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Yoga for managing Anthropometric Measures in Adult Obese: A review based on RCTs

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ABSTRACT

Excessive eating of energy-dense, nutrient less foods and inactive lifestyle has led to a pandemic of obesity worldwide. More than underweight, world's population died due to overweight and obesity. There are many factors like stress, environmental pressure, sedentary lifestyle, genetic factors etc causes obesity. This review assesses the effectiveness of *Yoga* as an intervention for weight related problems and as a management strategy of obesity and its related symptoms. This review is specifically to evaluate the effect of *Yoga* program on various anthropometric measures related to overweight and obesity. This review conducted in wide range of databases including PubMed and Google scholar using key terms *Yoga*, obesity and overweight. Randomized control trials and experimental researches are included based on the relevance of this study. The study excluded inappropriate researches with no quantitative measures. Overall, the studies showed the *Yoga* program significantly effective as a therapy for managing obesity. For management and prevention of obesity there are very limited strategies having several adverse effects. *Yoga* has been used as an effective therapeutic tool to attain positive health and to enhance satisfaction towards own body. It gives a best means to attain full potential of individual's body, mind and soul and plays a very considerable role in reducing anthropometric measures and body weight.

Key words: Obesity, Overweight, Anthropometry, Yoga, RCT

INTRODUCTION

Nowadays, Obesity is becoming very serious health problem worldwide but it is preventable.^[1] The prevalence of obesity and metabolic syndrome increasing regularly worldwide.^[2] More than underweight world's population died due to overweight and obesity.^[3] WHO stated that in 2016, about 1.9 billion adults were overweight and 650

million were obese. Overall, nearby 13% of world's adult population were obese.^[3] According to ICMR-INDIAB, a study of 2015 explores that the prevalence of obesity varies from 11.8% to 31.3% and central obesity from 16.9% to 36.3%.^[4]

Excess eating of energy-dense, nutrient less foods and inactive lifestyle have led to a pandemic of obesity worldwide.^[5] Generally, it considered as incongruity between energy intake and energy expense that results in adipocyte hypertrophy and hyperplasia, stress and inflammation within the adipose tissue, leading to accumulation of fat.^[6] The excessive buildup of fat defined as Obesity. It is measured in terms of Body Mass Index.^[1] BMI is a statistical index of weight for height to estimate body fat.^[7] BMI of at least 30 kg/m² is considered as obese and greater than or equals to 25kg/m² as overweight.^[7] To assess overweight and obesity and evaluate body shape and size at different ages, several Anthropometric indexes such as height, weight, body mass index, waist

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circumference, Hip circumference, waist-hip ratio etc are used as an effective means.^[8]

In recent pandemic, obesity related condition makes the effect of COVID-19 virus more badly. The information related to BMI of COVID-19 patients shows the high prevalence of obesity in severe COVID-19 patients and this prevalence remained higher in critical patients in comparison of non-critical COVID-19 patients.^[9] The mechanism of obesity is not clearly understood but there are many factors like stress, environmental pressure, sedentary lifestyle, genetic factors etc causes obesity.^[1] Bad Eating habits, extreme intake of sugar and junk food causes accumulation of fat.^[1] Likewise, Physical inactivity due to increasing sedentary work forms, changing modes of transportation and urbanization causes obesity.^[3]

Medical authorities recognizes obesity as a causal aspect in the development of various metabolic syndrome, hypertension, cardiovascular disease and other risk factors like respiratory disease, cancer, dyslipidaemia and fatty liver.^[10-12] For management and prevention of obesity there are very limited solutions now a day's having several adverse effects^[6] but it can be attained by various methods particularly high level of physical activity and change in mind-set towards food.^[2] Yoga plays an effective role as

alternative training plan for reducing body weight and stress level without any adverse effect.^[5] It is acknowledged fact that *Yoga* has been used as effective therapeutic tool to attain positive health.^[10] Initially *Yoga* originates in India includes several physical postures (*Asanas*), breathing techniques (*Pranayama*), Meditation and assured philosophical principles which helps to enhance awareness towards satisfaction and sense of eating.^[2,6] *Yoga* practice also useful for reduction of stress level body fat percentage, total cholesterol, triglycerides, low-density lipoprotein, similarly blood pressure and heart rate.^[2,6] It gives one of the best means to achieve self-improvement and attain full potential of individual's body, mind and soul.^[13]

Search Methodology

The electronic searches for present review was conducted by following key word, *Yoga*, obesity, anthropometric measures and body weight on online databases such as PubMed and Google scholar. From 2000 to 2022, published scientific studies were reviewed. 12 relevant studies were considered for review which are randomized control trials and experimental in nature. The inappropriate studies, duplicate studies, review article, non-*Yoga* based and studies with no quantitative data were eliminated.

Table 1: Evidence-based *Yogic* interventions for anthropometric measurements in obese participants

SN	Author (Year)	Study Design	No. of Participants (Age Range)	Intervention (s)	Assessments	Outcomes
1.	Telles et al., (2014)	Comparative Study with randomization	63 obese and 5 overweight (ages between 20-55 years)	The fixed <i>Yoga</i> protocol for 45 minutes twice a day for 15 days to yoga group and at same time walking for another group.	Biochemical measures, Anthropometric measurements, Body composition, Postural stability, bilateral hand grip strength	Both yoga and walking group improved anthropometric variables. However, yoga increased serum leptin level and walking reduced serum adiponectin level.
2.	Dushyant et al., (2015)	Single Group pre-post study	24 obesity patients (between 18 and 60 years)	Integrated approach of <i>Yoga</i> therapy for 7 days	BMI, Hip circumference, waist circumference, mid-arm circumference	Statistical analysis showed a significant decrease in BMI, WC, HC, MC. IYAT program was beneficial for obesity patients.

3.	Mewada et al., (2022)	Randomized control trial with two arms- Ashtanga Yoga and General Yoga	62 participants with abdominal obesity ages between 25 and 45 years.	<i>Ashtanga Yoga</i> and General <i>Yoga</i> for 45 min. daily for 5 days a week for period of 3 months	Anthropometric measurements, Gunas assessment and Quality of life	The result indicates that Ashtanga yoga decrease BMI and HC, positive changes in personality trait (gunas) and increase social and physical quality of life.
4.	Yazdanparast et al., (2020)	Randomized clinical trial	19 participants in each group (total-38) having age range between 30-50 years.	60 minutes <i>Hatha Yoga</i> for 5 days in a week for 8 weeks and restricted diet with 300 kcal per day	Resting metabolic rate, anthropometric indices, serum adiponectin and leptin	RMR and level of adiponectin increased in yoga group as compared with the diet and level of leptin and anthropometric indices decrease in both group.
5.	Rshikesan & Subramanya (2016)	Randomized controlled trial	72 obese male participants ages between 18-60 years	Integrated approach of <i>Yoga</i> Therapy for 90 minutes for 5 days in a week for 14 weeks.	Body weight, BMI, Mid-arm circumference, waist circumference, hip circumference, waist-hip ratio, body shape index, skinfold thickness	IYAT yoga training is effective in improving anthropometric parameters of male obesity and psychological stress related to body weight also reduced.
6.	Luo & Zheng (2019)	Three group Pre-post study	81 female college students	<i>Yoga</i> combined with aerobic exercise for 12 weeks	BMI, waist circumference, Hip circumference, blood lipid indicators like low-density lipoprotein cholesterol, high density lipoprotein cholesterol, total cholesterol and triglycerides	Body weight, BMI and body fat significantly decreased in all three groups. Waist circumference, hip circumference and waist to hip ratio had a significant change in overweight group.
7.	Shetty et al., (2017)	Single group pre-post trial	112 subjects with BMI more than 25 to less than 40 (average age, 29.81±3.10 years)	<i>Yoga</i> practice for 1 hour for three months	Body Mass Index, waist circumference, hip circumference and Biochemical measurements	Yoga can be used as effective life-style modality to reduce body weight and significant improvement in anthropometric parameters and lipid profile in obese patients.
8.	Shetty et al., (2018)	Single group pre-post trial	32 participants with BMI more than 23 and less than 40 (average age 30.3±2.8 years)	1 hour of <i>Yoga</i> session for 10 days as residential retreat	BMI, waist circumference, hip circumference, Body composition and biochemical measurements	Yoga helps in reducing body weight and produce significant improvement in anthropometric measurements ad lipid profile.

9.	Telles et al., (2010)	Single group longitudinal trial	47 participants (BMI more than 30kg/m ² , ages between 17-68 years)	5 hours of evening and morning <i>Yoga</i> session for 6 days and high fiber vegetarian diet	BMI, waist circumference, hip circumference, mid-arm circumference, body composition, Postural stability, hand grip strength and biochemical measurements	Yoga helps in decreasing BMI, total cholesterol, high density lipoprotein, fasting serum leptin levels, waist and hip circumference, lean mass and body water content and increases postural stability and bilateral hand grip strength.
10.	Telles et al., (2018)	Single blind comparative controlled trial	52 adult female with central obesity (ages between 30 to 59 years)	75 minutes <i>Yoga</i> for 3 days in a week for 12 weeks and 45 minutes presentation on nutrition	Waist circumference, Sagittal abdominal diameter, hip circumference, BMI and some other derived anthropometric indices, biochemical measures and quality of life	Yoga and nutritional advice reduces anthropometric measures related to central obesity.
11.	Anheyer et al., (2021)	Single-blind randomized controlled clinical trial	60 women ages between 18-64 years	90 minutes <i>Hatha Yoga</i> session based on integral <i>Yoga</i> of <i>Swami Sivananda</i> over a period of 12 weeks	BMI and waist circumference	Yoga supports people to eat healthier and reduced BMI and Waist circumference.
12.	Rshikesan et al., (2016)	Parallel group randomized controlled trial	80 subjects ages between 18 to 60 years	<i>Yoga</i> for 90 minutes, for 5 days in a week for 14 weeks	BMI, waist circumference, hip circumference, waist-hip ratio, body shape index, skinfold thickness, mid-arm circumference, percentage body fat and level of stress.	Final result showed improvement in anthropometric parameters, percentage body fat and level of stress reduced.

Summary of studies on anthropometric measurements following *Yoga* in obese participants

A comparative controlled trial was conducted to assess biochemistry, anthropometric variables (Body weight, BMI, waist circumference, hip circumference, waist-hip ratio, mid arm circumference), body composition, postural stability and bilateral handgrip strength. This study justified the effect of 90 min/day for 15 days supervised *Yoga* or supervised walking on 68 obese participants. Both supervised *Yoga* and supervised walking favourably reduce anthropometric

measures.^[2] In a single group pre-post study with sample size of 24 obese participants ages between 18 to 60 years, had significant effect of 7 days residential intensive integrated approach of *Yoga* therapy on Body mass index, waist circumference, hip circumference and mid arm circumference.^[10]

An open - label parallel randomized control trial with two arms showed the effect of 12 weeks *Ashtanga Yoga* and General *Yoga* on anthropometric measurements like height, weight, BMI, waist circumference, hip circumference, waist-hip ratio,

personality traits and quality of life in 62 abdominal obese participants. By the end of 12 weeks *Yoga* program, *Ashtanga Yoga* was found more effective over general in improving anthropometric measurements, personality traits and quality of life.^[11]

A randomized clinical trial was conducted to assess the resting metabolic rate, anthropometric indices (Height, Weight, body mass index, waist circumference, waist to hip ratio and body composition), and blood parameters on 44 obese female participants ages between 30 to 50 years. Result showed that 60 minutes daily *Hatha yoga* practice for 8 weeks significantly decreased anthropometric measures in both *Yoga* and restricted diet groups but resting metabolic rate is increased only in *Yoga* group. It founds that *Yoga* practice with less energy restricted diet is more effective in weight management.^[12] An another RCT assessed the anthropometric parameters such as body weight, BMI, Mid upper arm circumference, Waist-hip ratio, skin fold thickness, body shape index and percentage body fat of 72 subjects after practicing yoga for one and half hour for 5 days in a week for 14 weeks. Findings showed that yoga group had significant improvement in anthropometric parameters.^[1]

A three group pre-post research reported that 12 weeks of *Yoga* combined with aerobic exercise showed significant decrease in anthropometric parameters like body weight, BMI, waist circumference, hip circumference etc. of 81 female college students.^[14] A single group pre-post trial was conducted to consider the effect of *Yoga* practice 1 hour daily for 3 months on body mass index, waist circumference, hip circumference and biochemical measures in 112 obese participants with BMI more than 25kg/m². Findings justified that *Yoga* can be applied as an effective life style practice to produce significant decrease in anthropometric parameters and to reduce body weight.^[5]

In a separate single group pre-post trial body mass index, waist circumference, hip circumference, body composition and biochemical markers such as serum lipid profile were assessed in 32 subjects with BMI

greater than 23 kg/m² and less than 40kg/m² after practicing 1-hour *Yoga* for 10 days. Obtained data showed considerable improvements in body weight, BMI, triglycerides and total cholesterol.^[15]

An another single group longitudinal trial on 47 participants having BMI more than 30 kg/m² ages between 17-68 years was conducted to assess the effect of 5 hours of evening and morning yoga session for 6 days with high fiber vegetarian diet on anthropometric indices such as BMI, waist circumference, hip circumference, mid-arm circumference, body composition, postural stability, hand grip strength and biochemical measures. It founds that *Yoga* helps in lessening BMI, waist circumference, hip circumference, lean mass, body water content, total cholesterol, high density lipoprotein, and fasting serum leptin and improves postural stability and bilateral hand grip strength.^[16]

A single blind comparative controlled trial with sample size of 52 adult females with central obesity ages between 30 to 59 years had a significant reduction in anthropometric parameters (BMI, waist circumference, sagittal abdominal diameter, and hip circumference), biochemical measures and quality of life after following the 75 minutes, 3 days in a week for 12 weeks of *yoga* protocol.^[17]

A different single blind randomized controlled clinical trial on 80 subjects with an age group of 18 to 60 years was conducted to assess the effectiveness of 90 minutes *Hatha yoga* session based on integral yoga of Swami Sivananda over a period of 12 weeks on BMI and waist circumference. Following integral yoga BMI and waist circumference were significantly reduced and it also suggests people to eat healthier food.^[18]

A parallel group randomized controlled trial assessed BMI, waist circumference, hip circumference, and waist - hip ratio, body shape index, skinfold thickness, mid arm circumference, percentage body fat and level of stress of 80 subject ages between 18 to 60 years. 90 minutes practice of *Yoga* for 5 days in a week for 14 weeks showed the considerable improvement in anthropometric parameters, percentage body fat and reduced level of stress.^[6]

DISCUSSION

The review examined the all *Yogic* concepts, intervention and modern strategies of obesity with its causes, prevalence, prevention and management. It shows that *Yogic* approaches significantly affect the obesity and its related consequences. This review had a wide range of studies with various *yogic* interventions [Table 1]. The entire evidence based literature stated that it is becoming very serious health problem worldwide. Excessive eating of energy-dense, nutrient less foods and inactive lifestyle has led to a pandemic of obesity worldwide. More than underweight, world's population died due to overweight and obesity. *Yoga* helps to enhance awareness towards satisfaction and sense of eating and also useful for reduction of stress level and gives one of the best means to achieve self-improvement and attain full potential of individual's body, mind and soul.^[13] All the studies included in this review have been discussed in two groups based on short term and long term intervention. The short term intervention consists 15 days or less duration and long term intervention consists of two months to three and half months duration. Four studies with short term intervention showed significant improvement in weight reduction along with anthropometric measures. Eight studies with long term intervention showed considerable changes in anthropometric measurements as well as some other parameters like biochemical measurements, body composition, and quality of life.

CONCLUSION

This review suggests that *Yoga* and its related techniques shows significant improvement in body weight and anthropometric parameters in obese participants. Overall, the studies showed the *Yoga* program significantly effective as a therapy for improving obesity. For management and prevention of obesity there are very limited solutions having several adverse effects. *Yoga* has been used as an effective therapeutic tool to attain positive health and to enhance satisfaction towards own body. It gives a best means to attain full potential of individual's body, mind

and soul and plays a very considerable role in reducing anthropometric measures and body weight.

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