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Prevalence and Impact of Depression, Anxiety and Stress on CD4+ Cell Counts of HIV/AIDS Patients Receiving HAART in Ghana

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Abstract

Psychosocial disorders such as depression, anxiety and stress are more prevalent among HIV/AIDS patients compared to the general population. These psychosocial disorders impact negatively on HIV AIDS patients on highly active anti-retroviral therapy (HAART). This study determined how these psychosocial disorders impact CD4+ cell counts of HIV/AIDS patients receiving HAART in a peri-urban hospital in Kumasi, Ghana. This cross-sectional study included randomly selected 138 HIV/AIDS patients receiving HAART. DASS-21 questionnaire was used to determine the depression, anxiety and stress levels of participants. Venous blood sample was collected from each participant for the estimation of CD4+ cell counts. The mean age of the study sample was 45.2 ± 10 years, with about 79% of them being females. The prevalence of depression, anxiety and stress among the participants were 87%, 78.3%, 71% respectively. The median (Inter-quartile range, IQR) CD4+ count of participants with depression compared to non-depressed [340.8 (261, 713) cells/μL *vs.* 418 (242, 481.2) cells/μL; $p \leq 0.0001$], anxiety compared to non-anxious [318 (124, 540) μL *vs.* 438 (267, 487) μL; $p \leq 0.0001$] and stress disorders compared to non-stressed [370 (251, 467) μL *vs.* 484 (424.5, 752.3) μL; $p \leq 0.0001$] were significantly lower. Depression and anxiety correlated negatively with CD4+ cell count of participants [Depression; (r=-0.13, p=0.556), Stress; (r=-0.2, p=0.359)]. This study shows that depression, anxiety and stress have negative impact on CD4+ cell counts of HIV/AIDS patients receiving HAART.

Keywords: HIV/AIDs; Psychosocial disorders; CD4+ cell counts; HAART

Introduction

HIV/AIDS continues to be a major cause of death worldwide despite various interventions to reduce its incidence and prevalence, and possibly eradicate it totally [1]. According to the UNAIDS Gap Report, there was an estimated 35 million people living with HIV/AIDS worldwide in 2014 [2]. Certain studies have reported that HIV/AIDS patients have a two-fold increased risk of developing psychosocial disorders such as depression, anxiety and stress [3], which have been found to have adverse effects on HIV/AIDS progression [4]. The causes of these psychosocial disorders in people living with HIV/AIDS are many. One documented cause is stigmatization [5]. In developing countries like Ghana, HIV/AIDS related stigmatization and discrimination are very high [6] which could result in the high incidence of psychosocial disorders among HIV/AIDS patients in such regions [7]. Another possible cause is the presence of viral reservoirs in the central nervous system [8] which lead to neurocognitive disorders in living with HIV/AIDS [9]. Neurological impairment is associated with psychosocial disorders like depressive syndrome among people living with HIV/AIDS [10].

Highly Active Anti-Retroviral Therapy (HAART), combinations of anti-retroviral drugs are the recommended treatment of all HIV patients by the World Health Organization (WHO). It is estimated that as at mid-2016, 18.2 million people living with HIV/AIDS were receiving HAART [11]. Since its inception in the late 1990s, HAART has positively influenced the life expectancy of people living with HIV/AIDS [12,13]. The efficacy of HAART has been found to be affected by certain factors. One of these factors is the presence of viral reservoirs such as in the central nervous system (CNS) [14]. The virus in these reservoirs are altered and different from those in blood, making HAART less effective on viruses in these reservoirs [8]. Another cause is psychosocial disorders such as depression, anxiety and stress. These psychosocial disorders have been found to cause medication non-adherence in HIV/AIDS patients [15] which affects the efficacy of medications.

Despite the association of psychosocial disorders and the efficacy of HAART, the impact of psychosocial disorders on HIV/AIDS treatment has not been adequately studied. Particularly, there have not been enough studies to determine how psychosocial disorders affect CD4+ cell counts which are widely used as the gold standard in most facilities to monitor treatment of HIV/AIDS [16].

In this study, we determined the prevalence of depression, anxiety and stress as well as their impact on the CD4+ cell counts among HIV/AIDS patients receiving HAART.

Methodology

Study design and study site

This cross-sectional study was conducted from November 2015 to June 2016 at Aninwah Medical Center. The hospital is located at Emena, a peri-urban town in the Ashanti Region of Ghana. The hospital serves an estimated 600 patients living with HIV/AIDS. Trading is the commonest occupation among the inhabitants.

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Study population and selection

HIV/AIDS patients who have been on HAART for more than 6 months and agreed to participate in the study were recruited. 138 participants were recruited into the study.

Socio-demographics and psychosocial disorders

A well-structured questionnaire was used to collect information on socio-demographic characteristics of participants who agreed to be recruited into the study. Depression, anxiety and stress levels were measured with DASS-21 questionnaire.

CD4+ Cell counts estimation

Venous blood (3 mls) was taken from each participant for estimation of CD4+ T lymphocyte cell counts. This was determined using the Becton Dickinson FAS Count system (Becton, Dickinson and Company, California, USA). The BD FAS Count system uses flow cytometry for the quantification of the CD4 T Lymphocytes.

Data analysis

Continuous variables were expressed as mean ± Standard deviation (SD) and median (inter-quartile range) where appropriate. Categorical variables were expressed as frequency (n) and percentages (%). Associations between variables were done using Mann-Whitney non-parametric t-test or Fisher exact tests where appropriate. p-value less than 0.05 were considered statistically significant for all analysis using GraphPad Prism 6 and IBM Statistical Package for the Social Sciences (SPSS) version 20.00 (SPSS Inc, Chicago, USA).

Ethical consideration

Ethical clearance for commencement of the study was sought from the Committee on Human Research, Publication and Ethics (CHRPE), Kwame Nkrumah University of Science and Technology, School of Medical Sciences (KNUST-SMS). Informed consent.

Results

The prevalence of depression was 87.0%. Anxiety and stress had prevalence of 78.3% and 71.0% respectively among our study population.

Table 1 shows the socio-demographic characteristics of the participants. The mean age was (45.2 ± 10.0) years with majority (52.2%) being in the age group (40-50) years and least (21.7%) in <40years. Females accounted for 79.7% whereas males formed 20.3%. More than one-third (39.1%) were married whereas 15.9% and 13.0% were single and divorced respectively. The average CD4+ cell count of the participants was 428.4 ± 263.4.

Table 2 shows the relationship of the various socio-demographic characteristics of participants and depression. Majority of the depressed participants were females 96 (80.0%), and most of the participants who were married 8 (44.4%) were not depressed. There was significant association between depression and CD4+ cell counts ($p \leq 0.0001$). The

Variables	Frequency (138)	Percentages (%)
Age		
<40	30	21.7
40-50	72	52.2
>50	36	26.1
Mean age ± SD	45.2 ± 10.0	--
Gender		
Female	110	79.7
Male	28	20.3
Marital Status		
Single	22	15.9
Married	54	39.1
Divorced	18	13.0
Widowed	38	27.5
Co-habiting	6	4.4
Level of Education		
No formal education	24	18.8
Primary	84	65.6
Secondary	14	10.9
Tertiary	6	4.7
Residency		
Owned	26	21.0
Rented	54	43.6
Family House	44	35.5
CD4+ cell count (cells/ml)		
Less than 200	22	15.9
200-499	82	59.4
>500	34	24.6
Average CD4+ ± SD	428.4 ± 263.4	
Hemoglobin conc. (g/dl)		
Less than 10	20	14.5
10.0-12.5	72	52.2
Greater than 12.5	44	31.9

Table 1: Socio-demographic characteristics of participants.

Variable	Depressed N=120 (87%)	Non depressed N=36 (13%)	p-value
Gender			
Male	24 (20.0)	4 (22.2)	0.877
Female	96 (80.0)	14 (77.8)	
Marital Status			
Single	20 (16.7)	2 (11.1)	0.558
Married	46 (38.3)	8 (44.4)	
Divorced	14 (11.7)	4 (22.2)	
Widowed	36 (30.0)	2 (11.1)	
Co-habiting	4 (3.3)	2 (11.1)	
Level of Education			
No formal education	18 (15.0)	6 (33.3)	0.606
Primary	74 (61.7)	10 (55.6)	
Secondary	12 (10.0)	2 (11.1)	
Tertiary	6 (5.0)	0 (0.0)	
Duration of HAART			
Less than 3 years	16 (13.3)	2 (11.1)	0.8668
3-6 years	74 (61.7)	10 (55.6)	
More than 6 years	30 (25.0)	6 (33.3)	
CD4 (cells/ml)			
Less than 200	20 (16.7)	2 (11.1)	0.1000
200-499	72 (60.0)	10 (55.6)	
401-800	54 (23.3)	6 (33.3)	
Median (Inter-quartile range)	340.8 (261, 713)	418 (242, 481.2)	<0.0001
HB (g/dl)			
Less than 10	18 (15.0)	2 (11.1)	0.948
10-12.5	62 (51.7)	10 (55.6)	
More than 12.5	38 (31.7)	6 (33.3)	

Table 2: Comparison of socio-demographic distribution of participants and depression.

median CD4+ cell count of the depressed participants was 340.8 (261, 713) and that for those not depressed was 418 (481.2, 242). Very few participants who were depressed had been on HAART for less than 3 years 16 (13.3%).

Table 3 shows the relationship of the various socio-demographic characteristics of participants and anxiety. Most females 90 (83.3%) experienced anxiety disorders. Among the participants who were divorced, 18 (16.4%) expressed anxiety disorders. The median CD4+ cell count of those who suffered anxiety and those who were non-anxious were 318 (124, 540) and 438 (267, 487) respectively. About a quarter of those who were anxious 28 (25.9%) had been on HAART for more than 6 years.

Table 4 shows the relationship of the various socio-demographic characteristics of participants and stress. More than 80% of the participants who were stressed were females 80 (81.6%). The average CD4+ cell count of those who were stressed was 426.5 ± 261.3, and those who were not stressed was 432.8 ± 275.5.

Majority of those who were stressed had been on HAART between 3 to 6 years 60 (61.2%). Only 8 (8.2%) of the stressed participants had CD4+ cell counts greater than 800 cells/ml.

The Figures below show the correlation of depression, anxiety and stress and CD4+ cell counts of the participants. Increasing levels of depression, stress but not anxiety result in slight decrease in CD4+ cell counts, r=-0.13, 0.1 and -0.2 respectively for depression, anxiety and stress.

Variable	Anxious N=108 (78.3%)	Non anxious N=30 (21.7%)	p-value
Gender			
Male	18 (16.7)	10 (33.3)	0.156
Female	90 (83.3)	20 (66.7)	
Marital Status			
Single	16 (14.5)	6 (21.4)	0.447
Married	20 (36.4)	14 (50)	
Divorced	18 (16.4)	0 (0.0)	
Widowed	32 (29.1)	6 (21.4)	
Co-habiting	4 (3.0)	2 (7.1)	
Level of Education			
No formal education	14 (13.0)	10 (41.7)	0.062
Primary	76 (70.4)	8 (33.3)	
Secondary	12 (11.1)	4 (16.7)	
Tertiary	6 (5.5)	2 (8.3)	
Duration of HAART			
Less than 3 years	14 (13.0)	8 (26.7)	0.434
3-6 years	66 (61.1)	16 (53.3)	
More than 6 years	28 (25.9)	6 (20.0)	
CD4+ cell count			
Less than 200	14 (12.9)	8 (26.7)	0.200
200-499	68 (63.0)	14 (46.6)	
>500	26 (12.1)	8 (26.7)	
Median (Inter-quartile range)	318 (124, 540)	438 (267, 487)	<0.0001
Hemoglobin level			
Less than 10	14 (13.0)	6 (20.0)	0.483
10-12.5	54 (50.0)	18 (60.0)	
More than 12.5	38 (35.2)	6 (20.0)	

Table 3: Comparison of socio-demographic distribution of participants and anxiety disorders.

Variable	Stressed N=98 (71%)	Non stressed N=40 (29%)	p-value
Gender			
Male	18 (18.4)	10 (25.0)	0.534
Female	80 (81.6)	30 (75.0)	
Marital Status			
Single	14 (14.3)	8 (20.0)	0.912
Married	38 (38.8)	16 (40.0)	
Divorced	12 (12.2)	6 (15.0)	
Widowed	30 (30.6)	8 (20.0)	
Co-habiting	4 (4.1)	2 (5.0)	
Level of Education			
No formal education	12 (12.2)	12 (30)	0.322
Primary	60 (61.9)	24 (60)	
Secondary	10 (10.2)	4 (10)	
Tertiary	6 (6.1)	0 (0)	
Duration of HAART			
Less than 3 years	12 (12.2)	10 (25.0)	0.225
3-6 years	60 (61.2)	22 (55.0)	
More than 6 years	26 (26.6)	14 (35.0)	
CD4+ cell count (cells/ml)			
Less than 200	14 (14.3)	6 (15.0)	0.4000
200-499	62 (63.3)	20 (50.0)	
>500	11 (22.4)	16 (40.0)	
Median (Inter-quartile range)	370 (251, 467)	484 (424.5, 752.3)	<0.0001
Hemoglobin level			
Less than 10	16 (16.3)	4 (10.0)	0.190
10-12.5	44 (44.9)	28 (70.0)	
More than 12.5	36 (36.7)	8 (20.0)	

Table 4: Comparison of socio-demographic distribution of participants and stress.

Discussion

This study measured depression, anxiety and stress among HIV/AIDS patients receiving HAART and their impact on the CD4+ cell counts of participants.

About 87.0%, 78.3% and 71% prevalence of depression, anxiety and stress respectively among the participants (Figure 1). These proportions are similar to those observed by a cross-sectional study conducted among HIV/AIDS patients living in Ghana [17]. These proportions are also close to another cross-sectional study conducted among people living with HIV/AIDS in Malaysia [18]. The slight differences could have resulted from differences in demographics and cultural values in the studied participants.

The median CD4+ cell count of patients who were depressed was lower than those who were not depressed (Table 2). There was a negative correlation between depression and the CD4+ cell counts of the participants (Figure 2). Kaharuza et al., found in their cross-sectional study among HIV/AIDS living in Uganda that depression was associated with low levels of CD4+ cell counts [19]. In a longitudinal study in the United States, Ickovics et al., found that CD4+ cell counts were negatively affected by psychosocial disorders such as depression [20].

Those who had anxiety disorders had lower median CD4+ cell count than those who were not anxious (Table 3). However, unlike the other psychosocial disorders, we found that anxiety disorders do not affect CD4+ cell counts negatively (Figure 2). A similar observation was made by Fincham et al., who found that anxiety had no effect on CD4+ cell counts in their study in South Africa [21].

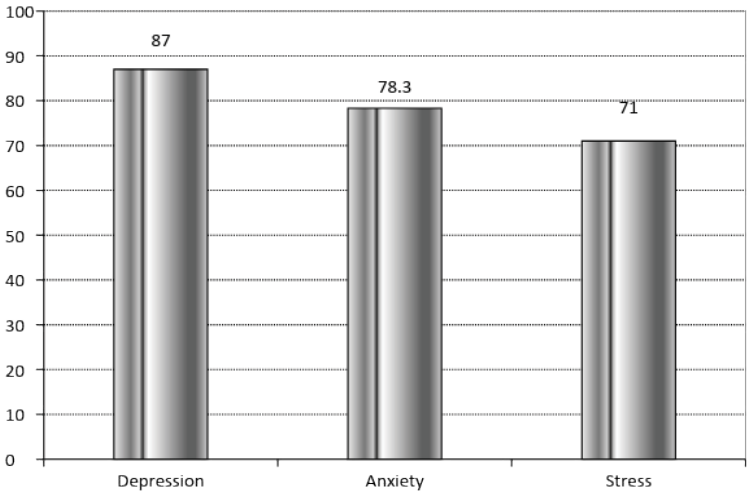

Figure 1: Prevalence of depression, anxiety and stress among study participants.

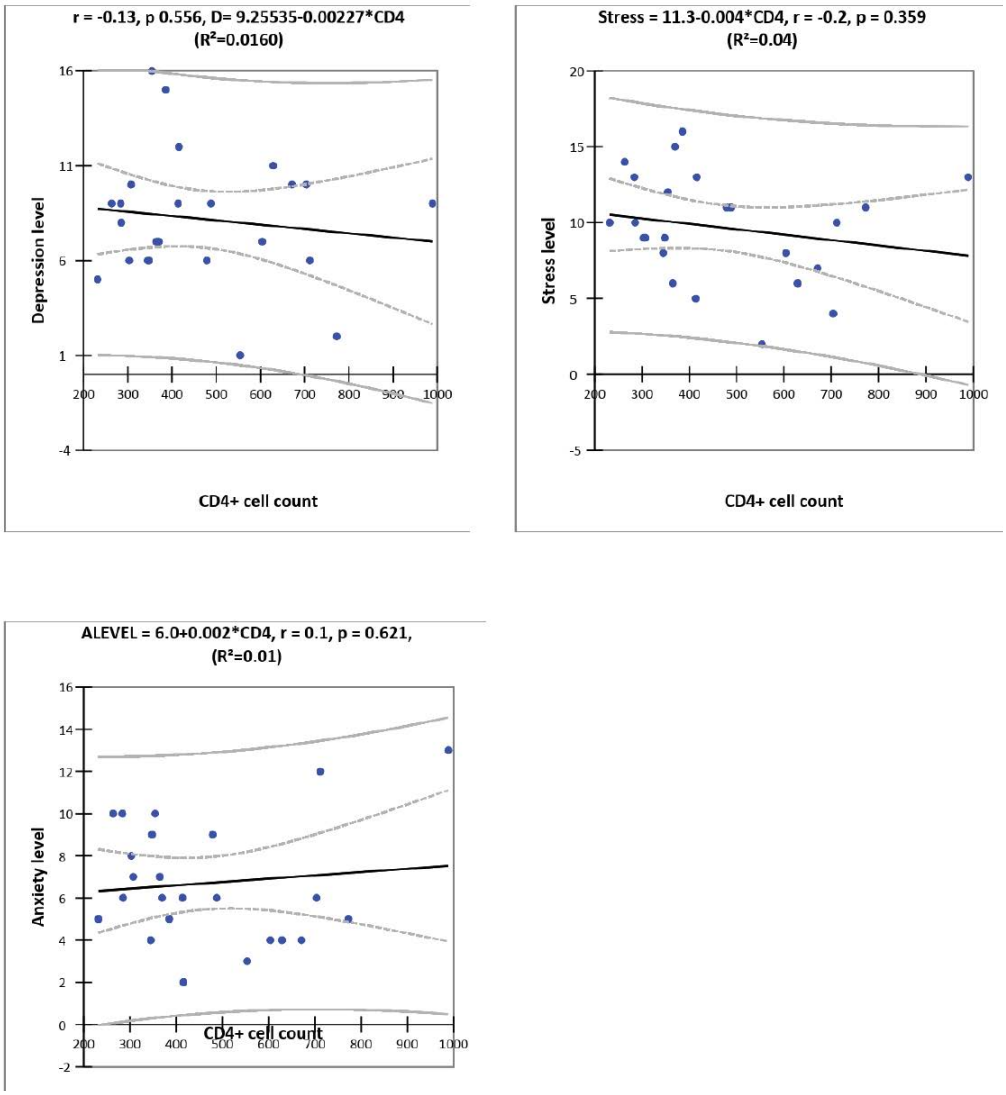

Figure 2: Effect of depression, anxiety and stress on the CD4+ cell count of participants.

The participants who were stressed had lower CD4+ cell counts than those who were not stressed (Table 4). Stress had a negative correlation with CD4+ cell counts (Figure 2). Jane Lesserman and colleagues had found in their cross-sectional study in North Carolina, USA that stressful life events had significant increase HIV disease progression [22]. Our study shows that this progression may be due to the negative impact of stress on CD4+ cell counts.

The negative impact of psychosocial disorders on CD4+ cell counts of the participants could be attributed to several factors. In particular, it is possible that medication non-adherence observed among depressed, anxious or stressed HIV/AIDS patients [15,23,24] could have resulted in the decrease in CD4+ cell counts observed in the participants in this study. Considering the gravity of the positive influence that HAART has had on CD4+ cell counts [12], it is very likely that non-adherence to HAART should have led to decreased CD4+ cell counts as observed in our study.

One limitation of our study is the use of questionnaire- based assessment in measuring the psychosocial disorders instead of diagnostic interviews.

Further studies need to be done using diagnostic interviews to assess the depression, anxiety and stress. In addition, future studies should focus on the impact of antidepressants on HIV/AIDS management.

Conclusion

Depression, anxiety and stress are prevalent among HIV/AIDS patients and they have been found to have negative impact on CD4+ cell counts. To effectively treat HIV/AIDS patients, it is necessary to examine the presence of such disorders in HIV/AIDS patients and treat them accordingly. Policies regarding the management of HIV/AIDS should be revised to possibly include antidepressants in the drugs administered to HIV/AIDS patients as well as diagnosing and treating other psychosocial disorders alike.

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