



ISSN: 0976-3376

Available Online at <http://www.journalajst.com>

ASIAN JOURNAL OF
SCIENCE AND TECHNOLOGY

Asian Journal of Science and Technology
Vol. 08, Issue, 09, pp.5524-5528, September, 2017

RESEARCH ARTICLE

EVALUATION OF THE EFFECT OF YOGA THERAPY ON SOME HAEMATOLOGICAL PARAMETERS OF HIV INFECTED SUBJECTS- A RANDOMIZED CONTROLLED TRIAL

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ARTICLE INFO

Article History:

Received 26th June, 2017
Received in revised form
14th July, 2017
Accepted 29th August, 2017
Published online 15th September, 2017

Key words:

HIV,
Yoga Therapy,
ART,
Cytopenia.

ABSTRACT

Acquired Immune Deficiency Syndrome (AIDS) is the condition in the body that the whole immune system is collapsed due to the Virus namely Human Immune-deficiency Virus (HIV). The treatment of HIV/AIDS is a highly challenged job across the world. Yoga has got the potential to bring the prosperity and happiness to the practitioner. Attaining perfect health through yoga is a time tested factor. The present study is chosen in order to find out an alternative and authentic approach through yoga, to assess how yoga effects on haematological parameters and for the betterment of the quality of life of the HIV infected people as well as to standardize the yogic practices to cure or manage HIV/AIDS. In the study, 100 subjects are selected which involves both males and females. The subjects are divided into two groups equally i.e., 50 subjects in Experimental Group and 50 subjects in Control group. Experimental Group members were practiced various Yogic Practices. Control group subjects continued their normal routine. Both the groups were under their regular HAART treatment. The duration of the study is 6 months which includes 3 months of practice and 3 months of follow-up. To find the effect of yoga, the hematological parameters such as CD4 counts, Total WBC count and Absolute count of WBCs are used. The study has shown highly significant improvement at the level of $p < 0.001$ in the Parameters of experimental group such as CD4 count, Total Count of WBC, Absolute count of Neutrophils and Lymphocytes clinically as well as statistically. Decreasing tendency of cell counts (Cytopenia) is noticed in the control group subjects in the duration of 6 months. It is evident that, there are lot of side effects to the HIV subjects who are under the HAART.

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INTRODUCTION

In the present era, the individuals are subjected to various kinds of diseases/disorders due to unhealthy living and lack of awareness regarding the personal health. HIV infection may be congenital or also a result of unhealthy sexual contacts and lack of awareness. There are other causes too. Acquired Immune Deficiency Syndrome (AIDS) is condition in the body that the whole immune system is collapsed due to the Virus namely Human Immune-deficiency Virus (HIV). The treatment of HIV/AIDS is a highly challenged job across the world. The world wide spread of HIV infection has resulted in a dramatic lowering of life expectancy in some countries (Drake William, 2012). There is a treatment namely ART introduced in 1996 by CDC. Currently, the modern medical science considers it as the only effective therapy for HIV which slows the progression of HIV into AIDS and it helps in the prevention of opportunistic infections.

Along with the beneficial aspects of ART, there are lot of side effects too which becomes fatal to the HIV/AIDS subjects. Haematological and biochemical abnormalities like Cytopenia are among the most common pathological manifestations of HIV subjects on ART (Sharma *et al.*, 2013). Real comfort lies in good health. It is individual's priceless treasure. Disease free condition and contentment at the level of mind are essential component of happiness. If one does not possess good health, one cannot enjoy success, prosperity, peace and other comforts of life. This can be achieved by following and practicing Yogic principles by continuous effort. Yoga has got the potential to bring the prosperity and happiness to the practitioner. Attaining perfect health through yoga is a time tested factor. The present study is chosen in order to find out an alternative and authentic approach through yoga, to assess how yoga effects on haematological parameters and for the betterment of the quality of life of the HIV infected people as well as to standardize the yogic practices to manage HIV/AIDS.

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Aims and Objectives

- To find out the impact of selected Yogic practices on the Hematological parameters of HIV infected people.
- To prove the effect of *Yoga* Therapy on HIV infected people.

MATERIALS AND METHODS

The present study is done in a HIV network centre of Mangalore city of Dakshina Kannada district, Karnataka state, India. The subjects of age group between 25 to 50 years with HIV infection are considered for the present study. Informed written consent is taken from the subjects who are participating in the study. The research title has clearance from the institutional human ethical committee. In this study, 100 subjects are selected which involves both males and females. The subjects are divided into two groups equally i.e., 50 subjects in Experimental Group and 50 subjects in Control group. A detailed case history of each of the subjects is taken. According to the symptoms and condition of the subject, the Experimental Group members were practiced various Yogic Practices. Control group subjects continued their normal routine. Both the groups were under their regular ART treatment. The duration of the study is 6 months which includes 3 months of practice and 3 months of follow-up. Here the subjects are treated and individual care is taken to enhance the effect of Yogic practices. Data are collected before and after the Yogic Intervention.

The following parameters are selected for the study:

- **CD4 Count (Helper T-cell Count):** Counting the number of helper T-cells technically called CD4+ lymphocytes is the most important tool used to assess the overall health of the immune system in people with HIV. The normal CD4 count is between 500 and 1500 cells/cumm. Without anti-HIV treatment, the average HIV-infected person undergoes a decrease in helper T-cell count of about 50 to 100 cells per cubic millimetre each year. Opportunistic infections typically occur once the helper T-cell count falls below 200.
- **Total Count:** Total count is the representation of number of WBCs. White blood cells or leukocytes are cells of the immune system involved in defending the body against both infectious diseases and foreign materials. Leukocytes are found throughout the body, including the blood and lymphatic system. The elevated counts signify an infection. The Normal Range is 4000-11000 cells/cumm.
- **Differential count (DC) & absolute count:** WBC Differential count determines the percentage of each type of white blood cell in a sample. The absolute count depicts the exact number of blood cells present in a sample.
- **Neutrophil:** Neutrophil defend against bacterial or fungal infection and other very small inflammatory processes that are usually first responders to microbial infection. The neutrophil count may be lowered by certain medications used by people with HIV. Normal Range is 60-70% and absolute count is 1800-7700 cells/mm³.
- **Lymphocyte:** Lymphocytes are much more common in the lymphatic system. Lymphocytes are the key WBCs

involved in immune responses and are often lowered by HIV infection. The normal range is 20-45% and absolute count is 800-4800 cells/mm³.

- **Eosinophil:** Eosinophil primarily deals with parasitic infections. Eosinophils are also the predominant inflammatory cells in allergic reactions. Normal range of Eosinophil is 0-4% and absolute count is 0-800 cells/mm³.
- **Monocyte:** These play an important role in fighting certain types of infections by maturing into macrophages that can ingest bacteria and cellular debris. Unlike Neutrophils, Monocytes are able to replace their lysosomal contents and are thought to have a much longer active life. The Normal range is 5-12% and absolute count is 200-900 cells/mm³.

Yogic Intervention

Yogic intervention for the current study involved the following practices and taught in the same sequence. According to the *prakriti*- nature of the individual, the practices are taught to the subjects.

Vahnisara, Kapalabhati, Swastikasana Vajrasana, Suptavajrasana, Simhasana, Trikonasana, Parsvakonasana, Veerabhadrasana, Pascimottanasana, Purvottanasana, Janusirsasana, Pavanamuktasana, Bhujangasana, Dhanurasana, Makarasana, Bharadwajasana, Ardhamatsyendrasana, Uttanapadasana Ujjayi, Anuloma-Viloma, Suryabedhana, Bhastrika, Bahya Kumbhaka, Bhramari Mahamudra, Viparitarani, Pranava Dhyana Yoga Nidra, Savasana

RESULTS

Paired t-test is used to analyse the data and to find out the effectiveness of Yogic Treatment. The findings are tabulated as below. There are highly significant improvement in the Parameters of experimental group such as CD4 count, Total Count of WBC, Absolute count of Neutrophils and Lymphocytes clinically as well as statistically. There are no significant changes in the Parameters of control group except total WBC count but decreasing tendency of the cell counts is noticed in Neutrophils, Lymphocytes and also in the Total WBC count.

DISCUSSION

CD₄ Counts

In the experimental group, the pre CD₄ count is noticed a minimum of 208 cells/mm³ and a maximum of 1036 cells/mm³ with a range of 828 cells/mm³. The mean CD₄ count is found to be 580.82 cells/mm³ with a standard deviation of 192.69 giving a standard error of 27.25 cells/mm³. In the post, it is observed that the counts varied between 351 to 1120 cells/mm³ giving a range of 769 cells/mm³. The mean CD₄ count is observed to be 637.6 cells/mm³ with a standard deviation of 184.58 giving a standard error of 26.1 cells/mm³. In the control group, the pre CD₄ count is noticed a minimum of 238 cells/mm³ and a maximum of 956 cells/mm³ with a range of 718 cells/mm³. The mean CD₄ count is found to be 521.42 cells/mm³ with a standard deviation of 162.38 giving a standard error of 22.97 cells/mm³.

Table 1. Paired T-test for Experimental Group

Sl. No	Parameters	Mean		S. D		t-value	p-value	Sig
		Pre	Post	Pre	Post			
1	CD4	562.81	634.31	200.04	204.65	-4.180	0.000804	HS*
2	Total Count	4750	6193.75	1271.2	1343.4	-10.40	2.95E-08	HS
3	Neutrophil	2492.43	3339.5	794.42	2362.4	-6.784	6.15E-06	HS
4	Eosinophil	280.06	398.87	204.38	147.96	-3.186	0.006127	HS
5	Lymphocyte	1679.56	2072.25	695.05	673.78	-6.812	5.87E-06	HS
6	Monocyte	296.25	369.62	132.53	141.12	-3.176	0.006262	HS

Table 2. Paired T-test for Control Group

Sl. No	Parameters	Mean		S. D		t-value	p-value	Sig
		Pre	Post	Pre	Post			
1	CD4	480.563	519.56	176.63	218.33	-1.374	0.1897	NS**
2	Total Count	4850	4637.5	1253.3	1379.8	2.211	0.0430	S***
3	Neutrophil	2417.63	2362.19	667.37	752.5	0.789	0.4422	NS
4	Eosinophil	456.56	394.63	182.48	217.21	1.865	0.0819	NS
5	Lymphocyte	1801.75	1709.25	600.08	520.51	1.522	0.1488	NS
6	Monocyte	151.06	152.81	85.1	107.24	-0.079	0.9376	NS

In the post, it is observed that the counts varied between 153 to 1080 cellsmm³ giving a range of 927 cellsmm³. The mean CD4 count is observed to be 571.82 cellsmm³ with a standard deviation of 183.63 giving a standard error of 25.97 cellsmm³. It is found that there is significant effect of yoga therapy in increasing the levels of CD4 count (p<0.01). This is an indication of favourable effect of Yoga therapy. On the other hand there was small increase in the CD4 counts of control group subjects which is not significant. The finding supports the research findings of Sharma *et al.*, (2013) who depicted the beneficial effect of yoga therapy on the immune level of HIV infected children.

Total WBC Count (TC)

In the experimental group, the pre TC is noticed a minimum of 2400 cellsmm³ and a maximum of 8400 cellsmm³ with a range of 6000 cellsmm³. The mean TC is found to be 4762 cellsmm³ with a standard deviation of 1507.92 giving a standard error of 213.25 cellsmm³. In the post, it is observed that the counts varied between 3700 to 10300 cellsmm³ giving a range of 6600 cellsmm³. The mean TC is observed to be 6040 cellsmm³ with a standard deviation of 1479.93 giving a standard error of 209.29 cellsmm³. In the control group, the pre TC is noticed a minimum of 3300 cellsmm³ and a maximum of 9200 cellsmm³ with a range of 5900 cellsmm³. The mean TC is found to be 5050 cellsmm³ with a standard deviation of 1339.39 giving a standard error of 189.4 cellsmm³. In the post, it is observed that the counts varied between 2900 to 9500 cellsmm³ giving a range of 6600 cellsmm³. The mean TC is observed to be 4846 cellsmm³ with a standard deviation of 1544.86 giving a standard error of 218.47 cellsmm³. It is found that there is significant effect of yoga therapy in increasing the levels of WBC count (p<0.01). This is an indication of favourable effect of Yoga therapy. The control group subjects have shown a decreasing tendency of cell counts which is a clear indication of haematological abnormality. Even though it is statistically significant, it has shown decreasing cell count which is clinically not significant.

Neutrophil

In the experimental group, the pre absolute neutrophil count is noticed a minimum of 972 cellsmm³ and a maximum of 5964

cellsmm³ with a range of 4992 cellsmm³. The mean neutrophil count is found to be 2498.4 cellsmm³ with a standard deviation of 1009.92 giving a standard error of 142.83 cellsmm³. In the post, it is observed that the counts varied between 1961 to 5076 cellsmm³ giving a range of 3115 cellsmm³. The mean neutrophil count is observed to be 1189.5 cellsmm³ with a standard deviation of 841.1 giving a standard error of 118.95 cellsmm³. In the control group, the pre neutrophil count is noticed a minimum of 1677 cellsmm³ and a maximum of 4692 cellsmm³ with a range of 3015 cellsmm³. The mean neutrophil count is found to be 2572.9 cellsmm³ with a standard deviation of 864.43 giving a standard error of 122.2 cellsmm³. In the post, it is observed that the counts varied between 1540 to 4560 cellsmm³ giving a range of 3020 cellsmm³. The mean neutrophil count is observed to be 2490.8 cellsmm³ with a standard deviation of 883.56 giving a standard error of 125 cellsmm³.

Eosinophil

In the experimental group, the pre eosinophil count is noticed a minimum of 54 cellsmm³ and a maximum of 1148 cellsmm³ with a range of 1094 cellsmm³. In the post, it is observed that the counts varied between 78 to 912 cellsmm³ giving a range of 834 cellsmm³. In the control group, the pre eosinophil count is noticed a minimum of 162 cellsmm³ and a maximum of 924 cellsmm³ with a range of 762 cellsmm³. In the post, eosinophil count is noticed a minimum of 80 cellsmm³ and a maximum of 1014 cellsmm³ with a range of 934 cellsmm³. In the control group, the pre eosinophil count is noticed a minimum of 162 cellsmm³ and a maximum of 924 cellsmm³ with a range of 762 cellsmm³. The mean eosinophil count is found to be 442.84 cellsmm³ with a standard deviation of 209.63 giving a standard error of 29.65 cellsmm³. In the post, eosinophil count is noticed a minimum of 80 cellsmm³ and a maximum of 1014 cellsmm³ with a range of 934 cellsmm³. The mean eosinophil count is found to be 433.7 cellsmm³ with a standard deviation of 257.14 giving a standard error of 36.37 cellsmm³.

Lymphocyte

In the experimental group, the pre lymphocyte count is noticed a minimum of 720 cellsmm³ and a maximum of 3575 cellsmm³ with a range of 2575 cellsmm³. The mean

lymphocyte count is found to be 1670 cellsmm³ with a standard deviation of 628.78 giving a standard error of 88.92 cellsmm³. In the post, it is observed that the counts varied between 1102 to 3912 cellsmm³ giving a range of 2810 cellsmm³. The mean lymphocyte count is observed to be 2142 cellsmm³ with a standard deviation of 633.19 giving a standard error of 89.55 cellsmm³. In the control group, the pre lymphocyte count is noticed a minimum of 990 cellsmm³ and a maximum of 4140 cellsmm³ with a range of 3150 cellsmm³. The mean lymphocyte count is found to be 1865.7 cellsmm³ with a standard deviation of 569.73 giving a standard error of 80.57 cellsmm³. In the post, it is observed that the counts varied between 841 to 4085 cellsmm³ giving a range of 3244 cellsmm³. The mean lymphocyte count is observed to be 1765 cellsmm³ with a standard deviation of 569.71 giving a standard error of 80.57 cellsmm³.

Monocyte

In the experimental group, the pre monocyte count is noticed a minimum of 62 cellsmm³ and a maximum of 918 cellsmm³ with a range of 856 cellsmm³. The mean monocyte count is found to be 272.44 cellsmm³ with a standard deviation of 175.12 giving a standard error of 24.77 cellsmm³. In the post, it is observed that the counts varied between 45 to 927 cellsmm³ giving a range of 882 cellsmm³. The mean monocyte count is observed to be 300.94 cellsmm³ with a standard deviation of 195.49 giving a standard error of 27.65 cellsmm³. In the control group, the pre monocyte count is noticed a minimum of 33 cellsmm³ and a maximum of 399 cellsmm³ with a range of 366 cellsmm³. The mean monocyte count is found to be 162.8 cellsmm³ with a standard deviation of 91.13 giving a standard error of 12.89 cellsmm³. In the post, it is observed that the counts varied between 34 to 510 cellsmm³ giving a range of 476 cellsmm³. The mean monocyte count is observed to be 144.22 cellsmm³ with a standard deviation of 90.68 giving a standard error of 12.82 cellsmm³.

By the statistical analysis it is found that the neutrophil count and lymphocyte count has shown significant improvement in experimental group whereas the corresponding decrease was noticed in the control group. This increase in the neutrophil and lymphocyte count is the clear indication of improvement in the immune level of HIV infected subjects. This will become helpful to delay the progression of opportunistic infections. The decrease in the absolute count and total count is quite common and it is referred as the HIV associated haematological abnormalities that are under ART (Rachel Kyeyune *et al.*, 2014). The ART treatment is helpful for the HIV subjects to resist the opportunistic infections. Here, the subjects who have practiced yogic discipline along with ART have got highly significant improvements in the haematological parameters. This is because of the effectiveness of various yogic practices in improving and balancing action of psycho-physiological systems of the individual. Regular practice of classic Asanas is helpful for the better healthy immune system (Schatz Mary, 1987). The Asanas, Pranayamas, Dhyana and relaxation techniques especially Yoga Nidra is more effective in improving the immunological systems HIV infected subjects. A decreasing tendency of cell counts (Cytopenia) is noticed in the control group subjects in the duration of 6 months and it is evident that, there are lot of side effects to the HIV subjects who are under the HAART. Cytopenia is the most common HIV

associated abnormality (Bartholomew, 2013). This is clinically a serious condition. In case of experimental group subjects, the minimization of Cytopenia condition is observed. Comparatively the yoga practice group has shown significant improvement in their haematological parameters.

Conclusion

The immune system of HIV infected subjects becomes inefficient day by day and the chance of getting opportunistic infections is very high. Infection with HIV and treatment with ART have been associated with several metabolic and haematological alterations (Cade Todd *et al.*, 2010). Modern medicine system introduced an effective HAART treatment which has got lot of side effects like Anaemia, Cytopenia etc. In this study, the effectiveness of yogic therapy is assessed and the efficiency of yoga in improving the health condition of HIV subjects is proved. One can go for further deep research in this field to draw out the efficacy of yoga in various levels of immunological condition of HIV infected subjects.

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