International Research Journal of Ayurveda & Yoga Vol. 8(6), pp. 11-15, June, 2025
Available online at http://irjay.com
ISSN: 2581-785X
DOI: 10.48165/IRJAY.2025.80603

ORIGINAL RESEARCH ARTICLE

Impact of Yogic Interventions on Biochemical, Physical, and Physiological Parameters among Obese Female Students (21–24 years)

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ARTICLE INFO

Article history:
Received on: 03-05-2025
Accepted on: 18-06-2025
Published on: 30-06-2025

Key words:
Body mass index and respiratory rate,
High-density lipoprotein,
Low-density lipoprotein,
YOGA

ABSTRACT

Background: In the era of electronic gadgets, where information and technology are just clicks away, the health goals are getting farther and difficult to achieve. Modern yoga is playing a key role in upgrading our lifestyle and mental peace to achieve the longevity of life. The objective of the study was to examine the effect of yogic practices on the selected biochemical, physical, and physiological variables of obese college students.

Materials and Methods: A total of 40 obese college students were selected and categorized into two groups, i.e., group 1 (yoga practice group) and group 2 (control group). All the testing and recording were done for both groups, the control group and the yoga practice group, on the baseline day and after 12 weeks of training. All the students were assessed on the same day and in the same place, hall/laboratory, to exclude the environmental factors. The biochemical variables, high-density lipoprotein and low-density lipoprotein, were assessed in the laboratory. The physiological variables, pulse rate, respiratory rate, and blood pressure, were recorded in the yoga hall. The body composition was assessed with the help of skin folds and body mass index. A total period of 12 weeks of training program was designed and practiced by the students for the purpose of the study. Descriptive analysis and one-way analysis of variance were done for the purpose of analyzing the data.

Results and Conclusion: A significant difference was found in biochemical variables and physical variables. There was also a significant difference found in systolic blood pressure. However, no significant difference was found in respiratory rate, pulse rate, and diastolic blood pressure. The findings of the research reviews express that the changes in body composition are the result of long-term training. Yoga adopted as a lifestyle practice will help improve the status of cardiovascular health and respiratory health.

1. INTRODUCTION

The importance of yoga is well known. The word "Yoga" from the Sanskrit root you ("yoke") is generally translated as the union of the individual atma (loosely translated to mean soul) with Paramatma, the universal soul**.** Patanjali's writing also became the basis for a system referred to as "Ashtanga Yoga" ("Eight-Limbed Yoga"). This eight-limbed concept is derived from the 29th Sutra of Book 2 of the Yoga Sutras. They are: Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana, and Samadhi.

Molecules called lipoproteins carry cholesterol in the blood. Two important kinds of lipoproteins are low-density lipoprotein (LDL) and high-density lipoprotein (HDL). When checking LDL and HDL, doctors often include another type of fat called triglycerides.

- Total cholesterol is a measure of the total amount of cholesterol in your blood and is based on the HDL, LDL, and triglyceride numbers.
- LDL cholesterol makes up the majority of the body's cholesterol. LDL is known as "bad" cholesterol because having high levels can lead to plaque buildup in your arteries and result in heart disease and stroke.
- HDL cholesterol absorbs cholesterol and carries it back to the liver, which flushes it from the body. HDL is known as "good" cholesterol because having high levels can reduce the risk of heart disease and stroke.
- Triglycerides are a type of fat found in your blood that your body uses for energy. The combination of high levels of triglycerides with low HDL cholesterol or high LDL cholesterol can increase your risk for a heart attack and stroke.[1]

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The heart rate/pulse rate is one of our vital signs. It is the number of times our heart contracts or beats in a minute. The pulse rate varies according to age, rest, exercise, and health status of the individual. The pulse rate and blood pressure are two separate measurements and are not necessarily increased or decreased at the same time. One's poor fitness level affects both the indicators of health adversely. Body mass index (BMI) is a measure of body fat based on height and weight that applies to adult men and women.

People who have obesity, compared to those with a normal or healthy weight, are at increased risk for many serious diseases and health conditions, including the following:[3-5]

- All causes of death (mortality)
- High blood pressure (hypertension)
- High LDL cholesterol, low HDL cholesterol, or high levels of triglycerides (dyslipidemia)
- Type 2 diabetes
- Coronary heart disease
- Stroke
- Gallbladder disease
- Osteoarthritis (a breakdown of cartilage and bone within a joint)
- Sleep apnea and breathing problems
- Some cancers (endometrial, breast, colon, kidney, gallbladder, and liver)
- Low quality of life.

The present study has the following objectives:

1. To evaluate the effect of yogic practices on selected biochemical variables
2. To assess the impact of yoga on selected physical variables
3. To determine the influence of yogic practices on selected physiological variables
4. To analyze the pre- and post-intervention changes in the selected variables
5. To explore the potential of yoga as a non-pharmacological approach.

The study of 614 residents of a rural farming community in southwestern Japan found that a heart rate >80 beats/minute during a first examination in 1979 predicted the development of obesity and diabetes, which contribute to heart problems.[6] Obesity is characterized by a stiffening of the total respiratory system,[7] which is presumed to be due to a combination of effects on lung and chest wall compliance.[8] The practice of yoga increases muscle strength and cardiorespiratory fitness and has limited side effects. This is a cost-effective training program because it requires virtually no equipment.[9] In another study, the effect of yoga therapy on BMI and oxidative status was analyzed. The study consisted of 40 obese male and female subjects. The changes in body weight, BMI, blood sugar, malondialdehyde level, and antioxidant levels were found to be statistically significant. According to Godham, he concluded that there is a significant decrease in systolic blood pressure, diastolic blood pressure, BMI, LDL, and an increase in HDL levels in the subjects practicing yoga asanas along with the Pranayama technique for a 3-month duration.[10]

2. MATERIALS AND METHODS

It is a comparative study between the control group and the yoga practice group. The group had 40 female college students, aged 20–24 years. The female students were chosen with an initial BMI of 25 and above for the purpose of the study to the effect of yogic practices on overweight and obese female college students. They were randomly categorized into the control and yoga practice groups of 20 each. Written informed consent was obtained from each students. On the very baseline day before starting the practice sessions, both groups were given 20 min of complete rest, and then the testing of physical, physiological, and biochemical variables was done. The blood pressure was recorded with a mercury sphygmomanometer in the supine position in the right upper limb by the auscultatory method. In the same resting condition, pulse rate and respiratory rate were also taken and recorded. Then and there, the blood samples for assessing LDL and HDL were also taken by the laboratory expert. Anthropometry measurements were taken by the trained examiners. The height was measured with the help of a standardized stadiometer. The weight was measured using a digital weighing scale. The skinfolds were measured with the help of a standardized skinfold caliper. The BMI was estimated using the formula BMI = Wt. (in kgs)/Ht. (in mtr)2. The same procedure was done after the completion of the total training period, i.e., 12 weeks. The yoga practice session included prayer, warming up exercises, and stretching exercises. Various yoga postures of sitting, standing, and lying asanas. Pranayama, Neti, and Dhyan were an equal and important part of the practice session.

3. RESULTS AND DISCUSSION

The influence of yoga practice on each criterion variable was analyzed separately and presented below.

Table 1 depicts that the mean differences for pre-test values have no or very less difference between the control and yoga practice groups in all the criterion variables. The mean values for post-test are significantly different, as for HDL, it is 53.35 and 58.27 for the control and yoga group, respectively. For LDL, the mean values are 135.58 and 125.12, respectively. Similarly, the post-test mean values for pulse rate, respiratory rate, B.P. systolic, and BMI are 81.05, 73.30, 17.60, 14.85, 13.30, 12.15, and 32.00, 24.19, respectively. The table also reveals the "F" ratio for the post-test on all the criterion variables, where significant differences are found on HDL, LDL, and BMI. As the tabulated "F" ratio values are 7.314, 9.737, and 14.463, respectively, more than the critical "F" value of 4.41 required to be significant at the 0.05 level of confidence.

The result of the study indicated that a significant difference was found between pre-test and post-test of the yoga practice group on biochemical variables and physical variables compared to physiological variables. This is shown in Figure 1.

With healthy living habits, the biochemical, physical, and physiological variables of health could be maintained and controlled to the desired levels of health. Regular and continuous negligence and absence of physical activity lead to a substantial loss of health.

4. CONCLUSION

1. Yogic practices significantly improved the HDL levels (good cholesterol), reduced LDL levels (bad cholesterol), and lowered BMI significantly.
2. Pulse rate and respiratory rate showed positive trends, but changes were not statistically significant.
3. Blood pressure (systolic and diastolic) remained relatively stable, with minor non-significant changes.
4. Furthermore, found that there was a significant difference between the yoga practice group and control group on HDL, LDL, and BMI.

The prevalence of overweight and obesity is increasing among all age groups, including children and adults. The research has shown its various harmful effects and greater risks for Type II Diabetes and cardiovascular diseases at an early age of life. Yoga practice is beneficial for preventing diseases and maintaining good health by regulating the biochemical levels in the body and controlling over the increasing BMI. Yoga practices are safe for all ages, cost-effective, and result-oriented with no side effects, a modality to be adopted for future practices.

5. ACKNOWLEDGMENT

Nil.

6. AUTHORS' CONTRIBUTIONS

All the authors contributed equally to the design and execution of the article.

7. FUNDING

Nil.

8. ETHICAL APPROVALS

This study is approved by the institutional ethical committee.

9. CONFLICTS OF INTEREST

Nil.

10. DATA AVAILABILITY

This is an original manuscript, and all data are available for only review purposes from the principal investigators.

11. PUBLISHERS NOTE

This journal remains neutral with regard to jurisdictional claims in published institutional affiliations.

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How to cite this article:
Sharma B. Impact of Yogic Interventions on Biochemical, Physical, and Physiological Parameters among Obese Female Students (21–24 years). IRJAY. [online] 2025;8(6);11-15
Available from: https://irjay.com
DOI link- https://doi.org/10.48165/IRJAY.2025.80603

LDL (bad) cholesterol level	LDL cholesterol category
<100 mg/dL	Optimal
100–129 mg/dL	Near optimal/above optimal
130–159 mg/dL	Borderline high
160–189 mg/dL	High
190 mg/dL and above	Very high
HDL (good) cholesterol level	**HDL cholesterol category**
<40 mg/dL	A major risk factor for heart disease
40–59 mg/dL	The higher, the better
60 mg/dL and higher	Considered protective against heart disease

Source: National Heart, Lung, and Blood Institute.[2] HDL: High-density lipoprotein, LDL: Low-density lipoprotein

Table 1: Analysis of one-way variance ANOVA of the data on HDL, LDL, pulse rate, respiratory rate, blood Pressure, and BMI for pre- and post-yoga practice of control and yoga groups

S. No.	Variables	Groups	*n*	Mean	SD deviation	F-ratio	Significant
1	HDL control	*Pre Trg*	20	53.84	6.96		
	HDL yoga		20	53.77	7.96		
	HDL control	*Post-Trg*	20	53.35	6.98	7.314*	4.41
	HDL yoga		20	58.27	8.59		
2	LDL control	*Pre-Trg*	20	134.52	20.64		
	LDL yoga		20	137.29	19.04		
	LDL control	*Post-Trg*	20	135.58	20.19	9.737*	4.41
	LDL yoga		20	125.12	17.14		
3	Pulse rate control	*Pre-Trg*	20	80.90	7.52		
	Yoga		20	78.10	4.25		
	Pulse rate control	*Post-Trg*	20	81.05	6.96	4.070	4.41
	Yoga		20	73.30	3.15		
4	Respiratory rate control	*Pre Trg*	20	16.60	2.85		
	Yoga		20	18.20	3.13		
	Respiratory rate control	*Post-Trg*	20	17.60	2.62	1.672	4.41
	Yoga		20	14.85	1.26		
5	B.P. systolic control	*Pre-Trg*	20	13.08	9.36		
	Yoga		20	13.20	9.23		
	B.P. systolic control	*Post-Trg*	20	13.30	9.09	0.541	4.41
	Yoga		20	12.15	3.66		
6	B.P. diastolic control	*Pre Trg*	20	89.75	6.58		
	Yoga		20	90.50	8.25		
	B.P. diastolic control	*Post-Trg*	20	89.50	7.76	1.566	4.41
	Yoga		20	88.75	5.09		
7	BMI control	*Pre-Trg*	20	29.13	2.69		
	Yoga		20	27.80	2.66		
	BMI control	*Post-Trg*	20	32.00	11.18	14.463*	4.41
	Yoga		20	24.19	3.80		

*Significant at 0.05 level of confidence. ANOVA: Analysis of variance, HDL: High-density lipoprotein, LDL: Low-density lipoprotein, BMI: Body mass index

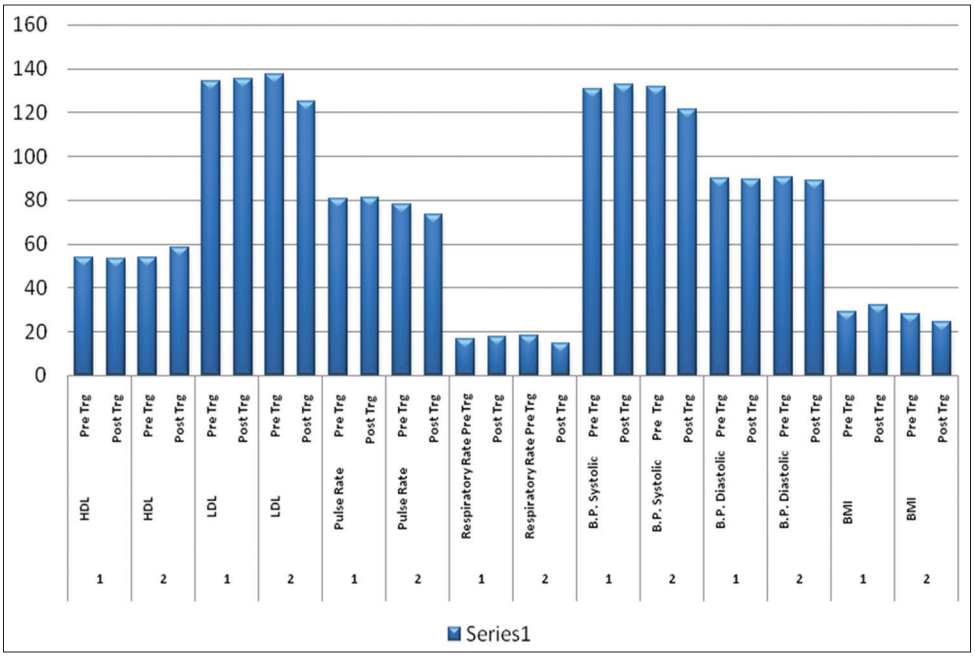

Figure 1: Graphical representation of mean scores of high-density lipoprotein, low-density lipoprotein, pulse rate, respiratory rate, blood pressure, and body mass index for pre- and post-yoga practice of control and yoga groups