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Original Research Article

A study of the effect of yoga on C-reactive protein, lipid profile and insulin resistance in obese patients

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ABSTRACT

Background: Obesity is defined as a state of excess adipose tissue mass. In the last decade, there has been an alarming prevalence of obesity in the developed and developing countries like India. While modern medicine has so far been unable to control the menace of obesity, yoga offers an alternative holistic approach to tackle the problem of obesity by inculcating an approach towards balanced diet (Satwik aahar), physical activity and behavior modification (through pranayama). In this study, we have included the core anthropometric parameters of obesity, as well as associated abnormalities secondary to obesity like, insulin resistance, glucose intolerance, hypertension, atherogenic dyslipidemia.
Methods: The study was conducted in the department of medicine, L. L. R. M. Medical College and associated S. V. B. P. Hospital, Meerut, U.P. during 2020-2021 with the objective to assess the role of yoga therapy in modifying anthropometric and biochemical parameters of obese patients. It was a prospective, controlled trial in which 120 obese patients (BMI≥25 kg/m^2) were enrolled and followed for a period of six months.
Results: Yoga therapy along with dietary restrictions is highly effective in improving the various anthropometric and biochemical parameters in obese patients and also beneficial in controlling complications like hypertension, diabetes and dyslipidemias secondary to obesity. It also improved the quality of life of these patients.
Conclusions: This study is a modest attempt to ascertain the role of yoga in obesity and it hopes to encourage further research in the field.

Keywords: Yoga, Obesity, Insulin resistance, Anthropometric parameters, Clinical parameters

INTRODUCTION

According to WHO, obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health. Obesity is a chronic and stigmatizing disease that is causally related to serious medical illnesses, impaired quality of life, and considerable economic burden due to increased health care costs and loss of productivity. Obesity is a leading preventable cause of death worldwide, with increasing rates in adults and children. Obesity increases the risk for type 2 diabetes through induction of insulin resistance.[1] HOMA-IR (Homeostatic model assessment of insulin resistance) has been used to quantify insulin resistance.

Yoga is beneficial in large number of medical diseases like obesity, hypertension, diabetes, gastroesophageal reflux diseases, migraine, chronic backache, bronchial asthma, dysmenorrhoea, HIV/AIDS and many other problems. It is heartening to see that modern medical communities are also accepting the beneficial role of yoga in many diseases. We hope that in future, yoga will be an important part of medical management of a large number of diseases.

Yoga has been shown to be a simple and economical therapeutic modality that may be considered as a beneficial adjuvant for many of the health problems. Yoga therapy is the two fold therapeutic system that prevents and cures various diseases through practice of yoga system.

This system concentrates on purification of body and mind, through this integrated holistic approach one can overcome almost all kinds of afflictions in life.[2-4] It is a kind of low-impact physical exercise, and is used for therapeutic purposes. Yogasanas have been practiced in India from Vedic period and was coordinated and organized in a systematic way, as known today, by sage Patanjali. He defined yoga as a systematic practice for purifying one's mind, intellect and body.

The following theories have been postulated, as the mechanisms, by which yoga may show beneficial effect in patients who are obese, in controlling body mass index, dyslipidemias and further cardio-vascular and other illnesses attributed to obesity: a study was undertaken by Azami et al to assess the effect of yoga on lipid profile and C-reactive protein in women.[5] After a 26-week follow-up for participants, only 24 women had the necessary criteria to be included in the study. Thereby concluding that, yoga reduced TC and LDL-C significantly, but had no significant effect on TG, HDL-C, and CRP.

Singh et al

This study, was aimed to see if yoga-asanas and pranayama have any influence in modifying certain biochemical parameter.[6] Results showed a significant improvement in all the biochemical parameters in group (yoga group) while other group showed significant improvement in only few parameters, thus suggesting a beneficial effect of yoga regimen on these parameters in patients.

Gordon et al

The study demonstrate the efficacy of Hatha yoga exercise on fasting blood glucose, lipid profile, oxidative stress markers and antioxidant status in patients with type 2 diabetes and suggest that Hatha yoga exercise and conventional PT exercise may have therapeutic preventative and protective effects on diabetes mellitus by decreasing oxidative stress and improving antioxidant status.[7]

Netam et al have demonstrated beneficial effects of short-term yoga-based life- style intervention programme on diabetes risk factors in obese individuals.[8] This study also highlighted the challenges in sustainability of this intervention during the follow up period.

McDermott et al did a pilot study to look at the effect of yoga in individuals at a high risk for diabetes. Each yoga session lasted for 75 min.[9] The study group showed a significant weight loss, reduction in waist circumference and an improvement in psychological well-being.

Bijlani et al observed the short term impact of yoga life style modification and concluded that all biochemical parameters of metabolic abnormalities improved.[10] Tulpule et al reported the beneficial effect of yogic asanas in controlling blood pressure, weight and cholesterol levels in patients of CAD.[11] Manchanda et al reported significant improvement in multiple metabolic risk factors and regression of coronary atherosclerosis using a comprehensive lifestyle change package that included diet, physical activity, and yoga.[12]

Agrawal et al evaluated the beneficial effects of yoga and meditation in metabolic syndrome. The result showed that yoga is anti-aging, lowers blood pressure, and is beneficial for treating metabolic syndrome.[13] Waist circumference, Blood sugar and Triglycerides were significantly lowered and good cholesterol (HDL) was higher in yoga group as compared to control group. Our study also showed significant improvement in HDL- cholesterol and triglyceride levels in yoga group, as compared to control. There was also non-significant reduction in total and LDL-cholesterol levels.

Schmidt et al, 1997 and Selvamurthy et al, 1998 very convincingly demonstrated that regular yoga practice is as effective as medical therapy in controlling hypertension.[14,15] This was further substantiated in a study by Murugesan et al, 2000.[16] The lifestyle heart study by Ornish et al, 1990 demonstrated the usefulness of comprehensive lifestyle changes along with certain yogic practices in ameliorating multiple cardiovascular risk factors and causing regression of atherosclerosis.[17] Bera et al, Mahajan et al observed the effect of santhi kriya on certain psycho-physiological parameters with a significant decrease in body weight.[18,19] Studies on beneficial effects of yoga in recent years include the study by Rshikesan et al, who suggested that yoga practice is effective for obesity control and weight-related psychological difficulties.[20]

The study was conducted at L. L. R. M. Medical College and associated S. V. B. P. Hospital, Meerut. The objective of this study were (a) to determine the effect of yoga on lipid profile in obese individuals; (b) to determine the effect of yoga on C-reactive protein in obese individuals; (c) to study the effect of yoga on insulin resistance in obese individuals; and (d) to study the effect of yoga on anthropometric parameters and BMI of obese patients.

METHODS

This study was conducted at department of medicine, L.L.R.M. Medical College, Meerut from April 2020 to August 2021.

Type of study

This was a prospective, randomized, interventional study.

Details of the participants

Recruitment

From patients attending general medicine OPD at S.V.B.P. Hospital Meerut for minor complaints unrelated to obesity.

Sample size

The sample size was 120 participants.

Inclusion criteria

Patients between the age of 18 and 60 years. BMI≥25 kg/m^2. The participants should be willing to practice yoga and follow the dietary recommendations/ give written informed consent.

Exclusion criteria

Pregnant women. Persons who have undergone any major surgery in the last 1 year. Obesity secondary to medication (e.g., steroids, medicines for psychiatric disorders, musculoskeletal disorders, epilepsy, osteoporosis).

Persons who have practiced yoga earlier (3 days/week for last three months). Persons who are taking any special diet, supplement, medicine for obesity. Any physical deformity which prevents them from doing yoga e.g., a paralyzed limb. Patients with type-2 diabetes mellitus who have complications. Patients with hypertension of stage-II and above.

Study design

120 subjects meeting the inclusion criteria were assessed thoroughly with proper clinical assessment and requisite investigations.

Participants were randomly allotted into two groups of 60 participants, each. Group A included participants practicing yoga. Group B included participant's not practicing yoga. The participants were assessed 3 times i.e.; at 0 months (baseline), then 3 months and 6 months after beginning the yoga practice.

Step 1

Assessments- Signed informed consent. Anthropometric assessments done i.e. Blood Pressure, Weight, Height, BMI, waist circumference, Hip circumference, Waist: Hip ratio. Patient's Fasting Lipid Profile, C reactive protein, Fasting and Post Prandial blood sugar and fasting insulin levels were assessed in both the groups on 1st visit (0 month).

Step 2

Started the intensive yoga classes for a week

Step 3

Participants in the yoga group were asked to attend online yoga classes 3 times/week and for the rest of the days of the week they practiced the yoga module at their home. This schedule was for 3 months.

Step 4

All participants were assessed after 3 months.

Step 5

Step 3 was repeated for next 3 months.

Step 6

Assessments were done again after next 3 months (i.e., 6 months from the beginning). Participants in the Yoga group were advised Yoga- based lifestyle. Concept of yoga which includes correct routines, sleep habits, cultivation of faith and positive attitudes, saatvik yogic diet, were explained to the participants. Assessment schedule of study subjects is given in Table 1.

Table 1: Assessment schedule of study subjects.

Assesment paramètres	At the beginning	Months					
		1	2	3	4	5	6
Detailed general physical examination	✓	-	-	✓	-	-	✓
Fasting blood sugar	✓	✓	✓	✓	✓	✓	✓
Post prandial blood sugar	✓	-	-	✓	-	-	✓
Serum urea	✓	-	-	-	-	-	✓
Serum creatinine	✓	-	-	-	-	-	✓
C reactive protein	✓	-	-	✓	-	-	✓
Serum insulin level	✓	-	-	✓	-	-	✓
Fasting lipid profile	✓	-	-	✓	-	-	✓
Insulin resistance calculation by HOMI-IR	✓	-	-	✓	-	-	✓

Investigations

Fasting blood sugar (FBS). Fasting serum insulin along with FBS from the same prick. Fasting lipid profile including serum total cholesterol, triglyceride, HDL, LDL and VLDL. C reactive protein value. HOMA-IR: fasting insulin (µU/l)×fasting glucose (nmol/l)÷22.5 for insulin resistance quantification. The yoga class was designed by trained professional. The class was of sixty minutes duration and it started with 20 minutes of Pranayama, followed by 40 minutes of asanas which included 10 minutes of sitting postures, 15 minutes of Standing and

Prone postures followed by 15 minutes of supine postures. A booklet illustrating the technique of these asanas along with dietary restrictions, was given to the subjects for their independent practice. Yoga class by yoga instructor (Figure 1-4).

Figure 1: Warm up exercises.

Figure 2: Adhomukh svanasana.

Data analysis

For statistical analysis, results were tabulated. Mean of each parameter and standard deviation along with change in these parameters were calculated for each group at baseline and at six months, all the data were expressed till two decimal places and presented as ±SD unless stated otherwise.

Significance of difference within each group was calculate by paired t-test and between study and control groups was calculated by independent t-test. The significance level of 5% has been considered for reporting the results. The calculations were done either manually or using Statistical package for social sciences (SPSS) (Statistical Package for Social Sciences) software.

Figure 3: Tadasana.

RESULTS

While in group A (patients undergoing yoga therapy), out of 60 patients who were enrolled, 46 patients (76.67%) completed 6 months follow up and the rest were lost to follow up; in the group B (patients not on yoga therapy), out of 60 patients, 45 patients (75%) completed 6 months follow up, and the rest were lost to follow up.

The baseline characteristics of the patient population are detailed in Table 2. All data are presented as ±1 SD unless stated otherwise. It can be seen from the above table (Table 2) that there was no significant difference between the study and control groups at baseline in any of the characteristics examined (independent t-test $p>0.05$), thus it can be inferred that both groups reflect the same population. Results of individual parameters tabulated in Table 3-10.

Table 2: Demographic data of study population.

S. no.	Parameters	Group-A (study group)	Group-B (control group)	P value (independent t-test)
1.	Mean BMI (kg/m^2)	30.38±2.10	30.74±1.89	0.39
2.	Mean waist circumference (cm)	92.15±8.31	93.04±6.84	0.57
3.	Mean hip circumference (cm)	107.00±8.18	106.91±6.98	0.95
4.	Mean waist:hip ratio	0.858±0.04	0.865±0.04	0.40
5.	Mean systolic BP (mmHg)	141.17±11.47	141.64±11.90	0.85
6.	Mean diastolic BP (mmHg)	88.83±7.37	87.78±7.65	0.51
7.	Mean fasting blood sugar (mg%)	119.52±22.76	119.44±24.90	0.98
8.	Mean post-prandial blood sugar (mg%)	164.30±48.64	172.31±49.73	0.43

Continued.

S. no.	Parameters	Group-A (study group)	Group-B (control group)	P value (independent t-test)
9.	Mean serum total cholesterol (mg%)	216.52±26.00	215.44±27.82	0.85
10.	Mean serum HDL-cholesterol (mg%)	40.98±8.95	40.60±9.21	0.84
11.	Mean serum triglyceride (mg%)	178.02±37.85	179.09±36.42	0.89
12.	Mean serum LDL-cholesterol (mg%)	122.46±23.33	122.67±23.18	0.96
13.	Mean age (years)	37.97±9.47	37.22±10.17	0.69
14.	C reactive protein	10.62±1.732	10.64±1.74	0.41
15.	Insulin resistance (using HOMA IR index)	2.313±0.502	2.303±0.502	0.39

Note: BMI= Body mass index; BP= blood pressure; HDL=high density lipoprotein; LDL= low density lipoprotein.

Table 3: BMI at baseline and at 6 months.

Groups	Baseline Mean BMI (kg/m^2)	At six months-Mean BMI (kg/m^2)	Mean difference	Percentage difference	P value within the group (paired t-test)
Group-A (yoga group)	30.38±2.10	27.34±1.72	-3.04	-10.01%	<0.05
Group-B (control group)	30.74±1.89	30.53±1.86	-0.21	-0.68%	>0.05
P value (independent t-test)	0.392	<0.05			

Table 4: C reactive protein at baseline and at 6 months.

Groups	CRP level (mg/l)	CRP level (mg/l)	Mean difference	Percentage difference	P value within the group (paired t-test)
Group-A (yoga group)	10.62±1.732	9.97±1.86	-0.65	-6.1%	<0.05
Group-B (control group)	10.64±1.74	10.32±1.68	-0.32	-3.0%	>0.05
P value (independent t-test)	>0.05	>0.05			

Table 5: Serum total cholesterol level at baseline and at 6 months.

Group	Baseline total cholesterol level (mg%)	At six months-total cholesterol level (mg%)	Mean difference	Percentage difference	P value within the group (paired t-test)
Group-A (yoga group)	216.52±26.00	203.54±23.12	-12.98	-5.99%	<0.05
Group-B (control group)	215.44±27.82	212.13±27.23	-3.31	-1.54%	>0.05
P value (independent t-test)	0.85	<0.05			

Table 6: Serum HDL-cholesterol at baseline and at 6 months.

Group	Baseline HDL-cholesterol level (mg%)	At six months-HDL-cholesterol level (mg%)	Mean difference	Percentage difference	P value within the group (paired t-test)
Group-A (yoga group)	40.98±8.95	48.20±6.23	+7.22	+17.61%	<0.05
Group-B (control group)	40.60±9.21	40.22±7.57	-0.38	-0.94%	0.537
P value (independent t-test)	0.84	<0.05			

Table 7: Serum triglyceride level at baseline and at 6 months.

Group	Baseline triglyceride level (mg%)	At six months-triglyceride level (mg%)	Mean difference	Percentage difference	P value within the group (paired t-test)
Group-A (yoga group)	178.02±37.85	154.65±33.75	-23.37	-13.12%	<0.05
Group-B (control group)	179.09±36.42	176.73±36.03	-2.36	-1.31%	>0.05
P value (independent t-test)	0.89	<0.05			

Table 8: Serum LDL-cholesterol at baseline and at 6 months.

Group	Baseline LDL-cholesterol level (mg%)	At six months-LDL-cholesterol level (mg%)	Mean difference	Percentage difference	P value within the group (paired t-test)
Group-A (yoga group)	122.46±23.33	113.76±18.49	-8.7	-7.1%	<0.05
Group-B (control group)	122.67±23.18	121.53±21.18	-1.14	-0.93%	0.10
P value (independent t-test)	0.96	<0.05			

Table 9: Insulin resistance (via HOMA-IR) at baseline and at 6 months.

Group	Baseline HOMA IR index	At six months-HOMA IR Index	Mean difference	Percentage difference	P value within the group (paired t-test)
Group-A (Yoga group)	2.313±0.502	2.159±0.433	-0.154	-6.65%	<0.05
Group-B (control group)	2.330±0.518	2.303±0.516	-0.027	-1.15%	>0.05
P value (independent t-test)	>0.05	<0.05			

Table 10: Final observed outcomes: significant decrease.

Parameters	Group A (%)	Group B (%)
BMI	-10.01	-0.68
Waist circumference	-5.76	-0.93
Hip circumference	-3.92	-0.38
Waist hip ratio	-2.56	-0.57
Systolic BP	-6.86	-1.25
Diastolic BP	-7.79	-0.70
Fasting blood sugar	-10.44	-0.93
Post prandial blood sugar	-4.05	-0.93
Total cholesterol	-5.99	-1.54
HDL	+17.61	-0.94
Triglyceride	-13.12	-0.31
LDL	-7.10	-0.93
C-reactive protein	-6.1	-3
Insulin resistance	-6.65	-1.15

DISCUSSION

The study was conducted on 120 patients, who were randomly allocated to either group A (study group or yoga group) or group B (control group) for the purpose of the study.

Out of them, only 91 completed the study owing to difficulties in follow up due to COVID-19 pandemic.

The details of the patients enrolled and completing the study is depicted in Table 4.

Patients completing study in each group.

While in group A (patients undergoing yoga therapy), out of 60 patients who were enrolled, 46 patients (76.67%) completed 6 months follow up and the rest were lost to follow up; in the group B (patients not on yoga therapy), out of 60 patients, 45 patients (75%) completed 6 months follow up, and the rest were lost to follow up. Yoga therapy and dietary modifications lead to improvement in all

measured parameters. In our study, there was significant decrease of 5.99% in total cholesterol, 13.12% in triglycerides and 7.10% in LDL and 6.1% in CRP, while Study by Azami eat al reflected significant reduction in LDL and TC while no decrease in HDL, TG and CRP.[5] Study by Agrawal et al showed that yoga is anti-aging, lowers blood pressure, and is beneficial for treating metabolic syndrome.[13]

Waist circumference, Blood sugar and triglycerides were significantly lowered and good cholesterol (HDL) was higher in yoga group as compared to control group. Our study also showed significant improvement in hdl-cholesterol and triglyceride levels in yoga group, as compared to control.

Studies by Schmidt et al and Tulpule et al showed significant improvement in blood pressure and our study too showed decrease of 6.86% and 7.79% in systolic and diastolic blood pressures respectively.[11,14] Studies by Singh et al, Gordon et al, Netam et al et al, Mc Dermott et al, Bijlani et al showed similar results, reinforcing the positive effects of Yoga therapy on health.[6-10] This research, however is subject to certain

Limitations

Time constraints- study should have ideally been continued for years but due to paucity of time and COVID-19 pandemic, duration of study was compromised. Loss to follow up.

CONCLUSION

From the present study, we found that yoga therapy along with dietary restrictions is highly effective in improving the various anthropometric (BMI, waist circumference, hip circumference, waist: hip ratio) and biochemical (blood pressure, blood sugar, insulin resistance, CRP and lipid profile) parameters in obese patients. On comparing the yoga group and the control group, statistically significant improvement was observed in these parameters in the yoga group (independent t-test $p<0.05$), while statistically no significant difference was observed between the two groups in term. It also improved the quality of life of these patients. Yoga appears to have a holistic effect on obese patients and will prove as useful tool in the management of obesity. We recommend large scale, multi-centric trials to further authenticate the findings of this study.

Recommendations

This study is a modest attempt to ascertain the role of yoga in obesity and it hopes to encourage further research in the field.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Matthews DR, Hosker JP, Rudenski AS, Naylor BA, Treacher DF, Turner RC. Homeostasis model assessment: insulin resistance and beta-cell function from fasting plasma glucose and insulin concentrations in man. Dia- betologia. 1985;28:412-9.
2. Flier JS. Obesity wars: Molecular progress confronts an expanding epidemic. Cell (Review). 2020;116(2):337-50.
3. 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.
4. McCall, Timothy. Yoga as Medicine: the yogic prescription for health and healing: a yoga journal book. Bantam, New York; 2007: 17.
5. Azami M, Ahmadi HMR, Kooshali YMH, Qavam S. Effect of yoga on lipid profile and C-reactive protein in women. Int J Prev Med. 2019;10:81.
6. Singh S, Kyizom T, Singh KP, Tandon OP, Madhu SV. Influence of pranayamas and yoga-asanas on serum insulin, blood glucose and lipid profile in type 2 diabetes. Indian J Clin Biochem. 2008;23(4):365-8.
7. Gordon LA, Morrison EY, McGrowder DA, Young R, Fraser YT, Zamora EM et al. Effect of exercise therapy on lipid profile and oxidative stress indicators in patients with type 2 diabetes. BMC Complement Altern Med. 2008;8:21.
8. Netam R, Yadav RK, Khadgawat R, Sarvottam K, Yadav R. Interleukin-6, vitamin D & diabetes risk-factors modified by a short-term yoga-based lifestyle intervention in overweight/obese individuals. Indian J Med Res. 2015;141(6):775-82.
9. McDermott KA, Rao MR, Nagarathna R. A yoga intervention for type 2 diabetes risk reduction: a pilot randomized controlled trial. BMC Complement Altern Med. 2014;14:212.
10. Bijlani RL, Vempati RP. A brief but complement lifestyle education programme based on yoga reduces risk factors for Cardiovascular disease and Diabetes mellitus. J Altern Complement Med. 2005;11(2):267-74.
11. Tulpule TH, Shah HM, Shah SJ, Haveliwala HK. Yogic exercises in the management of ischaemic heart disease. Indian Heart J. 1971;23(4):259-64.
12. Manchanda SC. Retardation of Coronary Atherosclerosis with yoga lifestyle intervention. JAPI. 2000:48;687-94.
13. Agrawal RP. Effects of yoga and meditation on clinical and biochemical parameters of metabolic symdrome. Diabetes Research and Clinical Practice. 2007;78(3):e9.
14. Schmidt T, Wijga A, Muhlen A, Brabant G, Wagner TOF. Changes in Cardiovascular Risk factors and Hormones during a comprehensive Residential 3 month kriya yoga training and vegetarian nutrition. Acta Phys Scand Suppl. 1997;161:158-62.

15. Selvamurthy W. New physiological approach to control essential Hypertension. Indian J. Physiology ang Pharmacology. 1998;42:205-13.
16. Murugesan R, Govindarajulu N, Bera TK. Effect of selected yogic practices on the management of hypertension. Indian J Physiol Pharmacol. 2000;44:207-10.
17. Ornish D. Can lifestyle changes reverse heart disease? The Lifestyle Heart Trial. Lancet. 1990;336:129-33.
18. Bera TK, Rajapurkar MV. Body composition, cardiovascular endurance, and anerobic power of yogic practitioner. Indian J Physiology and Pharmacolgy. 1993;37:225-8.
19. Mahajan AS, Reddy KS, Sachdeva U. Lipid profile of coronary risk subjects following yogic lifestyle intervention. Indian Heart J. 1999;51(1):37-40.
20. Rshikesan PB, Subramanya P, Nidhi R. Yoga Practice for Reducing the Male Obesity and Weight Related Psychological Difficulties-A Randomized Controlled Trial. J Clin Diagn Res. 2016;10(11):OC22-8.

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