



EFFECT OF YOGA ON OVERWEIGHT AND OBESE STUDENTS OF MIMER MEDICAL COLLEGE

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ABSTRACT

Introduction:- Yoga, a simple and inexpensive technique can be used as a means of improving fitness and health status. With this view, it was thought to study the effect of yoga on various biochemical parameters in overweight and obese MBBS students.

Materials & Methods:- A pilot study was conducted on ten overweight and obese MBBS students. Yoga sessions were given to the participants. Before and at the end of yoga sessions, their blood samples were examined for various biochemical parameters.

Result:- After eight weeks of yoga, statistically significant reduction in fasting plasma glucose, fasting serum insulin, and LDL cholesterol was observed.

Conclusion:- Yoga improves insulin sensitivity. Serum LDL cholesterol is also reduced. This may be helpful in preventing future development of insulin resistance, Type 2 Diabetes mellitus and cardiovascular disease in healthy overweight & obese individuals.

KEYWORDS : Body mass index, Yoga, Insulin, LDL cholesterol

INTRODUCTION:-

Yoga is based on one of six systems of Indian philosophy. Patanjali, the father of Ayurvedic medicine, formalized this discipline. The word yoga originates from the Sanskrit for union and aims to harmonize mind, body, and spirit. Traditional yoga incorporates the eight limbs: Yamas and Niyamas (moral and ethical restraints), Asanas (postures), Pranayama (regulation of breathing), Pratyahara (internalization of the senses), Dharana (concentration), Dhyana (meditation), and Samadhi (self realization).

Yoga provides one of the best means of self improvement and gaining full potential of one's body, mind & soul. It has been proved beyond doubt that pranayama and certain asanas are a very important means for preventing and curing many ailments. Yogasana and Pranayama has beneficial effect on different system of body thereby increasing longevity, bringing equipoise between psychic and somatic aspect of bodily function [1].

Over the last ten years, research studies have shown that the practice of Yoga improves strength and flexibility and may help in control parameters as blood pressure, respiration and heart rate, and metabolic rates. It improves autonomic functions, increases strength & flexibility of muscles, improves the sense of well being, slows ageing process, controls breathing, reduces signs of oxidative stress & improves spiritual growth [2].

The physiological and biochemical effects of Yoga training that have been previously reported include the inhibition of body weight gain, reduction in cholesterol levels and blood pressure along with improvement in immune function as well as beneficial psychological effects [3, 4, 5, 6, 7]. Yoga can also be used as a moderate intensity exercise for patients with limited aerobic capacity or restricted ability to exercise [8]. Yoga has been shown to decrease hypertension and cardiac inflammation, stabilize the sympathetic nervous system, and improve cardiac function [9, 10, 11]

AIMS AND OBJECTIVES:-

Aim of the study was to examine the effect of short term yoga on biochemical parameters in overweight (BMI \geq 25 – 29.99) and obese (BMI \geq 30) MBBS students before and after Yoga. The objectives were to study Biochemical blood parameters like Fasting Blood Sugar (BSL-F), Fasting Insulin, Total Protein, Albumin, Creatinine, Lipid profile [Total Cholesterol (TC), Triglycerides (TG), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL)], and Cortisol in overweight and obese MBBS students.

MATERIALS & METHODS:-

A prospective, pilot study was conducted on overweight (BMI \geq 25 – 29.99) and obese (BMI \geq 30) MBBS students between the age group of 18 – 22 years of MIMER Medical College, Talegaon Dabhade. Overweight & obese students not doing yoga or any other exercise and not on any medical treatment were included in the study. After proper informed consent, anthropometric parameters of the students were taken. Based on Body mass index (BMI) values they were classified in different groups as shown in table 1:

Table 1: Overweight & Obesity classification according to Body Mass Index (BMI)

Classification	Body Mass Index (BMI) (kg/m ²)
Overweight	\geq 25.00
Pre-obese	25.00 - 29.99
Obese	\geq 30.00
Obese class I	30.00 - 34.99
Obese class II	35.00 - 39.99
Obese class III	\geq 40.00

Yoga sessions were conducted for the participants under the guidance of special trainer from Kaivalyadhama trust. It included various asanas, pranayama and meditation as shown in table 2:

Table 2: Name and duration of various yoga asanas & pranayamas included in yogic exercises

Sr. No.	Asana Position	Name of Yoga, Asana, Pranayama [Duration]
1	Asana Supine	Ardha Halasana (one leg/both legs)- [30 sec], Pawan Muktasana (Ardha / Purna)- [30 sec], Naukasana (Supine)- [30 sec], Shavasana- [2 min]
2	Asana Prone	Makarasana- [1 min], Bhujangasana- [30 sec], Dhanurasana- [30 sec], Shwanasana- [30 sec]
3	Asana Sitting	Gomukhasana both sides as per capacity, Yogmudra all- [2 min]
4	Asana Standing	Tadasana-[30 sec], Chakrasana (Lateral)- [30 sec]
5	Pranayama	Anuloma-Vilom- [10 rounds]
6	Shuddhi Kriya	Kapala Bhati- [30-30 up to 70-80 strokes]
7	Mantra Chanting	Pranava Japa, Meditation- [10 min]

Before starting yoga sessions, about ten milliliter of 10-12 hour fasting venous blood sample was collected by venipuncture with all aseptic precautions in a fluoride and plain bulb. Sample was tested for fasting plasma glucose (BSL-F). Serum was estimated for Total protein, albumin, creatinine & Lipid profile (Total cholesterol, Triglycerides, HDL cholesterol, LDL cholesterol), fasting insulin and cortisol 8 am level. A fully automated Biochemistry analyzer XL-640 was used. After 8 weeks of yoga, again blood sample was collected & all biochemical parameters mentioned above were tested. The data collected was analyzed using biostatistics software. All facilities required for the study and research were available in the Central Clinical Laboratory (CCL) of MIMER Medical College & Bhausaheb Sardesai Talegaon Rural Hospital.

Results of biochemical parameters studied before and after yoga were as shown in table 4:

Table 4: Biochemical parameters before and after yoga (mean + SD)

	BSL-F (mg/dl)	Creatinine (mg/dl)	T. Protein (g/dl)	Albumin (g/dl)	T. Cholesterol (g/dl)	HDL-C (mg/dl)	TG (mg/dl)	LDL-C (mg/dl)	Insulin-F (mIU/l)	Cortisol 8 am (µg/dl)
Before yoga	107.3 +8.69	0.7+0.09	6.6+0.29	3.8+0.24	179.5+16.17	45+6.68	123.3+25.64	109.9+15.77	18.1+2.41	12.3+2.75
After yoga	93.6+5.04	0.67+0.05	6.7+0.29	3.6+0.23	165.4+15.68	49+6.18	109.5+24.73	97.7+13.61	11.8+2.23	10.2+2.81
P value	<0.001	0.111	0.352	0.200	0.096	0.277	0.339	<0.05	<0.001	0.128
Inference	HS	NS	NS	NS	NS	NS	NS	S	HS	NS

* HS: Statistically highly significant, S: Significant, NS: Not significant

Mean fasting plasma glucose level (BSL-F) before yoga was 107.3 mg/dl. After completion of yoga sessions, mean fasting plasma glucose level dropped to 93.6 mg/dl. Reduction of in mean BSL-F value by 13.7 mg/dl was statistically significant (p <0.001). Out of different groups according to BMI, reduction in blood glucose was statistically highly significant in pre-obese participants with reduction in mean blood glucose by 12.3 mg/dl (p 0.005), and significant in obese class II participants with reduction in mean blood glucose by 13 mg/dl (p 0.049) (Fig.1).

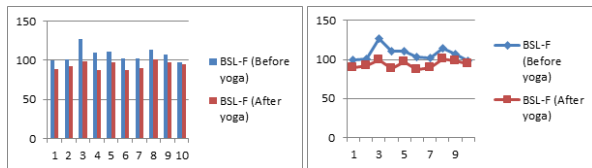


Fig.1: Plasma glucose (BSL-F) level (mg/dl) before & after yoga

Mean fasting serum insulin level before yoga was 18.1 mIU/l. After completion of yoga sessions, this level decreased to 11.8 mIU/l with a mean difference of 6.4 mIU/l. Decrease in mean fasting serum insulin value was statistically significant (p <0.001). Out of different groups according to BMI, reduction in mean fasting serum insulin was statistically highly significant in pre-obese with decrease in mean fasting serum insulin by 6.1 mIU/l (p 0.008), and in also significant in obese class II participants with decrease in mean fasting serum insulin by 6.1 mIU/l (p 0.02) (fig.2):

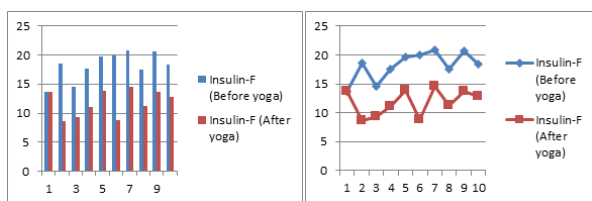


Fig.2: Serum Insulin fasting level (mIU/l) before & after yoga

Out of lipid profile parameters studied (Total cholesterol, Triglycerides, HDL cholesterol, LDL Cholesterol), LDL Cholesterol (LDL-C) levels showed statistically significant reduction after yoga sessions. Mean LDL-C value before yoga was 109.9 mg/dl. After yoga sessions, mean value dropped by 12.2 mg/dl to 97.7 mg/dl (p 0.036). Decrease in mean LDL-C was statistically significant in obese class I participants with mean decrease in LDL-C by 22.5 mg/dl (from 131.5 mg/dl to 109 mg/dl) (p 0.042) and in obese class II participants with mean decrease in LDL-C by 19.5 mg/dl (from 104 mg/dl to 84.5 mg/dl) (p 0.016) (Fig.3).

OBSERVATIONS:

A total 10 overweight and obese MBBS students were included in this pilot study. Number of participants in different BMI classes was as shown in table 3:

Table 3: Overweight and obese participants in different Body mass index (BMI) classes:

Category (BMI in kg/m2)	No. of participants	% Total
Overweight / Pre-obese (25.00 - 29.99)	6	60
Obese class I (30.00 - 34.99)	2	20
Obese class II (35.00 - 39.99)	2	20
Obese class III (≥40.00)	0	0

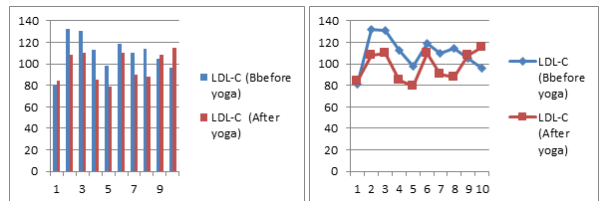


Fig.3: LDL-C values (mg/dl) before & after yoga

Other parameters, namely sr. creatinine, sr. total proteins, albumin, total cholesterol, Triglycerides, HDL cholesterol and serum cortisol 8 am levels did not show statistically significant difference in pre and post yoga session values.

DISCUSSION:-

Yoga is simple and inexpensive and can be used as a means of improving fitness. It decreases stress and anxiety and improves health status. It encompasses use of asanas, pranayams and relaxation techniques along with yogic counseling. It has been known to have stimulatory or inhibitory effects on the metabolic parameters and to be uncomplicated therapy for obesity [3, 4]. With this view, it was thought to study the effect of yoga on biochemical parameters in overweight and obese MBBS students.

Damodaran et al. [3] reported that three months of yoga training significantly decreased plasma glucose concentrations, whereas a study by Elder et al. [4] showed no significant impact of yoga training on glucose levels. Obese adolescents who participated in regular exercise had lower insulin levels and HOMA-IR than those who did not exercise regularly [6]. As per Sahay B K et al., long-term yoga training has been shown to have a beneficial effect on insulin resistance in patients with diabetes [7]. Savita Singh et al. studied influence of pranayamas and yoga-asanas on blood glucose, serum insulin, and lipid profile in type 2 diabetes. They observed significant improvement in all the biochemical parameters after yoga regimen. A significant decrease in blood sugar, serum insulin level was observed [12]. In our study also, we observed statistically significant decrease in mean plasma glucose & serum insulin level, although both values were within the normal reference range. Various yoga-asanas may be directly rejuvenating cells of pancreas as a result of which there may be increase in utilization and metabolism of glucose in the peripheral tissues, liver and adipose tissues through enzymatic process [13]. The beneficial effect on the insulin kinetics may be by improving the sensitivity of the target tissues and rise in the number of insulin receptors thus decreasing insulin resistance and consequently, increasing peripheral utilization of glucose. Yoga intervention leads to shift of the peak level of the insulin level to the left.

Gadham J et al. observed a statistically significant decrease in Systolic BP, Diastolic BP and BMI after three months of Yoga training. Also, they observed a decrease in total cholesterol, VLDL, triglycerides and an increase in HDL cholesterol which was not statistically significant [1]. But Savita Singh et al. observed significant improvement in lipid profile [12]. Pal A et al. observed reduction of body fat%, total cholesterol, triglycerides and LDL after regular yogic practices. They concluded that yogic practices included in their study were helpful in prevention of coronary artery disease. Dae Yun Seo et al. also observed that after yoga training, body weight, BMI, fat mass (FM), and body fat % (BF %) were significantly decreased, and fat-free mass and basal metabolic rate were significantly increased than baseline values. Total cholesterol (TC) was significantly decreased by yoga practice. Their findings showed improvement in body composition and TC levels in obese adolescent boys after eight weeks of yoga training, suggesting that yoga training may be effective in controlling some metabolic syndrome factors in obese adolescent boys [14]. In our study also, we observed statistically significant decrease in LDL-C level after eight weeks of yoga sessions. But there was no statistically significant decrease in Total cholesterol and Triglycerides, and no significant increase in HDL-C was observed. Besides these, following yoga-asanas and pranayamas, participants reported a feeling of well being, more relaxed and satisfied.

LIMITATIONS:-

Some limitations of the current pilot study are the relatively small sample size, which may not have been sufficient to obtain statistically significant results. A future study with a larger number of participants is necessary. Furthermore, overweight and obesity is a chronic condition and thus long-term intervention and follow-up will be required. Finally, diet of the participants was not monitored in the study, which may cause the changes in biochemical parameters.

CONCLUSION:-

Yoga reduces fasting plasma glucose (BSL-F) as well as fasting serum insulin levels in healthy overweight & obese individuals, indicating improvement in insulin sensitivity. This may be helpful in preventing future development of insulin resistance & Type 2 Diabetes mellitus in healthy overweight & obese individuals. Also, there is reduction in serum LDL Cholesterol due to yoga sessions, which may be helpful in preventing the future risk of development of cardiovascular disease.

DECLARATIONS:-

Competing interests: None.

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REFERENCES:-

- [1] Jayaram Gadham, Srikanth Sajja, V. Rooha. Effect of Yoga on obesity, hypertension and lipid profile Int J Res Med Sci. 2015 May;3(5):1061-1065
- [2] Cohen DL-Yoga and hypertension. J Yoga Phys Ther. 2013;3:144]
- [3] Damodaran A, Malathi A, Patil N, Shah N, Suryavanshi, Marathe S. Therapeutic potential of yoga practices in modifying cardiovascular risk profile in middle aged men and women. J Assoc Physicians India. 2002;50:633-640.
- [4] Elder C, Aickin M, Bauer V, Cairns J, Vuckovic N. Randomized trial of a whole-system ayurvedic protocol for type 2 diabetes. Altern Ther Health Med. 2006; 12:24-30.
- [5] Pal A, Srivastava N, Tiwari S, Verma NS, Narain VS, Agrawal G G, et al. Effect of Yogic practices on lipid profile and body fat composition in patients of coronary artery disease. Complement Ther Med. 2011; 19:122-7.
- [6] Balagopal P, George D, Patton N, Yarandi H, Roberts WL, Bayne E, Gidding S. Lifestyle-only intervention attenuates the inflammatory state associated with obesity: a randomized controlled study in adolescents. J Pediatr. 2005; 146:342-348..
- [7] Sahay BK. Role of yoga in diabetes. J Assoc Physicians India. 2007; 55: 121-126.
- [8] Birdee GS, Legedza AT, Saper RB, Bertisch SM, Eisenberg DM, Phillips RS. Characteristics of Yoga users: results of a national survey. J Gen Intern Med. 2008; 23:1653-8.
- [9] Innes KE, Selfe TK, Taylor AG. Menopause, the metabolic syndrome, and mind-body therapies. Menopause. 2008; 15:1005-13.
- [10] Pullen PR, Nagamia SH, Mehta PK, Thompson WR, Benardot D, Hammoud R, et al Effects of Yoga on inflammation and exercise capacity in patients with chronic heart failure. J Card Fail. 2008; 14:407-413.
- [11] Vempati RP, Telles S. Yoga-based guided relaxation reduces sympathetic activity judged from baseline levels. Psychol Rep. 2002;90:487-94
- [12] Savita Singh, Tenzin Kyizom, K P Singh, O P Tandon and S V Madhu, Influence of

Pranayamas and Yoga-Asanas on Serum Insulin, Blood Glucose and Lipid Profile in Type 2 Diabetes, Ind J of Clinical Biochemistry, 2008; 23 (4) 365-368

- [13] Yadav RK, Ray RB, Vempati R, Bijlani RL. Effect of a comprehensive yoga based life style modification program on lipid peroxidation. Ind J Physiol Pharmacol 2005; 49(3):358-62.
- [14] Dae Yun Seo, SungRyul Lee, Arturo Figueroa, Hyoung Kyu Kim, Yeong Ho Baek, Yi Sub Kwak, Nari Kim 1, Tae Hoon Choi, Byoung Doo Rhee, Kyung Soo Ko, Byung Joo Park, Song Young Park, and Jin Han. Yoga Training Improves Metabolic Parameters in Obese Boys. Korean J Physiol Pharmacol Vol 16: 175 — 180, June, 2012