

Assessment of Biochemical and Haematological Disparities in Regular Yoga Practitioners

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Abstract

Yoga is a physical and mental discipline that forms part of natural medicine, a comprehensive and ancient holistic health system. Available of the limited information on the haematological and biochemical changes associated with the prolonged practice of yoga, the purpose of the present study was to examine the effects of long-term yoga practice (more than two years) on blood parameters. Thirty two healthy volunteers of whom twenty were advanced practitioners of yoga took part in the study. The remaining twelve participants were not practitioners and constituted the control group. Blood samples were taken to determine the following haematological parameters: erythrocytes, haemoglobin, platelets and erythrocyte sedimentation rate. Biochemical parameters were renal and hepatic profile, glucose, uric acid, total protein and albumin. The Mann-Whitney U test was used to ascertain the statistical analysis. The experimental group showed higher haemoglobin levels ($p > 0.01$) and erythrocyte sedimentation rate ($p > 0.01$) and lower albumin levels ($p > 0.05$). It is found that the regular practice of yoga brings about changes in basic haematological parameters. New clinical trials with a wider sample of subjects are required in order to recommend the use of yoga as a complementary or alternative therapy in those cases where the above-mentioned parameters are altered.

KEYWORDS: Yoga, haemoglobin, erythrocyte sedimentation rate, Uric acid, albumin, Suryanamaskar asana, Pranayama.

The word *yoga* is derived from the Sanskrit root *Yuj*, which means to join or to yoke. In philosophical terms, yoga refers to the union of the individual self with the universal self. Yoga is one of six branches of classical Indian philosophy and has been practiced for thousands of years. References to yoga are made throughout the Vedas, ancient Indian scriptures that are among the oldest texts in existence. About two thousand years ago the Indian sage Patanjali codified the various philosophies and methodologies of yoga into 196 aphorisms called "The Yoga Sutras," which helped to define the modern practice of yoga. The Sutras outline eight limbs, or disciplines, of yoga: yamas (ethical disciplines), niyamas (individual observances), asana (postures), pranayama (breath control), pratyahara (withdrawal of senses), dharana (concentration), dhyana (meditation), and samadhi (self-realization, enlightenment). In the United States, the term yoga usually refers to the third and fourth limbs, asana and pranayama, although traditionally the limbs are viewed as interrelated.

Yoga, a system of mental and physical exercise techniques aimed at achieving a state of well-being in human beings is considered as one of the elements of Ayurvedic medicine (the Science of Life). While there are many different systems of yoga practice, all essentially include physical postures, breathing exercises and meditation. Traditional yoga is a philosophy for living and thus is associated with a series of behavioural modifications that contribute to a healthy life-style.

Yoga is traditionally believed to have beneficial effects on physical and emotional health. Today yoga is included in mind/body strategies designed to promote good health that include relaxation techniques, hypnosis, visualization, Tai Chi, meditation,

autogenic, cognitive behavioural therapy, group therapy and spirituality. All these strategies are based on research into the connections between the nervous, immune and endocrine systems, all of which make up the basis of psychoneuroimmunology, the essence of mind/body strategies, efficacious in many illnesses and greatly sought after by the general public.

The practice of yoga has proved useful both for the healthy and for the sick. In some studies researchers have found that regular practice of yoga help in feeling of well-being, energy and removing fatigue and in subjective sleep quality. Better spirometry results (FEVI and PEFr) were also obtained when compared with those seen in athletes. Women subject to psychological stress found significant improvement of their symptoms after a three-month yoga program [17]. In anxiety disorders, at least two comparative studies of yoga and meditation techniques (mindfulness) revealed the same effectiveness for both procedures.

Studies further corroborate that in diabetic patients a sustained drop in glucose levels have been achieved, both after fasting and after eating and an increase in the number of insulin receptors associated with decreased resistance has also been confirmed. Yoga also acts as an essential variable in the prevention of cardiovascular disease. Clinical practice guidelines for chronic back pain recommend it for its analgesic effect. In disorders associated with menopause, positive feelings and self-esteem have increased and led to improving the quality of life. It has been observed that a three-month practice of yoga for patients suffering from chronic renal insufficiency, undergoing haemodialysis, raises the red blood cell count by 11%, the haematocrit by 13% and lowers pain by 37% tiredness by 55%, urea by 29% and creatinine by 14% . In addition, as with other mind-body strategies, yoga is an effective technique for reducing stress and consequently can bring about clinical improvement in those processes where bio-psychosocial stressors of special intensity are involved (cancer, bronchial asthma, etc.).

Given the limited information available on the haematological and biochemical changes associated with the long practice of yoga, in this pilot study we assess the influence that prolonged practice (more than two years) has on the blood parameters.

Materials and Methods

Participants thirty two healthy subjects (9 male, 23 female) aged between 18 and 28 took part in this study. The experimental group consisted of 20 long-term yoga practitioners (15 female and 5 male), while the control group was made up of 12 ordinary subjects (8 female and 4 male). Experimental subjects were selected from Bagnan Yoga Centre, Howrah. Control subjects were selected from Panskura Banamali College, Purba Medinipur. A group of healthy individuals with no disease or suspicion of disease was selected for control group. These subjects were, therefore, not in medical clinic owing to any pathology that could have compromised the representatively of the control sample. These individuals were of the same age and sex as the experimental group and followed a similar lifestyle but had no experience of yoga or similar techniques.

All subjects volunteered to participate in the study and gave written informed consent. All the subjects were interviewed and were informed about the purpose of the study. Subjects were screened to exclude both those with any pathological conditions and those who had received pharmacological treatment in the three months prior to the experiment. Only healthy subjects, with regular daily life habits, none of whom took any type of drugs or played sports regularly, were chosen to be part of the

experimental or control groups. Female participants were all within the first ten days of their last menstrual cycle. The scholars got the permission from the IEC for the study.

Table 1 reveals the information on sex, age, height and weight of all participants. As can be seen, none of these variables differed significantly between the control and the experimental groups. Subjects in the experimental and control groups were homogeneously distributed with respect to their lifestyle and habits.

Yoga Program

The attendance register confirmed that the experimental subjects had been taking one-hour sessions, at least three times a week for the last two years at a Bagnan yoga centre. None of them had engaged in any other regular physical activity. The same instructor led all the training sessions and thus maintained the homogeneity of the physical and mental protocol. The procedure began with Surya Namaskar (Sun Salutation) and continued with a session of 12 asanas. Pranayama (yogic –abdomen, thorax, cervical– breathing), Savasana (physical, mental and spiritual relaxation) and Dhyana (meditation, inner peace) techniques accompany these exercises. Information obtained on the subject practitioner at an initial meeting with the yoga instructor ensured a homogeneous sample of experimental subjects that met the inclusion criteria for.

Blood sampling

Between 8.30 and 9.30 a.m, the same pathologist of Panskura Banamali College, Purba Medinipur, took blood samples from a forearm vein of all the participants, in identical basal repose and fasting (more than eight hours) conditions. The Biotechnology laboratory of Panskura Banamali College analysed the following blood parameters: erythrocytes, haemoglobin, haematocrit, platelets, erythrocyte sedimentation rate (ESR), glucose, urea, creatinine, uric acid, bilirubin, alkaline phosphatase, total protein and albumin.

Procedure

Scholars used a quasi-experimental design. An initial meeting was conducted with the yoga instructor to obtain information on the practising subject and to procure a homogenous sample of experimental subjects to fulfil the inclusion criteria of the study. All participants were interviewed at the start of the study to establish socio-demographic data, relevant medical information and specific yoga practice protocol. Subsequently they were given appointments for the blood tests. The design of our study did not contemplate a base line condition and therefore the variables were measured only once. The experimental group had of necessity, to be composed of yoga practitioners with prolonged experience and therefore this requirement rendered recording the initial measurements at the start unfeasible. Taking into consideration the scarcity of information about the effects of prolonged and uninterrupted yoga practice, we consider that the use of this design in a first attempt to explore the changes associated with this practice will be of major interest.

Statistical Analysis

The problems of normality of the study determined the application of the non-parametric Mann-Whitney “U” test to analyse the differences between the experimental and control groups of various dependent variables. These were done using the IBM v20.0 data analysis package for Windows. $p < 0.05$ was considered statistically significant.

Results

Table 1. Mean \pm standard deviation, and range (in brackets), of sex, age, height and weight in the control and yoga groups (practice time), as well as statistic and p-value.

Variable	Yoga group (n=20)	Control group (n= 12)	Statistic	p-value
Sex	15 (F), 5 (M)	8 (F), 4 (M)	$\chi^2 0.08$	0.75
Age (Year)	24.68 \pm 3.32	25.90 \pm 3.69	t= -0.50	t= -0.51
Height (cm)	165.37 \pm 10.19	168.60 \pm 8.68	t= 0.82	0.42
Weight (Kg)	61.62 \pm 12.65	64.60 \pm 13.11	t= 0.57	t= 0.57
Month of Yoga Practice	29 \pm 4	-	-	-

Table 2. Mean standard deviation (SD) in the control and yoga groups, as well as U-statistic

Parameters	Yoga Group	Control Group	U
Erythrocytes	12.04 \pm 0.32	13.15 \pm 0.29	63.5
Haemoglobin	14.68 \pm 0.93	9.45 \pm 1.16	39.5*
Haematocrit	12.18 \pm 2.43	12.95 \pm 11.19	65.5
Platelet	11.21 \pm 4.87	14.30 \pm 4.78	52
ESR	15.39 \pm 4.17	8.45 \pm 1.68	29.5**
Glucose	11.91 \pm 9.9	16.05 \pm 6.05	54.5
Urea	13.66 \pm 8.06	13.25 \pm 7.13	77.5
Creatinine	14.78 \pm 0.163	11.45 \pm 0.68	59.5
Uric Acid	13.63 \pm 1.68	13.30 \pm 0.29	78
Bilirubin	13.56 \pm 0.29	13.40 \pm 1.03	79
Alkaline Phosphate	14.19 \pm 11.99	12.40 \pm 20.43	69
Total Proteins	14.97 \pm 0.26	11.15 \pm 0.46	56.5
Albumin	9.97 \pm 0.25	17.56 \pm 0.32	23.5**

Discussion

The principal findings of this trial were the presence of higher levels of haemoglobin and erythrocyte sedimentation rate (ESR) and, when compared with the control group, lower albumin levels associated with prolonged yoga practice (longer than two years). The small size of the sample, together with the fact that the biochemical measurements were established only once could, to some degree, be considered a limitation to the study. However, this limitation must be understood as a consequence of the very nature and characteristics of this study. Specifically, one of the most significant difficulties we had to face in our research was the selection of long-term yoga practitioners who had at no time interrupted their practice and the selection of a control group who conformed to similar characteristics.

The fact which emerged is that although regular yoga practice does generate a noticeable increase in haemoglobin, this does not imply there is an increase in the haematocrit values. This finding could partly explain the cardio-protectant effect of yoga practice which improves cell oxygenation by supplying red blood cells richer in haemoglobin without modifying the percentage of red blood cells in the total blood volume and consequently without elevating blood viscosity which is an important cardiovascular risk factor.

Some authors have found that short-term yoga practice in patients with type II diabetes brings about a marked drop in levels of glycaemia, and glycated

haemoglobin and a moderate rise of haemoglobin. In any event, we still do not know how the mechanics of the exercises function to bring about these modifications in blood parameters. A further explanation of the cardio-protectant factor of yoga practice by the isolated increase in haemoglobin may be justified by the anti-stress effect which is produced by parasympathetic nerves. The increase in haemoglobin values after regular yoga practice might also add a new alternative therapeutic focus in those clinical situations where a deficit of this blood parameter is present.

The significant increase in the ESR in the group of yoga practitioners (within normal levels) does not indicate any inflammatory event but may play the role of modulator. ESR is a sign of unspecific inflammation. It is simple and cheap to obtain. It fluctuates easily, depending on the metabolic activity of the blood cells and presents an important correlation with the serum levels of the different reagents in the acute phase. An experimental study indicates that emotional stress induced in rats causes a qualitative and quantitative change in the oxidation processes of the erythrocytes. Psychological stress activates the oxidation processes at membrane lipid level, modifying its permeability and disrupting the setting and release of oxygen. Possibly the increase in the ESR in yoga practitioners represents one more consequence of yoga's anti-stress effect reducing the oxidation process and release of free radicals at erythrocyte membrane level.

The lower levels of albumin observed in advanced yoga practitioners have not been evaluated in any trial so far. Previous studies on the subject have shown inconclusive results though after a yoga practice period lasting only a few weeks. Other authors have found that after only a short period of practice, albumin figures decreased while yet another study on the effects of a six-week yoga program showed no significant changes in albumin levels.

In summary, the present work represents a first attempt to explore the impact of long-term yoga practice on specific haematological and biochemical parameters. The higher levels of haemoglobin without changes in haematocrit and increased ESR suggest a modulating effect that could have interesting clinical implications. Further research is needed to verify these preliminary results as well as to assess their possible application as complementary therapy.

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