

Prevalence of Human Immunodeficiency Virus, Clinical Presentation and Related Factors among Adult Patients with Heart Failure at Jakaya Kikwete Cardiac Institute-Dar Es Salaam, Tanzania

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Abstract

Background: Patients with heart failure are not exempted from HIV infection. Globally, in the year 2016, about 1.0 million people died of HIV related diseases including heart failure. A study conducted in South Africa showed that about 10% of hospitalized patients with Cardiovascular Disease (CVD) and heart failure had HIV infection. In Tanzania 5% of people aged 15 to 49 years live with HIV infection but no study has been conducted to determine the magnitude of HIV infection among patients with Heart Failure (HF).

Aim of the study: The aim of this study was to determine the prevalence of HIV, clinical presentation and related factors among patients with heart failure attending Jakaya Kikwete Cardiac Institute (JKCI) in Dar es Salaam, Tanzania.

Patients and Methods: A cross-sectional hospital based study involving 523 adults with heart failure attending at JKCI was carried out from September 2016 to January 2017. Exclusively Framingham score of two or more was used to confirm the presence of heart failure. Upon consent by the patients, HIV testing was done on 523 patients by the use of SD Bioline and Uni-Gold cartridges. According to the National algorithm, for a patient to be defined as HIV positive, both Bioline and Uni-Gold tests have to be positive. If the first test which was Bioline was negative then the individual was considered negative and no further testing was done and patient counseled and instructed to come again after 2-4 weeks for retesting. If however, Bioline test was positive, a second test Uni-Gold was done. If the Uni-Gold test was negative i.e. discordant results then a confirmatory ELISA test was done. A structured questionnaire was used to extract demographic data and to record blood pressure, respiratory rate, serum creatinine, lipid profile, and random (casual, non-fasting) plasma glucose (for diabetes) as well as hemoglobin level. Data management, processing and analysis were done by computer software SPSS version 20. Logistic regression model was used to determine the associated factors, the Chi square test, Fishers exact test and F test was computed and P value <0.05 was considered as statistically significant.

Results: A total of 523 adult patients with heart failure were studied and the prevalence of HIV infection was found to be 5% HIV infection was more prevalent among patients aged 40-64 years (6.8%), female (6.7%) and to single/living without partner (11%). Heart failure was found to be significantly advanced among those who tested HIV positive compared to HIV negative individuals [NYHA IV 57.7% vs. 19.9%, (p<0.001)]. Furthermore anemia, dilated cardiomyopathy and pericardial effusion were significantly more prevalent among those with HIV infection than those with no HIV infection. The respective proportions were 61.5% vs. 22.1%, 79.9% vs. 41.3%, 53.9% vs. 27.2% and 15.4% vs. 4.4% (p<0.001). On an adjusted analysis, widowed/divorced/separated, anemic patients with heart failure and those with New York Heart Association functional class IV (NYHA IV) had significantly elevated odds of at least 3 for HIV.

Conclusion and recommendations: The prevalence of HIV infection among patients with heart failure at JKCI was 5%. The patients who were HIV positive were more likely to have an advanced heart failure (NYHA function class IV), have anemia, and were widowed/divorced/separated.

It is strongly recommended that early HIV counseling and testing be done among cardiac patients who presents with, anemia and to those whose are single/living without a partner as these are associated with increased likelihood of developing advanced stages of heart failure.

Introduction

Heart failure is a pathophysiological state in which the heart is unable to pump blood at a rate commensurable with the requirements of the metabolism of the tissues. The 2013 ACCF/AHA Guideline for the Management of Heart Failure also defined heart failure as

a complex clinical syndrome that results from any structural or functional impairment of ventricular filling or ejection of blood [1]. Patients with heart failure in a clinical setting may present with the features of left-sided or right-sided or both. The syndrome is characterized by increased filling pressures and congestion of the

heart due to backward flow of blood and impaired systemic perfusion due to forward failure. Furthermore, heart failure has been classified as either systolic failure which is an inability to expel sufficient blood or diastolic failure which is the failure of the heart to relax and fill blood [2].

Human immunodeficiency virus infection is a public health problem worldwide especially in developing countries [3]. It was estimated that more than 70 million people of all age groups have been infected with HIV since the beginning of epidemic globally and about 35 million people died of HIV. The epidemiological data shows that about 36.7 million people were HIV positive at the end of the year 2016 around the world and that 0.8% was adults aged 15-49 years. The burden is more in the Sub-Saharan Africa in which nearly 1 in every 25 adults (4.2%) is living with HIV which was equivalent to nearly two-thirds of the people who were living with HIV in the world in 2016. HIV related morbidities are extra burden all over the world and about 1.0 million people died of HIV related diseases in 2016 [4].

In Tanzania it is estimated that about 5% of all adults age 15 to 49 are HIV positive. Of all Tanzanian adult women, 6% are HIV positive which is higher when it is compared with 4% adult men. Geographically, HIV prevalence is higher in urban (7%) than in rural areas (4%), also the prevalence is higher in Tanzania mainland (5%) than in Zanzibar (1%) [5]. Moreover at Muhimbili National Hospital which is a tertiary health facility, the prevalence of HIV infection among patients with stroke was found to be higher at 20.9% (45/215) in 2010 [6].

HIV is a chronic systemic disease which is characterized by anemia (bone marrow infiltration), continuing inflammation process, all of which are risk factors for the heart failure either directly or indirectly [7]. The virus also may infects the heart directly and cause inflammatory injury and morphological alteration of the myocardium and coronary blood vessels. The autoimmune response/activation, metabolic changes and Highly Active Antiretroviral Therapy (HAART) side effects have been reported to cause heart diseases [8-12]. Cardiovascular diseases and heart failure has been associated with advanced HIV disease in adolescents in the USA. HIV stage IV was reported to cause accelerated atherosclerosis perhaps due to inflammatory process and endothelia dysfunction and pulmonary hypertension, all of which may progress to cause heart failure [13]. But with the introduction of HAART and great coverage use, most of HIV infected patients survive to live longer with an increased risk of degenerative diseases and heart failure [14,15]. The global heart and electrophysiology functions are also impaired by HIV infection. The structural heart diseases such as pericarditis and effusion, dilated cardiomyopathy and endocarditis were reported to cause heart failure among 500 HIV infected individuals in USA [16]. Sometimes HIV infected individuals develops asymptomatic structural heart diseases and heart failure which is diagnosed at autopsy [17]. The severity of HIV infection-related cardiac muscle diseases (acute myocarditis) with resultant dilated cardiomyopathy is more fulminant among people of African ethnicity than others [18].

However the causes of heart failure in HIV infected patients are multifactorial. The known causes include direct myocardial injury from HIV infection, HAART, inflammation, minerals (selenium) and other nutritional deficiencies [19]. Also these patients have the tendency to develop endothelial dysfunction and premature vascular aging which are initial steps for atherosclerosis that progress to CVDs and heart

failure [20]. Also HIV treatment with PIs induces dyslipidemia which is the risk factor for Ischemic Heart Diseases (IHD) and myocardial infarction and eventually the patient's heart fails [21]. However, Anti-retroviral drugs reduce the rate of HIV transmission, virus replication and viral load and thus reduce or decelerate the rate of heart failure [22].

The aim of this study was to determine the prevalence HIV disease and its associated factors among the patients with heart failure at JKCI. This will help to put more emphasis on the need for universal HIV testing for all patients with heart failure attending JKCI. Also this will be a pioneer study in Tanzania to document the prevalence of HIV among patients with heart failure. By identification of HIV related factors among these patients with heart failure, the physicians will be able to identify them early, initiate treatment and hence reduce morbidity and mortality among this population.

Patients and Methods

A cross-sectional hospital based study that consecutively enrolled 523 consenting adults with heart failure attending at JKCI was carried from September 2016 to January 2017. Framingham criteria were exclusively used for the diagnosis of heart failure, the score of two or more was used to confirm the presence of heart failure. HIV testing was done on 523 patients by the use of SD Bioline and Uni-Gold cartridges. According to the National algorithm, for a patient to be defined as HIV positive, both Bioline and Uni-Gold tests run in series have to be positive. If the Bioline was negative then the individual was considered negative and no further testing was done and patient counseled and instructed to come again after 2-4 weeks for retesting. If however, an SD Bioline test was positive, a second test-Unigold was done. If the Unigold test was negative i.e. discordant results then a confirmatory ELISA test was done. Chest radiography, Electrocardiogram and Trans Thoracic Echocardiogram were used to determine the structural and ischemic changes from the participants.

A structured questionnaire was used to obtain demographic data and gather co-morbid information such as record blood pressure, serum creatinine, lipid profile, and random (casual, non-fasting) plasma glucose (for diabetes) as well as hemoglobin level. Data management, processing and analysis were done by computer software SPSS version 20. Logistic regression mode was used to determine the associated factors, bivariate analysis was done on demographic and other statistically significant univariate tests to obtain COR, and a multivariate analysis was done on statistically significant bivariate tests to obtain AOR. The multivariate analysis was done on marital status, NYHA functional class, hypertensive heart diseases, dilated cardiomyopathy, pericardial effusion and hemoglobin level. The Chi square test, Fisher's exact test and F test was computed and P value <0.05 was considered as statistically significant.

Ethical Consideration

The ethical clearance was obtained from MUHAS Senate Research and Publications committee and a permission to do research was obtained from JKCI administration. The fully informed and comprehensive informed consent form was signed by the participant or a close relative of a patient. The issue of autonomy, beneficence and justice were explained in the form in a language that the patient understood. Participants were allowed to ask questions for more clarification. The HIV status of the patient remained confidential and the patient can disclose to the close relative willingly. Those who tested positive were initiated ART in the ward or referred to the nearby CTC for proper management.

Results

Patients selection

Figure 1 show a flow chart diagram. During the period of data collection, 6,000 patients attended at JKCI and out of them 1,500 had heart failure. After assessment 1,000 patients met eligibility criteria however 477 were excluded due several reasons. Out of 523 patients with heart failure, 26 tested positive for HIV.

Socio demographic characteristics of the participants N=523

Table 1 show socio demographic characteristics of patients with heart failure. Majority of them 54.3% (284/523) were female and 44.7% (234/523) of all participants were middle aged, 40-64 years. Africans were the predominant race 98.5% (515/523) among the study population and in terms of education level 47.8% (250/523), 45.1% (236/523) of all had primary and secondary or higher education respectively. About two-thirds (64.2%) of the patients were married and a greater proportion of participants 55.1% (288/523) was not employed.

Prevalence of HIV among patients with heart failure N=523

Figure 2 show the prevalence of HIV infection among patients with heart failure. Out of 523 patients with heart failure, 26 tested positive for HIV and this figure accounted for the prevalence of 5% (5%, 95% C.I 3.4 - 6.9).

Social Demographic Characteristics of patients presenting with heart failure by their HIV status

Table 2 summarizes the Social Demographic Characteristics of patients presenting with heart failure by their HIV status. The proportion of HIV infection among patients with heart failure was higher among middle aged (40-64 years) individuals (6.8%) when compared to those who were less than 40 years (5.1%) and more than 65 years of age 0.9%. Significantly more female, 6.7% (19 cases),

tested positive for HIV infection as compared to males, 2.9% (7 cases) ($p=0.049$). Also there was statistically significant difference observed in the proportion of HIV infection by marital status. Marital status was significantly associated with the prevalence of HIV ($p=0.003$).

Distribution of clinical and laboratory features by HIV status among patients with heart failure

Table 3 summarizes the distribution of clinical and laboratory features by HIV status among patients with heart failure. The heart failure was found to be significantly advanced among those who tested HIV positive compared to HIV negative individuals (NYHA IV 57.7% vs. 19.9% non-HIV ($p<0.001$)). Furthermore anemia, dilated cardiomyopathy and pericardial effusion were significantly more prevalent among those with HIV infection than those with no HIV infection. The respective comparative proportions were 61.5% vs. 22.1%, 79.9% vs. 41.3%, 53.9% vs. 27.2% and 15.4% vs. 4.4% ($p<0.001$). On the other hand the proportion of hypertensive heart disease were significantly more among those with no HIV that those with HIV infection, 38.0% vs. 11.5% ($p<0.001$).

Logistic regression analysis of factors associated with HIV infection among patients with heart failure at JKCI

In table 4 we show the relationship between various factors associated with HIV infection among patients with heart failure. For example, widow/divorce/separated, anemic patients with heart failure and those with New York Heart Association functional class IV (NYHA IV) had significantly elevated odds of at least 3 for HIV (Table 4).

Discussion

A total of 523 adult patients with heart failure were studied to determine the prevalence of HIV, describe their socio-demographic, clinical and laboratory characteristics as well as HIV associated factors. The prevalence of HIV infection among patients with heart

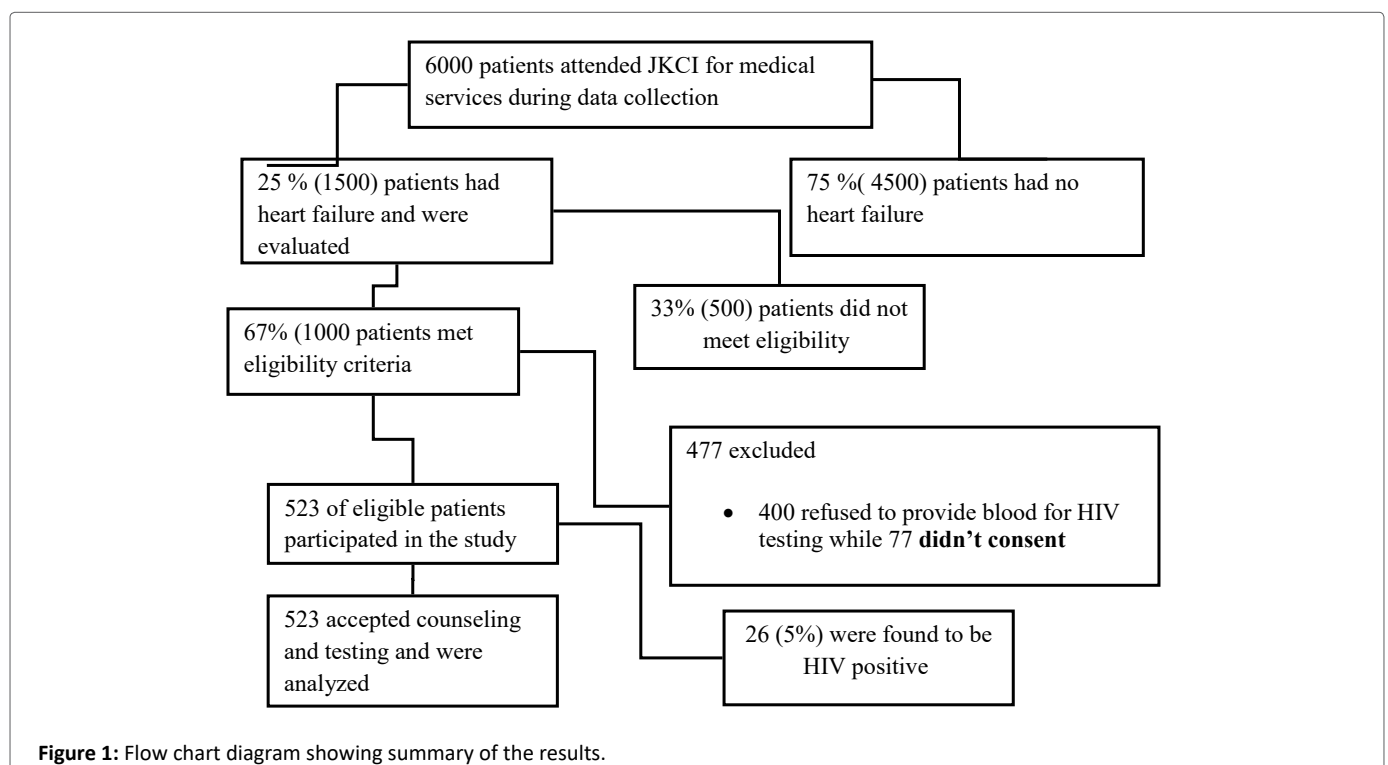
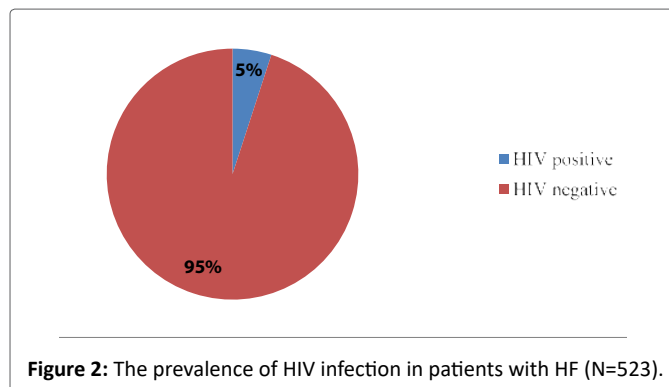


Figure 1: Flow chart diagram showing summary of the results.

Table 1: Social Demographic Characteristics of patients presenting with heart failure (N =523).

Variables	Frequency	Percentage
Age (years)		
<40	178	34
40-64	234	44.7
≥ 65	111	21.2
Sex		
Female	284	54.3
Male	239	45.7
Cigarette smoking		
Smokers	66	12.6
Non smokers	457	87.4
Occupation		
Employed	235	44.9
Not Employed	288	55.1
Ethnic of origin		
African	515	98.5
Mixed race	8	1.5
Education level		
None	37	7.1
Primary	250	47.8
Secondary & above	236	45.1
Marital status		
Single	105	20.1
Married	336	64.2
Widowed/divorced/separated	82	15.7



failure was found to be 5%. HIV infection was more prevalent among patients aged 40-64 years (6.8%), female (6.7%) and those with unstable sexual relationship (widowed/divorced/separated) (11%). The clinical and imaging characteristics of these patients were characterized by advanced stage of heart failure (57.7%), anemia (61.5%), dilated cardiomyopathy (53.8%) and pericardial effusion (15.4%). The advanced stage of heart failure, anemia and unstable sexual relationship were associated with HIV infection among the patients with heart failure at JKCI.

Of all patients who had heart failure attending JKCI, 5% were identified to be positive for HIV infection. The rate found in this study is lower than the previous reported rate in South Africa in 2008 where 10% of patients with CVD and heart failure were found to be HIV positive [8]. The difference noted in the rate of HIV infection between the two studies may be explained by the variation in the sample

Table 2: Social Demographic Characteristics of patients presenting with heart failure by their HIV status (N =523).

Variables	HIV status			p value
	Total N	Positive n (%)	Negative n (%)	
Age groups				
<40	178	9 (5.1)	169 (94.9)	
40-64	234	16 (6.8)	218 (93.2)	0.060*
≥ 65	111	1 (0.9)	110 (99.1)	
Sex				
Female	284	19 (6.7)	265 (93.3)	0.049*
Male	239	7 (2.9)	232 (97.1)	
Cigarette smoking				0.136**
Smokers	66	1 (1.5)	65 (98.5)	
Non-smokers	457	25 (5.5)	432 (94.5)	
Occupational				
Employed	235	14 (6.0)	221 (94.0)	0.349*
Not Employed	288	12 (4.2)	276 (95.8)	
Ethnic of origin				
African	515	26 (5.0)	489 (95.0)	0.663**
Mixed race	8	0 (0.0)	8 (100.0)	
Education level				
None	37	0 (0)	37 (100)	
Primary	250	18 (7.2)	232 (92.8)	0.055*
Secondary & above	236	8 (3.4)	228 (96.6)	
Marital status				
Single	105	8 (7.6)	97 (92.4)	0.003*
Married	336	9 (2.7)	327 (97.3)	
Widowed/divorce/ separated		9 (11)	73 (89)	

* χ^2 Test, **Fisher's Exact Test

size, population clinical characteristics, and inevitably demographic characteristics. Furthermore, the HIV rate in South Africa in the general population at the time when the study was conducted was about 10%, a rate which is much higher compared to 5% in the setting where our study was conducted (5,23). On the other hand, the prevalence found in this study is similar to that reported by the Tanzania HIV/AIDS and Malaria Indicator Survey (THMIS) in 2011-2012 among adults aged 15-49 years [5]. The similarity may have been contributed by the fact that study patients came from unselected population. The findings from this study deferred from rate of HIV infection in the hospital setting where the HIV prevalence is higher. Among admitted patients with stroke at Muhimbili National Hospital, HIV prevalence reported in 2010 was 20% [6]. The study referred here was conducted seven years ago and HIV dynamics in the population have been occurring in terms of improvement of awareness and prevention strategies. In addition to that, the variation in the clinical and demographic characteristics of the study population may all explain the differences in the rates noted in these hospital based studies.

About 6.7% of female and 2.9% of male patients tested positive for HIV infection in our study. The findings from this study are comparable to previous reports from different parts of the world and

Table 3: Distribution of clinical and laboratory features by HIV status among patients with heart failure (N=523).

Clinical presentation	HIV status		p-value
	Positive n=26 (%)	Negative n=497 (%)	
DBP (mmHg); Mean ± SD	82 ± 20	81 ± 44	0.636***
SBP (mmHg); Mean ± SD	128 ± 26	129 ± 26	0.854***
RR (Cycl/Min); Mean ± SD	21.08 ± 4.00	19.34 ± 3.45	0.013***
eGFR; Median (IQR)	86 (28-146)	96 (4-234)	0.308***
LV Hypertrophy			
YES	6 (23)	242 (48.7)	<0.011*
NYHA functional class			
NYHA class I&II	4 (15.4)	259 (52.1)	
NYHA class III	7 (26.9)	139 (28.0)	<0.001*
NYHA class IV	15 (57.7)	99 (19.9)	
Hemoglobin gm/dl			
Normal hemoglobin	10 (38.5)	387 (77.9)	<0.001*
Anemia	16 (61.5)	110 (22.1)	
Ischemic heart disease			
YES	4 (15.4)	122 (24.6)	0.287*
LV Systolic dysfunction			
YES	20 (76.9)	214 (91.5)	<0.001*
Diastolic dysfunction			
YES	3 (11.5)	160 (32.2)	0.027*
Valvular heart diseases			
YES	9 (34.6)	143 (28.7)	0.522*
Dilated cardiomyopathy			
YES	14 (53.9)	135 (27.2)	<0.003*
Hyperten. Heart diseases			
YES	3 (11.5)	189 (38.0)	<0.006*
Pulmonary hypertension			
YES		45 (9.1)	0.580**
Pericardial effusion			
YES	4 (15.4)	22 (4.4)	<0.034**
Arrhythmia			
YES	4 (15.4)	42 (8.5)	0.187**
Diabetes			
YES	0 (0.0)	61 (12.3)	0.037**
Chronic lung disease			
YES	0 (0.0)	23 (4.6)	0.302**
Serum cholesterol			
Normal	24 (92.3)	439 (88.3)	0.408**
Hypercholesterolemia	2 (7.7)	58 (11.7)	

*χ² Test, ***F test

Table 4: Logistic regression analysis of factors associated with HIV infection among patients with heart failure at JKCI.

Variable	COR (95%CI)	p-value	AOR (95%CI)	p-value
Age groups (years)				
<40	1.38 (0.59-3.19)	0.455		
40-64	0.17 (0.02-1.37)	0.096		
≥ 65	1.0 (Ref)			
Sex				
Male	1.0 (Ref)			
Female	2.38 (0.98-5.75)	0.055		
Cigarette smoking				
Non-smokers	1.0 (Ref)			
Smokers	0.27 (0.04-1.99)	0.198		
Occupation				
Not Employed	1.0 (Ref)			
Employed	0.69 (0.31-1.51)	0.351		
Marital status				
Married	1.0 (Ref)			
Single	2.99 (1.13-7.98)	0.028	1.99 (0.68-5.90)	0.211
Widow/divorce/separated	4.48 (1.72-11.68)	0.002	3.05 (1.08-8.66)	0.036
NYHA functional class				
NYHA class I&II	1.0 (Ref)			
NYHA class III	3.26 (0.94-11.33)	0.063	2.69 (0.73-9.96)	0.138
NYHA class IV	9.81 (3.18-30.28)	0.001	4.68 (1.32-16.57)	0.017
Hemoglobin gm/dl				
Normal hemoglobin	1.0 (Ref)			
Anemia	5.63 (2.48-12.76)	<0.001	3.76 (1.57-9.01)	0.003
Dilated cardiomyopathy				
NO	1.0 (Ref)			
YES	3.13 (1.41-6.93)	0.005	1.58 (0.58-4.31)	0.369
Pericardial effusion				
NO	1.0 (Ref)			
YES	3.93 (1.25-12.37)	0.02	2.41 (0.66-8.82)	0.183
Hypertensive heart diseases				
NO	1.0 (Ref)			
YES	4.71 (1.39-15.88)	0.013	2.02 (0.31-13.18)	0.462

within our local setting where HIV infection is proportionally higher among female. In 2016, there were 19.4 million people living with HIV in Eastern and Southern Africa, women and girls accounted for more than half (59%) of the total number of people living with HIV [23,24]. Also a cohort study in South Africa reported a higher proportion of HIV infection in women (62%) [8]. In Tanzania, the Tanzania HIV and Malaria Indicator Survey (THMIS) reported the prevalence of HIV infection among women and men to be 8.2% and 5.3% respectively in Dar es Salaam region [5]. However the proportion of the females and males with HIV infection in this study was relatively low compared to the rate reported by THMIS 2011-2012 in Dar es Salaam. One reason for low prevalence of HIV in this study may be due to decrease of the prevalence among females (6.5%) and males (3.5%) in a community and a decline of HIV prevalence up to 4.7% in Dar es Salaam as reported in the current Tanzania HIV Impact Survey (THIS) 2016-2017 [25]. Furthermore, socio-demographic and clinical characteristics of the current study population may constitute a lower risk of HIV infection as compared to the general population in 2011-2012.

Among all participants who tested positive for HIV in this study, 11% were widowed/divorced/separated where as 7.6% and 2.7% were single and married respectively. These proportions appear to be lower compared to the previous reported rates by THMIS. The THMIS report of 2011-2012 showed that, the prevalence of HIV infection was 15.2%, 24.7% and 5.5% among divorced/separated, widow and single respectively [5]. The difference may be due to variations in the sample size, demographic and clinical characteristics of the participants. Also THMIS participants were adolescents and middle aged (15-49 years) individuals who are at a higher risk for the HIV infection acquisition.

On the other hand 57.7% of those patients who tested positive for HIV infection were in NYHA functional class IV. Our finding is lower compared to the previous reported rate in South Africa in 2008 where 77% of HIV positive patients were in NYHA functional class II, III or IV [8]. The difference may be explained by the fact that, the South Africa study included NYHA functional class II, III or IV. Furthermore, the variation in the sample size, clinical and socio-demographic characteristics may be responsible for the difference found. This indicates that the patients with heart failure and HIV infection deteriorates clinically and may need a special support and double treatment for both HIV infection and heart failure earlier.

Moreover, the patients with heart failure in this study who tested positive for HIV presented with different clinical, laboratory and imaging characteristics. Among the laboratory findings, anemia was found to be 61.5%. The prevalence of anemia in this study is higher than that found in South Africa cohort of the patients with CVD and heart failure (30%) [8]. The differences in rates among the two studies could be due to the variation in the sample size, clinical and socio-demographic characteristics. Our finding reveals the burden of hematological disorder among the patients with heart failure and HIV infection. Both HIV and heart failure causes anemia in different pathways [26]. The hypoxic state due to heart failure and nutritional deficiencies (iron deficiency) can be implicated [27]. Not only that, but the HIV infection is associated with bone marrow suppression and gastroenteropathy, all of which may cause underproduction of the red blood cells and malabsorption of the nutrients (iron and Vitamin B12) respectively leading to anemia. The side effects of anti-retrovirus and opportunistic diseases like TB of the bone can also cause anemia [7]. The previous studies had put forward that anemia is a modifiable independent prognostic factor of both morbidity and mortality which overlaps between Heart failure and HIV infection.

Echocardiographic abnormality was evident among the participants who tested positive for HIV infection. The echocardiography showed that 53.9% had a dilated cardiomyopathy, 15.4% pericardial effusion, 23% left ventricular hypertrophy, 11.5% diastolic dysfunction, 76.9% left ventricular systolic dysfunction and 11.5% hypertensive heart disease.

Previous studies on echocardiographic findings have reported conflicting results where some showed lower rates while others higher rates of the cardiac structural changes. The meta-analysis conducted among the patients with heart failure and HIV infection in other parts of the world and Sub-Saharan Africa demonstrated a lower prevalence of dilated cardiomyopathy (10%) and pericardial effusion (12%) [28-35]. The prevalence of pericardial effusion was 20% and dilated cardiomyopathy 30% in USA among patients with HIV infection and heart failure [32]. In a South Africa study conducted between 2006-2008 among patients tested positive for HIV infection, the rate left ventricular systolic dysfunction, pericardial effusion, dilated cardiomyopathy and hypertensive heart disease were 29%, 12.5%, 37.8% and 6.2% respectively [8]. The variation from our study may be explained by the fact that some of the studies were multicenter with large sample sizes. Furthermore the differences in the socio-demographic and clinical characteristics among the participants may as well explain this disproportionality with our study.

An increased survival rate of HIV infected individuals on ART has been associated with development of cardiac diseases such as cardiomyopathy. One study demonstrated that the use of ART reduced mortality from 29.4 to 8.8 per 100 person-years. Reduced mortality rates predispose HIV infected patients to cardiovascular diseases and heart failure [36]. Nonetheless, our study was not intended to know the duration of HIV infection among our participants.

The unstable families like widowed, divorced, separated and single, advanced heart failure and anemia were independently associated with HIV infection among patients with heart failure. This is not keeping with the study which was done in South Africa between 2006-2008 in which the factors which were independently associated with HIV infection were the young age, African origin and lower education level [8]. The reasons for these dissimilarities may be resulted from variations in clinical and socio-demographic characteristics.

Also our findings were almost similar to recent documented cohort studies. One study concluded that individuals who are infected with HIV have an increased risk of heart failure with preserved ejection fraction and heart failure with reduced ejection fraction compared with uninfected individuals [37]. Therefore, we may strongly argue that HIV infection and heart failure fuel each other to determine the prognosis of the patients and quality of life.

Study Limitations

HIV stigma, self-denial and refusal to test were observed among some patients, which may underestimate the actual prevalence of HIV among patients with heart failure. However, the guarantee of confidentiality as well as proper counseling of patients was the gold standard modality to reduce the study limitations. In addition, the HIV rapid test used cannot detect HIV infection in patients during the window period. Also measurement of random (Casual, non-fasting) plasma glucose could not provide the final diagnosis of diabetes. Finally, the study was conducted in a highly specialized hospital among patients with heart failure so it cannot be generalized.

Conclusion

The prevalence of HIV among the patients with heart failure at JKCI was 5%. The patients who were HIV positive were more likely to have

an advanced heart failure (NYHA function class IV), anemia and were widowed/divorced/separated.

Recommendations

It is strongly recommended that, early HIV counseling and testing be done among cardiac patients who presents with anemia and to those whose are single/living without a partner as these are associated with increased likelihood of developing advanced stages of heart failure.

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