

Effect of Yoga practices with suryanamaskar on flexibility, BMI, Hb level in underweight anemic college students

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ABSTRACT

The main aim of this study is to find out the effect of Yoga suryanamaskara on flexibility, BMI and anemia in underweight anemic college students. Anemia hampered the strength, efficiency and health. Yoga has become part and partial of our healthy life and empowerment. For this study, 50 underweight (BMI < 18.50) and anemic students aged between 18-22 years who were willingly to participate in the program were selected randomly as subjects from Senior College , Pimpalner, Dhule(MS) for 60 days program from 1st Nov. to 30th Dec.2018. They were divided into an experimental group and a control group. Yogic practices were progressively introduced to the experimental group on six day in a week for nearly 60 to 70 minutes. The therapy was carried out in the evening from 5.30 pm to 6.45 pm. in Maratha mangal Karyalaya, Pimpalner, Dist. Dhule. The control group was not exposed to any yogic practices. Assessment has been done before and after study for the parameters like flexibility, height, weight and Hb% for both groups. After the Yoga therapy every student showed significant positive improvement in flexibility, weight gaining and Hb level among experimental group when compared to control group. Flexibility, BMI and Hb level showed a significant improvement.

Key words: Yoga, suryanamaskar, BMI, Flexibility, underweight, Hb etc.

INTRODUCTION

Flexibility is an important ability for health related fitness. Lack of flexibility in back can be cause for bad posture, back pain and many more may be due to compression of peripheral nerves. With good flexibility an individual have great ease movements, less chance of injury during movements (Miller 2006). The practice of asanas is one of the best ways to improve flexibility. There are plenty of studies have been done to see the effect of yogic asanas on flexibility and suryanamaskar is itself combination of six asanas (Bhavanani 2011). What happens when you are underweight? Some people might be underweight genetically, others are probably under the mark because they don't get required nutrients to remain in the pink of health.

These nutrients are not reaching where they should because of lack of consumption or improper absorption. In such condition immune system takes a hit, difficult to fight infections and illness, individual will also be more prone to flu and pneumonia. Being anemic and extremely slender could also affect menstrual cycle in females; MC will be irregular or completely stop due to lesser estrogen. There may be lethargic, fatigued and lower stamina (Google-by Shrishti walia).

How does yoga help you gain weight? Yogic asana alone may elicit a positive improvement in the body mass index (Aloke 2016). Yoga is such an incredible workout that it has solutions to almost all health-related problems. Yoga is a mind body therapy it addresses problems like poor metabolism, stress, lack of appetite and digestive issues. While it helps overcome these problems, it also stabilizes flexibility, weight and ensures the right weight goals. Yoga enhances the circulation of oxygen and blood and this helps improve the nutrients absorption. It also induces the proper secretion of enzymes and hormones needed for proper health. It strengthens the muscles and allows becoming strong and flexible. It also improves stamina of individuals. Essentially yoga works mainly towards regulating metabolism (Google-by Shrishti walia). In India, a great need of yoga and yogic practices to be taught and also to practice yoga, to overcome physical, mental, and physiological problems, as it is the current need. A lot of research is conducted in Yoga for the prevention anemia (Ramanath 2013), BMI and Cholesterol level (Seema Patel and Kamakhya Kumar 2016), Obesity (Dhara *et al*, 2012).

Anemia is the most common ailments in developing countries, especially in women and children, mostly it encountered in general practice is iron deficiency anemia and it affect up to 10% world population (Petry *et al*, 2016, Hasan *et al*, 2016 and Zsaku *et al*, 2016). Anemia is a medical condition in which decrease in number of red blood cells or less than the normal quantity of hemoglobin in the blood. Anemic patients have feeling of weakness or fatigue and poor concentration (Medicine net.com 2000, Merran 2009). Yoga as a therapy works on the body as a whole: Increases the RBCs production as well as purifies the blood. Helps to manage symptoms of anemia. Helps to improve vital energy in the body. Improves mental health, blood circulation appetite and maintain good health (Seshadri, 2013).

Yoga practices can make them emotionally stable and make them free from psychological disturbances. It helps to control and check emotions. It gives balance of mind, physically fit and healthy and their approach the future life without any disturbances (Sharma *et al*, 2014). Yoga is a self discipline method of the integrating the body, breath and mind and attaining one's full potential. The antistress and antioxidant effect of yoga is beneficial in the improvement of hematological parameters in anemic patients. Yoga increases the circulation of the blood and improves the functioning of entire circulatory system (Neena Sharma and Ritu Gupta 2016 and Purohit *et al* 2013).

The Pranayama which is systematic and rhythmic respiration helps to relax the physical and mental organs of the body and keeps every cell oxygenated which helps in metabolism. Psychological benefits: Regular Yoga practice creates mental clarity and calmness, increases body awareness, relieves chronic stress patterns, relaxes attention and sharpens concentration (Sharma Preeti and Pradeep Kumar 2016). Haemoglobin is the iron-containing oxygen-transport agent in the red blood cells of all vertebrates which carries oxygen from the respiratory organs to the rest of the body (i.e. the tissues) where it releases the oxygen to burn nutrients to provide energy to power the functions of the organism and collects the resultant CO₂ to bring it back to the respiratory organs to be dispensed from the organism.

Blood Hb level is the weight and quantity of Hb in the blood measured in gms/100ml. The quantity of Hb/deciliter or 100ml of blood is determined by Hemoglobinometer. The normal value of Hb for men is 13-18g/dl and for women is 11.5-16.5g/dl. Therefore this study undertaken to test the effectiveness of yogic practices with suryanamaskar in the management of flexibility, low BMI and anemic condition.

Objectives of the Study:

1. To help students to build their capacity and quality.
2. To provide opportunities for students to be physically, mentally, emotionally and spiritually empowered.
3. To make them aware about old Indian culture and social behaviour with in the society.
4. To create the awareness in society about this new field of treatment of diseases by Yoga.

MATERIAL METHODS

Study setting: The place of work was Karm. A. M. Patil and Kai. N. K. Patil Sr. College, Pimpalner, Dhule (M.S.) India.

Selection criteria: Selection was based on inclusion and exclusion criteria as follows,

Inclusion Criteria:

- 1) Age group of 18 to 22 years
- 2) Subjects of both genders.
- 3) Willingness towards participation
- 4) Anemic and underweight (low BMI) students.

Exclusion Criteria:

- 1) Students who are below 18 years and above 22 years.
- 2) Students with cardiac abnormalities/disease.
- 3) Female students who are pregnant.
- 4) Any congenital anomaly and auto immune disease.
- 5) Students suffering from any kind of diagnosed / clinically seems to be neurologically/orthopedic disorders.
- 6) Body mass index more than 18.5.
- 7) Students who underwent major surgery.
- 8) Visual problems.

Parameters used in study:

- i. **Flexibility:** Extensibility of lower back and hamstring muscles was taken for flexibility of the body.
- ii. **Body Mass Index:** the ratio of weight and height.
- iii. **Blood hemoglobin** level by *Hemoglobinmeter*.

Tools used in study:

- i. **Modified sit and reach assessment score chart and sit-and-reach test box** : used for measurement of flexibility of lower back and hamstring muscles.
- ii. **Height frame and weighing machine:** to measure height and weight for calculation of body mass index.
- iii. **Hemoglobinometer:** for Hb estimation.

Duration of study: The total study period was of two months (8 weeks).

Procedure: Subjects were selected based on inclusion and exclusion criteria with a written consent signed by them for participation in the study.

Flexibility of lower back and hamstring muscles was assessed by modified sit and reach test score (Tsang and Mak 2004) using a sit-and-reach test box and the score was taken for the consideration. The sit and reach test box (Base: 18" Length X 12" Width X 13-3/4" Height and Top: 27 1/2" Length X 12" Width, as per Lafayette adjustable Sit and Reach Flexibility Tester 2003) has been tested and found good test-retest reliability (0.994). The sit and reach test scores (Davis 2000) are considered in 7 grades; Very poor (1), Poor (2), Fair (3), Average (4) and Good (5), Excellent (6), Super (7). The very poor (grade 1) consist of <-20 score for men and <-15 for women, poor (grade 2) consist of -19 to -9 for men and -14 to -8 for women, fair (grade 3) consist of -8 to -1 for men and -7 to 0 for women, average (grade 4) consist of 0 to +5 for men and +1 to +10 for women, good (grade 5) consist of +6 to +16 for men and +11 to +20 for women, excellent (grade 6) consist of +17 to +27 for men and +21 to +30 for women.

The test involves sitting on the floor with the back and head against a wall, legs fully extended with the bottom of the feet against the sit-and-reach box. Later on placing the hands on top of each other, stretching the arms forward while keeping the head and back against the wall. The distance has been measured from the fingertips to the box edge with a ruler. This becomes zero or starting point. Later slowly bending and reaching forward as far as possible sliding the fingers along the ruler, holding the final position for two seconds and the distance reached was recorded. The test was repeated three times, and the best distance was noted for the score. In this study grade has been taken for consideration.

Standard height and weighing machine have been used for the measurement of height and weight. BMI (WHO 1997) was calculated by taking the ratio of the subject's height (in meter) and weight (in kilogram) i.e.(weight/height²). BMI has been divided in to three groups; Low BMI (<18.5), Medium BMI (18.5-24.9), and High BMI (>25).

Blood hemoglobin level is the weight and quantity of Hemoglobin in the blood measured in gms /100ml. The quantity of Hb/deciliter or 100ml of blood is determined by *Hemoglobinmeter*. The normal value of hemoglobin for men is 13-18g/dl and for women is 11.5-16.5g/dl.

The present study was conducted to assess the effect of Yogic practices with suryanamaskar among young

students who were underweight (low BMI) and less in Hb content. The study was undertaken at Maratha Mangal Karyalaya, Pimpalner, Dist-Dhule (MS). All the subjects of the study were of the age group of 18 to 22 years. The practices were taught six days in a week for nearly 60 to 70 minutes. Every day the therapy was carried out in the evening from 5.30 pm to 6.45 pm. The 50 subjects were divided randomly into two groups. Experimental group containing 25 subjects and Control group containing 25 subjects. The control group was not exposed to any yogic practices. Yoga therapy was introduced to the experimental group,

The set of Asanas and Pranayama included in the course (10)

I. Humming in meditative postures- Sukhasana (Easy pose)/ Padmasana (Lotus pose) / Vajrasana (Thunderbolt)

II. Loosening Exercises-Warm ups : starting from head, working towards the toes.

1. Neck roll, 2. Shoulder rotation, 3. Arm rotation, 4. Elbow movement, 5. Wrist movements, 6. Finger movements, 7. Waist movements, 8. Knee rotation, 9. Ankle rotation, 10. Toe movements

III. Suryanamaskar (One avartan daily i.e. 11 times)

IV. Asanas-(A) Standing

1. Konasan (Side bend pose), 2. Tadasana and 3. Vrikshasana (Tree pose)

(B) Sitting

1. Vajrasana or Shashankasana (Forward bending)
2. Ustrasana/Ardhachandrasana(Backward pose)
3. Vakrasana (Twist pose)/Ardhamatsyendra -sana (Half-spine twist pose)
4. Paschimotanasana (Back stretch pose)

(C) Lying on stomach (prone)

1. Bhujangasana (Cobra pose), 2. Shalabhasana (Leg back bend), 3. Dhanurasana (Bow pose)

(D) Lying on back (Supine)

1. Markatasana (Twisting pose), 2. Pavanmuktasana (Wind relieving pose)

3. Setubandhasana (Bridge pose), 4. Sarvangasana (Shoulder pose), 5. Matsysana (Fish pose)

V. Deep Relaxation in Shavasana pose (Corpse pose)

VI. Pranayama (Breathing practices)

1. Bhastrika
2. Kapalbhati (Short and strong forceful exhalation and inhalation happens automatically)
3. Anuloma-viloma (Alternate nostril breathing)
4. Ujjai
5. Bhramari (Om Chating/ Honeybee sound during expiration)
6. Udgeeth (Chating of Om mantra)

VII. Deep Relaxation In Shavasana pose

VIII. Humming in meditative postures- Sukhasana (Easy pose)/ Padmasana (Lotus pose) / Vajrasana (Thunderbolt)

RESULTS & DISCUSSION

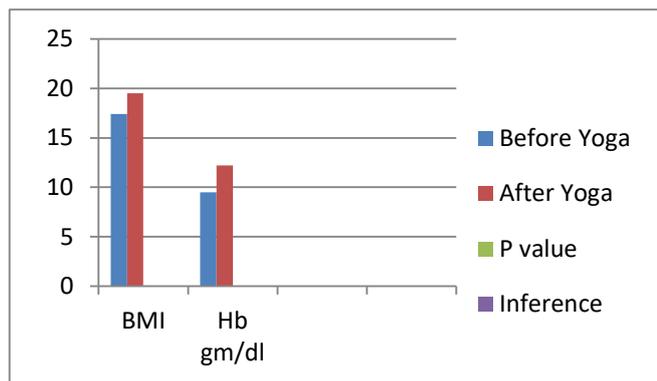
Results are displayed on table 1, we found significant changes between experimental and control groups in flexibility, BMI and hemoglobin.

Experimental group -depicts significant improvement in flexibility poor (Grade 2: -19 to -9) to Average (GRADE 4: +1 to +5) [*], Weight 45.33 to 48.20 [*], BMI 17.40+-0.4 to 19.50+-0.3 [*] and Hb 9.5+-0.3 to 12.2+-0.2 [**].

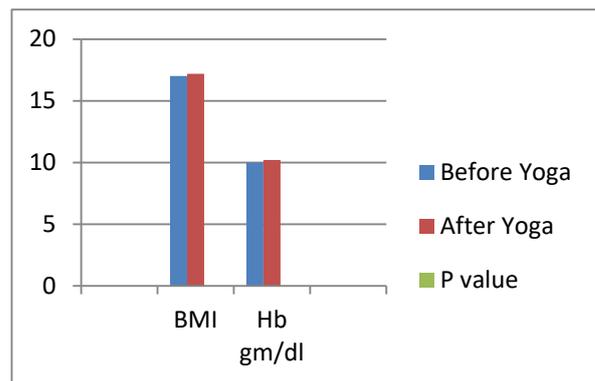
Control group -depicts no significant improvement in flexibility poor (Grade 2: -18 to -9) to Average (GRADE 4: -17 to -8) [NS], Weight 45.60 to 45.65 [NS], BMI 17.00 to 17.20 [NS] and Hb 10.00 to 10.2 [NS].

Table 1

Variables	Experimental Group		Control Group	
	Before Yoga Mean Score	After Yoga Mean Score	Before Yoga Mean Score	After Yoga Mean Score
Flexibility (cm) mean	Poor (Grade 2) -19 to -9	Average (Grade 4) 0 to +5	Poor (Grade 2) -18 to -9	Average (Grade 4) -17 to -8
BMI	17.40 +- 0.4	19.50 +- 0.3*	17.00	17.20 (NS)
Hb gm/dl	9.5 +- 0.3	12.2 +- 0.2**	10.00	10.2 (NS)



1) Experimental Group



2) Control Group

DISCUSSION

From the results it is evident that the eight week of yoga with suryanamaskar programme showed significant improvement in flexibility level. The finding is supported by the study conducted by (Shankar and Pancholi, 2011, Galantino ML et al; 2004 and Bal B. S. and Kaur P. J. 2009). The finding of Sisodia A Singh 2017 also revealed that a significant improvement found in flexibility due to regular practice of suryanamaskar. It may be due to regular stretching exercise increase extensibility of muscles, ligaments and tendons.

From the results it is also evident that the eight week of yoga with suryanamaskar programme showed significant improvement also in BMI level of underweight students. The increase of body weight may be due to the decrease of body fat and increase of body mass. Similar finding also reported by Aloksen Sen Borman 20016.

The present work was also carried out to investigate Hb % by yoga with suryanamaskar in anemic students. As shown in above table among 24 students the Hb % was increased in 90 % students., the reason for increased red blood cell count can be explained by two different mechanisms; it may be due to hypoxia that release more erythropoietin during yoga practices and second is that yoga practices increased release of iron stores from reticulo endothelial cells and splenic concentration enhance the release of reserved RBCs. Very similar results was found by other researchers Verma Rahul et al; 2017, Karpoor Chandrashekher, Vikash K Tiwari et al; 2017 and Ramnath B. et al; 2013.

The practices of asanas and pranayama have proved very valuable for the production of hemoglobin and

necessary element in the blood in the pure form (6). Trikonasana (Budilovsky Joan and Adamson Eve 2000 and Swami Muktibodhanand Saraswati 2006) and its variations, Sarvangasana (Francina 2003), Surya namaskara, Yoga mudras (kongtrul 2005) are useful for purification of blood and increases of blood cells. *Yoga practices hold great promise and potential in the field of medical science. Yoga therapy will definitely emerge as a major branch of medical treatment and eventually become a standard of care and practice in coming few years. India has made great progress in yogic science research as evidenced by a number of scientific and clinical papers in various journals.*

Although Yoga as a therapy is still at the stage of clinical research, advances have been made in understanding how to use these practices for treating various diseases via correlating its biochemical, hematological spectrum (Preeti Sharma and Pradeep Kumar 2016). Krishna Sharma et.al 2014 also demonstrated that short-term yoga practice increase Hb, Hematocrite, White Blood Cell count and Peck Expiratory Flow rate dut to 1 month regular practice of yoga. Yoga can help in increasing RBC count in two ways. One is by making use of breathing exercses and the other is by doing special asanas. Breathing exercises like Ujjayi, Suryabhedana, AnulomViloma and Kapalhatti increases circulation of blood and improre functioning of the entire circulatory system. According to various Yoga gurus anaemic patients should start their Yoga session with Pranayama followed by Trikonasan. Other Yoga poses for anaemia are Sarvangasana, Paschomittanasana,Uttanpadasana, learit-Karani-mudra and various shavasans.(30). For Anaemia the practice of asanas and Pranayama have proved very valuable for prduction of hemoglobin and necessary elements in the blood in the pure form. The practices of asana are useful for purification of blood

and increase of blood cells. The Pranayams like Sivananda, Shitali, Sitkari and Anulom Vilom are recommended for anaemia (30). By doing Sivananda Pranayama, may get maximum oxygen by inhaling. The air (Containing oxygen) that we breathe into our lungs is transferred into our blood, which travels around our body delivering oxygen to our brain, organs and all other parts of our body. It helps the nervous system, the heart, the digestive system, muscles, sleep, energy levels, mental soundness, concentration and memory and much more, when we exhale properly, we also get rid of the waste products like carbon dioxide, toxins etc. (30). Shitali and Sitkari Pranayamas are performed in the early morning before sunrise, a very good digestive power is observed, hunger increases, blood gets purified. Anulom - Vilom Pranayam increase of working capacity of intestines creates a new process of sending the iron that is produced additionally, in the various organs of the body. KapalBhatti / KapalBharti controls breathing and increases oxygen level in the blood, thus increasing body capacity and the lung capacity. It also detoxifies the body of toxins (31).

CONCLUSION

The present study reveals that yoga with suryanamaskar helps efficiently in enhancing flexibility; enhance BMI of underweight and reducing the symptoms of anemia with minimum effort. Based on above results and discussion, we can come to the following conclusion -

1. This short-term study has showed very significant results in Hb level.
2. The yogic practices can be used efficiently to improve flexibility and BMI.
3. The yoga therapy would yield more result if it is carried out for longer duration unlike present study.

Conflicts of interest: The authors stated that no conflicts of interest.

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