therefore, he believes that the government should be doing more to educate people about the realities of this disease and how it is spread in order to create a more accepting community for those with HIV.

The interview conducted with the counselor provided an insight into the strategy behind his counseling sessions with patients. In the initial meeting, he does not try to discover what the cause of the disease is, he just focuses on explaining what HIV is and why it is necessary to be adherent to the medication. In the next 2-3 counseling sessions he focuses on gaining their trust and assisting them with any issues they may be having accepting the realities of the disease. Finally, in meeting 4 or 5, he usually learns the true cause of the infection. In regards to the realities of being a counselor at an ART Centre, he stated that his favorite part of the job is being able to build meaningful relationships with all of his patients and help them live their best lives with this disease. He gets very invested in their lives and does whatever he can to solve any problems they may be having. The worst part of his job is explaining to the pediatric patients that they have, through no fault of their own, contracted this incurable disease. A particularly difficult case was that of a 14 year old boy with an intellectual disability who, his parents believe, got HIV from children at his school bullying him since neither parent tested positive and they could think of no other way he could have contracted the disease. While these patients are difficult for him he states that overall, he greatly enjoys his job and plans to continue working at the ART Centre for a long time.

Conclusion

This study provides an insight into the realities of living with and treating HIV in rural India. The sociodemographic data collected during this study can be used as an important tool for

determining what future actions need to take place. India has a population of over one billion people and is home to approximately one of every eight people with an HIV infection.⁹ With such a large population of infected individuals, knowing the sociodemographic factors that contribute to the disease will help in prevention efforts. India is made up of huge cities with large slums, but more than 70% of its people live in rural areas.⁹ And, nearly 70% of the infected individuals in India live in rural areas.⁸ Unfortunately, even with the vast majority of infected persons' living in the rural areas there is little epidemiological information available specifically for rural populations. The data collected from this study can be used as a starting point for more research into the rural HIV positive population and future tasks for prevention. The pharmacological data obtained from this study can also be used to ensure patients and physicians that the antiretroviral medications being used at this ART Centre are effective in treating HIV, even though they may not be first line medications in more developed countries.

Due to the comparisons of multiple effects on the hemoglobin production in HIV related anemia, it cannot be said with certain confidence that opportunistic infections have the largest impact on the body's ability to produce hemoglobin, however, in this study, it can be implied that opportunistic infections affect hemoglobin more than those of alcohol or tobacco. This can be useful because, as tobacco or alcohol use does indeed harm the body's immune system ability and ART treatment reactivity, a greater focus should be put more on education of how opportunistic infections can reduce the time of survival for those that have contracted HIV.

Finally, the data obtained during the interviews shows that more work needs to be done to educate the public about this disease and dispel the stigma surrounding it. Current work in India focusing on empowering women should continue, as it was seen during the interviews that women are still not treated equally to men, especially in regards to HIV status.

Limitations

The numerical findings of this study are limited by the inconsistencies in documentation on the patients' medical charts. The ART Centre has a high turnover rate with employees; thus, documentation is not completed in a consistent way throughout the patients' treatment. Also, when interviewing patients, it was found that a lot of information on their charts had not been recently updated and were not accurate. For the 150 medical charts that were examined, it is very likely that some of the information recorded was inaccurate or outdated. Another limitation was that all of the interviews were conducted through a translator; therefore, some of the information may have been lost in translation or possibly mistranslated. Finally, some patients may have lied about some of the information they provided in the interviews because they may not trust someone who is not from their community with this personal information.

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References

- [1] Fact Sheet November 2016. UNAIDS. <http://www.unaids.org/en/resources/fact-sheet>.
Published November 2016. Accessed March 5, 2017.
- [2] McBride Murry, V. Current issues with addressing HIV/AIDS in rural communities.
American Psychological Association:Psychology and AIDS Exchange Newsletter.
<http://www.apa.org/pi/aids/resources/exchange/2015/01/hiv-aids-rural.aspx>. Published January
2015. Accessed March 5, 2017.
- [3] Mondal M, Shitan M. Factors affecting the HIV/AIDS epidemic: an ecological analysis of
global data. *African Health Sciences*. 2013;13(2):301-310. doi:10.4314/ahs.v13i2.15.
- [4] HIV and AIDS in India. AVERT. [https://www.avert.org/professionals/hiv-around-world/asia-
pacific/india](https://www.avert.org/professionals/hiv-around-world/asia-pacific/india). Published December 01, 2016. Updated February 09, 2017. Accessed March 5,
2017.
- [5] U. S. Department of Health & Human Services. What is HIV/AIDS? AIDS.gov.
<https://www.aids.gov/hiv-aids-basics/hiv-aids-101/what-is-hiv-aids/>. Updated July 14, 2016.
Accessed March 5, 2017.
- [6] U. S. Department of Health & Human Services. How do you get HIV or AIDS? AIDS.gov.
<https://www.aids.gov/hiv-aids-basics/hiv-aids-101/how-you-get-hiv-aids/>. Updated December
31, 2015. Accessed March 5, 2017.
- [7] Pais P. HIV and India: Looking into the abyss. *Tropical Medicine and International Health*.
1996;1(3):295–304. doi:10.1046/j.1365-3156.1996.d01-47.x.
- [8] Alvarez-Uria G, Midde M, Pakam R, Naik P. Gender differences, routes of transmission,
socio-demographic characteristics and prevalence of HIV related infections of adults and

children in an HIV cohort from a rural district of India. *Infectious Disease Reports*. 2012;4(1).

doi:10.4081/idr.2012.e19. Accessed March 5, 2017.

[9] Steinbrook R. HIV in India — A complex epidemic. *New England Journal of Medicine*.

2007;356(11):1089–1093. doi:10.1056/nejmp078009.

[10] Singh K, Buckner B, Tate J, Ndubani P, Kamwanga J. Age, poverty and alcohol use as HIV risk factors for women in Mongu, Zambia. *African Health Sciences*. 2011;11(2):204-210.

[11] Thomas B, Rehman F, Suryanarayanan D, et al. How stigmatizing is stigma in the life of people living with HIV: A study on HIV positive individuals from Chennai, south India. *AIDS Care*. 2005;17(7):795–801. doi:10.1080/09540120500099936. Accessed March 5, 2017.

[12] Ganju D, Saggurti N. Stigma, violence and HIV vulnerability among transgender persons in sex work in Maharashtra, India. *Culture, Health & Sexuality*. January 2017:1–15.

doi:10.1080/13691058.2016.1271141. Accessed March 5, 2017.

[13] Hemasri M, Sudhapoornima P, Sowmya Sri C, Ramya S, Avinash I, Kiran Kumar B. Safety and Effectiveness of Anti-Retroviral Drug Regimens ZIn and Tle in Tertiary Care Teaching Hospital: A Prospective Observational Study. *IOSR Journal of Pharmacy and Biological Sciences*. 2016;11(2):88–96. doi:10.9790/3008-1102018896.

[14] Hasabi I, Shivashankarappa A, Kachapur C, Kaulgud R. A study of compliance to Antiretroviral therapy among HIV infected patients at a tertiary care hospital in north Karnataka. *Journal of Clinical and Diagnostic Research : JCDR*. 2016;10(5):27–31.

doi:10.7860/JCDR/2016/17948.7792. Accessed March 5, 2017.

[15] Obirikorang C, Yeboah FA. Blood haemoglobin measurement as a predictive indicator for the progression of HIV/AIDS in resource-limited setting. *Journal of Biomedical Science*.

2009;16(1):102. doi:10.1186/1423-0127-16-102.

- [16] Giri P, Deshpande J, Phalke D. Prevalence of pulmonary tuberculosis among HIV positive patients attending Antiretroviral therapy clinic. *North American Journal of Medical Sciences*. 2013;5(6):367–70. doi:10.4103/1947-2714.114169. Accessed March 6, 2017.
- [17] Kwan CK, Ernst JD. HIV and Tuberculosis: a Deadly Human Syndemic. *Clinical Microbiology Reviews*. 2011;24(2):351-376. doi:10.1128/CMR.00042-10.
- [18] Chander G, Lau B, Moore RD. Hazardous Alcohol Use: A Risk Factor for Non-Adherence and Lack of Suppression in HIV Infection. *Journal of Acquired Immune Deficiency Syndromes (1999)*. 2006;43(4):411-417. doi:10.1097/01.qai.0000243121.44659.a4.
- [19] Nordenberg D, Yip R, Binkin N. The effect of cigarette smoking on hemoglobin levels and anemia screening. *JAMA*. 1990;264(12):1556–9. doi:10.1001/jama.1990.03450120068031. Accessed March 5, 2017.
- [20] Giganti MJ, Limbada M, Mwangi A, et al. Six-month hemoglobin concentration and its association with subsequent mortality among adults on antiretroviral therapy in Lusaka, Zambia. *Journal of Acquired Immune Deficiency Syndromes (1999)*. 2012;61(1):120-123. doi:10.1097/QAI.0b013e31825da11d.