

## EVALUATION OF PRANAYAMA PRACTICE INTERVENTION ON HAEMOGLOBIN, HIGH AND LOW-DENSITY LIPOPROTEINS IN WOMEN SOCCER PLAYERS

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### ABSTRACT

**Background:** In yoga, researchers suggest that pranayama practices affect the various physiological parameters. The cholesterol and biochemical profiles of the body could be changed, and the changes reflect on the performance of athletes.

**Objective:** The main objective of this study was to assess the effect of a six-week Pranayama practice intervention on the Haemoglobin (Hb), High-Density Lipoprotein (HDL), and Low-Density Lipoprotein (LDL) cholesterol levels in Women Soccer Players.

**Methods:** Thirty (N=30) national women soccer players aged  $21.5 \pm 0.5$  yrs trained  $10 \pm 1.5$  yrs were randomly selected and divided into experimental and control groups consisting of 15 players each. The study was designed as an interventional and observational study. A six-week pranayama practice intervention was assigned five days per week to the experimental group only and the control was kept unless assigning the pranayama practices except regular soccer practice. The pertaining data of pre and post-pranayama practice intervention on Hb, HDL, and LDL levels of 30 women soccer players were collected through a clinical investigation.

**Results:** Statistically, the paired t-test showed a significant difference between the pre and post-test means of Hb, HDL and LDL for the experimental group as the obtained values of 't' = -6.19, -3.08 and 4.25, respectively, are more significant at 0.05 ( $p < 0.05$ ). However, there was no significant difference between the pre and post-test means of the control group ( $p > 0.05$ ). Further, the analysis of covariance (ANCOVA) showed significant differences among the pre and post-test means comparison between the experimental and control groups on Hb, HDL, and LDL levels as the respective 'F' = 13.58, 5.32, and 13.93, were more significant ( $p < 0.05$ ).

**Conclusion:** This study showed an increase in Hb and HDL cholesterol, and a decrease in LDL cholesterol levels. Within six weeks, pranayama practice intervention significantly improved women soccer players haemoglobin and cholesterol levels authentically.

**Key Words:** Soccer, pranayama, intervention, haemoglobin, high-density lipoprotein, low density lipoprotein, cholesterol.

## 1. INTRODUCTION

Winning a medal in the professional major or main competitions is not an easy task. It depends on the die-hard dedication and patience of the individual. Many performance-responsible factors include physical, physiological, psychological, biomechanical, social, genetic inheritance, environmental factors, etc. We need to identify and develop such different performance factors with timely implementation of adequate facilities and infrastructures. Sports sciences monitor to a great extent and evaluate the achievement of performance levels with various criterion measures. Several techniques of sports training are used to enhance performance. The sports scientists have now started looking beyond these horizons and yogic techniques are also used nowadays to enhance the performance of sports person [1].

Yoga science is emerged as contemplation and also communion and yoking all powers of the body, mind, and soul to God. Yoga practices are gaining popularity and have the potential to make a significant contribution to the field of health sciences [2]. With the addition of yoga in training program, the most important benefit is to allow an athlete to do movement with greater range of motion and enhanced the muscular economy with reducing the chance of injury [3]. The most significant benefit of adding yoga to a training programme is its effect on performance. It allows an athlete to train harder and a higher level because of motion is greater and the fears of injury lessen [4]. Yoga can be a powerful enhancement intervening in the regular training programme of athletes. Adding yoga to a routine training programme can help to develop strength, flexibility, range of motion, concentration, mind focus, cardiorespiratory efficiencies, and reduces stress, tension, and tightness. We have found that high density lipoprotein-cholesterol (HDL-C) was increased in men with Pranayama, while triglycerides (TG) and Low density lipoprotein-cholesterol (LDL-C) decreased in women after yoga asanas [5]. A regular yoga practices decrease in all lipid parameters except high density lipoprotein (HDL) [6]. With the help of yogic life style intervention found that total cholesterol (TC), LDL, serum triglyceride (STG) can be managed in the body [7]. A short term yogic training makes a significant decrease in LDL cholesterol and increase in HDL cholesterol [8]. The is report of significant decrease in the total cholesterol (TC), total triglycerides (TTG), LDL cholesterol and significant increase in the HDL cholesterol after 3 months of yogic practice [9].

Women's soccer is also one of the most prominent team games played by women around the globe. It is a professional game played in most countries in the world [10]. Soccer players can benefit from participating in the different yoga asanas and pranayama to improve flexibility, strength, endurance, agility, concentration, and other physiological systems [10]. Many studies have confirmed the physiological changes of female groups and made a complete body biochemistry. It is also true that regular yoga practice intervention influences biochemical and haematological changes, and athletes are benefitted from the performance improvement. However, few scientific studies have been conducted to assess the effect of yoga pranayama on lipid profiles such as HDL-C, LDL-C, and haematological profiles, in addition to performance enhancement.

Therefore, this study was conducted to assess the effect of yogic practice intervention on haemoglobin, HDL-C, and LDL-C in women soccer players.

## 2. OBJECTIVE

The objective of this study was to assess the effect of a six-week Pranayama practice intervention on the Haemoglobin (Hb), High-Density Lipoproteins (HDL), and Low-Density Lipoprotein (LDL) cholesterol levels in Women Soccer Players.

## 3. METHODS

### 3.1 Participants

Thirty (N=30) national women soccer players aged  $21.5 \pm 0.5$  yrs with  $10 \pm 1.5$  yrs of soccer training were selected from the different football clubs, Imphal. It was a randomized cross-sectional study with the approval of the local ethical committee and individual consent of the subjects in accordance with the research ethical standards in sport and exercise.

### 3.2 Study Design

The study was designed as an interventional and observational study. Pre and post-test design was used for the collection and analysis of data. Individual consent was taken from the subjects to act as the study sample. A pilot assessment was conducted for one week to familiarize the pranayama practices to the subjects. The selected subjects (N = 30) were equally divided randomly into two groups: experimental group-I (n=15) and control group-II (n=15). Only the experimental group-I under-went pranayama practices for five days per week, i.e., Monday, Tuesday, Wednesday, Friday, and Saturday in the morning (6.00 to 7.00 AM), and control group-II was kept under control. However, both groups participated in their regular soccer training.

### 3.3 Intervention

The study was based on the six-week pranayama practices exercised upon the experimental group-I intervening in the regular soccer training programme and to assess the changes of haemoglobin (Hb), High-Density Lipoprotein (HDL), and Low-Density Lipoprotein (LDL) among the women soccer players of both experimental and control groups. The data were collected through a clinical investigation before and after the six-week pranayama practice intervention training.

### 3.4 Experimental Treatment

A yoga mat, stopwatch, and comfortable sportswear were used to conduct the pranayama practices. The subjects of the experimental group were guided to some loosening (warming-up) yogic exercises along with asanas and Suryanamaskar. After the body limbered adequately, the subjects were asked to lay down on back for 2-3 minutes Savasana (complete rest), sit comfortably in Siddhasana, Padmasana, or Vajrasana to perform the selected pranayama exercises: deep inhalation (Pooraka), retention (Kumbhaka), exhalation (Rechaka), Nadi Sodhana, Bhastrika,

Kapalabhati, Ujjayi, Sheetali and Sheetkari. As the subjects adapted to the pranayama practices, there was an increase in the number of cycles or repetitions of the same practices. The six-week pranayama practice programme had been designed as shown in table 1.

**Table 1: Six-Week Pranayama Practices**

Week	Training	Practice Intensity Cycle
I & II	Pooraka-Kumbhaka-Rechaka	5
	Nadi Sodhana	5
	Bhastrika	20
	Kapalabhati	20
	Ujjayi	10
	Sheetali	5
	Sheetkari	5
III & IV	Pooraka-Kumbhaka-Rechaka	8
	Nadi Sodhana	8
	Bhastrika	30
	Kapalabhati	25
	Ujjayi	15
	Sheetali	8
	Sheetkari	8
V & VI	Pooraka-Kumbhaka-Rechaka	10
	Nadi Sodhana	10
	Bhastrika	40
	Kapalabhati	30
	Ujjayi	20
	Sheetali	10
	Sheetkari	10

### 3.5 Collection of Data

The collection of pertaining data of pre and post-pranayama practice intervention on Hb, HDL and LDL levels of 30 women soccer players was performed with reliable tests and evaluated at SRL Diagnostic Centre, RIMS Road, Imphal, with the help of the clinical staffs. The scores were numerically recorded and interpreted in grams per deciliter (g/dl) for Hb and milligrams per deciliter (mg/dl) for both HDL and LDL of blood. The first data (pre-test data) for 30 women soccer players on Hb, HDL and LDL were collected in fasting conditions within two days before starting the pranayama practice intervention programme. After completing the six-week pranayama practice intervention programme, the final data (post-test data) were also collected within two days in a fasting condition.

### 3.6 Statistical analysis

The characteristics of all the values are expressed in mean and standard deviation (M±SD). The paired sample t-test and analysis of covariance (ANCOVA) were used to determine differences within and between the experimental and control groups, respectively. The statistical analysis was performed via IBM-SPSS (version 20.0), and the significance for all tests was set a priori at  $p < 0.05$ .

## 4. RESULTS

The physical characteristics of the experimental and control groups are shown in the table 2.

**Table 2: Physical Characteristics of Experimental and control Groups.**

Characteristic s	Experimental Group-I	Control Group-II	Range	Mean	SD
Age	15	15	18-25	21.5	±0.5
Height	15	15	155-170	162.5	±1.6
Weight	15	15	50-68	59	±2.1
BMI	15	15	21.22-24.53	22.88	±0.2

The mean, SD, SEM, and the significant mean differences between the pre and post-test means of the experimental and control groups (n=15) for Hb, HDL and LDL cholesterol levels, the paired sample t-test analysis have been shown in table 3.

**Table 3: Mean± SD and SEM of Experimental and Control Group for Hb, HDL and LDL Cholesterol Levels.**

Variables	n	Mean± SD	SEM	t	df	Sig. p
Hb Expt. Pre	15	12.98±0.57	0.15	-6.19*	14	0.00
Hb Expt. Post	15	13.23±0.61	0.16			
Hb Cntl. Pre	15	13.01±0.63	0.16	-0.13	14	0.89
Hb Cntl. Post	15	13.01±0.69	0.18			
HDL Expt. Pre	15	60.43±5.51	1.26	-3.08*	14	0.008
HDL Expt. Post	15	61.61±5.95	1.14			
HDL Cntl. Pre	15	60.41±6.37	1.26	-0.32	14	0.755
HDL Cntl. Post	15	60.53±4.27	1.10			
LDL Expt. Pre	15	112.90±5.59	1.55	4.25*	14	0.001
LDL Expt. Post	15	111.62±5.51	1.42			
LDL Cntl. Pre	15	113.65±6.37	1.64	0.03	14	0.981
LDL Cntl. Post	15	113.64±5.87	1.52			

\*Significant at 0.05 level of confidence.  $t_{0.05(14)} = 2.145$  ( $p \leq 0.05$ ).

Table 3 reveals that, for the experimental group, there are significant differences between the pre and post tests means of Hb, HDL and LDL test as the obtained values of ‘t’ = -6.19, -3.08, and 4.25, respectively, are more significant than the tabulated value of ‘t’ = 2.145 at 0.05 level of confidence ( $p < 0.05$ ). However, in the case of the control group, no significant mean differences are found in Hb, HDL and LDL as the obtained values ‘t’ = -0.13, -0.32, and 0.03, respectively, are lesser than the table value of ‘t’ = 2.145 at 0.05 level of confidence ( $p > 0.05$ ).

The graphical representations of pre and post-test means differences of experimental and control groups for Hb, HDL and LDL level have been shown at figure 1, 2 and 3.

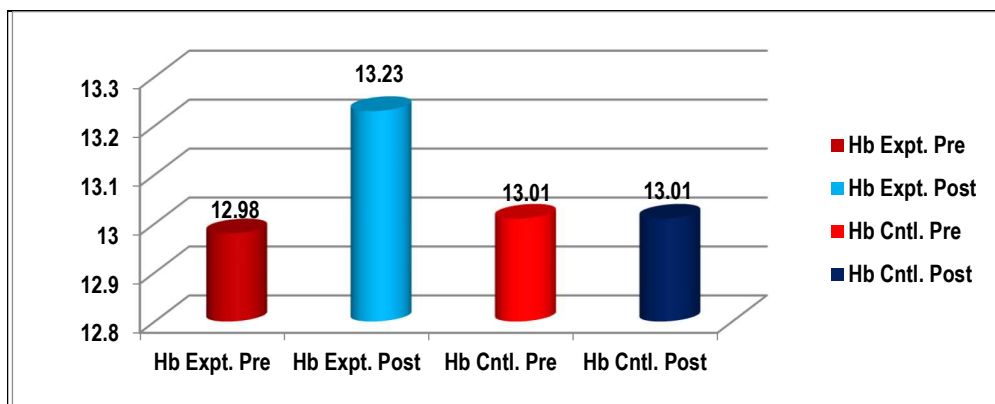


Fig. 1: Pre and Post-Test means of experimental and control groups for Hb.

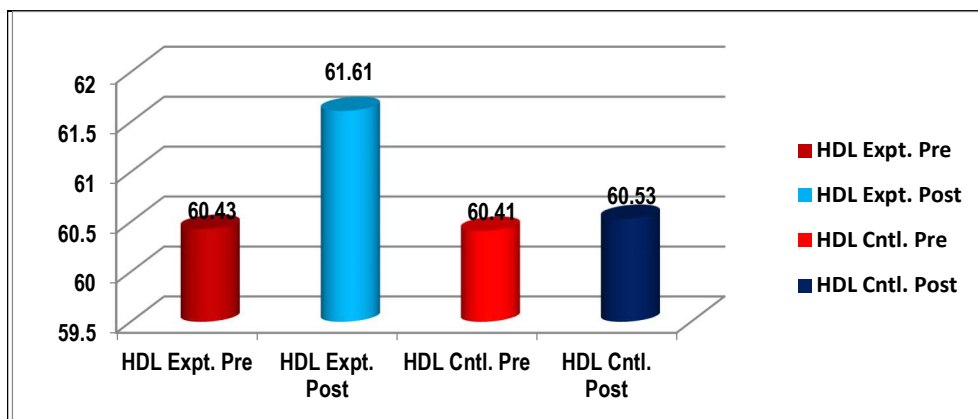
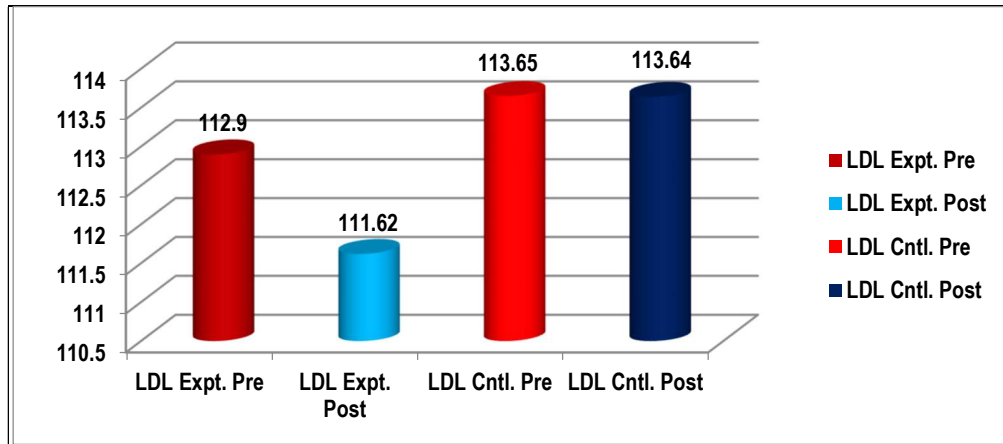


Fig. 2: Pre and Post-Test means of experimental and control groups for HDL.



**Fig. 3: Pre and Post-Test means of experimental and control groups for LDL.**

Therefore, it shows a significant effect of six-week pranayama practices on Hb, HDL and LDL cholesterol levels in the women soccer players of the experimental group. As the experimental group shows a significant improvement of pranayama practices on Hb, HDL and LDL cholesterol levels, and no significant changes in the case of the control group; further, the means of pre and post-test are compared between the experimental and control groups by employing the analysis of covariance (ANCOVA) as shown in table 4.

**Table 4: Pre and Post-test Means Comparison between Experimental and Control Groups.**

Pre-Post Comparison Groups	Means between Source	Type III Sum of Squares	df	Mean Square	F	Sig. <i>p</i>
Hb	Group	0.41	1	0.41	13.58*	0.001
	Error	0.81	27	0.03		
	Total	5176.34	30			
HDL	Group	8.65	1	8.65	5.32*	0.029
	Error	43.87	27	1.62		
	Total	112428.24	30			
LDL	Group	13.42	1	13.42	13.93*	0.001
	Error	26.01	27	0.96		
	Total	381527.72	30			

\*Significant at 0.05 level of confidence.  $F_{(1,27)} = 4.21$ , ( $N=30$ ).

Table 4 reveals that there were significant differences among the pre and post-test means comparison of Hb, HDL and LDL levels between the experimental and control groups as the



obtained critical values of 'F' =13.58, 5.32, and 13.93, respectively, are greater than the table value of 'F'= 4.21 at 0.05 level ( $p<0.05$ ). Further, it shows that the six-week pranayama practices are effective for the improvement of Hb level and maintain the good cholesterol level of women soccer players.

## 5. DISCUSSION

The objective of the study was to assess the significant effect of six-week pranayama practices on Hb, HDL and LDL of women soccer players. Higher level of Hb is required to supply more oxygen to the working voluntary and involuntary muscles during the normal and intensive activities. HDL is considered to have good cholesterol because it helps to prevent the harmful build-up of LDL on the walls of the arteries. It also provides energy and fulfills the fat requirements of the body. LDL, on the other hand, is bad cholesterol because it tends to accumulate in the walls of the arteries, thus forming plaque that can lead to serious problems such as stroke and heart attack. In games and sports, highly trained athletes need higher level haemoglobin and low level of LDL cholesterol level and high level of HDL cholesterol. Many studies had been conducted to find out the changes of haematology, lipid profiles, and other biochemical components that affect the performance of players.

In the present study, pranayama practices were employed on the women football players to investigate the significant changes of haemoglobin (Hb), high density lipoprotein (HDL) and low density lipoprotein (LDL). Statistically, the pre and post-test means and standard deviation of Hb for the experimental group were  $12.98\pm 0.57$  and  $13.23\pm 0.61$ , and for the control group were  $13.01\pm 0.63$  and  $13.01\pm 0.69$ , respectively. In the case of the HDL cholesterol, the pre and post-test means and standard deviation of the experimental group were  $60.43\pm 5.51$  and  $61.61\pm 5.95$ , and the control group were  $60.41\pm 6.37$  and  $60.53\pm 4.27$ , respectively. For LDL cholesterol, the pre and post-test means and standard deviation of the experimental group were  $112.90\pm 5.59$  and  $111.62\pm 5.51$ , and the control group were  $113.65\pm 6.37$  and  $113.64\pm 5.87$ , respectively. The paired sample t-test analysis results showed a significant difference between the pre and post-test means of Hb, HDL, and LDL for the experimental group as the obtained value of 't' = -6.19, -3.08, and 4.25, respectively, are more significant than the tabulated value of 't' = 2.145 ( $p<0.05$ ). However, there was no significant difference between the pre and post-test means of the control group in Hb, HDL and LDL as the  $p>0.05$ . Further, the result of the analysis of covariance (ANCOVA) revealed the significant differences among the pre and post-test means comparison between the experimental and control groups Hb, HDL and LDL levels as the obtained critical value of 'F' = 13.58, 5.32, and 13.93, respectively, were more significant than the table value of 'F'= 4.21.

Various researches had been conducted relevant to the present studies. A significant reduction in total triglycerides, total cholesterol, VLDL-cholesterol and LDL cholesterol, and a significant elevation of HDL-cholesterol was seen in the healthy volunteers at the end of 3 months pranayama and yogasanas [11]. There was an evidence of short term practice of pranayama that found a



significant decrease in heart rate and systolic blood pressure in young healthy volunteers [12]. The effects of Chandranadi pranayama on hematological parameters by practicing only 4 weeks was assessed and no significant differences were found in Hb, TC, LDL, HDL and TG among university level girls [13]. There was an elevation of HDL-cholesterol in men with pranayama, while triglycerides and LDL-cholesterol decreased in women after 30 days (S-I) and 60 (S-II) yoga asanas [14]. The bharamari Pranayam and Jyoti Dhyana was also found to have significant effect on hemoglobin level and alpha EEG of the students [15]. It seems yoga interventions had a substantial effect on lipid profiles, however, more qualified trials or cohort studies are needed to conclude exactly [16]. There is a report of significant decrease in the LDL cholesterol and increase in the HDL cholesterol after the short term yogic training on serum cholesterol level [17]. A significant effect could be observed with the pranayam practice on fasting blood glucose and serum cholesterol [18]. There is significant decrease in triglycerides, VLDL cholesterol, LDL cholesterol and increase in HDL cholesterol. It is also suggested the significant decrease in the total cholesterol, total triglycerides, LDL cholesterol and significant increase in the HDL cholesterol after 3 months of yogic practice [19]. It is also found that Nadi Sodhan Pranayama (NSP) plays positive significant role to enhance blood Hb level within the normal range [20]. Further, it also stated that yoga had decreased TC, LDL-C, TG and VLDL-C and increased HDL-C among yoga practitioners [21].

If proper treatment and scientific examination exist, pranayama could be a promising scope of massive definite conditions for athletes. The haemoglobin and lipid profiles play a significant role in enhancing the fitness and performance of players.

## 6. CONCLUSION

The study's findings with the different reviews clearly reveal that the six-week pranayama practices effectively changed the haemoglobin and cholesterol level of women soccer players. This study showed an increase in Hb and HDL cholesterol and a decrease in LDL cholesterol. The subjects gradually adapted to pranayama practices under the specific training programme of six-week was found. Therefore, the significant improvement of pranayama practices on women's soccer players' haemoglobin and cholesterol levels could be assessed authentically.

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## ACKNOWLEDGEMENT

The author expresses sincere thanks and gratitude to all the women soccer players, laboratory staff of SRL Diagnostic Centre and assistants who cooperated to fulfill the present study.

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