

## Research Article

# Cardioprotectant and Antistress Effect of Yoga Training and Its Correlation with Hematological Parameters: A Prospective Study of 47 Young Healthy Individuals

Purohit Geetanjali\*, Mendpara Sameer, Chawla Vinod K, Harsoda Jaman M

Department of Physiology, SBKS Medical Institute and Research Centre, Dheraj Hospital, Sumandeep Vidyapeeth, Vadodara-391760, Gujarat, India

### \*Corresponding author

Geetanjali Purohit

Email: [purohit85geet@gmail.com](mailto:purohit85geet@gmail.com)

**Abstract:** YOGA is a curative as well as preventive therapy. This study intended to evaluate the effect of yoga training on various hematological parameters based on the hypothesis that long term regular yoga practice have cardioprotectant and antistress role in young healthy individuals. A prospective study was conducted in 47 normal healthy male participants, aged between 15-35 years. The hematological parameters studied include Hb concentration, RBC count, TLC, PCV, ESR and blood indices which included MCV, MCH and MCHC. The experimental group is considered as control for own before the training. Pre and post yoga training data were analyzed by students paired t test. Post yoga training participants showed, significant increase in MCHC ( $32.2 \pm 1.0$  Vs  $34.8 \pm 1.3$ ,  $p < 0.01$ ), haemoglobin concentration ( $13.2 \pm 2$  Vs  $14.6 \pm 2.1$ ,  $p < 0.05$ ) and neutrophil count. Erythrocyte sedimentation rate ( $11.4 \pm 2.87$  Vs  $3.87 \pm 1.81$ ,  $p < 0.01$ ) and total leucocyte count decreased after yoga. Packed cell volume, red blood cell count and other white blood cells showed changes but within physiological limit. In conclusions, the improvement in hemoglobin concentration and MCHC without increase in number of RBC and haematocrit indicates cardioprotectant and antistress effect of yoga. This statement further supported by decrease total leucocyte count and ESR after yoga. Yoga can be recommended as combined therapy in various clinical conditions, where these parameters altered.

**Keywords:** Yoga, antistress, cardioprotectant

## INTRODUCTION

Yoga in India being reputed to develop remarkable control over body functions and it provides one of the best means of self-improvement and attaining once full potential [1]. It is a combination of three main parts DHYAN, ASANAS and PRNAYAMS. Today yoga included in mind/body strategies designed to promote good health that include relaxation, hypnosis, visualization, feedback, qigong [2], Tai-chi, meditation, autogenic, cognitive behavioral therapy, group therapy and spirituality. All these strategies are based on research into the connection between yoga and the nervous, immune and endocrine system, all of which make up the basis of psychoneuroimmunology [3, 4].

The practice of yoga has proved to be useful for both healthy and sick. It is now evidenced that yoga has significant impact in cardiovascular diseases, asthma, rheumatoid arthritis, immunodeficiency disorders, and diabetes mellitus and in stress relaxation [5-10]. Studies on impact of yoga on various hematological parameters are scanty and limited with the short term and unsatisfactory training especially in young healthy population. It is reported that anemia is a common problem of young Indian females, but cannot be ignored in young population as overall. Erythrocyte sedimentation rate (ESR), the most widely used laboratory measure of disease activity in clinical

medicine, is still considered useful for monitoring inflammatory diseases [11].

Taking into consideration, the scarcity of information about cardioprotectant and antistress role of yoga and its relation with hematological parameters, we planned to conduct a study on effect of a long term regular yoga training of three months, on various hematological parameters and ESR in young healthy individuals. Gender has a significant role in variation in hematological parameters so we conducted this study in male subjects only.

## MATERIALS AND METHODS

### Participants

Fifty healthy male subjects aged between 20-35 years were included after ethical clearance. Pre training participants group (considered as control group), were recruited from the yoga centre of Jodhpur city, Rajasthan. The procedure began with the briefing of nature of the study to the participants. The difficulty encountered in the selection of participants, given the very nature of the study, determined the same gender of participants. Participants were selected randomly, declared healthy by a clinical person. We used a quasi-experimental scheme, in the days following their initial interview they were at all times unaware that a selection process was underway. Only healthy subjects with

regular daily life habits and similar life style were chosen to be part of the study. None of them took any type of drugs and had no experience of yoga or similar techniques before. All subjects volunteered to participate in the study and had been given written informed consent.

### Blood sampling

Blood samples were collected in fasting condition (more than eight hours), during morning hours between 8.30am to 9.30 am. 5 ml blood was collected in EDTA vials, and analysed within 3 hrs of collection. Blood was analyzed using the automatic digital analyser SF-3000. The following blood parameters were studied: erythrocyte count (RBC), haemoglobin concentration (Hb), hematocrit value (PCV), total leucocyte count (TLC) and differential leucocyte count (DLC) and Blood indices (MCV, MCH and MCHC). Erythrocyte sedimentation rate(ESR) was measured by Westergreen method, recommended by the "International Council for Standardization in Haematology and the National Committee for Clinical Laboratory Standards", using EDTA anticoagulated samples without dilution [12].

### Yoga Program

After hematological investigation all 50 subjects (now considered as experimental group) were practiced yoga for three months, under the supervision of professional yoga trainers. The yoga schedule was fixed for every month as prescribed by the yoga expert and it was a combination of different yoga practices. The same instructor led all the training sessions and thus maintained the homogeneity of the physical and mental protocol. Participants had been taking one-hour session in morning from 8.30am to 9.30 am, six times in a week. The attendance register was maintained for all the students and they supposed to sign every day before the yoga session. It is reported that these yoga kriyas are used for improvement in immunity and various hematological parameters [13].

Table 1 depicts the detail schedule of yoga programme for every month.

### Statistical Analysis

Statistical analysis involved qualitative and quantitative variables summarized through mean± SD. Students paired t- test used to analyze the differences between pre and post data of various dependent variables.  $\alpha$  error was set at 5% level ( $p < 0.05$ )

**Table 1: Detail schedule and type of yoga practices for every month**

Total duration of intervention = 90 days, Timing= 1 hour daily (8.30-9.30am)	
1 <sup>st</sup> month:	Instant relaxation with Gayatri mantra, Calmness and Prayer: Shanti Mantra. Surya-namaskar, soham meditation and Aum chanting Breathing exercise: Abdomen breathing [UdarSwasha], chest breathing [UraSwasha], neck breathing. [grivaswasha], hand stretch breathing [purnaswasha], kapalbhati Asanas: Sharvasana, (corpse pose), halasana- shavasana- paschimothasana-shavasanaachalane, shasomkasana, vajrasana, camel pose, chakrasana
2 <sup>nd</sup> month:	Instant relaxation with Gayatri mantra, Calmness and Prayer: Shanti Mantra. Surya-namaskar, soham meditation and Aum chanting Breathing exercises: Cat/Tiger Breathing [murgalawasha or vaghraswasha], dog Breathing [SwanaSwasha], bhramripranyam (BRP), Asanas: Halasana, chakrasana (Wheel pose), ardha-jathara-parivarthanasanaachalane, virasana-parvatasana., svastikasana, padmasana, gomukhasana
3 <sup>rd</sup> month:	Instant relaxation with Gayatri mantra, Calmness and Prayer: Shanti Mantra. Surya-namaskar and Soham meditation, Aum chanting Breathing exercises: NadiSadhnapranayam (NSP), Bhastrika (BTP), Asanas: Bhujangasana ( serpent pose), urdwhahasthasana, uttanasana (Standing forward bend), pashcimostasana, namaskara, pavanamuktasana, savasana.
2-3 days extra before the study for some practice and information	

### RESULTS

50 participants were recruited for this study, but 3 were excluded due to their irregularity during yoga training. Results are displayed in the form of mean±SD. Forty seven participants with mean age (24.5±2.4) were assessed. All participants were normotensive.

Table 2 shows the hematological variables before and after the yoga training. The pre data was

considered as control group data, considered control for their own. Data in table depicts the pre-post difference of variables and the p values. Level of significance is indicated by the \* ( $p < 0.05$ ) and \*\* ( $p < 0.01$ ) symbols. The principle findings were the significant increase in hemoglobin ( $p < 0.05$ ) and MCHC ( $p < 0.01$ ) and neutrophil count ( $p < 0.05$ ). ESR found to be decrease significantly after yoga practice ( $p > 0.01$ ). Red blood cell count, hematocrit value and other white blood cells were remaining unchanged.

**Table 2: The hematological variables before and after the three months of yoga training**

Parameters	Before Training		After Training		Diff.	P value
	Mean	SD	Mean	SD		
Hb (gm/dl)	13.2	2	14.6	2.1	-1.4	0.0*
RBC (million/cumm)	4.1	0.7	4.2	0.6	-0.1	0.11
PCV (%)	39	4.8	39.5	4.5	-.04	0.63
ESR	11.43	2.58	3.87	1.81	7.56	0.0**
<b>Blood Indices</b>						
MCV	79.3	7.2	78.4	6.6	0.9	0.07
MCH	27.6	2.8	29.6	3	-2	0.0**
MCHC	32.2	1	34.8	1.3	-1.6	0.0**
<b>Total And Differential Count</b>						
TLC	7.29	1.8	6.18	1.7	1.11	0.04*
Neutrophils	57.4	7.5	60.3	5.8	-2.9	0.03*
Lymphocytes	34	7.3	32.7	6.3	0.8	0.52
Eosinophils	3.7	.7	2.4	.9	0.8	.23
Basophils	0.1	.2	0	0	0.1	0.16
Monocytes	4.8	1.1	4.6	.9	0.2	.34

N= 47, Diff- difference, Hb- hemoglobin concentration, RBC- red blood cells, PCV- packed cell volume, ESR- erythrocyte sedimentation rate, MCV- mean corpuscular volume, MCH- mean corpuscular hemoglobin, MCHC- mean corpuscular hemoglobin concentration, TLC- total leucocyte count , \*Significant (p<0.05) \*\* highly significant (p<0.01)

## DISCUSSION

Yoga is considered to be one of the most effective and valuable ancient Indian systems to overcome various physical and psychological problems. Studies on yoga claim prolonged existence [14, 15] and has therapeutic [16, 17] and rehabilitation effects [18]. Evidences found that, as a non-pharmacotherapy, yoga has promotive, preventive as well as curative potentials. Practice of yoga improves biochemical profile, even after the short term training of six weeks indicating antistress and antioxidant effects, two important risk factors for degenerative disorders [13]. In our study practice of yoga improves hematological profile indicating hematopoietic, antistress and cardioprotectant effects of yoga. We had performed comprehensive literature search on effect of yoga on white blood cell count, red blood cell count, blood indices, ESR and the relative risks as bronchial asthma, anemia, arthritis, stress and cardiovascular diseases, which supported our findings in this study. The principle findings were the rise in hemoglobin concentration, MCH, MCHC, neutrophil count and decline in ESR and TLC. In our knowledge these are the first results referring to these biological parameters in young healthy male individuals.

After yoga rise in RBC count and PCV was within physiological limit, although the improvement in hemoglobin concentration and MCHC were found to be significant. Above findings could partly explain the cardioprotectant effect of yoga which improves oxygenation by RBC with more hemoglobin without

modifying the percentage of red blood cells in total blood volume and consequently without elevating blood viscosity, an important cardiovascular risk factor [19]. Studies found that yoga also increases the myoglobin pigment which is helpful to supply more amount of oxygen [20]. A further explanation for the cardioprotectant role of yoga practices may be justified by the antistress effect produced by parasympathetic dominance in yogic practitioners [21, 22]. Above findings supported the statement that yoga act as a blood donor[23].

It has been well-established that negative psychosocial and psychological factors, in particular depression and anxiety syndromes, contribute to the pathogenesis of ischaemic heart diseases [24, 25]. Their effect is comparable with proposed pathophysiological mechanisms involve sympathetic nervous system predominance and inflammatory conditions. Yogic asanas minimizes all types of stress whether it is physical, physiological or psychological as revealed by decreased leukocyte count after yoga [26, 27]. Decline in total WBC count may be due to the concept that hypoxia induced during yoga, increase erythroied series in bone marrow causes relative decrease in WBC count or Yoga may transited the WBC in their resting condition and decrease various cytokines which are responsible for leucopoiesis [28]. On the other side neutrophil count was found to be increase significantly after yoga, may be due to hypoxia induced increased capillary permeability [29], which can increase the circulatory pool of these cells.

ESR fluctuates easily and it is a sign of unspecific inflammation, depending on the metabolic activity of red blood cells [30]. Psychological stress activates the oxidation process at membrane lipid level and modifying its permeability may increase ESR [31]. Possibly the decrease ESR after yoga practice represents one more consequence of yoga's antistress effect, reducing the oxidation process and release of free radicals at RBC membrane level<sup>32</sup>. ESR represents an important co relation with the serum level of different reagents in the acute phase, evaluated the ESR as a screening test for infections in specific clinical conditions [33-36]. The basic factor influencing the ESR have been understood as a amount of fibrinogen in the blood, directly correlates with ESR<sup>37</sup>, found to be decreased after yoga training[38]. This is all due to imbalance in metabolism, hence practice of yoga not only relax the body, mind and emotions; it regulates the metabolism also [39]. In last few years people have become aware of usefulness of yoga in relation to health and diseases, thanks to some perpetuators of yoga, spreading the message of yoga benefits through their camps and health centre's. The best part of these practices is that, it is something that can be done comfortably even at home and there is no side effect reported so far in yoga.

#### ACKNOWLEDGEMENTS

I acknowledge the owner of yoga centre, Dr. Hemant Benda (Benda Acupuncture and Yoga Centre, Jodhpur, Rajasthan), for providing me the clinical person for inclusion of participants as well as for the maintenance of the attendance of students. In addition I am very thankful to my guide the Dr. VK Chawla, former Prof and HOD, SNMC, Jodhpur for such a great idea of research. We would like to thank central hematology laboratory, MGM Hospital for sample analysis and their great support. Last but not the least I acknowledge the participants to maintain the regularity and punctuality in my study, without them this study was not possible.

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