EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 4
Issue: 12
386-391
Year: 2017

A STUDY OF BODY COMPOSITION ANALYSIS OF PLWHA RECIEVING ART AT SUSHEELA TIWARI HOSPITAL, HALDWANI, UTTARAKHAND, INDIA

Suman Singh Baghel*

Associate Professor, School of Nutrition Food Science and Technology, College of Agriculturem, Hawassa University, Ethiopia.

***Corresponding Author: Suman Singh Baghel**
Associate Professor, School of Nutrition Food Science and Technology, College of Agriculturem, Hawassa University, Ethiopia.

Article Received on 25/09/2017 **Article Revised on 15/10/2017** **Article Accepted on 05/11/2017**

ABSTRACT
Anthropometry may not predict body cell mass and provides only limited information about nutritional status in patients. So bioelectric impedence analysis (BIA) offers a useful alternative to anthropometry because it measures multiple body compartments and provides a more detailed assessment of body composition. The present investigation was carried out at ART centre of Susheela Tiwari Hospital, Haldwani, India. 110 subjects were purposively selected from the study population. Bioelectrical impedance was used to assess body composition and determine. The female subjects showed mean values 13.79±9.64 Kg, 34.06±7.69 Kg, 20.11±2.20 kg and 5.66± 0.71degree and while male subjects showed 11.69±4.61Kg, 43.28±6.76 Kg, 24.37±3.59kg and 5.89±1.06 respectively for fat, fat free mass, body cell mass and phase angle. Distributions of female and male subjects on the basis of body fat per cent revealed that majority of subjects (58 per cent females and 55.78 per cent male) were moderately lean. Necessary intervention like supplementation and exercise should include as a part of treatment to prevent malnutrition

KEYWORDS: HIV, ART, body cell mass, fat free mass, body fat, phase angle.

INTRODUCTION
The introduction of highly active antiretroviral therapy (HAART) has dramatically changed the scenario of HIV infection, resulting in prolonged survival, decreased opportunistic infection, slower disease progression, decreased mortality and improved quality of life (Lazzaretti *et al.,* 2012; Shievitz and Knox, 2001). HAART has reduced AIDS-related mortality in HIV-infected patients by improving virological control and by increasing immunological response (CD4 lymphocyte count) and clinical effects (reducing the incidence of opportunistic infection, length of hospitalization). Pallela, 1998; Portsmouth *et al.,* 2003. Despite significant benefits associated with HAART, HIV infection and its therapy has been associated with the development of adverse nutritional problems, such as weight loss, lipodystrophy, obesity, diarrhoea, malabsorption, altered metabolism, cardiovascular disease, hyperlipidemia, bone disease, and insulin resistance. Shievitz and Knox, 2001; Lazzaretti *et al.,* 2012.

Body wasting is a prominent feature of the AIDS syndrome. The severity of wasting in HIV infected patients and especially the degree of body cell mass depletion is strongly associated to survival. Kyle *et.al* 2004. Moreover, weight reduction in the asymptomatic HIV-positive subject seems to be a predisposing factor for the progression to the AIDS syndrome. Kyle *et.al* 2004.

Body cell mass is the metabolically active tissue compartment in the body and correlates better with mortality so its measurement are superior to body weight measures. Kotler and Hellerstei (1998) established a progressive depletion of body cell mass in the late stages of HIV disease and pointed out that measurement of body weight alone failed to identify dramatic losses in body cell mass leading to death because of relative increases in body water with disease progression where as Suttmann *et.al* (1995) reported when body mass is more than 30 per cent of body weight and serum albumin levels exceeds 3.0 g/dl results in significant prolonged survival in patients.

However, body composition measured by anthropometry including fat mass and fat-free mass (Durnin and Womersley 1974) may be associated with observer bias. Moreover anthropometry may not predict body cell mass and provides only limited information about nutritional status in patients. So Bioelectrical impedance analysis (BIA) offers a useful alternative to anthropometry because it measures multiple body compartments and provides a more detailed assessment of body

composition. Bioelectric impedance analysis (BIA) is useful for early detection of occult wasting in PLWHA in comparison to the normally used weight-for-height methods and signs of wasting can be seen without change in body weight (Kotler *et al.*, 1989, Muurahainen, 1994 and Sluys *et al.,* 1993). Siqueira *et al.* (2011) reported that total fat mass can be measured by BIA with good precision, but not by Skin fold measurement in HIV-infected patients with lipodistrophy.

BIA is non invasive method and takes only a few minutes to determine a patient's body composition. It is accepted as a means for measuring nutritional status and body cell mass, and has been validated for this purpose in AIDS patients. So the present investigation was carried out assess the body composition of PLWHA receiving ART at Susheela Tiwari Hospital, Haldwani, Uttarakhand, India.

MATERIAL AND METHODS

The present investigation was carried out from August 2013 to October 2013 at ART centre of Susheela Tiwari Hospital, Haldwani. The study population includes all registered patients at ART centre. The sample size of 110 subjects was calculated according to Kish-Leslie (1965) formula and subjects were purposively selected from the study population who fulfil the study criteria. All adults, non- pregnant, non-lactating women and asymptomatic subjects attending ART centre during study period were included for the study. Whereas pregnant and lactating women, symptomatic, unable to give consent for the study and who could not communicate in the study languages were excluded for the study.

The investigation was approved by the advisory committee of Department of Foods and Nutrition, College of Home Science, GBPUA&T, Pantnagar, Uttarakhand. Permission was taken from the hospital administration of Susheela Tiwari Hospital, Haldwani to carry out the study. For ethical consideration the subjects were well explained the purpose of the study and their confidentiality in participant information sheet. A written consent was obtained from the subjects in participant information sheet for their willingness in participating in the study.

Pre-designed semi structured questionnaire was used for obtaining socio-demographic and medical information. Bioelectrical impedance (**Maltron bioScan 915/016 analyser)** was used to assess body composition and determine

- Body fat per cent.
- Fat free mass per cent.
- Body cell Mass.
- Phase angle.

Bioelectrical impedance is phase sensitive instrument to estimate body composition. Bio scan determines, body impedance, phase, resistance, reactance and is based upon the conduction of an applied electrical current in the organism. Living organism consist of intra and extra cellular fluids that behave as electrical conductors and cell membranes that act as electrical condensers. The Maltron BioScan uses four electrode pads applied to the hand, wrist, foot, and ankle. A low- level signal is induced through the Electrodes placed on hand and foot and the voltage drop is detected by electrodes on the wrist and ankle. The total body impedance and phase is measured through the arm, trunk and leg. Procedure was as follows:

- The bladder of the subject was emptied.
- Subjects were without shoes and stockings/socks.
- Height and weight were determined accurately.
- Subjects lay relaxed and flat on an examination bed, with the arms and legs slightly spread, but with no parts of the body touching one another.
- The self-adhesive disposable electrodes (ME4000) were attached to the right hand (one below the third knuckle and middle finger and second on the crease of the wrist) and the right foot (one centrally where the second and third toe meet the foot and second at the crease of the ankle in the line with shin bone).
- Cable connection.

Hand: Clip the negative (black) to the electrode pad nearest to the knuckle, the positive (red) to the electrode pad on the wrist.

Foot: Clip the negative (black) to the electrode pad near to the toe, the positive (red) to the electrode pad on the ankle.

- The machine was switched on, and when the reading was stabilized, the impedance reading was recorded **(Maltron bioScan 915/016 analyser).**

Statistical Analysis

Data were cleaned, coded, entered and analyzed for sample size, per cent, central tendency and dispersion using the Microsoft Excel 2007. Background information, medical information and body composition data was subjected to per cent and dispersion.

RESULT AND DISCUSSION

The present investigation was carried out on 110 HIV positive subjects at ART centre of Susheela Tiwari Hospital, Haldwani. The socio demographic profile of the subjects revealed that the majority of subjects (55.45per cent) were in the age group 30-60 years which is economically and socially most productive age group and thus affecting the economically productive and a tremendous impact on the livelihood of the affected family (Sonani *et al.*, 2011; Deshpande *et al.*, 2012 and Mandal *et al.*, 2000). A 77.28 per cent of subjects were literate but only 10.92 per cent subjects were graduate and above. A 68.19 per cent of subjects were working. Among working subjects majority of subjects (30 per cent) had private job and 15.45, 11.81, 9.90, 1.81 and 1.81 per cent subjects were farmers, labourer, self employed, government job and retired,

respectively. The per capita income per month of the subjects was Rs. 2125±1512, ranged (300-7500). Medical history of the subjects revealed that the heterosexual transmission was main mode of transmission in 82.73 per cent subjects. Sexual, especially the heterosexual, transmission is the main driver of the epidemic in most of India.

Measurement of body weight alone failed to identify dramatic losses in body cell mass because of relative increases in body water with disease progression so body composition analysis are crucial in identifying persons with HIV/AIDS who are at risk for serious consequences of malnutrition (Kotler *et al.*,1989). So in the present investigation body composition analysis was carried out to investigate nutritional status of the subjects more precisely.

Body composition parameters of subjects

Body composition parameters of female and male subjects have been depicted in Table 1. The female subjects showed mean values 13.79±9.64 Kg, 34.06±7.69 Kg, 20.11±2.20 kg and 5.66± 0.71degree and while male subjects showed 11.69±4.61Kg, 43.28±6.76 Kg, 24.37±3.59kg and 5.89±1.06 respectively for fat, fat free mass, body cell mass and phase angle. Similar observation for phase angle was observed by Schwenk *et al* (1999) reported mean value 5.8 ± 0.9 degree for HIV positive patients on ART.

Table 1: Body composition of Subjects.

Parameters	Female (n =58)	Males (n =52)
Fat (Kg)	13.79±9.64 (5.86-22.63)	11.69±4.61 (5.26-17.21)
Fat free mass (Kg)	34.06±7.69 (31.48-58.8)	43.28±6.76 (33.4-65.78)
Body cell mass, kg	20.11±2.20 (15.39-25.17)	24.37±3.59 (17.35-31.92)
Phase angle, degree	5.66± 0.71 (3.64-7.08)	5.89±1.06 (3.86-8.72)

Values in box show Mean ± SD (range).

DISTRIBUTION OF SUBJECTS ON THE BASIS OF PER CENT BODY FAT

Distribution of female subjects on the basis of body fat per cent has been presented in Figure 1. The figure revealed that none of the female subjects were at risky high range body fat (>40 per cent) category. Majority of subjects (58 per cent) were moderately lean followed by 18.5, 13.79 and 6.9 per cent subjects with lean, excess and ultra lean fat per cent, respectively.

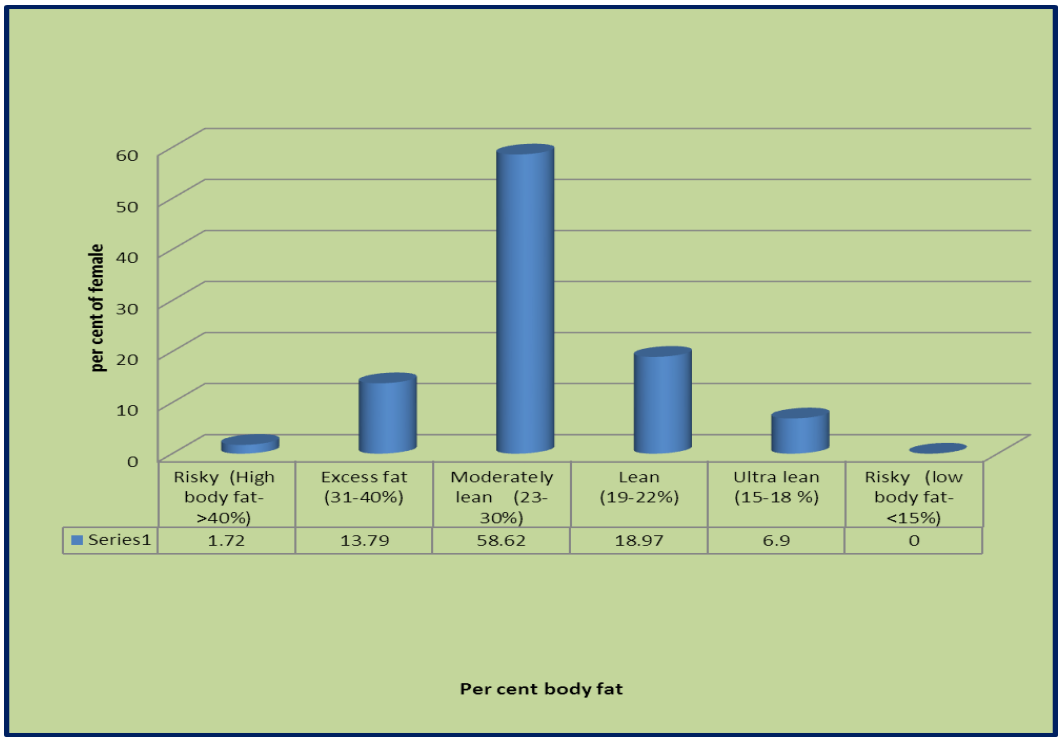

Fig 1: Distribution of Female Subjects On The Basis of Percent Body Fat.

Distribution of male subjects on the basis of body fat per cent has been presented in Figure 2. Among male subjects none of the subjects were Risky high and low body fat category. Majority of the subjects (55.78 per cent) were in moderately lean and 26.93 per cent, 15.39 per cent and 1.9 per cent male subjects were lean, excess fat and ultra lean respectively.

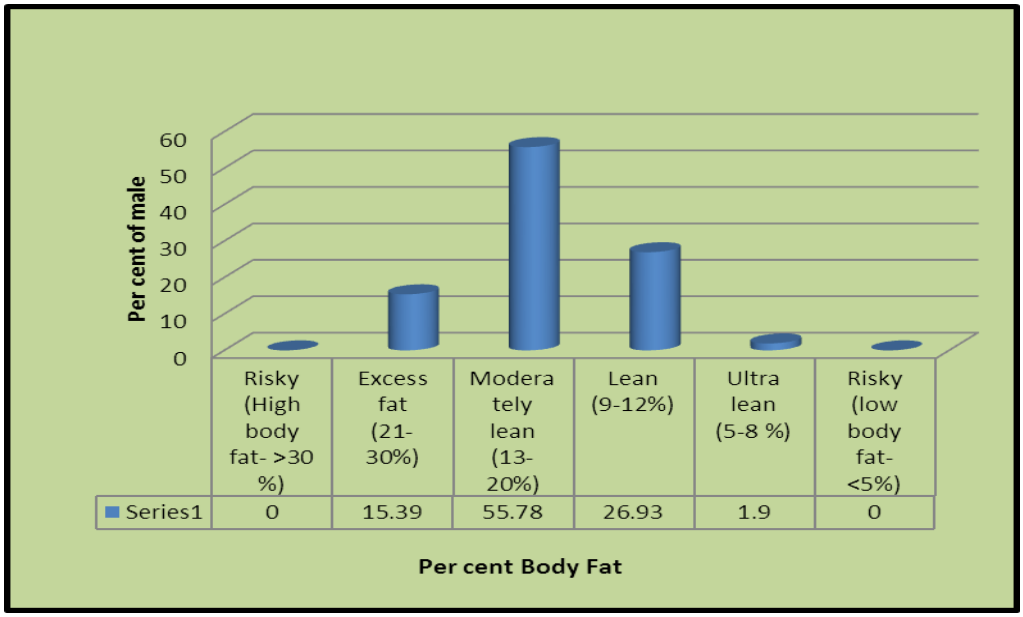

FIG 2: Distribution of Male Subjects on The Basis of Percent Body Fat.

Distribution of female subjects on the basis of phase angle

Phase angle is the relationship between resistance and reactance in series or parallel circuits. The phase angle increase with the amount of reactance (cell membrane or cell mass). A healthy individual will have a phase angle of between 4-15 degrees. Lower phase angle is associated with lower reactance or with cell death or a breakdown in the selective permeability of cell membrane. High phase angle is associated to be consistent with high reactance and large amounts of cell membrane and body cell mass.

Distribution of female subjects on the basis of phase angle has been presented in Figure 3. The figure reveals that majority of subjects 37.93 and 27.58 per cent were having satisfactory and good nutritional status, respectively and 20.69 and 12.07 per cent subjects were at moderate and poor nutritional status respectively. Only 1.73 per cent subjects were at very poor nutritional status.

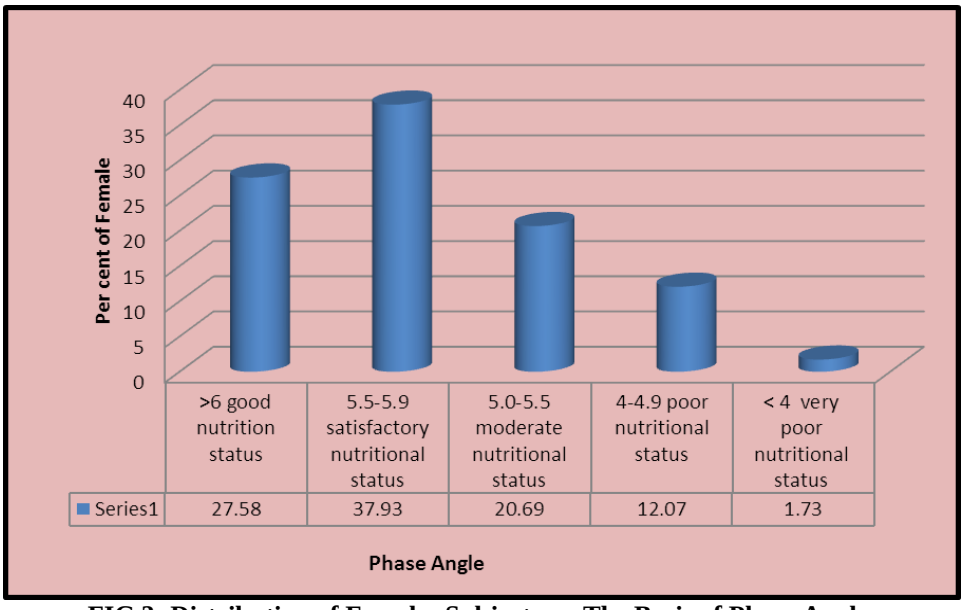

FIG 3: Distribution of Females Subjects on The Basis of Phase Angle.

Distribution of male subjects on the basis of phase angle

Distribution of males on the basis of phase angle has been depicted in **Figure 4**. The figure reveals that majority of the subjects 32.69 and 30.77 per cent were at satisfactory and moderate nutritional status respectively. A13. 46 per cent subjects were poor nutritional status while 11.54 per cent subjects were at good nutrition status we well as very poor nutritional status.

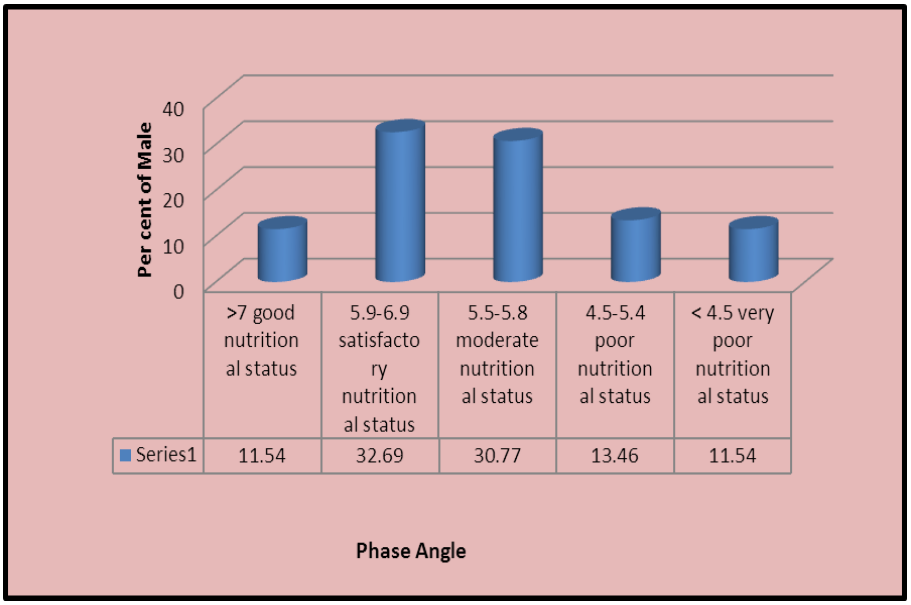

Fig 4: Distribution of Males Subjects on The Basis of Phase Angle.].

DISCUSSION

Deshpande *et al.* (2012) and Jayaram *et.al* (2008) also reported that the seropositivity was higher among the subjects with lesser education and low education status and less awareness regarding safe sex can be the reason for high prevalence among this group of people. Deshpande *et al.* (2012) also found that patients were from the lower middle and lower socio-economic classes. Mandal *et al.* (2000) also found that the main risk groups were truck drivers and labourers. Many studies reported heterosexual transmission in 80.4, 90 and 92.3 per cent of subjects (Chakravarty *et al.*, 2006; Deshpande *et al.*, 2012 and Kothari and Goyal, 2001).

The higher body fat observed was female subjects is because women have higher body fat than men even under normal circumstances (Robergs and Roberts, 1997; Chantal and Kravitz, 2003). Another study by Yelmokka (2001), had confirmed that the amount and distribution of body fat was higher among HIV positive women receiving HAART than HIV positive men.

Agin *et al*. (2000) also showed that the combination of supplementation and resistance exercise led to gains in FFM, whereas supplementation alone increased fat mass. Nutritional support and progressive exercise significantly improves FFM in HIV/AIDS patients (Leyes *et al*., 2008; Roubenoff and Wilson, 2001; Roubenoff *et al*., 1999 and Shevitz and Crystal, 2000).

Padmapriyadarsini *et.al* 2010 in an observational study found that after 12 months of ART a significant increase in body weight, BMI, haemoglobin and body cell mass in both males and females was observed along with metabolic changes with increased abdominal fat and loss of peripheral subcutaneous fat, especially in the face and upper limbs was more prominent among women than men.

CONCLUSION

In conclusion, the results of present investigation have been shown that the subjects are moderately malnutrition. The early detection and treatment of malnutrition are important features of HIV treatment which includes supplementation, change in life style and physical exercise and necessary cost- effective intervention should include as a part of treatment to prevent malnutrition to allow PLWHA lead a good quality life.

ACKNOWLEDGEMENT

Author is thankful to Administration of Susheela Tiwari Hospital, Haldwani, Uttarakhand, India for granting permission to carried out research. The support and cooperation extended by ART centre staff is duly acknowledged. I would like to pay gratitude at all the subjects willing participated in the present investigation.

REFERENCES

1. Agin D, Kotler DP, Papandreou D, Liss M, Wang J, Thornton J, Gallagher D and Pierson RN. Effects of whey protein and resistance exercise on body composition and muscle strength in women with HIV infection. *Ann. N Y Acad. Sci*., 2000; 904: 607-609.
2. Chakravarty H, Mehta A, Parekh SVS, Attili NR, Agrawal S.P and Singh SS. Study on clinico-epidemiological profile of HIV patients in eastern India. *J. Assoc. Physicians Ind*., 2006; 54: 554-557.
3. Chantal MS and Kravitz Gender Differences in Fat Metabolism. 2003. www.afpafitness.com/articles
4. Deshpande JD, Giri PA and Phalke DB. Clinico-epidemiological profile of HIV patients attending ART centre in rural Western Maharashtra, India. *South East Asia J. Public Health*, 2012; 2(2): 16-21.
5. Durnin JV and Womersley J. Body fat assessed from total body density and its estimation from skinfold thickness: measurements on 481 men and women

aged from 16 to 72 years. Br J Nutr, 1974; 32(1): 77–97.
6. Jayaram S, Shenoy S, Unnikrishnan B, Ramapu-ram J and Rao M. Profile of attendees in Voluntary Counseling and Testing Centers of a Medical College Hospital in Coastal Karnataka. *Ind. J. Comm Med.*, 2008; 33: 43-46.
7. Kothari K and Goyal S. Study of clinical presentation, spectrum of systemic involvement and opportunistic infections in AIDS patients. *J. Assoc. Physicians Ind*., 2001; 49: 435-438.
8. Kotler D and Hellerstein M. HIV-associated wasting syndrome and body habitus changes Nutrition brief: Nutrition and HIV in East, Central and Southern Africa. Tanzania and Washington, DC. PRN Notebook, 1998; 3(3): 14-21.
9. Kotler DP, Tierney AR, Wang J and Pierson RN. Magnitude of body-cell-mass depletion and the timing of death from wasting in AIDS. *Am. J. Clin. Nutr*, 1989; 50: 444-447.
10. Kyle UG, Bosaeus I and De Lorenzo AD. Bioelectrical impedance analysis – part I: review of principles and methods. Clin Nutr., 2004; 23: 1226-43.
11. Kyle UG, Bosaeus I and De Lorenzo AD. Bioelectrical impedance analysis – part II: utilization in clinical practice. Clin Nutr., 2004; 23: 1430-53.
12. Lazzaretti RK, Kuhmmer R, Sprinz E, Polanczy k A and Ribeiro JP. Dietary intervention prevents dyslipidemia associated with highly active antiretroviral therapy in human immunodeficiency virus type 1-infected individuals. *J. the Am. College of Card.*, 2012; 59(11): 979-988.
13. Leyes P, Martinez E and Forga M de tallo. Use of diet, nutritional supplements and exercise in HIV-infected patients receiving combination antiretroviral therapies: a systematic review. *Antiviral therapy*, 2008; 13: 149-159.
14. Mandal AK, Singh VP and Gulati AK. Prevalence of Human Immuno deficiency virus infection in and around Varanasi, Uttar Pradesh. *Ind. J. Assoc. Physicians.*, 2000; 48: 288-289.
15. Muurahainen N. Detection of occult wasting by BIA technology. Graduate Hosp. of Philadelphia. *Int. Conf. AIDS*., 1994; 10(2): 220.
16. Padmapriyadarsini C, Swaminathan S, Karthipriya MJ, Narendran G, Menon PA and Thomas BE. Morphologic and Body Composition Changes areDifferent in Men and Women on Generic Combination Antiretroviral Therapy – An Observational Study. JAPI, 2010; 58: 375-7.
17. Pallela, F.J., Moorman DK, Loveless AC, Fuhrer MO, Statten J, GA, Aschman DJ and Holberg SD. Declining morbidity and mortality among patients with advanced immunodeficiency virus infection. N. Engl. J. Med., 1998; 338: 853-861.
18. Portsmouth S, Stebbing J, Gill J, Mandalia S, Bower M, Nelson M and Gazzard B A. Comparison of regimens based on non-nucleoside reverse transcriptase inhibitors or protease inhibitors in preventing Kaposi's sarcoma. AIDS, 2003; 17: 17-22.
19. Robergs RA and Roberts S O. Exercise Physiology: Exercise, Performance, & Clinical Applications. 1997. Boston: WCB McGraw-Hill.
20. Roubenoff, R. and Wilson, I.B. Effect of resistance training on self-reported physical functioning in HIV infection. *Med. Sci. Sports. Exerc*, 2001; 33(11): 1811-1817.
21. Roubenoff R, Weis, Land McDermott A. A pilot study of exercise training to reduce trunk fat in adults with HIV-associated fat redistribution. *J. Acquir. Immune. Defic. Syndr*, 1999; 13: 1373-1375.
22. Schwenk A, Steuck H and Kremer G. Oral supplements as adjunctive treatment to nutritional counseling in malnourished HIV-infected patients: randomized controlled trial. Cl. Nutr., 1999; 18(6): 371-374.
23. Schmitz MFand Crystal S. Social relations, coping, and psychological distress among persons With HIV/AIDS. *J. Appl. Soc. Psychol*., 2000; 30: 665-668.
24. Shievitz A and Knox TA. Nutrition in the era of highly active antiretroviral therapy. *Cl. Infect. Dis.*, 2001; 32(12): 1769-1775.
25. Siqueira H, Vassimon A, Jordão A, Albuquerque de Paula FJ, Artioli Machado A and Pontes Monteiro J.Comparison of bioelectrical impedance with skinfold thickness and x-ray absorptiometry to measure body composition in HIV- infected with lipodistrophy. *Nutr. Hosp*., 2011; 26(3): 458-464.
26. Sluys T. Ende, M.E. van der.; Swart, Berg GR, van den JW, Wilson, JH. Body Composition in patients with acquired immunodeficiency syndrome: a validation study of biolectric impedance analysis. *J. of Parenteral and Enteral Nutr*., 1993; 17: 404-406.
27. Sonani, H. P.; Undhad, A. M. and Savani, G. T. Clinical and social-demograpic profile of patients registered at ART centre, SMIMER, Surat. National *J. of. Comm. Med*., 2011; 2(1): 130-132.
28. Suttmann, U.; Ockenga, J.; Selberg, O.; Hoogestraat, L.; Deicher, H. and Miller, M. J. Incidence and Prognostic Value of Malnutrition and Wasting in Human Immunodeficiency Virus-Infected Outpatients. *J. of Acquir. Immune. Defic. Syndr. Human Retroviral*, 1995; 12(4): 263–273.
29. Yelmokas A, Sheits A, Tamsin K, Ronenn R, Kehayias J and Sherwood G. Effect of highly active antiretroviral therapy on fat, lean and bone mass in HIV-seroposetive men and women. Am J clin Nutr, 2001; 74: 679-86.