A Study on Hypertension among Persons Living with HIV attending ART Centers in Tamil Nadu- A Descriptive Cross-Sectional Study

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ABSTRACT
People suffering from immunosuppressive conditions like Human Immunodeficiency Virus (HIV) are more prone to suffer from non-communicable diseases like hypertension, which is not identified and treated at an earlier stage, can lead to significant mortality and morbidity in them. The study design was a cross-sectional study done in select Anti-Retroviral Therapy (ART) centers in Government hospitals in Tamil Nadu during a period from 2017-2018. Data regarding their HIV status, treatment history and Body Mass Index (BMI) were recorded and Blood Pressure (BP) was recorded by using mercury sphygmomanometer using standard guidelines. Data was entered in Microsoft excel and analyzed by using SPSS version 22 software. The study population comprised of 75% males and 25% females. Mean age of study participants was 45+8.2 years and the mean BMI was 22+3.4. The prevalence of hypertension among HIV affected individuals was found to be 14.63%. According to JNC criteria, 34% were having Stage 1 hypertension and 33% had Stage 2 hypertension and only 23% were on treatment. Significant association was found between increasing age, gender, BMI and hypertension. Health education and awareness creation has to be created among HIV patients on maintaining a healthy diet and lifestyle so that, obesity can be prevented or reduced which could play an important role in NCD’s like hypertension and also hypertensive patients have to be identified and treated at early stage to reduce the morbidity and mortality.

INTRODUCTION
Hypertension (HTN) is a medical condition in which the Blood Pressure (BP) is persistently raised. It is of concern because, it can increase the risk of affecting various organs including heart, kidney and brain. Globally, 1.13 billion people are affected by hypertension and only less than 1 person affected by hypertension has it under control and one in four persons are not aware that they have hypertension. If the disease is left untreated or if it is under poor control, hypertension can cause angina, heart attacks and heart failure. It could also cause stroke by blocking arteries that provide oxygen and blood to the brain (World Health Organization, 2019).
Globally, Human Immuno deficiency Virus (HIV), poses one of the major setbacks in public health, claiming around 33 million lives till date. By the year 2019, around 38 million were found to be living with HIV. The main target of this virus is the immune system and it weakens the ability of the body to fight against infections and some types of cancer. The signs and symptoms of the virus vary depending on the stage of infection the person is in. Initially the person may get only influenza like illness like fever, sore throat and rash, When the disease progresses, the person may develop symptoms such as weight loss, lymph node swelling, cough, fever and diarrhea. The transmission of HIV occurs through exchange of body fluids from people who are infected.

The infective body fluids includes blood, breast milk, semen and vaginal secretions. HIV can be diagnosed by rapid diagnostic tests which can provide results on the same day. The action of the HIV virus can be suppressed by use of treatment regimens comprising two or more Antiretroviral drugs known as Anti-Retroviral Therapy (ART). From the year 2000, due to the widespread use and availability of ART, HIV affected persons who had access to the ART increased significantly from 700 thousand to greater than 16 million (World Health Organization, 2020). Mortality rate due to HIV has nearly halved from 2 million deaths in the year 2005 to around 1 million in the year 2016 (World Health Organization, 2015). Though, around the same period, mortality rates due to cardiovascular disease more than doubled in people living with HIV (PLWH) (Feinstein et al., 2016).

Hypertension which is one among the major factors associated with mortality worldwide is one of the greatest problem in HIV affected individuals. Studies show that, there is a 30% increased chance of hypertension occurring in HIV affected individuals, as compared to HIV unaffected individuals. (Xu et al., 2017) Around half of PLWH above age of 50 years suffer from hypertension and its related complications. Also, HIV affected individuals with hypertension are more prone to be affected by cardiovascular events and mortality when compared with HIV infected individuals without hypertension. Virologic and treatment related factors seem to the major cause in the pathophysiologic mechanism in HIV affected individuals (Nüesch et al., 2013). Integrated care centers for HIV and NCD are lacking healthcare system in the country.

In HIV care systems currently in place in the country such as ART centers, caring for persons with HIV and hypertension co-occurring together could be a daunting task for the healthcare systems, as it is unknown whether the things will pan out as planned. In HIV care centers, some factors such as waiting times in the clinic, clinic hours which are inconvenient, unfriendly staff and the frequent scheduled visits which are required depending on the clinical condition play a vital role in patient care. ART treatment has increased the life expectancy of persons living with HIV and has reduced the mortality and morbidity which has ultimately led to elderly population with HIV who are more susceptible to NCDs like hypertension (Currier et al., 2003; Cruse et al., 2012).

Since PLWH [People Living With HIV] may be at an increased risk for hypertension and its complications, including CVD [Cardio Vascular Disease], the importance of hypertension screening by providers, with the intent to effectively treat, cannot be overemphasized. This study aims to estimate the prevalence of hypertension and its determinants among people living with HIV so that they can be effectively screened and identified for hypertension and its risk factors and effective interventions can be done to either treat or control HTN in them.

**MATERIALS AND METHODS**

**Study Design**
Hospital based descriptive cross-sectional study

**Study area and population**
As per the convenience of the research team, HIV positive patients attending ART centers in Government hospitals of Chennai from 2017-2018 were followed up for a period of minimum three times during the 6 months follow up period.

**Sampling Method**
The study participants were selected by purposive sampling method. Around 123 eligible patients with HIV were enrolled in the selected government hospital of Chennai during the study period. They were followed up for a period of 3 times during the 6-month period to confirm the presence of Hypertension.

**Ethical Approval**
Approval was obtained from the Institutional ethical committee before beginning the research study. Informed consent was obtained from all the study participants before they were included in the study.

**Data Collection**
A semi structured questionnaire was used to interview the study participants. It contained details like the Age, gender, and clinical details like how long they are suffering from HIV disease and duration of ART received. Anthropometric measurement
like Standard methods were used to measure the weight and height. After the participant was seated for 10 min in a separate room, Blood Pressure (BP) was measured in right arm using mercury sphygmomanometer, with foot placed at level ground with the elbow flexed at heart level. With a minimum interval of 5 minutes, two readings were taken and an average of the readings were used in the analyses. Patients were followed up for at least three times during the 6-month period to confirm the diagnosis of hypertension.

**Definition for Hypertension**

According to guidelines put forth by World Health Organization (WHO), hypertension is defined as systolic Blood pressure ≥ 140 or diastolic Blood pressure ≥ 90 mm Hg on any of the three recordings or self-reported current use of anti-hypertensives. Two stages were considered as Stage 1 hypertension is defined as systolic BP > 140 mm Hg and < 160 mm Hg or diastolic BP ≥ 90 mm Hg and < 100 mm Hg. Stage 2 hypertension is defined as systolic BP ≥ 160 mm Hg or DBP ≥ 100 mm Hg. Controlled hypertension was defined as systolic BP < 140 and diastolic BP < 90 mm Hg on all three occasions of blood pressure measurements (Chobanian et al., 2003)

**Statistical Analysis**

Data was entered in SPSS and analyzed by using SPSS version 25. Descriptive statistics were given in tables as frequency and percentage. Analytical statistics used were student T test which was used to assess whether there was significant difference between two means at 95% Confidence Interval.

**RESULTS AND DISCUSSION**

Among the 210 eligible HIV-infected patients, only 123 patients willing to participate in the study completed all visits. Nearly 75% of the study participants were found to be males. The mean age of the study participants was 45.0 ± 8.2 years and mean BMI was 22 ± 3.4 Table 1.

Table 1: General Baseline characteristics of the study participants.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency (%) (N = 123)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>93 (75%)</td>
</tr>
<tr>
<td>Female</td>
<td>30 (25%)</td>
</tr>
<tr>
<td><strong>Age (Mean in yr and SD)</strong></td>
<td>45.0 ± 8.2</td>
</tr>
<tr>
<td><strong>BMI (kg/m2)</strong></td>
<td>22 ± 3.4</td>
</tr>
</tbody>
</table>

Hypertension was detected in 18 (14.63%) HIV positive patients of which all of them are receiving anti-retroviral treatment but only 4 of them were known hypertensives and were under antihypertensive therapy. By gender, the prevalence of hypertension in HIV-infected patients was 13 (14%) in men and 5 (16.6%) in women. Among the hypertensives, 8 (34%) of them are under stage 1 and 6 (33%) are under stage II hypertension. Those who were having HIV with known diabetes was 7.3% Table 2.

Table 2: Clinical Variables related to Hypertension.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (%) (N = 123)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of HTN</td>
<td>18 (14.63%)</td>
</tr>
<tr>
<td>Known Diabetic</td>
<td>9 (7.3%)</td>
</tr>
<tr>
<td>Stage-1 HTN (n = 18)</td>
<td>8 (34%)</td>
</tr>
<tr>
<td>Stage-2 HTN (n = 18)</td>
<td>6 (33%)</td>
</tr>
<tr>
<td>On Treatment for HTN (n = 18)</td>
<td>4 (23%)</td>
</tr>
</tbody>
</table>

There was statistically significant association observed between gender, increasing age, BMI and Hypertension (p-value<0.05) Table 3. In this study, 10 years duration was the mean age of HIV infection and 7yrs was mean duration of starting ART. The mean CD4 count observed in the study participants was 228 and CD8 count was 532 Table 4.

Table 3: Association between baseline characteristics and HTN.

<table>
<thead>
<tr>
<th>Baseline Characteristics</th>
<th>Hypertension n (%) (n = 18)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>13 (72%)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Female</td>
<td>5 (28%)</td>
<td></td>
</tr>
<tr>
<td><strong>Age (Mean in yr and SD)</strong></td>
<td>47.0 ± 7.2</td>
<td>0.007*</td>
</tr>
<tr>
<td><strong>BMI (mean in kg/m2)</strong></td>
<td>25 ± 4.1</td>
<td>0.001*</td>
</tr>
</tbody>
</table>

* — Statistically significant at 95% Confidence Interval.

People living with HIV are already under psychological distress either due to the stigma or due to medication, associated illness or a combination of all of them. Thereby, they are more prone to develop NCD’s like hypertension which can add up to their morbidity. Increased blood pressure is also considered as an important modifiable risk factor for cardiovascular disease prevention. This study done among HIV patients regarding hypertension gave interesting results which are discussed below. In this study around the prevalence of hypertension
among study subjects was found to be 14.63%. Similar results were obtained in a study done by Jerico C et al (Jerico et al., 2005). Among HIV-positive individuals, the overall prevalence of hypertension increased from 10.7% in 1994–1999, to 22.2% in 2010–2015 (p<0.01) (Benzekri and Seydi, 2018).

**Table 4: Patient HIV History and laboratory profile.**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of HIV infection in years (mean year)</td>
<td>10 years (range from 2-14 years)</td>
</tr>
<tr>
<td>Duration under ART (mean year)</td>
<td>7 years (range from 4-9 years)</td>
</tr>
<tr>
<td>CD4 count [× 10^6 cells/L] (Mean)</td>
<td>228 (74 – 345)</td>
</tr>
<tr>
<td>CD8 count [× 10^6 cells/L] (Mean)</td>
<td>532 (404–732)</td>
</tr>
</tbody>
</table>

Higher prevalence of around 33%, 29.9% and 31% were obtained in studies done by Acharya V et al. in South India (Acharya and Gangadharan, 2017), Chireshe, R et al. in Zimbabwe (Chireshe et al., 2019) and Medina-Torne, S et al. in San Diego (Medina-Torne et al., 2012) respectively. The reason for hypertension among PLHIV may be due to intestinal problems, vascular inflammation, high cholesterol, HIV-related kidney disease and other conditions that present with HIV. Since their immune system is constantly functioning, people with HIV have inflammation in their arteries which occurs over chronic long periods, making them stiff and enlarged. High prevalence of insulin resistance was reported among adults treated with HAART in studies done elsewhere (Fantoni et al., 2002; Grinspoon, 2001). According to JNC Criteria for hypertension, there was a nearly equal distribution of Stage 1 and Stage 2 Hypertension among the hypertensives with HIV. Similar results were found in a study done by Kwarisiima, D. et al. (Chireshe et al., 2019). It is imperative that they are identified at this stage and put up on medications so that, complications due to hypertension can be prevented in them.

From this study, it was found that increasing age was found to significantly associated with PLHIV who are on ART. Similar results were obtained in a study done by Chireshe, R et al. (Kwarisiima et al., 2019). This may have been due to the various complications aging can bring to the individual which may cumulatively add up to the development of HTN in the study subjects. Regarding gender of the study participants, males were more prone to suffer from hypertension when compared to females and association was also found to be statistically significant. Similar results were obtained in study done by Jerico C et al (Jerico et al., 2005). In this study, statistically significant association was found between increasing BMI and Hypertension among PLHIV. In a study done by van Zoest, R.A. et al. it was found that, changes in body composition, such as abdominal obesity among HIV-1-infected individuals and lipoatrophy among persons who have taken stavudine before, may contribute to the increased risk of developing hypertension among HIV-1-infected individuals. Additionally, antiretroviral medications trigger conditions that can lead to inflammation (van Zoest et al., 2016).

Reduction of mortality and morbidity in persons with HIV with the usage of antiretroviral medications has brought an increase in prevalence and incidence of CVD in HIV affected population (Nduka et al., 2016). Similarly, in a study done by Acharya V et al, high prevalence of obesity, overweight and hypertension were found to be higher in HIV infected individuals (Acharya and Gangadharan, 2017). Physicians who prescribe antiretroviral medications have to be vigilant in identifying patients who are prone to develop obesity and counsel them to adopt lifestyle modifications to prevent obesity and counsel already obese individuals on reducing their weight. Larger multicentric studies have to be conducted to determine the factors that precede and predict hypertension in HIV infected individuals. None of the guidelines which are available for hypertension cater to specific population groups such as HIV affected individuals. Ambulatory blood pressure monitoring may be recommended for use in HIV affected individuals, as it has been validated in general population as a very good predictor for cardiovascular outcome (Kent et al., 2015).

**CONCLUSIONS**

HIV-infected adults have an increased risk hypertension and other cardiovascular diseases. Even in those who have hypertension there is a dire need to keep it under control. All HIV positive patients, have to be counseled on the frequent monitoring of blood pressure and must be advised to have a healthy balanced diet so that, obesity and related complications can be prevented. All health officers in health centers attending HIV patients must monitor blood pressure of PLIV and must be empowered to identify the cause which maybe lifestyle related or drug related and provide necessary treatment or change in regimen if necessary.

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Conflict of Interest

The authors declare that they have no conflict of interest for this study.

REFERENCES


