European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 09, Issue 08, 2022

Original Research Article

Association Of BMI And Lipid Profile In Overweight Young Adults After 3 Months Of Yoga Practice

[1]Jay Prakash Singh Rajput, [2]Asha Gandhi, [3]Sanjiv K Bansal, [4]P.N Singh, [5]Nimarpreet Kaur, [6]Deepti Dwivedi

[1]Ph.D. Scholar, Department of Physiology, SGT Medical College & Research Institute, Gurgaon, Haryana, India
[2]Professor, Department of Physiology, SGT Medical College & Research Institute, Gurgaon, Haryana, India
[3]Professor, Department of Biochemistry, SGT Medical College & Research Institute, Gurgaon, Haryana, India
[4]Professor, Department of Physiology, GS Medical College and Hospital, Pilkhuwa, Hapur, Uttar Pradesh, India
[5]Associate Professor, Department of Physiology, SGT Medical College & Research Institute, Gurgaon, Haryana, India
[6]Assistant Professor, Department of Physiology, SGT Medical College & Research Institute, Gurgaon, Haryana, India

Corresponding Author:
Dr. Nimarpreet Kaur

ABSTRACT

Background: Many studies have applied aspects of Yoga to different health conditions. Obesity is a major health problem and the 5th leading risk for death globally. Reasons for these health problems are improper lifestyle and stress, which cause hormonal and chemical imbalance and disturb the proper coordination of metabolic and biochemical functions. So, the aim and objective of the present study is to assess the beneficial effects of 3 months of yoga practice on BMI, and lipid profile as well as correlate BMI with lipid parameters in overweight medical students between the age group 18-24 years.

Material and Methods: This prospective follow-up study included 50 Medical students having overweight of either sex (male & female) as per the inclusion criteria. Their BMI, and Lipid Profile were estimated before the start of yoga, after 6 weeks and 12 weeks of yoga practice, and their mean values were compared from baseline by using student t-Test, and correlation was done by using Pearson correlation test.

Results: Statistically significant decreased mean values of BMI, TC, TG, LDL, and VLDL were recorded when compared from baseline. Pearson's correlation coefficient analysis between the BMI, TC and TG at three levels of yoga practice was statistically significant.

Conclusion: Yoga therapy is useful to overcome the complications of obesity. It is one of the non-pharmacological and cost-effective therapies to maintain better health by regulating BMI and other biochemical functions of the body.

Keywords: Yoga, body mass index, lipid profile, overweight, meditation

ISSN 2515-8260 Volume 09, Issue 08, 2022

INTRODUCTION

Obesity is the commonest hazardous factor found in modern sedentary society. It is a multifaceted disorder of today's world that has emerged as the most prevalent sedentary lifestyle disorder in urban society. Obesity-associated diseases are cardiovascular diseases, Type-2 Diabetes Mellitus, Obstructive sleep apnea, certain types of cancer osteoarthritis, etc. and it's the 5th leading risk for death globally [1, 2]. Obesity is defined as an excess accumulation of fat due to positive energy balance, resulting from energy intake that exceeds the energy expenditure, leading to adipocyte hypertrophy and hyperplasia, stress, and inflammation within the adipose tissue [3] (WHO. 2009). 30-65% of the Indian population are overweight or obese [4]. According to Epidemiologists reports, young people are more prone to obesity and alarming a series of lifestyle diseases [5]. Research is being carried out to find linkages between obesity and other chronic conditions and is a casual approach to the prevention and treatment of overweight and obesity [6].

Increased morbidity and mortality from a host of conditions and diseases, including cardiovascular disease, and autonomic imbalance may be a final common pathway. The autonomic nervous system plays a fundamental role to control blood pressure and heart rate and may be an important pathophysiological factor in the development of hypertension [7].

The simple and economical therapeutic modality is Yoga which may be considered a favorable adjuvant for many health problems. Yoga therapy is a two-fold healing system that prevents and cures various disorders through the practice of the yoga system. This system focuses on the purification of body and mind, through this integrated holistic approach one can defeat almost all kinds of health disorders in life. Low-impact physical exercise is yoga and is used for therapeutic purposes [8, 9, 10].

Yoga Asanas have been practiced since the Vedic period in India and were synchronized systematically, as known today, by Sage Patanjali. He defined yoga as a systematic practice for purifying one's mind, intellect, and body. In the current scenario, human beings are under stress from many chronic diseases, lifestyle disorders, non-communicable diseases, etc. Improper lifestyle and stress are major causes of all these diseases found by many researchers [1].

The ancient Indian science of yoga reveals the changes in mental attitude, diet, and the practice of specific techniques such as yoga postures (*asanas*), breathing practices (*pranayamas*), and meditation [11]. A combination of yoga asanas which emphasized breathing techniques was shown to reduce the body mass index in obese persons after yoga intervention [12]. So, yoga may be an attractive alternative exercise training program to reduce body weight and stress levels without any side effects [13].

In the current scenario, Western countries have shown interest in yoga and it is measured as one of the most significant methods of complementary medicine in the United States. Yoga is not primarily a treatment, but medical and scientific studies have proved a significant role of yoga in treating some diseases such as carpal tunnel syndrome, multiple sclerosis, asthma, mental health issues, cancer, irritable bowel syndrome, hypertension, quality of life, coronary heart disease, and chronic obstructive pulmonary disease within the past two decades [14].

Very few studies have reported the effect of yoga on anthropometric parameters, cardiovascular status, and lipid profile in overweight individuals. It is a well-known fact that youngsters are under great stress and have a mostly sedentary lifestyle. In view of this, the study is framed to assess the positive effects of yoga, if any, on anthropometric parameters,

ISSN 2515-8260 Volume 09, Issue 08, 2022

cardiovascular status, and lipid profile in overweight medical students between the age group 18-24 years.

Materials & Methods

Study design

After obtaining the institutional ethical committee approval, this study was carried out in the Department of Physiology, Faculty of Medicine and Health Sciences, SGT (Shree Guru Gobind Singh Tricentenary) University Gurugram, Haryana in collaboration with the Department of Physiology, GS Medical College & Hospital Pilkhuwa, Hapur. 50 overweight (BMI $\geq$ 25-29.9Kg/m^2) medical students between 18-24 years of age were enrolled after obtaining ethical approval from Institutional ethical committee. Informed and written consent was taken from all the students before enrollment into the study. All the subjects were supposed to do yoga practice for 45 minutes for six days a week between 7 AM to 8 AM for a continuous 3 months under the direct supervision of a trained yoga expert (Table 1). Subjects with a medical history of any disease and on any type of medication such as hypolipidemic drugs, hormonal therapy, or steroids were excluded from this study. Subjects who were practicing any type of physical exercise were also excluded. All parameters were recorded at a moderate temperature of 25 to 28 ^oC in the Department of physiology at 8:00 am at baseline, after 6 weeks and 12 weeks.

Anthropometric measurements

The body weight of the individuals was recorded by using Omron digital body weighing scale, HN-283 model, to the nearest 0.1 kg. Height was recorded by using a fixed stadiometer manufactured by Easy Care Model to the nearest 0.1 cm. Using Quetelet's Index formula, BMI was calculated by weight (kilograms) divided by the square of the height (meters) which is expressed as kg/m2.

Blood samples collection and biochemical analysis

5 ml of fasting venous blood in plain vacutainer was collected after 12 to 14 hours of the last meal for biochemical analysis before the start of the yoga practice and at the 3rd and 6thweek after the start of yoga practice to assess the changes. After blood collection, the serum was separated using a centrifuge machine at 5000rpm for 5 minutes. All parameters of the lipid profile were assessed daily by using the Erba Diagnostics Kit. Total cholesterol (TC) was assessed in serum by the CHOD-PAP method. Triglyceride (TG) was assayed in serum by the method of GPO-PAP Endpoint assay. HDL-cholesterol by (CHOD-PAP) method. LDL-c and VLDL-c were calculated BY FRIEDEWALD'S FORMULA. (LDL-c = TC-(HDL-c + VLDL-c).
VLDL-c = TG/5) Independent standard graphs for each test were used to decide their measured results; the intra-run Coefficient of Variance was <10 % for all the parameters.

Statistical analysis

Data was prepared in an Excel sheet and coded numerically to maintain the confidentiality of

ISSN 2515-8260 Volume 09, Issue 08, 2022

the subjects. Statistical evaluation was performed by using the Statistical Package of Social Sciences (SPSS) system 20.0. Intra-group comparison of parameters was done by a paired t-test. Correlation analysis was done using Pearson's correlation coefficient to determine the relationship between BMI and lipid profile. $p<0.05$ was considered significant, and $P<0.001$ was considered highly significant.

Results

BMI and parameters of lipid profile were analyzed of all 50 overweight subjects who were followed at baseline, after 6 and 12 weeks of yoga practice. After starting yoga, decreased mean values of BMI, TC, TG, LDL and VLDL were recorded when compared to their baseline. The highest significant changes ($p\leq.001$) [Table 1] in parameters of lipid profile were noticed after 12 weeks of yoga practice compared to 3 weeks of the start of yoga practice and from baseline. Pearson's correlation coefficient analysis for associations obtained between the BMI, TC, and TG at three levels of yoga practice are presented in [Table 3], which was statistically significant. An inverse relationship was found between BMI and HDL cholesterol, but it was statistically not significant.

Table 1: Yoga Asanas

S. N.	Yoga Asanas, Pranayama, Meditation	Minutes
1.	Surya Namaskar	10 (5 rounds)
2.	Ardha Chakrasana	1
3.	Trikonasana	1
4.	Uttanpadasana	1
5.	Viparita Karani	1
6.	Naukasana	1
7.	Pawanmuktasana	1
8.	Shavasana	5
9.	Bhujangasana	1
10.	Shalabhasana	1
11.	Dhanurasana	1
12.	Navaasana	1
13.	Kapal Bhati	3
14.	Bhastrika	3
15.	Alternate nostril breathing	5
16.	Right nostril breathing	3
17.	Om meditation	5

ISSN 2515-8260 Volume 09, Issue 08, 2022

Table 2: Comparison of BMI and biochemical mean values in overweight subjects at baseline, 3rd week and 12th week

Variables	Baseline (N=50) (Mean ± SD)	After 3rd week (N=50) (Mean ± SD)	After 6th week (N=50) (Mean ± SD)
Weight (kg)	72.5±8.1[b,c]	70.5±8.2[a.c]	67.9±7.8[a,b]
BMI (kg/m^2)	26.4± 1.4[c]	25.6±1.5[a,c]	24.7±1.4[a,b]
TC (mg/dl)	195.6±24.4[c]	194.0±23.6[c]	181.3±23.1[a,b]
TG (mg/dl)	175.7±83.0[c]	174.0±78.5[c]	161.2±74.4[a,b]
HDL (mg/dl)	42.4±6.2[c]	42.5±6.1[c]	44.0±6.3[a,b]
LDL (mg/dl)	118.0±23.5[c]	116.6±23.4[c]	105.0±23.7[a,b]
VLDL(mg/dl)	35.1±16.6[c]	34.8±15.7[c]	32.2±14.8[a,b]

BMI: body mass index, SBP: systolic blood pressure, DBP: diastolic blood pressure, TC: total Cholesterol, TG: triglyceride, HDL: high density lipoprotein, LDL: Low density lipoprotein, VLDL: Very low density lipoprotein $p<0.001$ is significantly denoted as 'a' for baseline, 'b' for after 3rd week, 'c' for after 6th week.

Table 3: Correlation of BMI with variables at baseline, 3rd week and 6th week

Variable		Baseline (N=50)	After 3rd week (N=50)	After 6th week (N=50)
TC (mg/dl)	*r*	0.643	0.658	0.548
	p	0.000**	0.000**	0.000**
TG (mg/dl)	*r*	0.649	0.649	0.598
	p	0.000**	0.000**	0.000**
HDL (mg/dl)	*r*	-0.190	-0.190	-0.100
	p	0.186	0.187	0.489

BMI: body mass index, TC: total Cholesterol, TG: triglyceride, HDL: high density lipoprotein, $p<0.001$ is significantly denoted as 'a' for baseline, 'b' for after 3rd month, 'c' for after 6th month.

Discussion

The present study confirmed the beneficial effects of yoga therapy to improve different biochemical parameters as well as BMI in overweight subjects. Body mass index is the easiest way to measure a person's fatness and thinness, which facilitates discussing overweight and underweight problems. BMI above 30 has been proven to reduce life expectancy by two to ten years [15, 16]. A reduction in body weight and BMI was observed in our study after 6 and 12 weeks of yoga practice. It was statistically significant after 12 weeks of yoga practice when compared to the baseline and after 6 weeks of yoga practice, which is similar to the study of Jayaram Gadham that found a statistically significant reduction in BMI after 3 months of yoga practice [17]. Another study also showed a decrease in BMI and body weight after one month of yoga practice and only after 6 days of yoga program [15, 11]. Increased body mass is the

ISSN 2515-8260 Volume 09, Issue 08, 2022

indication of an imbalance in various body parameters which is due to an unhealthy lifestyle and mental stress. To overcome the stress a person becomes used to overeating, which leads to the deposition of fat. It has become necessary to reduce mental stress and to do sufficient physical activities to manage overweight and obesity. Our results show that yoga practice can regulate all body functions and can reduce complications of obesity. The reduction in deposited fat in adipose tissues may be the reason for the reduction in body weight.

In our study after 12 weeks of yoga practice, we observed improvement in the various lipid profile parameters. It shows a decrease in total cholesterol, triglyceride, LDL, VLDL, and increased HDL after 6 and 12 weeks of yoga practice. This result is statistically significant ($p \leq .05$) after 12 weeks of yoga practice. A study by Sahay *et al*. also observed a significant reduction in TC and increased HDL after 6 months of yoga practice [18]. Previous studies showed decreased TC, TG, LDL, VLDL, and increased HDL after yoga practice but it was not statistically significant [17, 19]. Several techniques of yoga are helpful to manage the imbalance at the mental, emotional and physical levels which are claimed to manifest in biochemical changes [20].

The association between blood lipids and body fat distribution has been under discussion over the past few decades. Lipid parameters and body fat have been confirmed to be key determinants of metabolic disorders like diabetes, cardiovascular diseases, hypertension, hyperinsulinemia, dyslipidemia, and elevated serum uric acid [21].

The present study revealed that serum cholesterol and serum triglyceride levels were lower with low values of BMI. In the relationship between BMI and lipid profile, this study showed that BMI has no significant correlation with HDL-C value while the other parameters like TC and TG ($p \leq .001$) show a positive correlation with BMI. Observation of a study which was conducted in Korea demonstrates that there was a positive correlation between BMI with TC and LDL-C. A study conducted in India revealed the presence of only BMI vs. LDL-C correlation [22, 23]. A negative correlation of HDL-C with BMI was also reflected by a similar study conducted in Nigeria [24]. Similarly, a study conducted by Shamai *et al*. shows there was a correlation between BMI, HDL-C and TG [25]. Association of Lipid profiles is reported with lifestyle, age, intra-abdominal adiposity, obesity and BMI.

CONCLUSION

Our study shows that yoga practice has beneficial effects to combat the disorders linked with obesity. Yoga practice may have protective and therapeutic effects on obesity and lipid profile. The curative medicines used for these disorders are not long-term effective and give temporary relief. Yoga is one of the non-pharmacological, preventive, curative, and cost-effective therapy to provide benefits and maintain better health by regulating BMI and other biochemical functions of the body.

Acknowledgments

Authors wish to express their gratitude to Yoga Instructor, GS Ayurveda Medical College, Hapur for imparting yoga practices to the students. The authors are also grateful to all the subjects who volunteered and co-operated in all respects during the study. We thank Dr. Dimpal Rochlani, Assistant Professor, department of biochemistry, GSMCH, Hapur, UP for her valuable guidance and assistance during the recording sessions, data entry, data analysis,

and paper writing.

Conflict of interest

Authors have declared that there is no conflict of interest.

REFERENCES

1. Suchetha KN, Damodara KM, Sukesh N, Madhu LN, Kathyayani. Effect of yoga therapy on body mass index and oxidative status. NUJHS. 2011;1:1-3.
2. World Health Organization. Fact Sheet for Overweight and obesity, 2013.
3. WHO experts Committee on Obesity and overweight. World Health Organization Global strategy on diet, physical activity and health. Geneva, WHO, 2009.
4. Chopra M, Galbraith S, Darnton-Hill I. A global response to a global problem. The epidemic of over nutrition. Bull World Health Organ. 2002;80:952-958.
5. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of Obesity in the United States, 2009-2010. NCHS, 2012, 82.
6. Adams GB, Marcia A. The association between obesity, depression, and anxiety: Evidence from a community health needs assessment survey. J Ga Public Health Assoc., 2016, 5(3).
7. Goldstein DS. The fact of organization. Stress, Catecholamine's, and Cardiovascular Disease. New York, Oxford University Press, 1995, 56-102.
8. Ross A, Thomas S. The health benefits of Yoga and Exercise: A review of comparison of studies. The Journal of Alternative and Complementary Medicine. 2010;16(1):3-12.
9. McCall, Timothy. Yoga as Medicine: the yogic prescription for health and healing: a yoga journal book. Bantam, New York, 2007, 17.
10. Syman Stefanie. The Subtle Body: The Story of Yoga in America. Macmillan, 2010, 268-273.
11. Telles S, Naveen VK, Balkrishna A, Kumar S. Short term health impact of a yoga and diet change program on obesity. Hyperlink. 2010;16(1):CR35-40.
12. Gokal R, Shillito L, Maharaj SR. Positive impact of yoga and Pranayam on obesity, hypertension, blood sugar and cholesterol: a pilot assessment. J Altern Complement Med. 2007;13(10):1056-1057.
13. Collins C. Yoga: intuition, preventive medicine, and treatment. J Obstet Gynecol Neonatal Nurs. 1998;27(5):563-568.
14. Azami M, Hafezi Ahmadi MR, Yekta Khushali MH, Qavam S. Effect of yoga on lipid profile and C-reactive protein in women. Int. J Prev. Med. 2019;10:81.
15. Kumari NS, Gowda MD, Madhu LN. Effect of yoga therapy on body mass index and oxidative status. Nitte Univ. J Health Sci. 2011;1(1-3):19-22.
16. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. Jama. 2004 Mar;291(10):1238-45.
17. Gadham J, Sajja S, Rooha V. Effect of yoga on obesity, hypertension and lipid profile. Int. J Res Med Sci. 2015 May;3(5):1061-5.
18. Sahay BK. Yoga and diabetes. J Assoc. Physicians India. 1986 Sep;34(9):645-8.
19. Tundwala V, Gupta RP, Kumar S, Singh VB, Sandeep BR, Dayal P, *et al.* A study on effect of yoga and various asanas on obesity, hypertension and dyslipidemia. Int. J Basic Appl. Med. Sci. 2012;2(1):93-8.
20. Madanmohan AB, Dayanidy G, Sanjay Z, Basavaraddi IV. Effect of yoga therapy on reaction

ISSN 2515-8260 Volume 09, Issue 08, 2022

time, biochemical parameters and wellness score of peri and post-menopausal diabetic patients. Int. J Yoga. 2012 Jan;5(1):10-5.

21. Hussain A, Ali I, Kaleem WA, Yasmeen F. Correlation between Body Mass Index and Lipid Profile in patients with Type 2 Diabetes attending a tertiary care hospital in Peshawar. Pakistan Journal of Medical Sciences. 2019 May;35(3):591.
22. Choi S, Tan E. Anthropometric measures and lipid CHD risk factors in Korean Immigrants with Type 2 Diabetes. J Cardiovasc Nurs. 2011;26(5):414-422.
23. Himabindu Y, Sriharibabu M, Alekhya K, Saisumanth K, Lakshmanrao N, Komali K. Correlations between anthropometry and lipid profile in type 2 diabetics. Indian J Endocrinol Metab. 2013;17(4):727-729.
24. Omotoye FE, Fadupin GT. Effect of body mass index on lipid profile of type 2 Diabetic patients at an urban tertiary hospital in Nigeria. IOSR-JDMS. 2016;15(9):65-70.
25. Shamai L, Lurix E, Shen M, Novaro GM, Szomstein S, Rosenthal R, *et al*. Association of body mass index and lipid profiles: evaluation of a broad spectrum of body mass index patients including the morbidly obese. Obes. Surg. 2011;21(1):42-47.