

**A STUDY ON THE EFFECT OF PROBIOTIC CURD  
SUPPLEMENTATION ON HIV (PLWH) UNDERGOING ANTI-  
RETROVIRAL THERAPY (ART).**

**Amruth Rao P.\*<sup>1</sup>, Sree Vennela Rao P.<sup>3</sup>, Khaleel Pasha MD.<sup>2</sup>, Srinivas V.<sup>2</sup> and  
Hemalatha R.<sup>1</sup>**

<sup>1</sup>National Institute of Nutrition (ICMR), Jamai Osmania.P.O, Hyderabad – 500 007  
Telangana State, India.

<sup>2</sup>Department of Gastroenterology and ART centre, Osmania General Hospital, Hyderabad,  
Telangana State, India.

<sup>3</sup>Department of Pharmacy, Osmania University Hyderabad, Telangana State, India.

Article Received on  
16 March 2021,

Revised on 05 April 2021,  
Accepted on 26 April 2021

DOI: 10.20959/wjpr20215-20349

**\*Corresponding Author**

**Dr. Amruth Rao P.**

National Institute of  
Nutrition (ICMR), Jamai  
Osmania.P.O, Hyderabad –  
500 007 Telangana State,  
India.

**ABSTRACT**

**Background:** Human Immunodeficiency Virus (HIV) infection results in gastro-intestinal damage, microbial translocation and immune activation which are associated with decreasing CD4 cell count and persistent abdominal distress. According to some research studies, probiotic food supplementation has been demonstrated to have promising results in improving the immune status i.e. CD4 cell profile in HIV subjects. **Methods:** In present study we have selected about 100 patients (Males & Females) who were identified for HIV and were ART treatment with an age range of 20-50 years, and supplemented with indigenously prepared Probiotic curd (Indian dahi) which contained the blend of *Lactobacillus bulgaricus*, *Streptococcus*

*thermophilus* and *Bifidobacterium bifidum*) daily for three months (3) along with their regular diet (noon meals). Their height, weight and BMI, MUAC, Skinfolds were recorded both at baseline and after three months (90 days) i.e. before and after supplementation. Simultaneously blood samples were collected for CD4 cell counts, serum Adenosine deaminase (ADA) and Cholesterol (TC) levels for analysis. These patients were taking regularly Anti retroviral therapy (ART) at Osmania General Hospital, Hyderabad. **Results:** It was observed that all the anthropometric parameters were found to be significantly increased.

Further the results showed that there was 0.08 log increase in the CD4 cell counts with an average 5 point decrease in the supplementation HIV subjects under study. However there was decrease in cholesterol levels which was significant at 5% level i.e. the mean values decreased from 185 to 158 mg/ml. Similarly decrease was noticed in the ADA levels i.e. reverted back from abnormal to normal in these subjects after supplementation. **Conclusion:** The study has shown that the Probiotic curd (Indian dahi) indigenously prepared for supplementation was found to be effective as there was an improvement in the anthropometric parameters along with an enhancement of CD4 cell counts and decrease in cholesterol and ADA and in these subjects. Therefore these observations suggest that inclusion of probiotic curd in the daily diet of HIV patients can have enormous improvement in their HIV Patients. However there is a need to conduct further studies at a larger level on the supplementation of probiotic based food products suitable to HIV subjects.

## INTRODUCTION

According to estimates by WHO and UNAIDS, 36.7 million people were living with HIV globally at the end of 2016. There were approximately 37.9 million people across the globe with HIV/AIDS in 2018. Of these, 36.2 million were adults and 1.7 million were children (<15 years old). During the same year, about 1.8 million people became newly infected, and 1 million died of HIV-related causes were reported. India has the third largest HIV epidemic in the world, with 2.1 million people living with HIV. As per the recently released, India HIV Estimation 2017 report, National adult (15–49 years) HIV prevalence in India is estimated at 0.22% (0.16% – 0.30%) in 2017. In 2017, adult HIV prevalence is estimated at 0.25% (0.18-0.34) among males and at 0.19% (0.14-0.25) among Females. The adult HIV prevalence at national level has continued its steady decline from an estimated peak of 0.38% in 2001-03 through 0.34% in 2007, 0.28% in 2012 and 0.26% in 2015 to 0.22% in 2017.

## MATERIALS AND METHODS

During the period of study a total of about one hundred (100) HIV patients who were on ART were recruited from Osmania General Hospital, Hyderabad Telangana, and India. The institute ethical committee (IEC) clearance was obtained before the commencement of the study. The inclusion criteria included the enrollment of HIV-positive patients with CD4 counts  $>400$  cells/mm<sup>3</sup> and exclusion criteria was that patients with known allergy or intolerance to the product, diarrheal history of current inflammatory diseases of the small or large intestine, any past or current systemic malignancy, previous or actual drug addiction,

use of antibiotics or probiotics during the 3 weeks prior to the enrollment for the study. The eligible participants were interviewed using a structured questionnaire to collect information on demographics, medical history and drugs use etc. These treatment groups were divided into two categories i.e., The Group A and Group B. The group A was supplemented with probiotic curd (LB+ ST+ Bifido) of about 100g/day for 3 months along with their regular ART treatment. The group B was considered as non supplemented group and continued their ART treatment. All the subjects were subjected to all the measurements of anthropometric indices viz Height, weight, BMI, MUAC.

Blood samples were collected before and after supplementation for laboratory investigations which include CD4 cell counts using flowcytometer, serum cholesterol and Adenosine deaminase activity using commercially available kits supplied by Biosystems. Since that this was a preliminary study only 2-3 important markers were studied.

## RESULTS AND DISCUSSION

In this study we have observed significant changes in the anthropometric parameters i.e. there was increase in their body weights, BMI, waist, Hip, MUAC Triscep, Biceps, Skin folds. indicating the physiological effects i.e. ability for better absorption of nutrients during supplementation of probiotics.

HIV potentially infects and destroys CD4+ cells and leads to a gradual decline in the number of these immune cells. A combination of probiotic microflora is known to have up regulated T- reg activation there by suppressing pro inflammatory immune response in autoimmunity including inflammatory bowel disease which provides a rationale for use of probiotics in HIV-1/AIDS subjects. **All subjects** in the present study had a median of CD4+ T cell count of  $470.29 \pm 232.32$  which tend to increase to  $524.56 \pm 245.06$  cell / $\mu$ l. Our results are par with the earlier reports of Stephanie L. Irvine, B and Ruben Hummelen in 2010 the yogurt can increase the CD4 count among people living with HIV.

Further the calculated value of 0.08 log increased in the CD4 cell counts with an average of 5point decrease. The findings indicated that probiotics may have the ability to block receptors thereby decrease the impact of viral load of HIV on these cells. The increase the CD4 T lymphocyte count in patients with HIV provide a direct evidence that lactobacillus expresses the CD4 receptor and utilizes that to block HIV transmission in HIV positive subjects.

Recent studies have confirmed that ADA to be an important immunoenzyme biomarker which helps in diagnosis and prognosis of various diseases both NCD's and other infectious disease. In the present study it was observed that the ADA values were abnormally high i.e.  $31.35 \pm 18.16$ . which declined to  $26.21 \pm 10.60$  indicating the immunomodulation effect of probiotic curd supplementation on these individuals. Our observation was in line with previous reports indicating that HIV infection alters serum ADA activity (T.Soubi, Vallas V) therefore, elevated plasma ADA activity might be considered as a useful surrogate marker for HIV infection that occurs early in the disease process.

The body composition especially the weight increased in HIV patients because the Probiotic Dahi have the necessary micronutrients. We have observed that the mean difference in the serum cholesterol levels were decreased in these subjects which was significant at 5% level i.e. decreased from  $184.97 \pm 46.74$  to  $157.99 \pm 48.21$  among the total subjects under study.

#### Effect of Probiotic supplementation on changes in various parameters in PLWH.

	supplementation				
	Before		After		
	Mean	SD	Mean	SD	
AGE	34.20	7.96	34.20	7.96	
HT	164.08	8.33	164.08	8.33	
WT	56.15	13.69	57.51	13.82	↑
BMI	20.69	4.16	21.22	4.28	↑
WAIST	73.91	10.79	76.81	12.54	↑
HIP	79.89	9.73	84.19	10.67	↑
MUAC	23.62	4.35	24.87	4.69	↑
TSF	11.44	3.72	12.72	4.69	↑
BSF	7.19	2.46	8.42	3.77	↑
SC	11.64	4.32	12.99	4.05	↑
SI	8.67	3.21	9.32	3.30	↑
CD4	470.29	232.32	524.56	245.06	↑
logcd4	2.59	33	2.67	.22	↑
ADA	31.35	18.16	26.21	10.60	↓
CHOLESTEROL	184.97	46.74	157.99	48.21	↓

Note: Mean of % change for CD4 – 11%, CHOL – 7.8% and ADA - 16%

#### CONCLUSION

Probiotic curd supplementation was significantly effect on improving their physiological condition, immune system and CVD Risk factors therefore intervention with this food product may help immensely in people living with HIV(PLWH).

**REFERENCES**

1. WHO/FAO. Health and nutritional properties of probiotics in food including powder milk with live lactic acid bacteria, a joint FAO/WHO expert consultation. [WHO website] October 2001; 1–4.
2. Luyer MD, Buurman WA, Hadfoune M, et al. Strain-specific effects of probiotics on gut barrier integrity following hemorrhagic shock. *Infection Immunity*, 2005; 73: 3686–3692.
3. Yan F, Cao H, Cover TL, et al. Soluble proteins produced by probiotic bacteria regulate intestinal epithelial cell survival and growth. *Gastroenterology*, 2007; 132: 562–575.
4. Baroja ML, Kirjavainen PV, Hekmat S, et al. Anti-inflammatory effects of probiotic yogurt in inflammatory bowel disease patients. *Clinical Experimental Immunol*, 2007; 149: 470–479.
5. Foligne B, Zoumpopoulou G, Dewulf J, et al. A key role of dendritic cells in probiotic functionality. *PLoS ONE*, 2007; 2: e313.
6. Mohamadzadeh M, Olson S, Kalina WV, et al. Lactobacilli activate human dendritic cells that skew T cells toward T helper 1 polarization. *Proceedings National Academy Sciences United States America*, 2005; 102: 2880–2885.
7. Wolf BW, Wheeler KB, Ataya DG, et al. Safety and tolerance of *Lactobacillus reuteri* supplementation to a population infected with the human immunodeficiency virus. *Food Chem Toxicol*, 1998; 36: 1085–1094.
8. Salminen MK, Tynkkynen S, Rautelin H, et al. The efficacy and safety of probiotic *Lactobacillus rhamnosus* GG on prolonged, noninfectious diarrhea in HIV patients on anti-retroviral therapy: a randomized, placebo-controlled, cross-over study. *HIV Clinical Trials*, 2004; 5: 183–191.
9. Heiser CR, Ernst JA, Barrett JT, et al. Probiotics, soluble fiber, and L-Glutamine (GLN) reduce nelfinavir (NFV)- or lopinavir/ritonavir (LPV/r)-related diarrhea. *J Int Assoc Physicians AIDS Care (Chic Ill)*, 2004; 3: 121–129.
10. Toris L, Cardoso EM, Miura E. Use of probiotics in HIV-infected children: a randomized double-blind controlled study. *J Trop Pediatr*, 2008; 54: 19–24.
11. Anukam KC, Osazuwa EO, Osadolor HB, et al. Yogurt containing probiotic *Lactobacillus rhamnosus* GR-1 and *L. Reuteri* RC-14 helps resolve moderate diarrhea and increases CD4 count in HIV/AIDS patients. *J Clin Gastroenterol*, 2008; 42: 239–24.

12. Sattler FR, Rajcic N, Mulligan K, et al. Evaluation of high-protein supplementation in weight-stable HIV-positive subjects with a history of weight loss: a randomized, double-blind, multicenter trial. *American J Clinical Nutr*, 2008; 88: 1313–1321.
13. UNAIDS. Sub-Saharan Africa AIDS epidemic update regional summary 2007. [UNAIDS website] March, 2008.
14. Irvine SL, Hummelen RBS, Hekmat S, Looman CW, Habbema JD, Reid G. Probiotic yogurt consumption is associated with an increase of CD4 count among people living with HIV/AIDS. *J Clin Gastroenterol*, 2010.
15. Tsuboi I, Sagawa K, Shichijo S, Yokoyama MM, Ou DW, Wiederhold MD. Adenosine deaminase isoenzyme levels in patients with human T-cell lymphotropic virus type 1 and human immunodeficiency virus type 1 infections. *Clin Diagn Lab Immunol*, 1995; 2(5): 626–630.
16. Valls V, Ena J, Roca V, Perez-Oteyza C, Angeles FM, Enriquez-de-Salamanca R. Significance of adenosine deaminase measurement in sera of patients with HIV-1 infection. *AIDS*, 1990; 4(4): 365–366.
17. Ahoua L, Umutoni C, Huerga H, Minetti A, Szumilin E, Balkan S, et al. Nutrition outcomes of HIV-infected malnourished adults treated with ready-to-use therapeutic food in sub-Saharan Africa: a longitudinal study. *J Int AIDS Soc*, 2011; 14: 2. doi:10.1186/1758-2652-14-2.
18. Hummelen R, Hemsworth J, Chagalucha J, Butamanya NL, Hekmat S, Habbema JD, Reid G. *Nutrients*, 2011 Oct; 3(10): 897-909. doi: 10.3390/nu3100897. Epub 2011 Oct 21. Effect of micronutrient and probiotic fortified yogurt on immune-function of anti-retroviral therapy naive HIV patients.
19. Gilliland SE, Nelson CR & Maxwell C. Assimilation of cholesterol by *Lactobacillus acidophilus*. *Appl Environ Microbiol*, 1985; 49: 377–381. *AIDS* 1990; 4(4): 365–366.
20. Ahoua L, Umutoni C, Huerga H, Minetti A, Szumilin E, Balkan S, et al. Nutrition outcomes of HIV-infected malnourished adults treated with ready-to-use therapeutic food in sub-Saharan Africa: a longitudinal study. *J Int AIDS Soc*, 2011; 14: 2. doi:10.1186/1758-2652-14-2.
21. Hummelen R, Hemsworth J, Chagalucha J, Butamanya NL, Hekmat S, Habbema JD, Reid G. *Nutrients*, 2011 Oct; 3(10): 897-909. doi: 10.3390/nu3100897. Epub 2011 Oct 21. Effect of micronutrient and probiotic fortified yogurt on immune-function of anti-retroviral therapy naive HIV patients.

22. Gilliland SE, Nelson CR & Maxwell C. Assimilation of cholesterol by *Lactobacillus acidophilus*. *Appl Environ Microbiol*, 1985; 49: 377–381.