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Benefits of Yogic Practice on Body Fat Composition in Obese Adults

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Abstract: Obesity is a worldwide concern and is increasing rapidly across the continents. Yoga can be used as a preventive method for obesity. Therefore, current research investigates the effects of a yoga intervention on body composition among male and female participants. A total of 39 obese adults (Female = 21) were randomly assigned to the 12-week yoga intervention. The study utilized paired sample t-tests and repeated measures ANOVA to assess changes over time and explore potential gender differences. Results revealed significant main effects of time across all measured variables, including subcutaneous fat, visceral fat, Body Mass Index (BMI), and Muscle Mass (MM), indicating notable changes in body composition over the intervention period. In males, the effect size (ES) of Fat (subcutaneous) was -0.55 [t = 5.225, (17), p < 0.05], showing moderate degree of effect, while significant but small degree of effects were observed in Fat (visceral) ES = -0.17 [t = 4.016 (17), p < 0.05], and BMI ES was -0.15 [t = 2.592, (17), P < 0.05]. Muscle mass revealed a higher degree of ES 0.95 [t = -5.006, (17), p < 0.05]. In females, yogic intervention showed a significant but small degree of effects noticed in Fat (subcutaneous) ES = -0.39 [t = 4.464, (20), p < 0.05] and Fat (Visceral) ES = -0.24 [t = 3.039 (20), p < 0.05] respectively. Training had No significant impact on BMI and muscle mass in female participants. While some gender differences were observed in the main effects, particularly in Muscle Mass, the interaction between time and gender was not statistically significant, suggesting that the intervention's effects were consistent across genders. The study concluded that yoga is an effective means of promoting positive changes in body composition for male participants. However, the results were statistically significant in females, but the degree of effects was small. Further research could explore additional factors influencing these changes and investigate long-term impacts beyond the intervention period.

Introduction

Obesity is a medical condition, sometimes considered a disease (Powell-Wiley et al., 2021), in which excess body fat has accumulated to such an extent that it can potentially have negative effects on health. People are classified as obese when their BMI (body mass index, a person's weight divided by the square of the person's height) is over 30 kg/m^2; the range 25 – 30kg/m^2 is defined as overweight. Overweight and obesity are among the most important modifiable risk factors for chronic diseases and premature death (WHO, 2014; Madhu and Sarkar, 2016; Sarkar et al., 2021).

Overweight/obesity significantly increased all over the globe. A report published in World Obesity Atlas predicted that over 4 billion people may be affected by 2035, compared with over 2.6 billion in 2020. This reflects an increase from 38% of the world's population in 2020 to over 50% by 2035. The prevalence of obesity (BMI ≥30kg/m^2) alone is anticipated to rise from 14% to

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24% of the population over the same period, affecting nearly 2 billion adults, children, and adolescents by 2035 (World Obesity Federation, 2023).

India is the largest populated country in the world. Due to the genetic tendency of Indians towards abdominal obesity and its associated risk of related lifestyle diseases such as diabetes and anaemia, Indian standards for obesity and overweight are slightly different from the international standards. A BMI over 23 kg/m^2 is considered overweight, while a BMI over 25 kg/m^2 is considered obese (Misra et al., 2009). Based on the data from the National Family Health Survey, about 18.9% (26.46 million) of men and 20.7% (28.98 million) of women in India are overweight or obese (International Institute for Population Sciences, 2017). An annual increase in adult obesity (2020-35) is 5.20% respectively (World Obesity Federation, 2023).

A sedentary lifestyle is recognized as the most contributing factor to overweight and obesity (George and Dhull, 2023; Kumar, 2023a; Kumar, 2023b). The higher rates of obesity-associated mortality and comorbidities, such as diabetes, cardiovascular disease, chronic kidney disease, and several types of cancer, are equally staggering, with an average of 5 million deaths and 160 million disability-adjusted life-years (Bijender et al., 2023; Kumar et al., 2023a; Lobstein et al., 2022; Rassy et al., 2023). Therefore, regular physical activity is recommended in medical guidelines as the most important treatment option for non-morbid overweight or obesity and a preventive intervention (Ding et al., 2020). Given that many individuals with weight problems do not adhere to recommended exercise regimens (Lobstein et al., 2022; World Obesity Federation, 2023), the investigation of alternative forms of exercise for weight-related outcomes seems warranted.

Yoga is such an alternative form of physical activity that it is increasingly used for health and therapeutical purposes (Taneja, 2014). Yoga is a practical discipline incorporating a wide variety of practices whose goal is to develop a state of mental and physical health, well-being, inner harmony and ultimately "a union of the human individual with the universal and transcendent Existence". Yoga techniques include the practice of meditation, regulation of respiration with a variety of breathing exercises, and the practice of several physical exercises and postures, in which the focus is more on isometric exercise and stretching than on aerobic fitness (Akdeniz and Kaştan, 2023). While there is evidence to suggest that yoga is effective in promoting weight loss and improving body composition (Buttichak et al., 2019; Gawrys and Ślęzak, 2020; Manna, 2018; Rshikesan et al., 2017). Various systematic reviews and meta-analyses have evident the therapeutic benefits of yoga and are recommended to include yoga in physical activity guidelines (Caldwell et al., 2022; Roland et al., 2011; Thind et al., 2017a). Thus, this intervention aimed to explore the impact of 12 weeks of yoga intervention on overweight/obese adults.

The purpose of this study is to examine the effects of a 12-week yoga intervention on body fat composition in overweight and obese adults. Given the global rise in obesity and its associated health risks, yoga presents a promising alternative to traditional physical activity methods. By focusing on controlled breathing, meditation, isometric exercises, and stretching, yoga may help improve body composition and contribute to weight loss. This study aims to determine the potential benefits of yoga in managing obesity and enhancing overall physical well-being in adults, thereby supporting its inclusion in physical activity and weight management guidelines.

Material and Methods

Participants

A total of 50 overweight/obese male and female participants were enrolled in the present study. 11 participants dropped the intervention, and 39 participants completed the intervention. The integrated approach of Yoga therapy was imparted to the yoga group. Dean Students Welfare organized a twelve-week yoga program for those under the age of Maharishi Dayanand University, Rohtak. The university authority has granted written permission to collect pre- and post-measurements. After obtaining the permission, participants were recognized as per inclusion criteria, and baseline characteristics were assessed.

Inclusion Criteria

(i) BMI between 23 kg/m^2 and 35 kg/m^2, (ii) participants of both genders ages from 18 to 60 years, and (iii) normal health for doing simple yoga practices. No participants were trained in yoga practices before they were included.

Exclusion Criteria

(i) Individuals who had surgery in the past 6 months, (ii) any other neurological or psychiatric problems, and (iii) other health conditions (such as pain and injury) were unsuitable for doing yoga were excluded from the study.

The Institutional Ethical Committee approved the study, and informed consent was obtained from each participant. Both groups received their respective measurement values. Food log format and basic sample

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meal plan prepared for sedentary male adults based on standard guidelines.

Experimental Design

One group pretest-posttest, which is a type of quasi-experimental, was used. The one-group pretest–post-test pre-experimental design has been widely criticized, yet it continues to be used in some clinical nursing research studies. There are various threats to its internal and external validity i.e., history, maturation, testing, instrumentation, and statistical regression. In the present study, it was difficult to carry out random assignments for the yoga intervention and control group. Recent literature has evident the use of one group pretest-post-test design in clinical studies. While some studies suggested the use of one group pretest-post-test design with some methodological concerns (Knapp, 2016; Marsden and Torgerson, 2012).

Design of Yoga Intervention

The yoga intervention consists of a structured program spanning 12 weeks (from 21st March 2023 to 21st June 2023) divided into three phases of 4 weeks each. Each phase gradually increases the intensity and duration of yoga asanas and pranayama sessions. The intervention includes a variety of yoga asanas categorized into standing, seating, prone, and supine positions, targeting different muscle groups and body areas. Additionally, pranayama sessions focusing on Kapalbhati, Anulom-Vilom, Bhastrika, Ujjayi and Bharamari techniques are incorporated. The intervention also includes warm-up exercises (Suksham Vyayam) and Suryanamaskara as part of the routine. The duration of the intervention starts from 39 minutes in the initial phase and gradually increases to 57 minutes by the final phase, promoting a holistic approach to physical and mental well-being

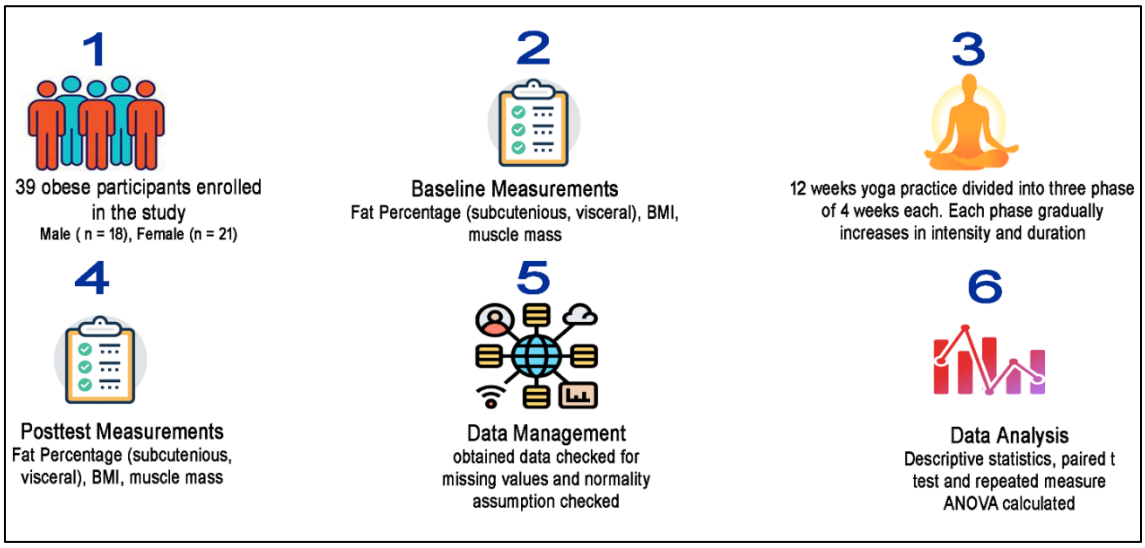

Figure 1. Schematic diagram showing the experimental design of the yogic intervention, including six six-step process.

Measurement of Body Compositions

Body fat compositions were measured through bioelectrical impedance methods using Omron Karada scan – body composition monitor model HBF-375. This device uses biochemical impedance to estimate fat percentage. Depending on where fat is accumulated. It is divided into intra-abdominal adipose tissue (IAAT) and Subcutaneous adipose tissue (ScAT). The particular device is reliable for assessing body composition parameters and has been used in several studies across the globe (Chitme et al., 2017; Hino et al., 2021; Solanki et al., 2015; Utami et al., 2020). A stadiometer measured height in centimetres, and weight was measured in kg using the digital weighing machine. BMI was calculated as weight divided by the square of height in meters (Kg/m^2) (Ahlawat, 2022; Nara et al., 2023; Nara et al., 2022a &b).

through yoga practice. The detailed structure of the yoga intervention is provided in Table 1 and Figure 1.

Analysis of Diet Patterns and Food Habits of Participants

Body fat composition may be affected by several factors. Diet pattern is one of the most important covariates to analyses the true outcomes of yoga intervention. In our study, participants were hostel residents, and their dietary intake was controlled, and they followed the hostel menu throughout the intervention period. This controlled dietary pattern ensures consistency and minimizes variability in participants' calorie intake, thereby allowing us to accurately assess the impact of the yoga intervention on their overall health and well-being. The hostel menu provided a balanced diet with essential nutrients necessary for optimal health. All participants were veget-

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Table 1. Yoga Intervention Details.

Yoga Asanas	1 to 4 weeks		5 to 8 weeks		9 to 12 weeks	
	Duration	**Rest**	**Duration**	**Rest**	**Duration**	**Rest**
Asanas (Standing position)	3 M	6 M	4 M 30 sec.	4 M 30	6 M	3 M
Tadasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Kati Chakrasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Varkshasana (Tree pose)	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Trikonasana (Tringle Pose)	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Virbhadrasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Utktasana (Chair pose)	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Asanas (Seating position)	3 M	6 M	4 M 30 sec.	4 M 30 sec.	6 M	3 M
Bhadrasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Paschimotanasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Uttanmandukasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Shashankasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
ArdhUstrasana and Ustrasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Vakrasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Asanas (laying Pronation)	2 M 30 Sec.	5 M	3 M 45 Sec.	3 M 45 Sec.	5 M	2 M 30 Sec.
Makarasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
VipritNaukasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Bhujangasana and TriyakBhujngasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Shalabhasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Dhanurasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Asanas (Laying Supination)	7 M 30 Sec.	9 M	9 M 45 Sec.	6 M 45 sec.	12 M	4 M 30 sec.
Naditansana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Ardhapawanmuktasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Naukasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Setubandhasana (Bridge pose)	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Uttanpadasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Ardha Halasana/ Halasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Viprit Karni Mudra	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Chakrasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Pawanmuktasana	30 sec.	60 sec.	45 sec.	45 sec.	60 sec.	30 sec.
Shavasana (Yog Nindra)	180 sec.		180 sec.		180 sec.	
Pranayam Session (10 Minutes)	10 M	10 M	12 M 30 sec.	7 M 30 sec.	15 M	5 M
Kapalbhati (Shodhan Kriya)	120 sec.	120sec.	150 sec.	90 sec.	180 sec.	60 sec.
Anulom-Vilom (alternate breathing)	120 sec.	120sec.	150 sec.	90 sec.	180 sec.	60 sec.
Bhastrika	120 sec.	120sec.	150 sec.	90 sec.	180 sec.	60 sec.
Ujjayi	120 sec.	120sec.	150 sec.	90 sec.	180 sec.	60 sec.
Bharamari	120 sec.	120sec.	150 sec.	90 sec.	180 sec.	60 sec.
Udgeet (Om Chanting)						
ShantiPadha						
Duration of Asanas + Pranayama	26 M	36 M	35 M	27 M	44 M	18 M
SukshamVyayam*	10 M	10 M	10 M	10 M	10 M	10 M
Suryanamaskara*	3 M	3 M	3 M	3 M	3 M	3 M
Total Duration of a Day	39 M	49 M	48 M	40 M	57 M	31 M

*Warm-Up Session: SukshamVyayam (10 minutes):- Nack rotation, Hand rotation, shoulder stretching and rotation, Kati Sakti Vikasak, Trunk twisting, Kneemovement, Jangha Sakti Vikasak (Jumping jack), Lateral rotation, forward-backward bending, forward bending with alternate toe touch, seven steps exercise. *Surya Namaskar asana (03 minutes) – performed daily in 3 times.

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arian and consumed a standard vegetarian diet consisting of a variety of foods such as vegetables, rice, milk, chapati, curd, salad, cheese, and desi ghee as a source of fat, along with all types of grains. Additionally, by adhering to the hostel menu, we can effectively monitor and analyze participants' calorie intake, enabling us to draw meaningful conclusions about the relationship between yoga practice and body fat composition where dietary intake as a covariate.

Statistical analysis

All statistical computations were performed in SPSS version 26.0 (IBM Corp, 2017; George and Mallery, 2019). Before analysis, all data were checked for missing values, and the Kolmogorov-Smirnov test of normality (Khatun, 2021) was performed to ensure the normal distribution of the data. Mean and standard deviation were used as descriptive statistics. Paired sample t-test along with effect size was used for hypothesis testing. Generally, a larger effect size indicates a stronger relationship between the intervention and the outcome. Cohen's guidelines (Kinney et al., 2020) suggest that a small effect size is around 0.2, a medium effect size around 0.5 and a large effect size around 0.8. The present study also utilized repeated measures ANOVA to assess changes over time and explored potential gender differences. The level of significance was 0.05, respectively.

Results

A total of 39 (Female, N = 21) overweighted (BMI ≤ 23) participants participated in the Yoga intervention. The mean age of the male participants was 27.44 years and 24.28 years for female participants. The subcutaneous fat percentage of male participants ranged between 20% to 32%, with an average of 25.19%, respectively. The average body fat was 25.19% in male participants and 30.90%reported in female participants, which is higher than the normal range of subcutaneous fat. The average visceral fat was 9.07% in males and 4.19% in female participants, showing the normal distribution range in bother genders. Similarly, the obtained body mass index values were also higher than the normal range. The values presented in Table 2 revealed the participants' baseline characteristics and indicated that most participants of both genders were overweight.

The table 3 presents the effects of a yoga intervention on the body composition of male participants, showcasing significant improvements across various parameters. Notably, the intervention resulted in a medium-sized decrease in subcutaneous fat and small decreases in visceral fat and BMI, as indicated by effect sizes of -0.55, -0.17 and -0.15, respectively. Conversely, there was a substantial increase in muscle mass, with a large effect size of 0.95. These findings suggest that engaging in yoga can effectively promote positive changes in body composition among male individuals, reducing fat accumulation while enhancing muscle development.

Table 4 presents the effects of a yoga intervention on

Table 2. Participant's characteristics.

	Male (N = 18)				Female (N = 21)			
	Baseline		***Posttest***		***Baseline***		***Posttest***	
	Mean	***SD***	***Mean***	***SD***	***Mean***	***SD***	***Mean***	***SD***
Age (y)	27.44	5.81	27.00	5.81	24.28	2.91	24.28	2.91
Weight (kg)	75.45	11.80	73.60	11.40	57.23	8.93	56.50	8.10
Height (cm)	173.44	7.39	173.44	7.39	160	4.86	160	4.86
Fat ^{Subcutaneous}	25.19	3.42	23.01	4.35	30.90	4.49	29.25	3.88
Fat ^{Visceral}	9.07	4.13	8.36	3.90	4.19	2.79	3.59	2.15
BMI*	24.86	3.69	24.31	3.30	22.30	3.59	21.52	2.58
Muscle Mass	31.19	1.86	33.02	1.98	25.48	3.10	26.25	1.65
BMI = Body Mass Index								

Table 3. Effects of Yoga Intervention on Body Composition of male participants in terms of dependent 't' test followed by degree of effects.

Variables	MD*	SD^{P}*	SEM*	(t)	Sig.	ES*	Degree
Fat ^{Subcutaneous}	2.183	3.912	0.417	5.225	.000	-0.55	Medium
Fat ^{Visceral}	0.716	4.016	0.254	2.811	.012	-0.17	Small
BMI*	0.555	3.500	0.214	2.592	.019	-0.15	Small
Muscle Mass	-1.116	1.92	0.223	-5.006	.000	0.95	Large
BMI = Body Mass Index; MD = Mean difference; SD^{P} = Standard Deviation Pooled; SEM = Standard error mean; ES = Effect size; *df* = 17							

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the body composition of female participants, revealing notable changes across several parameters. The intervention led to a small-sized decrease in subcutaneous fat (-0.39) and visceral fat (-0.24), as well as BMI (-0.24), although the latter was not statistically significant at the 0.05 level. Additionally, there was a small increase in muscle mass (0.31), although this change was also not statistically significant. These findings suggest that while the yoga intervention showed some positive effects on body composition among female participants, particularly in terms of reducing fat deposits, the impact on muscle mass and overall BMI may be less pronounced and require further investigation to establish statistical significance.

effects. It assesses the impact of time and gender on various measures related to body composition, including subcutaneous fat (Fat (S), visceral fat (Fat (V), Body Mass Index (BMI), and Muscle Mass (MM). The analysis reveals significant main effects of time on all measures, indicating that there were changes in body composition over the course of the intervention. Additionally, there were significant main effects of gender on some measures, suggesting differences in responses between genders. However, the interaction between time and gender was not statistically significant for any measure, indicating that the changes observed over time did not differ significantly between genders. These findings suggest that the intervention significantly impacted body

Table 4. Effects of Yoga Intervention on Body Composition of Female Participants in terms of dependent 't' test followed by degree of effects.

Variables	MD*	SD^{P}*	SEM*	(t)	Sig.	ES*	Degree
Fat ^{Subcutaneous}	-1.65	4.196	0.369	4.464	.000	-0.39	Small
Fat ^{Visceral}	-0.60	2.490	0.195	3.039	.006	-0.24	Small
BMI*	-0.78	3.126	0.565	1.373	.185	-0.24	Small
Muscle Mass	0.77	2.483	0.471	-1.647	.115	0.31	Small

BMI = Body Mass Index; MD = Mean difference; SD^{P} = Standard Deviation Pooled; SEM = Standard error mean; ES = Effect size; *df* = 20

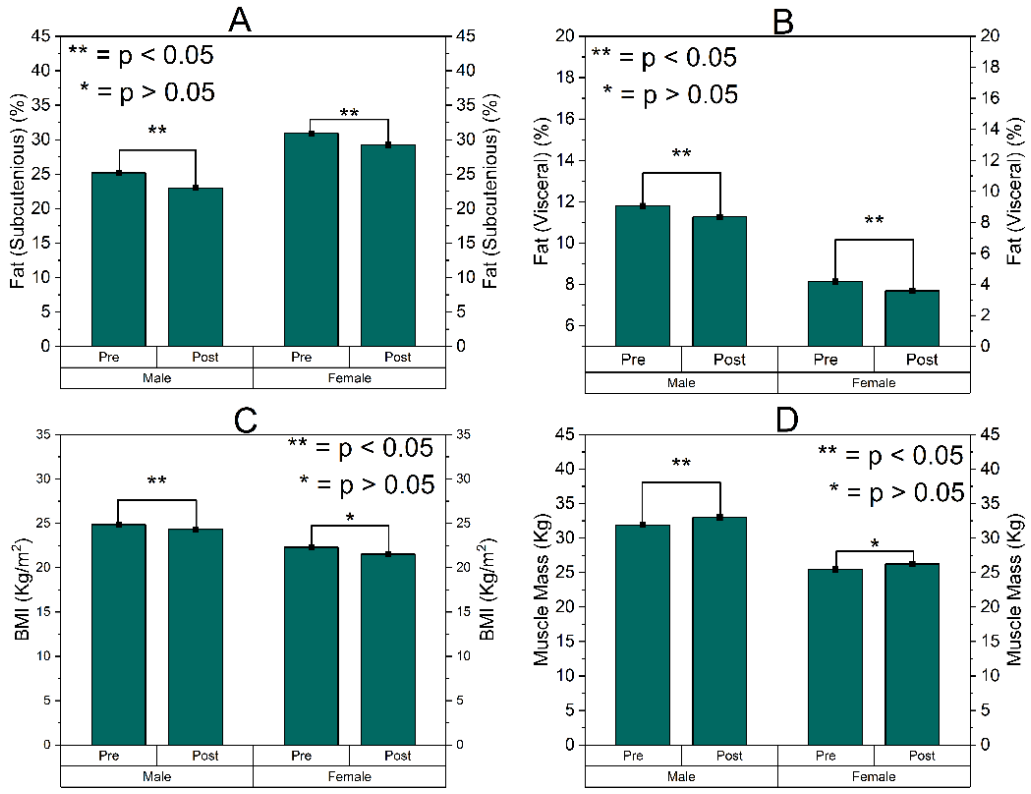

Figure 2. Bar graph depicting pre and post-test measurements of male and female participants for yoga intervention (A) Fat% (subcutaneous), (B) Fat% (Visceral), (C) Body Mass Index, and (D) Muscle Mass.

Table 5 displays the results of repeated measures ANOVA, within-subject contrasts, and the linearity of composition, with changes occurring over time, but these changes were not influenced by gender.

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Discussion

The prevalence of obesity is increasing worldwide, and obesity is an important risk factor for cardiovascular and metabolic disorders. Particularly worrisome is that children and teenagers with obesity may become obese adults. Obesity is associated with an increased risk of developing chronic NCD. Therefore, alternative therapies for obesity prevention and promotion of health in overweight adolescents are important. The effectiveness of yoga for weight control and improved body composition is evident from surveys (Kristal et al., 2005) and clinical studies (Lauche et al., 2016), and yoga has the potential to increase fat loss, develop muscle tone, and build flexibility, leading to better shape and good proportions. Many types of yoga also help build muscle strength and endurance (Lauche et al., 2016; Manna, 2018).

The present study explored the impact of 12 weeks of yoga intervention on body composition parameters including subcutaneous fat, visceral fat, body mass index, and muscle mass. The present study noted a significant reduction after 12 weeks of yoga intervention. This study also made evident the degree of impact and gender-based variations. The mean difference between baseline and post-test measurements was statistically significant, but the degree of impact ranged from small to large in the context of the parameters of body composition and gender of participants. In male participants, the degree of the effect of yoga intervention was medium in terms of effect size (ES). The value of the effect size was -0.55, which indicates a moderate degree of effect on the reduction of subcutaneous fat percentage. Although the mean difference between visceral fat and body mass index was also statistically significant, a small degree (ES < 0.25) of effects were noted except the muscle mass (ES = 0.95). A similar study included 60 healthy volunteers with a duration of sixty minutes of yoga intervention and reported a significant reduction in body fat%, BMI and muscle mass with a higher effect size (ES > 0.8) on both genders (male and female) (Kristal et al., 2005; Nara et al., 2022). In female participants, the effect size of all selected parameters of body composition was small (ES 0.25 to 0.5). However, female participants' body mass index and muscle mass were not significantly reduced.

Agreement with other studies and reviews

To align the results of present study with another randomized control trials, various systematic reviews and meta-analyses were approached. A meta-analysis (Asiah et al., 2023) included 15 studies containing 1161 participants across the globe, which showed much variation among the randomized control trials of yoga intervention regarding body composition. Much of the studies included in the meta-analysis showed no significant difference between yoga and control groups in the context of fat %. Similarly, body mass index was also not significantly affected by yoga intervention. Similarly, another review (Lauche et al., 2016) included 30 trials having 2173 participants reported that outcomes of yoga intervention were not significant among the group, especially in the context of the participants' fat %, body mass index and weight. Some reviews reported beneficial effects. A review of 23 trials included 2473 participants who reported yoga as an effective means for reducing weight and body mass index, respectively (Thind et al., 2017). The results of the present study aligned with another similar study, which involved 12 weeks of yoga intervention along with aerobic exercise. The following study reported beneficial effects on body composition parameters (Welford et al., 2022), but the effects were moderate among pre and post-measurements.

A significant variation among the outcomes of different studies was reported, but similar statements were highlighted by every study review that the methodological quality of studies was insufficient. Many factors may affect the outcomes of the intervention, for instance, calorie intake during the intervention, involvement of participants in additional exercise programs, certified yoga trainers, climatic conditions and altitude (Basak, 2019; Jamdade and Wange, 2023). In the present study, the participants were hostel residents, and their food patterns and calorie intake were assessed and controlled during the intervention. The university administration approached a certified yoga trainer in collaboration with the Ministry of Ayush, Govt. of India, for 12-week yoga intervention. Therefore, the present study recommended adopting sound methodological quality to ensure the true effects of intervention for future studies.

Conclusion

The current study revealed that yoga, including *Asana* and *Pranayam* is a safe and effective mean to improve body composition. The effects were statistically significant, but the degree of effect was small. However, rigorous randomized controlled trials are needed to examine the longitudinal effects of yoga for a particular population. Future studies might include the different physical (physical activity, diet) and psychological (stress, depression etc.) dimensions in their investigation.

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Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of Interest

The authors state no conflict of interest.

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