

“Effect of Suryabhedan Pranayama on Selected Blood Components among School Children”

Devendra Singh

(Research Scholar) S.G.S.U, Gandhinagar, Gujarat

Email-devendrabarar1@gmail.com

Dr Ashish. S.Phulkar,

Professor L.N.I.P.E, Gwalior

Email-ashishlnipe@gmail.com

ABSTRACT

Background: The aim of this study was to find out the effect of Suryabhedan Pranayama training on selected Blood components (WBC, RBC, Hg, Platelets, SBP, DBP and RHR) among school children. For this study 30 male school students from Govt. Higher Secondary School Tikamgarh, M.P, were selected randomly as the subjects for the study. The age of subjects was 13 to 18 years. The students were randomly assigned into two groups each consist of 15 students. Further, the experimental treatment was also assigned randomly to the experimental groups for 8 weeks and one group served as a control group. Pre-test, Post-test randomized group design was employed in the study. Data was collected two times from each group, before training (0 weeks) and after training (8 weeks). To find out the difference between different pair mean, the ANCOVA was used. The level of significance was set at 0.05.

Conclusion: The result supports that the Suryabhedan Pranayama training improves Blood components like WBC, RBC, Hg, Platelets, on the other hand no improvement was found in SBP, DBP and RHR among school students.

Keywords: Physiology, Suryabhedan Pranayama, Blood, Oxygen, Carbon dioxide, Puraka, Kumbhaka and Rechaka, WBC, RBC, Hg, Platelets, SBP, DBP and RHR etc.

1. Introduction

The modern day lifestyle is as such where humans struggle with physical and physiological stress in their lives. This is where yoga comes as a rescue to alleviate the physical and mental stress. Based on the holistic principles of harmony and unification within body and nature, Yoga's simple postures leave a powerful impact against busy lifestyle demands. It is not only a great solution to stay fit, but has also emerged as an alternative form of therapy. Many chronic ailments like asthma, diabetes, blood pressure,

arthritis have found a great solution in Yoga. All these facets convey the reason why this proactive discipline should be the part of our lives.

According to Maharishi Panini, the word Yoga is derived from two roots viz. Yujir and yuja. Yujir referring to yoking (yujir yoga), and Yuja referring to mental concentration (yuj Samadhan) and to sense control (Astdhyayi)^[1]. Hiranayagarbha of the earliest Vedic and Upanishads lore is spoken of as the first being of reveal yoga (Mahabharata)^[2].

More than a discipline to stay fit and healthy. Yogic techniques are known to improve one's overall performance and work capacity (Bhattacharya and Krishna, 1960). Yoga appears to provide a comparable improvement in health status (Caroline et al., 2007)^[3].

The blood serves as a principal transport medium of the body carrying oxygen, nutrients, and chemical massages to the tissues and waste products and synthesized metabolites away. The circulatory system provides access to all cells of the body for materials ingested or prepared elsewhere in the organism. Thus blood plays many important roles in coordinating the individual's cells in to a whole complex organism. This accomplish by presence in the fluid of dispersed or dissolved nutrients, metabolites, electrolytes, hormones, substances to counteract infection and haemorrhage and by equilibria between the cell and the blood stream so that homeostasis with respect to temperature, oxidation, reduction potential and ionic concentration is maintained throughout the organism (Sajwan & Uppal 1999). Old Indian life science is still relevant in serving the modern day world.

The practice of Pranayama is emphasized almost all the traditional scripture. According to Yogic terminology a systematic process by which one gains control over Prana is referred as Pranayama. Pranayama constitutes fourth step of eight fold of Yoga described in the Patanjaliyogasutra^[4] and occupies second place in Hathapradipika^[5] and fifth place in Gherandasamhita^[6]. According to Patanjaliyogasutra, Pranayama is a cessation of the movement of inhalation and exhalation (PYS)^[7]. Pranayama can produce different physiological responses in healthy individuals (Upadhyay et al., 2008)^[8]. Pranayama consists of modifications of the breathing process which we bring about deliberately and consciously in a sitting posture which is steady and comfortable^[9]. The science of Pranayama is based on the retention of prana called 'Kumbhaka'.

In Suryabhedan, all the inhalations are done through the right nostrils and all the exhalation are done through the left nostrils. Kumbhaka is to be practiced until one feels the retention up to the hairs and tips of the nails (HP II/48-49)^[10].

2. Aim and Objective

¹ Astdhyayi, 3.3.121

² Mahabharata, 12.35.69

³ Caroline, S., Jane, B.M. & Kerena, E. (2007). A randomized comparative trial of yoga and relaxation to reduce stress and anxiety. *Complementary Ther. Med.* 15 (2), 77-83.

⁴ Patanjaliyogasutra (PYS)

⁵ Digambarji & Shastri, R.N. (1998). Op. Cit.

⁶ Digambarji & Gharote, M.L. (1997). *Gherandsamhita*. Pune: Kaivalyadhama, S.M.Y.M. Samiti, 2nd Edition. Lonavala.

⁷ Patanjaliyogasutra, PYS II/49

⁸ Upadhyay, D.K., Malhotra, V., Sarkar, D., & Prajapati, R. (2008). Effect of alternate nostril breathing exercise on cardiorespiratory functions. *Nepal Medical College Journal*, 10 (1), 25-27.

⁹ Joshi, K.S. (1983). Op. Cit., p 11.

¹⁰ Digambarji & Shastri, R.N. (1998). Op. Cit., HP II/48-49

The aim and objective of the study was to see the effect of Suryabhedan Pranayama training on selected Blood Components among school children.

3. Hypotheses

1. Suryabhedan Pranayam will produce significant improvement on selected Blood Components.

4. Methods

4.1. Selection of Subjects: The study was designed to find out the comparative effect of three different variation of suryabhedan paranayama on selected blood component. For this study 30 male school students from Govt. Higher Secondary School Bamhori kalan, Palera, Tikamgarh, and M.P were selected randomly as the subjects for the study. The age of subjects was 13 to 18 years. The students were randomly assigned into two groups each consist of 15 students.

4.2. Selection of Variables: Suryabhedan Pranayama was selected as independent variable and White Blood Cell Count (WBC), Red Blood Cell Count (RBC), Platelets Count, Hemoglobin Count (Hgb), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) and Resting Heart Rate (RHR) were selected as dependent variables.

4.3. Experimental Design: The study was formulated as per Pre and Post-Randomized group design, in which 30 students were randomly divided into two equal groups, each comprising of 15 subjects. The experimental group – 1 (n=15) 1:4:2 group underwent for suryabhedan pranayama training, and group – 2 served as control group (n=15) who did not undergo any specific training.

Pre test and Post test Randomized group design:

G1	R	O1	T	O2
G2	R	O1		O2

R=Randomization, O1 = Pre-test, O2 = Post-test, and T = Treatment

4.4. Training and Practice of Suryabhedan Pranayam: The training program was administered in the play field of Govt. Higher Secondary School, Bamhorikalan, Palera, Tikkamgarh (M.P), by the researcher himself.

Training session was lasted for 40 minutes per day for each experimental group. The training programme was scheduled in the early morning from 8.40 am to 9.20 am for experimental group (G1).The G2 (control group) was not exposed to any specific training.

The details of the training program are as follows:

- Total training program duration was eight weeks.
- Five days a week training session.
- Training session was 30-40 minutes/day for each group.

The details of the training program are given below in table no. 1

TABLE 1
Training schedule for all the Experimental groups
(Eight weeks, Five days a week, 30-40 min/day)

Activities	Total time duration for all the Groups = 30-40 min
Prayer	3 min
Nadi Shuddhi	5 min
Suryabhedana Pranayama	20-30 min
Shanti Path	2 min

G2 did not participated in any training program as it served as a controlled group.

The training session was started with prayer, which takes three minutes. After that subject were asked to perform Nadi-Shuddhi (Pranayama) for five minutes. After that subject was asked to perform Surybhedan Pranayama (with their assigned ratio) for 30 minutes. And session was ended with two minutes shanti path. Same sequence was followed to the other experimental group with their assigned training programme.

In suryabhedan pranayam, the meaning of “Surya” is Sun and the meaning of the word “Bhedana” is piercing, enter or breaking through something. In term of yoga Right nadi (right nostril) is called surya nadi or Pingala, and Left nadi (left nostril) is named as Chandra nadi or Ida nadi. The right nadi is the entrance way of Pingala Nadi, speaking to the sun vitality, the hot vitality or the manly vitality in our body. That the resion behind imparting the training in winter sision, each subject was allowed for inhalation (Puraka), retention (kumbhaka) and exhalation (Rechaka) according to their training ratio.

4.5. Procedure For Blood Sample Collection: Venous blood was collected in the early morning after the subject were abstained from food and drinking except water for 10 hours to estimate the selected blood components. 5 ml of blood was drawn from the subjects by syringe drawn procedure and the blood was immediately transferred into sterilized small bottles, kept under the freeze box, and transported to the laboratory for testing of blood sample. Blood sample were taken at the beginning (pre test) and finally at the end of the experiment period of 8 weeks (post test).

4.5.1 Procedure for measuring Resting Heart Rate, Systolic & Diastolic Blood Pressure

Equipment: Digital Blood Pressure Monitor

Description: Subject was instructed to wear a short sleeved T-shirt or loose fitting clothing so that the sleeve can be rolled up comfortably. They were given the rest for five minutes before taking readings. Subject was sited down in a quiet place, with their arm resting on a firm surface. The deflated cuff was rolled on right upper arm of the subjects. It is very important that their arm should be supported so that the cuff around the arm is at the same level as their heart. The arm was totally relaxed and not tensed. The deflated cuff needs to be tight, but not too tight. Researcher inserted two fingers between it and the skin. Then the data was recorded by the digital blood pressure monitor. Three reading were taken from all the subjects.

Scoring: Averages of all three readings were considered as the final score. The reading on the display was recorded as number of heart beats per minute for RHR, and mmHg for SBP & DBP.

4.6. Statistical Procedure: In order to find out the effect of Suryabhedan Pranayama training on selected Blood Components among school children. Descriptive statistics and ANCOVA was used. The level of significance was set at 0.05.

5. Results

All the assumption of ANCOVA was checked. When all the assumptions were fulfilled, then only the main part was computed.

Table - 1

Analysis of Co-variance of the Mean of Experimental Group and Control Group in relation to WBC Count

*Significant at .05, A = Among Mean variance, W = Within Group variance

The analysis of co-variance for WBC count was insignificant in case of pre-test mean, the F-ratio was .066 which was less than tabulated value, from which it is clear that the pre-test mean does not differ

TEST	Mean $\pm$ SD		ANCOVA Table					
	Experimental	Control		SS	df	MS	F	Sig
Pre-test	7400 $\pm$ 1545.9	7520 $\pm$ 943.5	A	108000	1	108000	.066	.799
			W	45924000	28	1640142.8		
Post-test	6560 $\pm$ 702.8	7620 $\pm$ 1182.7	A	8427000	1	8427000	8.90*	.006*
			W	26500000	28	946428.57		
Adjusted	6574.25	7605.74	A	7960935.02	1	7960935.0	8.99*	.006*
			W	23906249.5	27	885516.65		

significantly and that random assignment of subject to the experimental group and control group was quite successful. The post-test means of two groups yielded and F-ratio of 8.904 which was significant at 0.05. The difference between adjusted post-test means was found significant as the obtained F-ratio was 8.991. The F-ratio needed for significance at 0.05 was 4.21 at *df* (1, 27) and 4.20 at *df* (1, 28).

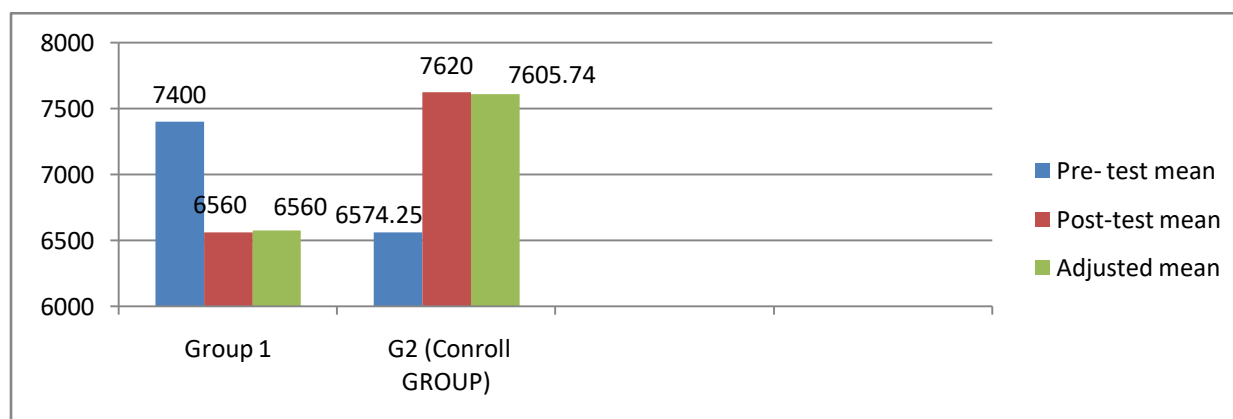


Figure-1. Pre-test, Post-test and Adjusted Post-test Mean of G1 & G2.

Table – 2

Analysis of Co-variance of the Mean of Experimental Group and Control Group in relation to RBC Count

*Significant at .05, A = Among Mean variance, W = Within Group variance

The analysis of co-variance for RBC count was insignificant in case of pre-test mean, the F-ratio was .661 which was less than tabulated value, from which it is clear that the pre-test mean does not differ significantly and that random assignment of subject to the experimental group and 71.72 which was significant at 0.05. The difference between adjusted post-test means was found significant as the obtained F-ratio was 67.52. The F-ratio needed for significance at 0.05 was 4.21 at df (1, 27) and 4.20 at df (1, 28).

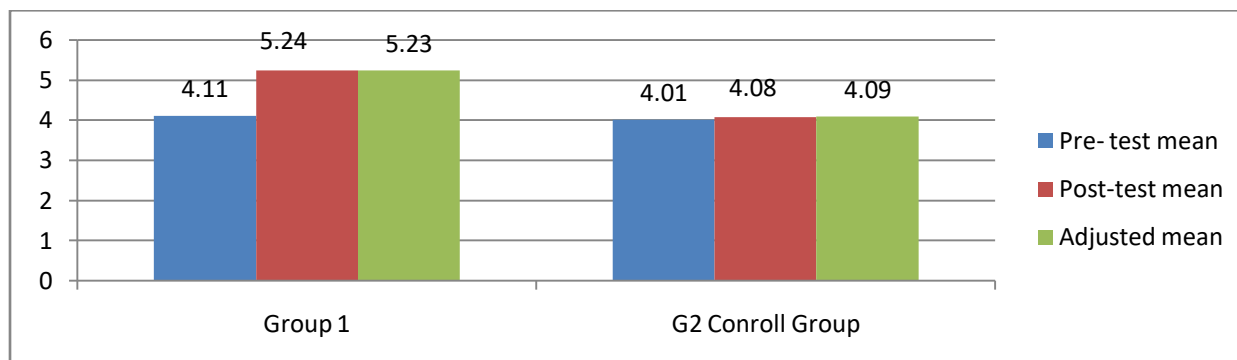


Figure-2. Pre-test, Post-test and Adjusted Post-test Mean of G1 & G2.

Table – 3

TEST	Mean $\pm$ SD		ANCOVA Table					
	Experimental	Control		SS	df	MS	F	Sig
Pre-test	4.1166 $\pm$.2915	4.018 $\pm$.3687	A	.073	1	.073	.661	.423
			W	3.093	28	.110		
Post-test	5.2440 $\pm$ 1.861	4.084 $\pm$.4967	A	10.092	1	10.092	71.72*	.000*
			W	3.940	28	.141		
Adjusted	5.234	4.094	A	9.509	1	9.509	67.52*	.000*
			W	3.802	27	.141		

Analysis of Co-variance of the Mean of Experimental Group and Control Group in relation to Hgb Count

*Significant at .05, A = Among Mean variance, W = Within Group variance

The analysis of co-variance for Hgb count was insignificant in case of pre-test mean, the F-ratio was .010 which was less than tabulated value, from which it is clear that the pre-test mean does not differ significantly and that random assignment of subject to the experimental group and 90.06 which was significant at 0.05. The difference between adjusted post-test means was found significant as the obtained F-ratio was 98.46. The F-ratio needed for significance at 0.05 was 4.21 at df (1, 27) and 4.20 at df (1,28).

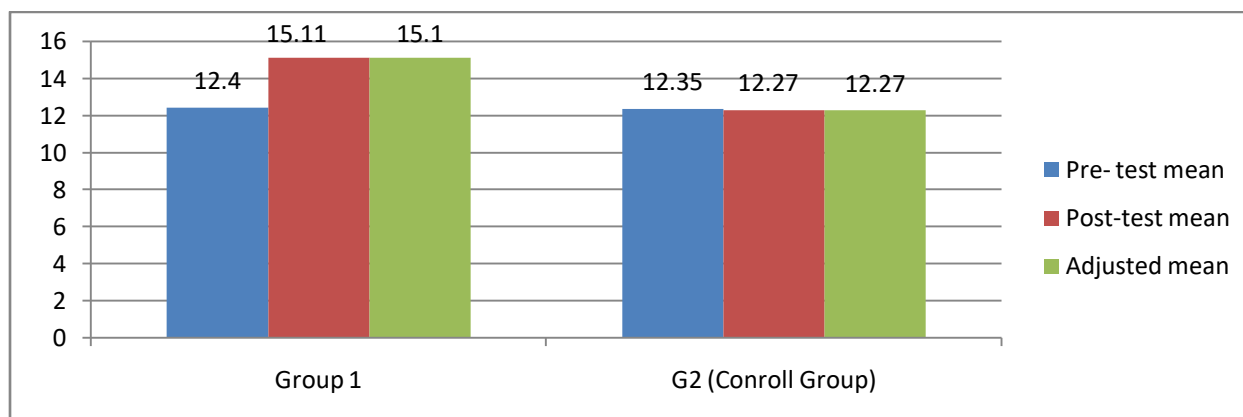


Figure-3. Pre-test, Post-test and Adjusted Post-test Mean of G1 & G2.

Table – 4

TEST	Mean $\pm$ SD		ANCOVA Table					
	Experimental	Control		SS	df	MS	F	Sig
Pre-test	12.400 $\pm$ 1.378	12.353 $\pm$ 1.128	A	.016	1	.073	.010	.920
			W	44.417	28	1.586		
Post-test	15.110 $\pm$.773	12.274 $\pm$.861	A	60.322	1	60.332	90.061*	.000*
			W	18.754	28	.670		
Adjusted	15.105	12.279	A	59.844	1	59.884	98.468*	.000*
			W	16.409	27	.608		

Analysis of Co-variance of the Mean of Experimental Group and Control Group in relation to Platelets Count

TEST	Mean $\pm$ SD		ANCOVA Table					
	Experimental	Control		SS	df	MS	F	Sig
Pre-test	119.40 $\pm$ 2.558	118.07 $\pm$ 2.31	A	13.333	1	13.333	2.242	.146

*Significant at .05, A = Among Mean variance, W = Within Group variance

The analysis of co-variance for Platelets count was insignificant in case of pre-test mean, the F-ratio was .035 which was less than tabulated value, from which it is clear that the pre-test mean does not differ significantly and that random assignment of subject to the experimental group and 38.83 which was significant at 0.05. The difference between adjusted post-test means was found significant as the obtained F-ratio was 39.75. The F-ratio needed for significance at 0.05 was 4.21 at *df* (1, 27) and 4.20 at *df* (1,28).

TEST	Mean $\pm$ SD		ANCOVA Table					
	Experimental	Control		SS	df	MS	F	Sig
Pre-test	2.084 $\pm$.614	2.045 $\pm$.543	A	.012	1	.012	.035	.854
			W	9.441	28	.336		
Post-test	3.768 $\pm$.562	2.127 $\pm$.781	A	18.025	1	18.025	38.838*	.000*
			W	12.995	28	.464		
Adjusted	3.672	2.135	A	17.711	1	17.711	39.756*	.000*
			W	12.029	27	.446		

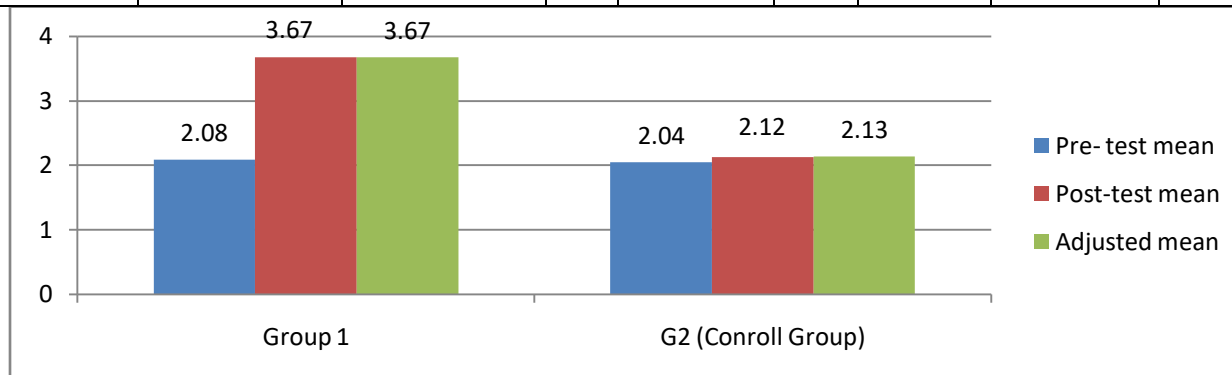


Figure-4. Pre-test, Post-test and Adjusted Post-test Mean of G1 & G2.

Table – 5

Analysis of Co-variance of the Mean of Experimental Group and Control Group in relation to SBP Count

			W	166.533	28	5.948		
Post-test	119.53 ± 1.922	118.13 ± 2.13	A	14.700	1	14.7000	3.565	.069
			W	115.467	28	4.127		
Adjusted	119.106	118.560	A	2.070	1	2.070	1.185	.286
			W	47.145	27	1.746		

*Significant at .05, A = Among Mean variance, W = Within Group variance

The analysis of co-variance for SBP count was insignificant in case of pre-test mean, the F-ratio was 2.242 which was less than tabulated value, from which it is clear that the pre-test mean does not differ significantly and that random assignment of subject to the experimental group and 3.565 which was insignificant at 0.05. The difference between adjusted post-test means was also found insignificant as the obtained F-ratio was 1.185. The F-ratio needed for significance at 0.05 was 4.21 at df (1, 27) and 4.20 at df (1,28).

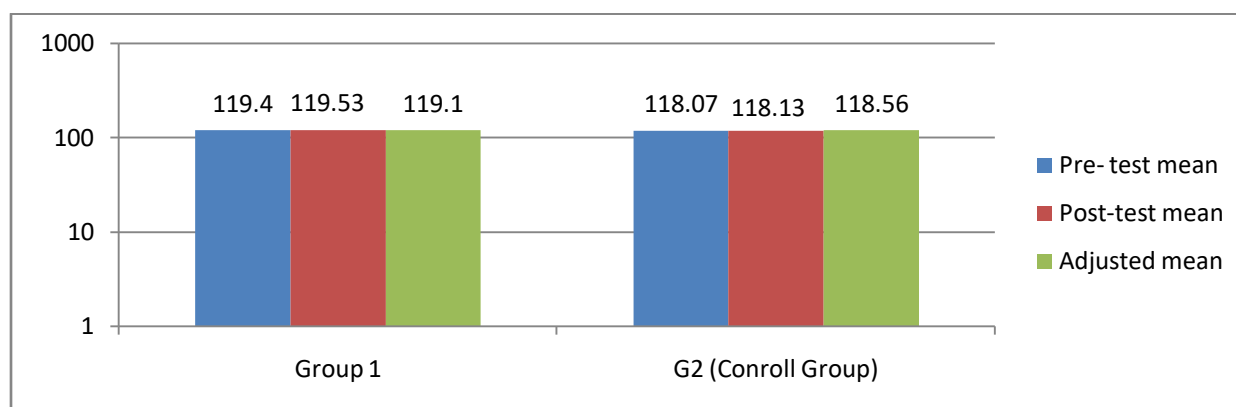


Figure-5. Pre-test, Post-test and Adjusted Post-test Mean of G1 & G2.

Table – 6

Analysis of Co-variance of the Mean of Experimental Group and Control Group in relation to DBP Count

*Significant at .05, A = Among Mean variance, W = Within Group variance

The analysis of co-variance for DBP count was insignificant in case of pre-test mean, the F-ratio was .040 which was less than tabulated value, from which it is clear that the pre-test mean does not differ significantly and that random assignment of subject to the experimental group and .834 which was insignificant at 0.05. The difference between adjusted post-test means was also found insignificant as the obtained F-ratio was 2.295. The F-ratio needed for significance at 0.05 was 4.21 at df (1, 27) and 4.20 at df (1,28).

TEST	Mean ± SD		ANCOVA Table					
	Experimental	Control		SS	df	MS	F	Sig
Pre-test	77.20 ± 4.329	77.47 ± 2.850	A	.533	1	.533	.040	.844
			W	376.133	28	13.433		
Post-test	77.07 ± 3.555	78.07 ± 2.314	A	7.500	1	7.500	.834	.369
			W	251.867	28	8.995		
Adjusted	77.162	77.971	A	4.894	1	4.894	2.295	.141
			W	57.574	27	2.132		

df (1,28).

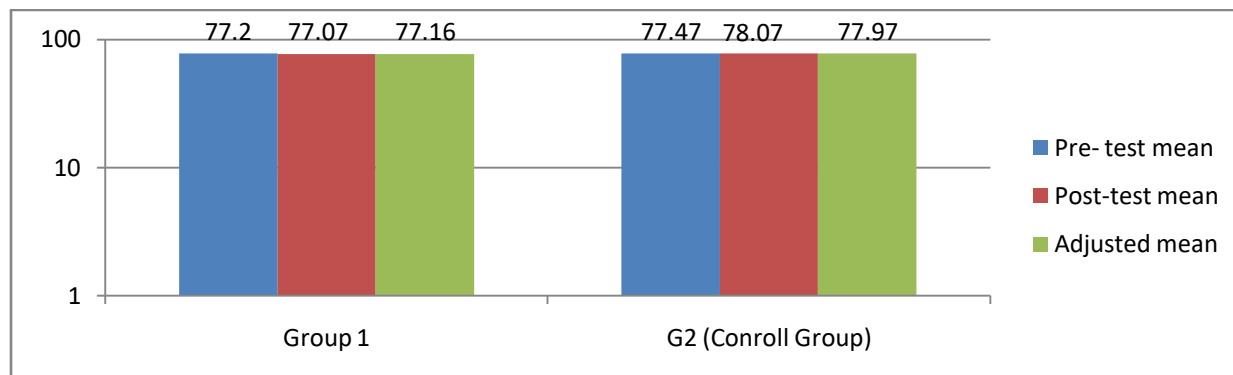


Figure-6. Pre-test, Post-test and Adjusted Post-test Mean of G1 & G2.

Table – 7

Analysis of Co-variance of the Mean of Experimental Group and Control Group in relation to RHR

*Significant at .05, A = Among Mean variance, W = Within Group variance

The analysis of co-variance for RHR count was insignificant in case of pre-test mean, the F-ratio was .137 which was less than tabulated value, from which it is clear that the pre-test mean does not differ significantly and that random assignment of subject to the experimental group and .226 which was insignificant at 0.05. The difference between adjusted post-test means was also found insignificant as the

TEST	Mean $\pm$ SD		ANCOVA Table					
	Experimental	Control		SS	df	MS	F	Sig
Pre-test	76.87 $\pm$ 3.159	76.33 $\pm$ 4.593	A	2.133	1	2.133	.137	.714
			W	435.067	28	15.538		
Post-test	76.93 $\pm$ 4.464	76.07 $\pm$ 5.470	A	5.633	1	5.633	.226	.638
			W	697.867	28	24.924		
Adjusted	76.73	76.23	A	1.606	1	1.606	.096	.759
			W	449.780	27	16.659		

obtained F-ratio was .096. The F-ratio needed for significance at 0.05 was 4.21 at df (1, 27) and 4.20 at df (1,28).

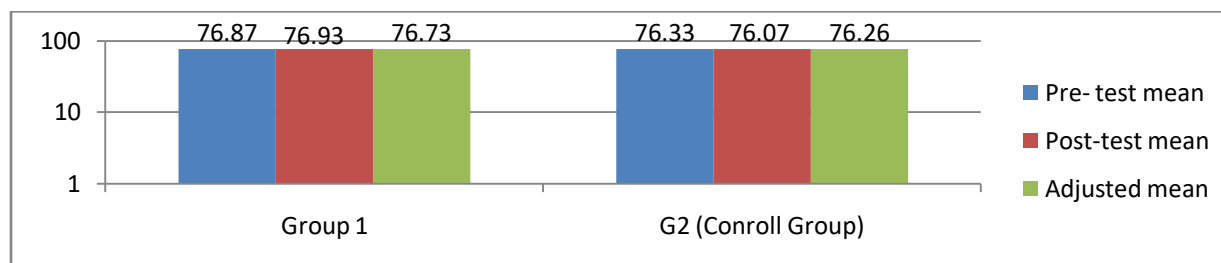


Figure-7. Pre-test, Post-test and Adjusted Post-test Mean of G1 & G2.

6. Discussion

The result of the study clearly indicates that no change was found in variable like SBP, DBP and RHR. But on the other hand WBC Count decreases significantly and variable like RBC count,

Hemoglobin count and Platelets count increases significantly over the 8 weeks period of Suryabhedan Pranayama training for experimental groups. The control group did not produce any significant improvement on selected Blood Components.

Some of the previous findings related to the effect of Yoga practices have been found with involvement of Pranayama. Kasundra, Thumar & Mungra.^[11] (2010) conducted a study on the topic “Impact of pranayama on selected components of blood- an analytical study”. The pranayama training has an effect on cholesterol, blood glucose, hemoglobin, White Blood Cells, Red Blood Cells and Platelets.

Sharma .N. and Gupta .R.^[12] (2015) conducted the study to assess the effect of yoga on the hematological parameters among anemic patients. The study revealed significant increase in hemoglobin ($p < 0.0001$) and RBC ($p < 0.0001$) in both men and women. The WBC count significantly decreased in both men ($p < 0.0001$) and women ($p < 0.0001$). The mean value of platelet count increased in both men and women but was statistically insignificant in men ($p = 0.3798$) and women ($p = 0.3479$).

The above mentioned studies lend support to the result of the present study.

7. Discussion on Hypothesis

Suryabhedan Pranayam will produce significant improvement on selected Blood Components, which is accepted at .05 level of significance for variable like WBC Count, RBC Count, Hemoglobin Count & Platelets Count, and is rejected for variable like SBP, DBP & RHR.

8. Conclusion

The present study demonstrated a decrease in WBC count and increases in RBC count, Hemoglobin count and Platelets count for experimental group respectively. The control group did not produce any significant improvement on selected blood components with regard to subject age. Based on results it is concluded that 8 weeks practice of Suryabhedan Pranayama helped to improve blood components like WBC, RBC, Hemoglobin and Platelets count among school children.

References

- 1 Asthhyayi, 3.3.121.
- 2 Mahabharata, 12.35.69.
- 3 Caroline, S., Jane, B.M. & Kerena, E. A randomized comparative trial of yoga and relaxation to reduce stress and anxiety. *Complementary Ther. Med.* 15 (2), 77-83, (2007).
- 4 Patanjaliyogasutra (PYS).
- 5 Digambarji & Shastri, R.N. Op. Cit. (1998).
- 6 Digambarji & Gharote, M.L. *Gherandsamhita*. Pune: Kaivalyadhama, S.M.Y.M. Samiti, 2nd Edition. Lonavala. (1997).
- 7 Patanjaliyogasutra, PYS II/49.
- 8 Upadhyay, D.K., Malhotra, V., Sarkar, D., & Prajapati, R. (2008). Effect of alternate nostril breathing exercise on cardiorespiratory functions. *Nepal Medical College Journal*, 10 (1), 25-27.
- 9 Joshi, K.S. (1983). Op. Cit., p 11.
- 10 Digambarji & Shastri, R.N. Op. Cit., HP II/48-49. (1998).
- 11 Kasundra, Thumar and Mungra. Impact of pranayama on selected components of blood: an analytical study. *Journal of Advanced Development of Research*, 1(1), 41-44. (2010).
- 12 Sharma .N and Gupta R. A study of yoga in anemic patients. *Int J Med Sci Public Health* 2016;5:399-401. (2015).

¹¹ Kasundra, Thumar and Mungra. (2010). Impact of pranayama on selected components of blood: an analytical study. *Journal of Advanced Development of Research*, 1(1), 41-44.

¹² Sharma .N and Gupta R. (2015). A study of yoga in anemic patients. *Int J Med Sci Public Health* 2016;5:399-401