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Impact of Yoga Practices in Anthropometric Variables and Total Cholesterol among Male Adults with High BMI

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Abstract: ***This study explores the impact of comprehensive yoga practices on high Body Mass Index (BMI), Total Cholesterol, and metabolic syndrome in male adults. Metabolic syndrome, a cluster of conditions that heighten the risk of heart disease, stroke, and type 2 diabetes, is characterized by elevated blood pressure, high blood sugar, excess abdominal fat, and abnormal cholesterol or triglyceride levels. The global prevalence of this syndrome is rising due to lifestyle factors such as poor diet, physical inactivity, and increased obesity rates. The research focuses on the effects of various yoga practices, including Asanas (physical postures), Pranayama (breathing exercises), Mudra (hand gestures), and Dhyana (meditation), supplemented with Haasya Kriya (laughter therapy) and lifestyle modifications. These holistic practices are hypothesized to positively influence both physical and mental well-being, potentially mitigating the risk factors associated with high BMI and metabolic syndrome. The study involved a sample of 80 men, selected using a convenient random sampling technique. These participants were divided equally into two groups: an experimental group (YG) that engaged in yoga practices and a control group (NYG) that did not participate in yoga/. The inclusion criteria for the study required male adults aged 30 to 45 years who were willing to participate, while individuals already practicing yoga or unwilling to take part were excluded. The experimental group practiced selected Asanas, Pranayama, Mudras, and Meditation three times a week over a period of 20 weeks. A statistical analysis was conducted to compare the pre-test and post-test results, assessing the effects of the yoga intervention. The findings show that consistent participation in yoga practices results in notable improvements in anthropometric measures, such as decreases in weight, waist and hip circumference, BMI, and total cholesterol levels. These results indicate that a comprehensive yoga routine can effectively address and reduce risk factors associated with high BMI, elevated cholesterol, and metabolic syndrome in adult males.***

Keywords: Metabolic Syndrome, High BMI, Yoga, Yoga Therapy

1. Introduction

Body Mass Index (BMI) is a numerical value calculated from a person's weight and height to assess their body fat and health status.

Prevalence of High BMI and Its Health Risk Factors

The prevalence of high Body Mass Index (BMI) has been steadily increasing worldwide, posing significant public health challenges. High BMI, classified as overweight (BMI 25-29.9) and obesity (BMI 30 and above), affects both developed and developing countries, with particularly alarming rates observed in urban areas and among children and adolescents.

According to the World Health Organization (WHO), as of 2016, more than 1.9 billion adults were overweight, with over 650 million classified as obese. This represents roughly 39% of adults being overweight and 13% being obese globally.

In 2016, an estimated 340 million children and adolescents aged 5-19 were overweight or obese. The prevalence has more than doubled since 1980, with significant increases noted in many low- and middle-income countries.

High Body Mass Index (BMI) is associated with numerous health risk factors that significantly impact overall well-being. Cardiovascular diseases, such as coronary artery disease, heart failure, and stroke, are prevalent among individuals with high BMI, driven by hypertension, dyslipidaemia, and atherosclerosis due to excess abdominal fat. Overweight and obesity also heightens the risk of insulin resistance and type 2 diabetes, particularly in those with central obesity. Additionally, high BMI is linked to metabolic syndrome, a cluster of conditions that elevate the risk of heart disease, stroke, and diabetes. Certain cancers, including breast, colon, endometrial, kidney, liver, and pancreatic cancer, are more common in obese individuals, with chronic inflammation, insulin resistance, and hormone imbalances as contributing factors. Musculoskeletal disorders, such as osteoarthritis, are exacerbated by the increased mechanical load and metabolic effects on cartilage. Respiratory issues like obstructive sleep apnoea, asthma, and reduced lung function are also prevalent. Furthermore, the psychological and social impacts of high BMI, including depression, anxiety, low self-esteem, social stigma, and discrimination, lead to social isolation and a diminished quality of life.

The rising prevalence of high BMI and its associated health risk factors underscore the need for comprehensive public health strategies to promote healthier lifestyles. These strategies should include initiatives to improve diet quality, increase physical activity, and create supportive environments that facilitate weight management and the prevention of high BMI-related diseases. Addressing these issues is critical to reducing the global burden of non-communicable diseases and improving overall health outcomes.

Anthropometric variables are measurements and assessments of the human body that provide quantitative data on individuals' physical dimensions and composition. These variables are commonly used in health, nutrition, and fitness research to evaluate growth, development, and the risk of various health conditions. Key anthropometric variables include:

1) Height: The measurement of an individual's stature from the base of the feet to the top of the head.
2) Weight: The total body mass of an individual.

3) Body Mass Index (BMI): A calculated value derived from an individual's height and weight (BMI = weight in kg/height in m^2) used to categorize underweight, normal weight, overweight, and obesity.
4) Waist Circumference: The measurement around the narrowest part of the torso, usually just above the navel, is used to assess abdominal fat.
5) Hip Circumference: The measurement around the widest part of the hips.
6) Waist-to-Hip Ratio: The ratio of the circumference of the waist to that of the hips, used to assess the distribution of body fat.
7) Skinfold Thickness: Measurements of the thickness of skinfolds at various body sites to estimate body fat percentage.
8) Body Fat Percentage: An estimate of the proportion of body weight that is fat tissue, often calculated using skinfold measurements or other techniques like bioelectrical impedance analysis (BIA) or dual-energy X-ray absorptiometry (DEXA).

Total cholesterol is a key biomarker often examined in the context of metabolic syndrome, a cluster of conditions that increase the risk of heart disease, stroke, and diabetes. Elevated total cholesterol, particularly high levels of low-density lipoprotein (LDL) cholesterol and low levels of high-density lipoprotein (HDL) cholesterol, is closely linked to insulin resistance, central obesity, hypertension, and other metabolic disorders. Research on the relationship between total cholesterol and metabolic syndrome aims to understand how lipid imbalances contribute to the development and progression of these conditions, as well as to explore potential interventions to reduce cardiovascular risk.

These variables are essential for identifying and monitoring health risks related to obesity, malnutrition, and other conditions, as well as for designing and evaluating interventions aimed at improving health outcomes.

The practices include Asanas (physical postures), Pranayama (breathing exercises), Mudra (hand gestures), and Dhyana (meditation), along with Haasya Kriya (laughter therapy) and lifestyle modifications. These practices are hypothesized to influence both physical and mental well-being, potentially leading to significant improvements in anthropometric measurements such as height, weight, waist circumference, hip circumference, and BMI. (Isolated And Combined Effects Of Yogic Practices And High-Intensity Interval Training On Cardio Vascular Risk Factors Among Adult Men (2013)). By addressing multiple dimensions of health through a holistic approach, this research seeks to provide evidence on the efficacy of yoga in managing and reducing the risk factors associated with high BMI and metabolic syndrome among male adults.

Key anthropometric variables assessed in this study include waist-hip ratio, Body Mass Index (BMI), and Total Cholesterol. (Pramod, Reddy., J, Sunayana., Prasanna, Kulkarni., Priyanka, BV., Kiran, M, Goud. (2024). Effect of yoga on physical health in overweight individuals with special reference to body composition analyser). These measurements are crucial in determining if an individual falls into the overweight category, a primary indicator of heightened risk for metabolic syndrome. The integration of yoga practices is expected to bring about significant improvements in these variables, thereby reducing the overall risk profile for metabolic syndrome. (Amit, Kumar. (2023). Effect of 10-week Yoga Intervention on Obesity on Working Male Professionals).

By addressing multiple dimensions of health through a holistic approach, this research aims to provide evidence on the efficacy of yoga and related practices in managing and potentially reversing risk factors associated with metabolic syndrome.

The findings are expected to contribute to the broader understanding of non-drug interventions in the prevention and management of lifestyle-related diseases.

The study investigates the impact of comprehensive yoga practices on anthropometric variables and Total Cholesterol among male adults with high Body Mass Index (BMI). The findings demonstrate that regular engagement in yoga practices, including Asanas (physical postures), Pranayama (breathing exercises), Mudra (hand gestures), and Dhyana (meditation), along with Haasya Kriya (laughter therapy) and lifestyle modifications, leads to significant improvements in the key anthropometric measurements. Participants experienced reductions in weight, waist circumference, hip circumference, and BMI, indicating a positive shift in their overall health profile. (Balakrishna, Shetty., Geetha, B, Shetty., Manjunath, N, K., Manjula, Shantaram. (2017). Effect of Integrated Yoga Practices on Anthropometric Measures, Serum Lipid Profile and Oxidative Stress Status in Obese Adults) These results suggest that a holistic approach to yoga can effectively manage and reduce the risk factors associated with high BMI and metabolic syndrome among male adults.

2. Methodology

The recruitment strategy consisted of marketing efforts and public announcements across various yoga therapy clinics. Individuals who met the inclusion criteria provided informed consent prior to data collection. The study enrolled a total of 80 male participants with high BMI, categorized into two equal groups: an experimental group and a control group.

Measurement of BMI, waist-hip ratio, and Total Cholesterol were tested at the start and end of the training. The control group did not participate in the yoga practices, whereas the experimental group followed the practice schedule, 3 days a week for 20 weeks.

Inclusion Criteria

- Male adults
- Ages 30 to 45 years
- Individuals willing to participate in the study

- Exclusion Criteria
- Individuals already practicing yoga
- Individuals unwilling to participate

- Framework of Analysis

- The experimental group followed a yoga regimen that included selected Asanas, Pranayama, Mudras, and Meditation, practiced 3 days a week over a period of 20 weeks.
- Pre-test and post-test results were statistically analyzed to assess the effects of the yoga intervention.

Training

The following practices were given for the experimental group-

Sukshma Vyayam- loosening practices (from toes to head)

Surya Namaskar, vakrasana, marjari asana, shalabhasana padasanchalanasana, pavanmuktasana,

Pranayam- Bhastrika, Ujjayi, NadiShodhana

Mudra- Prana Mudra, Chin Mudra

Meditation- Breath Awareness

Relaxation- IRT, QRT, DRT

1st to 4th week

S. No	Asana Practice	Repetition	Rest time	Duration
1	Sukshma Vyayam	1		10 minutes
2	Surya Namaskar	3	2 mnts	5 minutes
3	padasanchalanasana	15	60 secs	30 secs
4	pavanamuktasana	2	60 secs	30 secs
5	shalabhasana	3	60 secs	30 secs
6	Vakrasana	2	60 secs	30 secs
7	Marjari Asana	6	45 secs	45 secs

S. No	Pranayama Practice	No of Round	Ratio/ No. of Times	Duration
1	Bhastrika	2	15	2 minutes
2	Nadi Shodhana + Prana Mudra	6	1.0.1.0	12 Minutes

S. No	Practice	Duration
1	Breath Awareness Meditation	5 minutes
2	Instant Relaxation Technique	2 minutes
3	Quick Relaxation Technique	5 minutes

4th to 8th week

S.No	Asana Practice	Repetition	Rest time	Duration
1	Sukshma Vyayam	1		10 minutes
2	Surya Namaskar	4	2 mnts	6 minutes
3	padasanchalanasan	30	45 secs	45 secs
4	pavanamuktasana	3	45 secs	45 secs
5	shalabhasana	3	45 secs	45 secs
6	vakrasana	2	45 secs	45 secs
7	Marjari asana	6	30 secs	45 secs

S.No	Pranayama Practice	No of Round	Ratio/No. of Times	Duration
1	Bhastrika	2	15	2 Minutes
2	Ujjayi + Prana Mudra	6	6	3 minutes

S. No	Practice	Duration
1	Breath Awareness Meditation	5 minutes
2	Deep Relaxation Technique	7 minutes

9th to 12th week

S.No	Asana Practice	Repetition	Rest time	Duration
1	Sukshma Vyayam	1		10 minutes
2	Surya Namaskar	6	3 mnts	10 minutes
3	padasanchalanasan	30	15 secs	45 secs
4	pavanamuktasana	3	15 secs	45 secs
5	shalabhasana	3	15 secs	45 secs
6	vakrasana	2	15 secs	45 secs
7	Marjari asana	6	30 secs	30 secs

S.No	Pranayama Practice	No of Round	Ratio/No. of Times	Duration
1	Bhastrika	2	15	2 Minutes
2	Ujjayi + Chin Mudra	6	6	3 minutes
3	Nadi Shodhana + Prana Mudra	5	1.1.1.1	10 minutes

S. No	Practice	Duration
1	Breath Awareness Meditation	5 minutes
2	Deep Relaxation Technique	7 minutes

3. Statistical Analysis

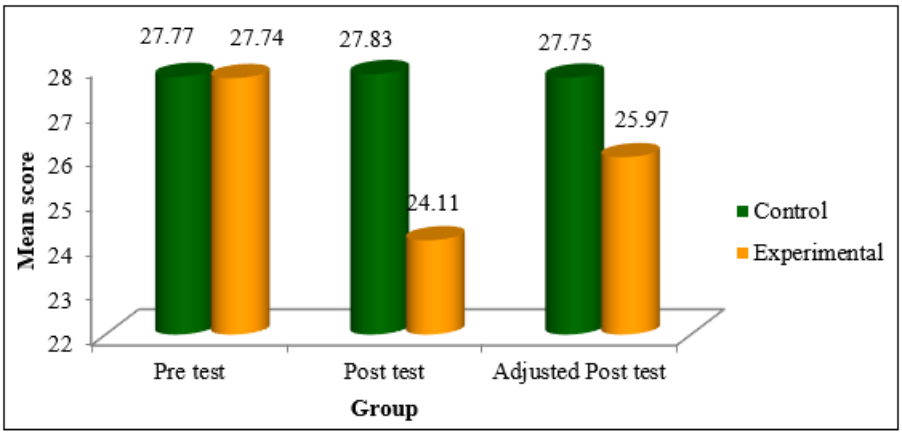
Analysis of Co-Variance of the Pre Test and Post Test Means of the Control group and Experimental group in Body Mass Index

Group	Control	Experimental	Source of variance	Sum of squares	df	Mean square	'F' Ratio
Pre-Test Mean	27.77	27.74	Between	0.012	1	0.012	0.025 NS
SD	0.67	0.71	Within	18.411	38	0.484	
Post-test Mean	27.83	24.11	Between	138.384	1	138.384	29.6*
SD	0.70	0.66	Within	17.731	38	0.467	
Adjusted Post-test mean	27.75	25.97	Between	142.065	1	142.065	32.7*
			Within	19.534	38	0.528	

S – Significant

NS – Not Significant

The table above reveals that the pre-test mean score of the control group is 27.77, and the experimental group is 27.74. Therefore, it is observed that the obtained 'F' value is 0.025 for the Pre-Test mean score. Therefore, the framed research hypothesis is rejected. It is inferred that there is no significant difference between the pre-test means of the Body Mass Index. Also, the Post-test mean score on the control group is 27.83, experimental group is 24.11. Therefore, it is evident that the obtained 'F' value is 29.6 for the Post-Test mean score. Therefore, the framed research hypothesis is accepted. Further, the above table taking into consideration the adjusted post-test mean score of the control group is 27.75, experimental group is 25.97. Therefore, it is evident that the obtained 'F' value is 32.7. Therefore, the framed research hypothesis is accepted. It is inferred that there is a significant difference between the adjusted post-test means of the Body Mass Index.

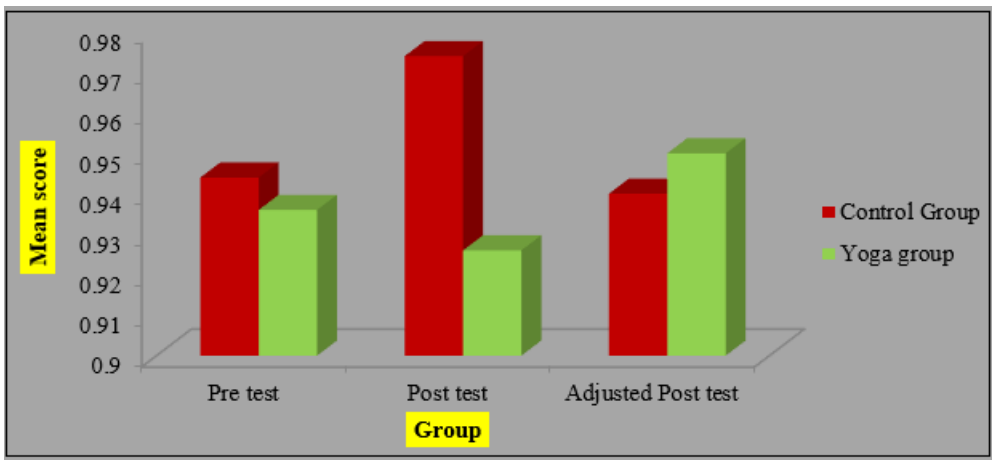


Analysis of Co-Variance of the Pre-Test and Post-Test Means of the Control group and Yoga group in Waist-Hip Ratio

Group	Control	Yoga	Source of variance	Sum of squares	df	Mean square	'F' Ratio
Pre-Test Mean	0.944	0.936	Between	0.056	1	0.056	1.73 NS
SD	0.012	0.027	Within	0.088	79	0.042	
Post-test Mean	0.974	0.926	Between	0.047	1	0.047	13.82 S
SD	0.010	0.024	Within	0.027	79	0.016	
Adjusted Post-test mean	0.940	0.950	Between	0.034	1	0.034	10.6 S
			Within	0.025	79	0.014	

S - Significant
NS – Not Significant

The results from the table show that the pre-test mean score for the control group is 0.944, and for the yoga group is 0.936. This suggests that the calculated 'F' value is 1.73 for the pre-test mean score, leading to the rejection of the research hypothesis. It is concluded that there is no significant difference between the pre-test means of the waist-hip ratio. However, the post-test mean score for the control group is 0.974, and for the yoga group is 0.926. This results in an 'F' value of 13.82 for the post-test mean score, leading to the acceptance of the research hypothesis. The table also shows the adjusted post-test mean score for the control group, which is 0.940, and for the yoga group, which is 0.950. The calculated 'F' value is 10.6, leading to the acceptance of the research hypothesis. This indicates a significant difference between the adjusted post-test means of the waist-hip ratio.



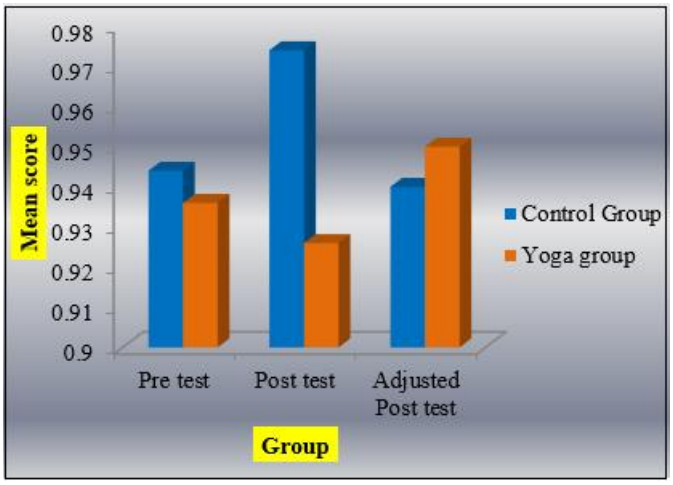
Analysis of Co-Variance of the Pre Test and Post Test Means of the control group and Yoga group in Total Cholesterol

Group	Control	Yoga	Source of variance	Sum of squares	df	Mean square	'F' Ratio
Pre-Test Mean	222.75	221.58	Between	4805.181	1	4805.181	1.06 NS
SD	16.41	16.35	Within	46515.285	79	586.074	
Post-test Mean	224.02	189.41	Between	24253.321	1	24253.321	69.6 S
SD	16.56	20.41	Within	27376.926	79	346.543	
Adjusted Post-test mean	214.86	208.74	Between	22738.183	1	22738.183	48.5 S
			Within	25244.370	79	274.550	

S – Significant
NS – Not Significant

The above table results proved that the pre-test mean score on the control group is 222.75, and the yoga group is 221.58. Therefore, it is inferred that the obtained calculated 'F' value is 1.06 for the Pre-Test mean score. Therefore, the framed

research hypothesis is rejected. It is inferred that there is no significant difference between the pre-test means of the Total Cholesterol. However, the Post-test mean score on the control group is 224.02 and yoga group is 189.41. Therefore, it is evident that the obtained 'F' value 69.6 for Post-Test mean score. Therefore, the framed research hypothesis is accepted. Further, the above table taking into consideration of the adjusted post test mean score on control group is 214.86, yoga group is 208.74. Therefore, it is evident that the calculated 'F' value is 48.5. Therefore the framed research hypothesis is accepted. It is inferred that there is a significant difference between the adjusted post-test means of the Total Cholesterol.



4. Conclusion

The present study contributes to establishing the scientific basis and confirming several positive effects of practicing yoga, including Asana, Pranayama, Mudra, Meditation, and Relaxation.

The findings of this study demonstrate a significant impact of yoga practices on total cholesterol levels and various anthropometric variables in male adults with high BMI. (Ronika, Agrawal., Seema, Asif, Memon. (2022)). Regular engagement in yoga resulted in a noticeable reduction in total cholesterol, contributing to improved lipid profiles. Additionally, positive changes were observed in anthropometric measures, such as BMI, waist-hip ratio, and body weight, indicating a reduction in obesity-related risk factors (Sharma, Dushyant., Tekur, Padmini., Tikhe, Sham, Ganpat., Nagendra, Hongasandra, Ramarao. (2015)). These results suggest that yoga can be an effective non-pharmacological intervention for managing cholesterol levels and promoting healthier body composition, particularly in individuals with high BMI (Dianne, Neumark-Sztainer., Allison, W., Watts., Sarah, A., Rydell. (2018)). The holistic nature of yoga, encompassing physical, mental, and metabolic benefits, underscores its potential as a supportive practice for overall health improvement in at-risk populations (Shirley, Telles., Sachin, Kumar, Sharma., Alok, Singh., Niranjan, Kala., Vikas, Upadhyay., Jaideep, Arya., Acharya, Balkrishna. (2019)).

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