IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 6 Ver. 15 (June. 2018), PP 70-79
www.iosrjournals.org

The Relationship of Baseline Anthropometric Profile with Cd4 Count, Functional Status And Who Clinical Staging of People Living With Hiv/Aids

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Abstract: ***This*** *study focused on the relationship of baseline anthropometric parameters with some WHO approved baseline assessments for people living with HIV /AIDS. A total of 352 individuals of both sexes on ART or PRE-ART, and were attending HIV clinic at Chukwuemeka Odumegwu Ojukwu University Teaching Hospital Awka were recruited for this study. The age, weight, height, CD4 count, WHO clinical staging, and functional status of the subjects were obtained. The age had a significant negative correlation with CD4 count and a positive correlation with WHO clinical staging, p-value =0.01. Height showed a positive correlation with clinical staging whi le weight had a negative correlation with functional status. The various BMI categories correlated significantly with CD4 count, p=0.035, and functional status, p=0.002. They did not correlate with WHO clinical staging. Body mass index categories in conjunction with functional status can be used as a screening tool for predicting prognosis of HIV/AIDS in poor resource areas where CD4 count machine is not available and affordable.*

Key Words: *Art,Pre-Art, Functional Status/Perfomatory, Cd4 Count*

Date of Submission: 16-06-2018 Date Of Acceptance: 02-07-2018

I. Introduction

Studies have demonstrated increasing prevalence of obesity in Human Immunodeficiency Virus (HIV) infected persons (Joy et al. 2008)**.** Gilks et al. (2006) showed that HIV-positive persons who have BMI higher than normal have better immunological health. For over two decades, HIV infection and Acquired Immunodeficiency Syndrome (AIDS) have caused significant public health concerns, and the epidemic continues to challenge humanity.

The majority of the world's new HIV infections occur in low and middle income countries, with two-thirds of the world's HIV-infected population living in Africa (Weinberg and Kovarik, 2010). Many socio-demographic factors such as poverty, disease stigma, socio-economic status, epileptic health care access, impaired financial strength, and poor educational attainment contribute to the disproportionate impact of HIV. In advanced countries, there is easy access to CD4 count machine unlike in developing countries. There is therefore the need to use anthropometric parameters to assess HIV positive patients in resource limited settings since CD4 count machines are not readily available or affordable. Body Mass Index is easily measurable, while viral load, CD4 count, and WHO clinical staging, are based on etiological diagnosis which require laboratory investigations (Gilks et al 2006).

Stringer et al. (2006) reported that BMI can be used to assess the prognosis of patients with HIV on ART or pre ART. HIV disease staging and classification systems are critical tools for tracking and monitoring the HIV epidemic. Two major classification systems currently in use are: the U.S Centers for Disease Control and Prevention (CDC) classification system and the World Health Organization (WHO) clinical staging and disease classification system. They can be used in resource constrained settings without access to CD4 cell count measurements or other diagnostic and laboratory testing methods. The WHO system classifies HIV disease on the basis of clinical manifestations that could be recognized and treated by clinicians in various settings with varying levels of HIV expertise and training. This system uses standardized clinical parameters to guide medical decision making for patients with HIV/AIDS.

The WHO clinical staging system has been shown to be a practical way to manage HIV- infected patients. It further stated that HIV/AIDS clinical staging system is intended for baseline patient assessment and for use in prognosis of patient's health status. According to Weinberg and Kovarik (2010), this revised system, assists clinicians in the assessment of a patient's current clinical status, classifies disease into a progressive sequence from least to most severe and provides guidance including when to start, switch, or stop prophylactic

medications of anti-retroviral. It is also designed to be used as a reference to current and previous clinical events, making it useful for surveillance purposes.

In Africa, with the exception of South Africa, Nigeria has the second highest number of new infections reported annually, and 3.7 percent of her populations are living with HIV (CDC, 2012). The national life expectancy in Nigeria is 52 years (CDC, 2012). Although it is low, the figure has been improving since the advent of antiretroviral therapy. The knowledge of the normal progression of the disease, and the patterns of transition in functional status is helpful in planning rehabilitation of the patients (Benjamin,1989).

II. Materials and Methods

This research study was a cross-sectional study. The data were obtained from patients who accessed medical care for the purpose of HIV/AIDS at Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH) Awka.

Ethical approval for the study was obtained from the Teaching Hospital Ethical committee signed by the ethical committee chairman.

Height and Weight Determination

These were obtained using the weighing balance and stadiometer, according to Steuer et al.(2002).

- **Height (Standing Stature):** An Avery height and weight scale was used to measure stature to the nearest 0.1cm. They subjects were asked to remove their shoes, hair ornaments, etc. They were asked to stand on a foot plate with their backs on the stadiometer rule. The subjects' legs were straight, arms by their sides and shoulders relaxed. They were asked to place their bodies in a straight line (mid- axillary line parallel to the stadiometer).The heads were placed in Frankfort's horizontal plane. The subjects were asked to breathe in and hold their breath while being measured. The head piece was lowered until it touches the crown of the head firmly, compressing the hair after which the measurements were read to the nearest 0.1cm. The observer's eyes were kept parallel with the head piece. Finally, the head board was removed, posture was re-checked and the subjects were re-measured for the second time before recording the most correct value.
- **Weight:** The weight of each subject was measured using an Avery height and weight scale; measurements were crosschecked using a portable weighing scale at the beginning of the study. The subjects were asked to remove their shoes, heavy outer clothing like jackets, sweaters and empty their pockets to remove items like wallets, cell phone, etc. The scale was set at zero reading. The subjects were asked to step on the scale platform, facing away from the scale with both feet on the platform. They were asked to remain still with their arms hanging naturally by their sides and then looking forward .Their weights were read to the nearest 0.1kg after which the subjects stepped out of the scale. The subjects' measurements were repeated for the second time before recording the most correct value.

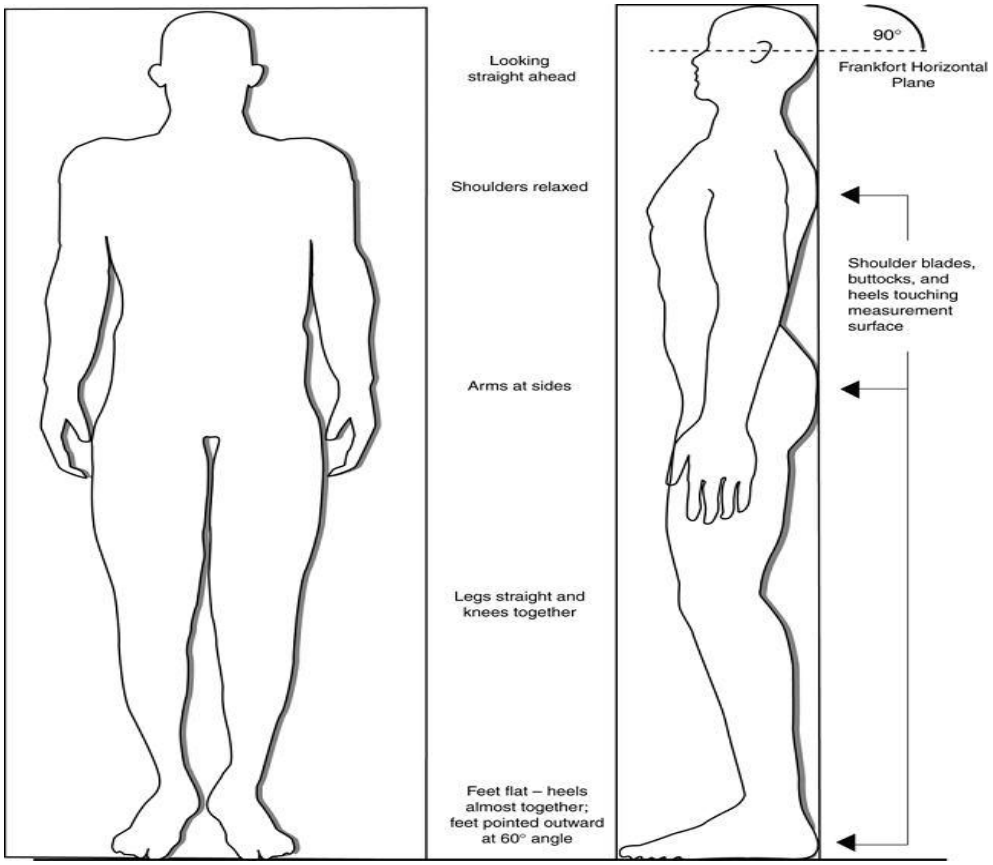

Plate 1: Measurement of Height

PLATE 2: Picture of a stadiometer

Body mass index determination

This was obtained by making empirical division of the subjects weight in kg with height in m^2. . Body mass index (Qu ̄etelet's index): it gives the ratio of body weight (W) to height (H) squared often used to assess obesity and under nutrition

$$BMI = \frac{W\ (kg)}{H\ (m^2)}$$

CD4 count determination

This was obtained with the use of CD4 count machine, using blood samples of the subjects. The blood samples were analyzed for the clusters of differentiation in an automated system and thereafter, the results were displayed.

Research materials

The following measuring instruments were employed for the research study:

- Weighing scale
- Stadiometer
- CD4 count machine

Statistical analysis

This was done using the statistical package for social sciences (SPSS) software, version 20.0, to obtain the descriptive analyses of the data. Test of association was done using chi-square. Correlation analysis was done using spearman correlation matrix and Pearson correlation matrix.

III. Results

A total of 352 subjects from Chukwuemeka Odumegwu Ojukwu Teaching Hospital Amaku Awka were used for the study for a 12-month period in 2014. The results obtained are listed as follows;

Table 4.1: Frequency distribution of subjects by age groups

Age groups (years)	Male	Female	Frequency	Percentage (%)
0-9	5	2	7	2.0
10-19	6	9	15	4.3
20-29	19	90	109	31.3
30-39	42	88	130	36.9
40-49	22	29	51	14.5
50-59	16	16	32	9.1
60-69	5	1	6	1.7
70-89	0	2	2	0.6
Total	115	237	352	100

Table 4.2: Frequency distribution of subjects by sex

Sex	Frequency	Percentage (%)
Male	115	32.8
Female	237	67.2
Total	352	100

TABLE 4.3: Frequency distribution of the population based on various BMI categories

	BMI CATEGORY	ART		PRE ART		BOTH	
		FREQ.	%	FREQ.	%	FREQ	%
	Severely under weight	45	17.8	25	28.4	70	20.3
	Under weight	18	7.1	5	5.7	24	7.0
	Normal	91	36.0	29	33.0	120	34.8
	Obese	69	27.3	17	19.3	89	25.8
	Morbid obese	30	11.9	12	13.6	42	12.2
	TOTAL	253	100.0	88	100.0	345	100

Table 4.4 : Frequency distribution of the sampled population based on WHO baseline clinical staging

Baseline Clinical Staging	ART		PRE ART		BOTH	
	FREQ.	% .	FREQ.	%	FREQ.	%
Asymptomatic	168	67.2	60	77.9	231	69.8
Mild symptoms	55	22.0	13	16.9	69	20.8
Advanced symptoms	23	9.2	4	5.2	27	8.2
Severe symptoms	4	1.6	0	0	4	1.2
Total	250	100.0	77	100.0	331	100

Table 4.5: Frequency distribution of the sampled population based on functional status

Functional Status	ART		PRE ART		BOTH	
	FREQ.	%	FREQ.	%	FREQ.	%
1.00	225	89.6	77	96.3	305	91.3
2.00	21	8.4	3	3.8	24	7.2
3.00	5	2.0	0	0	5	1.5
Total	251	100.0	80	100.0	334	100.0

Table 4.6: Frequency distribution of subjects based on CD4 Count , normal (>500) and low (<500)

CD4 CATEGORY	ART		PRE ART		BOTH	
	FREQ.	%	FREQ.	%	FREQ.	%
LOW	214	86.6	25	34.7	240	74.3
NORMAL	33	13.4	47	65.3	83	25.7
Total	247	100.0	72	100.0	323	100.0

Table 4.7: Correlation of BMI categories with WHO clinical staging

BMI CATEGORY	ASY	MILD	ADV	SEVE	TOTAL
Severely under weight	43(66.2%)	16 (24.6%)	5(7.7%)	1(1.5%)	65(100.0%)
Under weight	13(59.1%)	5(22.7%)	3(13.6%)	1(4.5%)	22(100.0%)
Normal	77(68.8%)	25(22.3%)	9(8.0%)	1(0.9%)	112(100.0%)
Obese	63(74.1%)	14(16.5%)	7(8.2%)	1(1.2%)	85(100.0%)
Morbid obese	30(71.4%)	9(21.4%)	3(7.1%)	0(0.0%)	42(100.0%)
TOTAL	226(69.3%)	69(21.2%)	27(8.3%)	4(1.2%)	326(100.0%)

LEGEND

ASY - Asymptomatic
ADV - Advanced
SEVE - Severe

Table 4.8: Test of association (Chi-Square Test) between BMI categorization and WHO Clinical Staging

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.597	12	.935
Likelihood Ratio	5.248	12	.949
Linear-by-Linear Association	1.261	1	.262
N of Valid Cases	326		

P-value = 0.262

Table:4.9: Correlation of BMI categories with functional Status

BMI CATEGORY	FUNCTIONAL STATUS			
	1	2	3	TOTAL
Severely under weight	58(85.3%)	7(10.3%)	3(4.4%)	68(100.0%)
Under weight	19(90.5%)	1(4.8%)	1(4.8%)	21(100%)
Normal	101(88.6%)	12(10.5%)	1(0.9%)	114(100%)
Obese	81(96.4%)	3(3.6%)	0(0%)	84(100%)
Morbid obese	40(97.6%)	1(2.4%)	0(0%)	41(100%)
TOTAL	91.2(299%)	7.3(24%)	1.5(5%)	100(328%)

Table 4.10: Test of association (Chi-Square Test) between BMI categorization and functional status

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.721	8	.089
Likelihood Ratio	14.474	8	.070
Linear-by-Linear Association	9.288	1	.002
N of Valid Cases	328		

P-value is significant

Table 4.11: Correlation of BMI groups with CD4 Count, Normal (>500) and low (<500)

BMI GROUPS	CD4 COUNTS GROUPING		
	LOW	NORMAL	TOTAL
Severely under weight	48(81.4%)	11(18.6%)	59(100.0%)
Under weight	17(73.9%)	6(26.1%)	23(100.0%)
Normal	88(77.9%)	25(22.1%)	113(100.0%)
Obese	61(72.6%)	23(27.4%)	84(100.0%)
Morbid obese	25(62.5%)	15(37.5%)	40(100.0%)
TOTAL	74.9(239%)	25.1(80%)	100.0(319%)

P- value is significant

Table 4.12: Test of association (Chi-Square Test) between BMI and CD4 count

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.094	4	.131
Likelihood Ratio	6.976	4	.137
Linear-by-Linear Association	4.456	1	.035

M P- Value is significant

Table 4.13 Spearman Correlation Matrix of the Various Variables

	AGE	HEIGHT	WEIGHT	BMI	FXN ST	CD4	CLINICAL STAGING
AGE	1.000	.186**	.223**	.118*	.036	-.242**	.175**
HIEGHT	.186**	1.000	.313**	-.050	.000	-.086	.139*
WEIGHT	.223**	.313**	1.000	.640**	-.111*	.003	.033
BMI	.118*	-.050	.640**	1.000	-.160**	-.105	-.023
FUNCTIONAL STATUS	-.242**	-.086	.003	.105	1.000	-.100	.271**
CD4 COUNT	-.242**	-.086	.003	.105	-.100	1.000	.303**
CLINICAL STAGING	.175**	.139*	.033	-.023	.271**	.303**	1.000

Levels of significance: ** P<0.01, *P<0.05

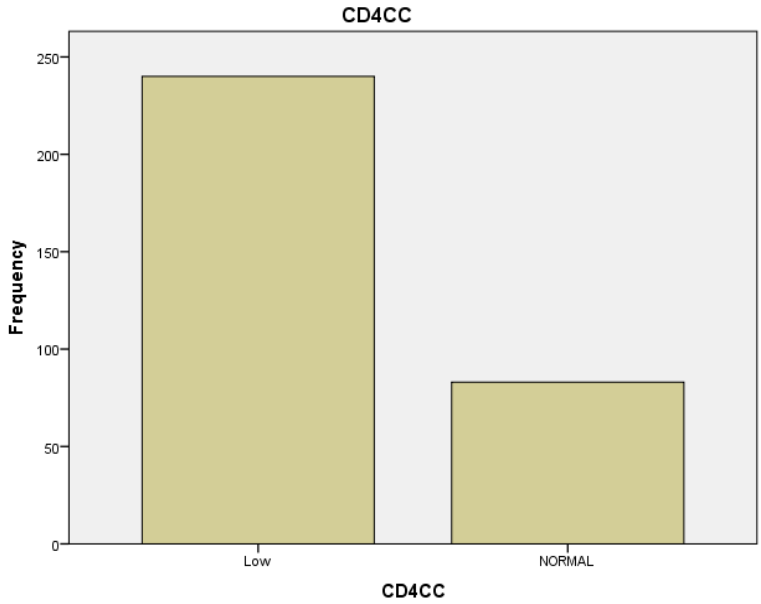

Figure 4.1: Bar chart showing distribution of CD4 count: low (< 500) and normal (> 500).

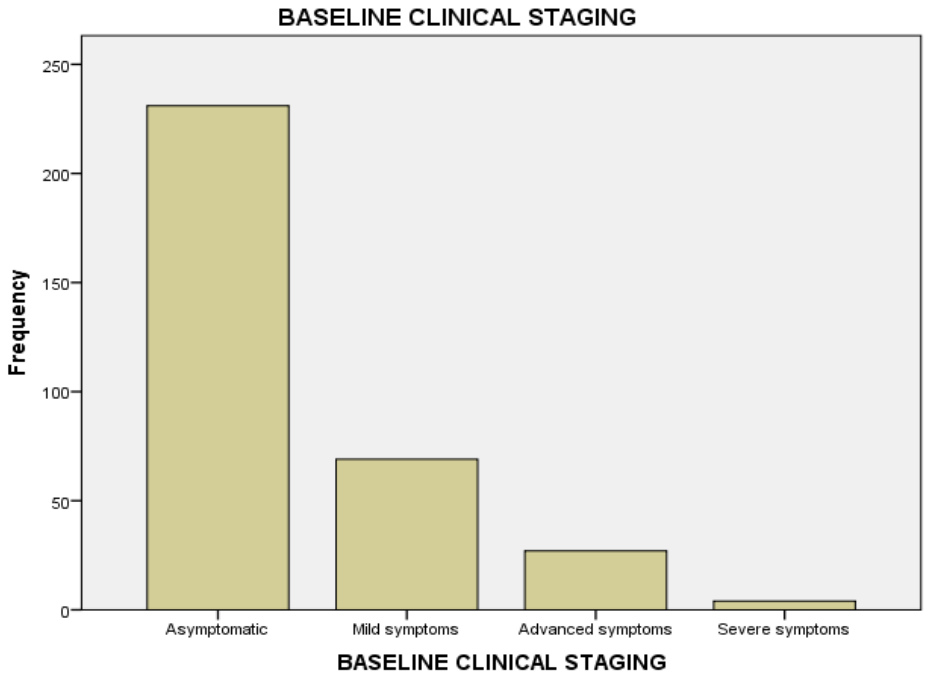

Figure 4.2: Bar chart showing baseline clinical staging.

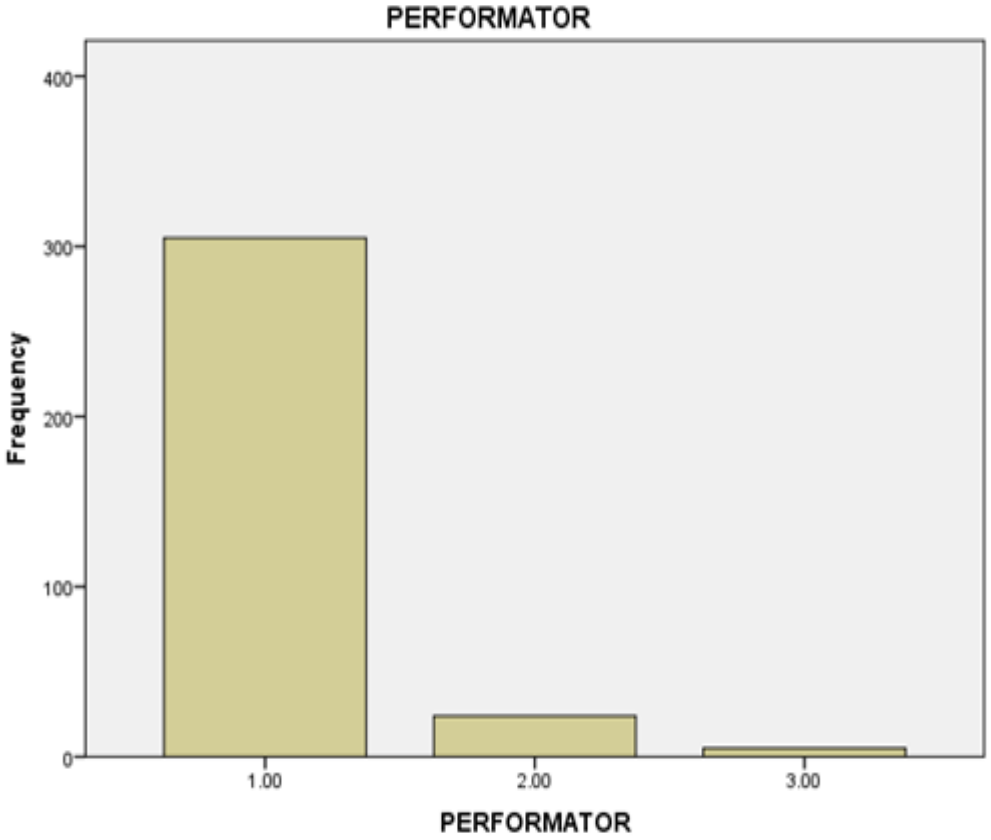

Figure 4.3: Bar chart showing baseline BMI categories

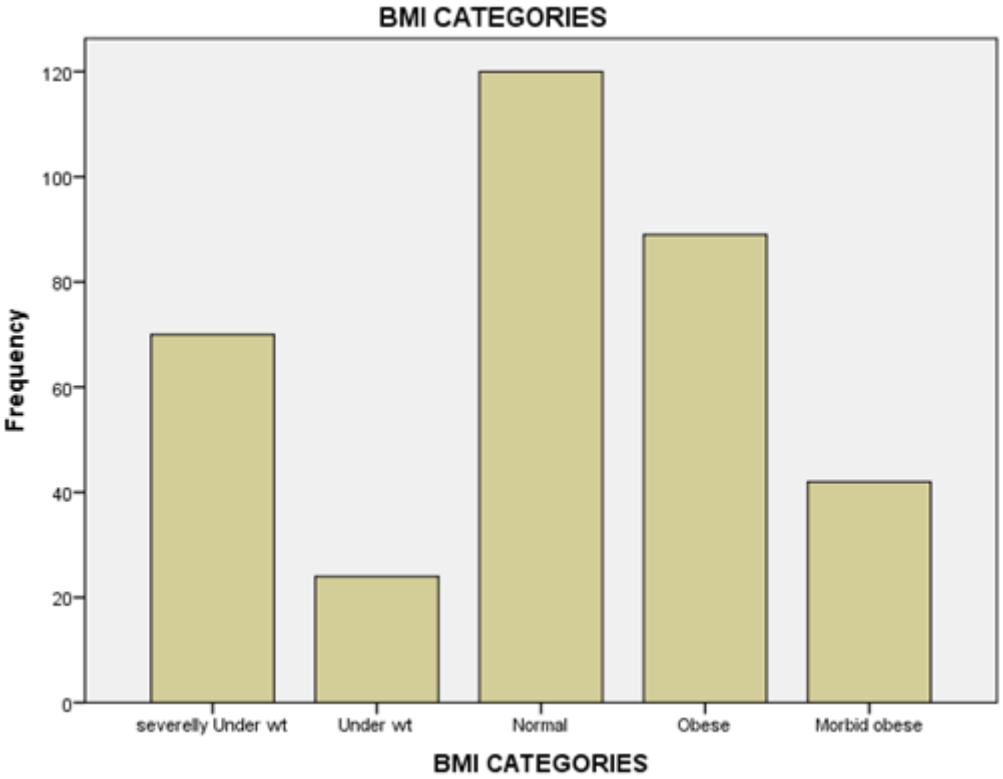

Figure 4.4 Bar chart showing functional status

Legend
1 Not ill looking/ able to perform normal activity
2: Ill looking/ unable to perform normal activity
3: Bed-ridden.

IV. Discussion

The relationship of baseline anthropometric profile categorization with baseline CD4 count, functional status, and WHO clinical staging was determined on 352 people living with HIV and AIDS (PLWHAs), who reported to Chukwuemeka Odumegwu Ojukwu Teaching Hospital, Amaku-Awka, for a 12-month period, in the year 2014. The male population in the study represented 32.8% of the population size, while the female population represented 67.2% of the test population size. The female population was dominant in the study. This entails that among PLWHAs more females accessed medical care from the hospital in the stipulated year. The dominant age group in the study population was the 30-39 age group in males (36.9%), and the 20-29 age group in females (31.3%).

BMI and clinical staging

The test of association using chi-square analysis for these two parameters did not give statistical significant relationship. By this result the BMI categorization will not be a reliable tool to supplement or predict the WHO Clinical staging in an individual.

Clinical staging was noted to have significant relationship with age, CD4 count and functional status ($P< 0.01$) and also with height ($p < 0.05$)This is in agreement with the findings of Weinberg and Kovarik,(2010) that clinical staging is used for baseline assessment of HIV/AIDS patients . While the correlation with CD4 count, functional status and age are well understood, the relationship with height is unclear.

BMI and CD4 count

The test of association between BMI categories and CD4 count showed significant positive relationship. The obese and morbid obese groups showed higher values of CD4 count. This result is in agreement with the works of Gilks et al. (2006). They noted that heavier than normal BMI in HIV infected positive individuals have been associated with improved immunological health. This furthermore confirms the findings of Keys,(2010),that although BMI may not be fully satisfactory, it is at least as good as any relative weight index as an indicator of obesity.

BMI and functional status

The test of association between BMI and functional status showed significant relationship ($p < 0.02$). The linear relationship was also significant. The result showed that across the BMI categories, over 85% of all the individuals are not ill looking and are able to perform their work. Over 90% of them who are within the normal, obese and morbid obese categories are still able to carry out their normal activities. This is in agreement with NACO (2007) that functional status reflects the immune state of HIV/AIDS patients and corresponds with the CD4 count as a proxy indicator of severity of HIV/AIDS disease. By implication the result shows that the stigmatization on the people living with HIV/AIDS by the public on their inability to work can affect the economy negatively and is uncalled for.

V. Conclusion

Body mass index categorization can be used as a screening tool for predicting prognosis of HIV/AIDS disease in poor resource areas where CD4 count machine may not be available and affordable although there is still need for health care providers to perform appropriate assessment in order to evaluate an individual's health status and risks.

VI. Acknowledgement

I am most grateful to God Almighty for His enabling grace to complete this research work. Let the name of the Lord be praised. I thank my team Mrs Ikele C.N, Dr G. E. Anyanwu, and to Prof E. N Obikili the supervisor to this work.

My thanks also go to the management of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital Awka, the staff of HIV Clinic and the subjects used for the study. To those who may have contributed in one way or the other but whose names were not mentioned, I sincerely appreciate your contributions. Ikenna Ikele

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