Original Research Article

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Effect of yoga on physical and various hematological parameters

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ABSTRACT

Background: Yoga is a physical, mental and spiritual practice that has been around since ages. With time, people have discovered a number of health benefits associated with yoga.

Methods: This longitudinal interventional study intended to evaluate the effect of yoga intervention on physical health and various hematological parameters. Thirty five healthy individuals between the age group of 18 to 45 years participated in the study. After a written informed consent, the individuals underwent various types of yoga exercises for 90 days under supervision of professional yoga trainer. Impact on body mass index (BMI), pulse rate, blood pressure (BP), and various haematological parameters like hemoglobin percentage (Hb %), white blood cell (WBC) count, platelet count, were taken under consideration before and after training. Statistical analysis was performed using paired t-test.

Results: Significant reduction in BMI, BP and rise in Hb % and platelet (p<0.05) was observed. However, although WBC count showed improvement, the difference was statistically non-significant. No adverse events were observed during the study period.

Conclusions: The present study findings highlight the importance of yoga in improving physical health and hematological markers.

Keywords: Yoga, BMI, Hematological markers, Hemoglobin

INTRODUCTION

Yoga is an Art and Science of healthy living. It is a spiritual discipline based on an extremely subtle science, which focuses on bringing harmony between mind and body. The holistic approach of yoga is well established in attaining balance in the physical, mental, emotional, and spiritual dimensions of the individual. It is known for disease prevention, promotion of health and management of many lifestyle-related disorders. The practice of yoga is believed to have started with the very dawn of civilization. Today, yoga is popular across the globe and

is being practiced as part of healthy life style. There is no single definition of universally accepted yoga practice, although it is generally described as an ancient tradition. It is based on five basic principles: proper relaxation, proper exercise, proper breathing, proper diet, positive thinking and meditation. Hence, some describe it as a "lifestyle polypill". Yoga includes the techniques of posture (asana), breath control (pranayama), and meditation, as well as moral and ethical observances. 2,10,11

The proposed benefits of regular yoga practice are many and varied, including increase in muscular strength, flexibility and balance, reduced stress, anxiety and

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depression, and an enhancement of overall well-being and quality of life. ^{12,13} There is not enough data to assess the effectiveness of yoga in the management of hematological problems. ¹⁴ Therefore, the aim of this study is to examine whether yoga practice alters the physical and hematological parameters among healthy volunteers.

METHODS

This was an uncontrolled longitudinal study. Thirty five healthy volunteers of both sexes in the age range 18-45 years were selected. The study was conducted betweenMarch 2019 and June 2019 for a period of 90 days. Healthy individuals with no previous experience in yoga were included. Exclusion criteria included patients with diabetes mellitus, asthma, and hypercholesteremia, recent surgery, arthritis, alcoholics, smokers, antenatal and postnatal mothers, and those with regular yoga practice or practicing similar techniques.

The study protocol was explained to the subjects and informed written consent was taken from all the participants. The participants were assessed before and after yoga practice. The same subjects were chosen as both study and control groups in order to minimize the confounding factors. An ISO certified weighing machine was used to measure weight; an inch tape and a scale (stadiometer) to determine height. Body mass index (BMI) was calculated by weight (kilograms) divided by height (meters) squared by Quetelet index. Before recording the parameters, the subject was asked to relax physically and mentally for 15 minutes. The pulse rate (PR) and blood pressure (BP) were recorded by LED BP monitor (Omron HEM-7130) in supine position in the right upper limb. Three readings were taken at an interval of 5-10 minutes each and average of the three values calculated. Haemoglobin percentage (Hb %), white blood cell (WBC) and platelets were measured by using Sysmex xp-300 automated hematology analyzer after drawing 2 ml of blood in ethylenediaminetetraacetic acid (EDTA) vial after aseptic precautions.

Yoga classes were conducted at the various locations across Jaipur between 6 am to 7am for 90 days. The subjects practiced asanas, pranayama and meditation under the guidance of a certified yoga teacher. The yoga program was designed based on the following principles: simple and safe; optimum stretch to the muscles of the extremities, trunk and neck; all postures: standing, sitting, supine and prone.

Asanas were standing position which were Tadasana, Ardhakatichakrasana, Padahasthasana, Trikonasana; sitting position which were Vakrasana, Vajrasana, Paschimottanasana, Gomukhasana; supine position which are as follows Pavanamuktasana, Padauttanasana - Eka and Dwipada; and prone position which includes Bhujangasana, Shalabhasana- Eka and Dwipada. At the end of asana session, they were advised to practice Shavasana for 5 min. After asanas, pranayama was practised Kapalabhati 3 rounds each of 30 to 50 strokes Nadishodana pranayama 3 rounds Bhramari 3 rounds, followed by Raja Yoga meditation for 15 min.

Results were expressed as mean±standard deviation (SD). Student's paired t test (two-tailed) from baseline to 3 months was computed.

RESULTS

In the present study, out of 35 participants, 19 (54.29%) were male and 16 (47.71%) were female in the age group between 18-45 years.

Table 1 shows evaluation of participants done on physical and hematological markers before and after yoga practice.

It was observed that BMI, systolic and diastolic BP, and Hb% changed after intervention. The results were statistically significant. Though PR, WBC and platelets showed improvement in values after yoga practice, it was statistically non-significant.

Table 1: Physical and hematological parameters before and after yoga practice (mean±SD).

Variable	Pre-test	Post-test	P value
BMI	23.04±2.04	21.21±1.095	0.001
PR	79.57±7.48	76.57±6.50	0.43
Systolic BP	120±5.03	115.14±4.88	0.0002
Diastolic BP	82±4.76	78.57±3.21	0.02
Hemoglobin	11.74±1.91	12.62±1.46*	0.05
WBC	5,771.43±1251.29	5785.24±1248.24	0.93
Platelets	3.11±0.40	3.22±0.382	0.06

P' value taken significant at <0.05, highly significant at <0.01 and very highly significant at <0.001; BMI=Body mass index; BP= Blood pressure; WBC= White blood cells.

DISCUSSION

This study intended to evaluate the effect of yoga training on various physical and hematological parameters based on the hypothesis that yoga has beneficial effect on health of individuals and long term regular yoga practice can be touted as the panacea for all of life's ills.

The general consensus was that there is a need for yoga. Individuals underwent various types of yoga exercises for

90 days under supervision of professional yoga trainer. Impact on body weight, PR, BP, and various haematological parameters like Hb%, WBC count and platelet count were taken under consideration before and after training. Significant reduction in body weight and BP, rise in haemoglobin was observed. However, although PR, WBC count and platelets showed improvement, difference was statistically non-significant.

A significant reduction in BMI was observed in our study which is consistent with other studies. Balaji in his study observed that training in yoga asana and pranayama one hour every day in the morning for three continuous months under a yoga expert resulted in decrease in body weight, BMI, and waist hip ratio. 15,16 Another study showed significant reduction in BMI, heart rate and BP in the total cohort with yoga. 17

PR in healthy humans is influenced by physical, emotional, and cognitive activities. ^{18,19} In the present study, there was a fall in average PR in subjects after intervention though not statistically significant. This was in tandem with earlier study. ²⁰

Yoga practices are reported to reduce PR without corresponding changes in heart rate variability. 21-23 Regular exercise improves the heart's ability to pump blood efficiently, so fewer heart contractions are required to supply the body's needs. 24

It is well known that physical activity has a BP lowering effect. 26 Significant reduction in systolic and diastolic BP was observed after yoga in our study which was consistent with previous studies. $^{27\text{-}30}$

Though it is evident that more than 70% of participants exhibited an improvement in both systolic and diastolic BP in study group, improvement in 100% was not achieved; a finding supported by earlier study. This could be due to participants doing some form of regular exercise apart from yoga. Some subjects with BP in the lower range of normal may not have further scope of reduction.

The mean values of heart rate, systolic BP and diastolic BP show significant reduction after at least 3 months of yoga practice. Reduction in heart rate and BP indicate a shift in the balancing components of autonomic nervous system towards the parasympathetic activity. 31,32 This modulation of autonomic nervous system activity might have been brought about through the conditioning effect of yoga mediated through the limbic system and higher areas of central nervous system.33 Regular practice of yoga increases the baroreflex sensitivity and decreases the sympathetic tone, thereby restoring BP to normal level in patients of essential hypertension.³⁴ Meditation by modifying the state of anxiety reduces stress induced sympathetic over activity thereby decreasing arterial tone and peripheral resistance, and resulting in decreased diastolic BP and heart rate. This ensures better peripheral circulation and blood flow to the tissues.^{35,36} The study by Devasena et al also revealed the significant response in subjects with BMI of >25.³⁷ This may suggest that yoga is more effective in reducing the basal heart rate and BP in morbid conditions like obesity. The study also revealed a highly significant reduction in weight after 6 months of yoga. Similar findings were reported by Udupa et al.³⁸

Our study revealed a significant rise in Hb% post yoga. Sayyad et al studied the effect of Sudarshan Kriya yoga for 8 days on Hb%, lipid profile, and pulmonary functions in 150 participants. Hb% was found to be elevated, along with improved lipid profile and pulmonary functions. ^{14,39}

Ramanath et al observed various beneficial results like improvement in PR, BP and Hb% in anemic patients after three months of treatment with iron and folic acid along with yoga practice. The reason for increased Hb% can be explained by two different mechanisms: release of erythropoietin due tohypoxia during yoga practices; increased release of iron stores from reticulo-endothelial cells and enhanced release of reserved RBCs by splenic contraction. Our study revealed a rise in WBC count though not significant. This is consistent with earlier studies. Thus the practice of yoga improves our immune system and protects against infections. 14

There was a non-significant rise in platelets in the present study. Purohit et al found a rise in platelets in 87.5% subjects. In addition, clotting time was increased while bleeding time was decreased significantly. A similar study by Chohan et al support our findings on platelet count. In their study on 7 previously untrained male adults, there was a rise in platelet count after 4 months of yoga training. The reason for increased platelet count can be explained by two different mechanisms: hypoxia induced during yoga practices; enhanced contraction of spleen which can release the reserved platelets.

Limitations

Small sample size, lack of control groups and short duration of the study were the major limitations of our study. Additionally, focusing on particular aspects for consideration as outcomes neglected the other possible benefits of yoga. Longitudinal research on this simple and promising intervention over long term in larger sample size and with control arms is necessary to reinforce the conclusions.

CONCLUSION

This study shows that yoga has positive effect on health. The integration of yoga with modern medicine in resource-strained public health systems might play a vital role to provide us with a holistic health care. Future research should also include economic consideration. The cost effective means of managing life style based diseases with and without yoga compared to the use of medication alone should be investigated.

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