EFFECT OF YOGA ON PHYSICAL HEALTH IN OVERWEIGHT INDIVIDUALS WITH SPECIAL REFERENCE TO BODY COMPOSITION ANALYSER

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ABSTRACT

Overweight or obesity is a significant concern in current scenario, it has been the most significant contributor of ill health than infectious diseases and undernutrition. Previous studies on yoga suggest that regular practice of yoga fulfils all 3 aims of weight loss management namely weight reduction, prevention of weight regain and maintenance of the target BMI along with long term efficacy. This study investigates the impact of yoga on physical health in overweight individuals, with a specific focus on body composition. Utilizing a well-defined methodology, the study enlisted overweight participants for a structured yoga regimen. Body composition analysis was conducted pre and post-intervention to assess changes in weight, fat percentage, and muscle mass. The results indicate significant improvements in participants' physical health metrics, suggesting yoga as a feasible intervention for weight management. This research contributes to the growing body of evidence supporting yoga's beneficial effects in managing overweight and obesity-related health issues.

Key words: Sthoulya, Yoga Therapy, Body Composition, Weight Management, Physical Health, Overweight Intervention

INTRODUCTION

Overweight or obesity is defined as an excessive accumulation of adipose tissue. This state might arise from enlarged fat cell size, an increase in fat cell number, or both.[1,2] Overweight is a condition where a person's weight exceeds the recommended limit. Currently, non-communicable diseases like cardiovascular diseases, diabetes, and hypertension, linked to overweight or obesity, exceeds the deaths caused by infectious diseases. Given their role as primary drivers of non-communicable diseases, focusing on overweight conditions is crucial for this study. The rapid rise in obesity and overweight in industrialized nations is alarming. Factors such as increased consumption of energy-dense foods, minimal physical activity, and high stress levels significantly contribute to this Epidemic. Obesity, a chronic disease affecting both children and adults, is prevalent in developed and developing countries and contributes significantly to ill health. Globally, overweight and obesity are major risk factors, ranking fifth in leading causes of death. By 2016, over 1.9 billion adults aged 18 and older were overweight, and there were more than 41 million overweight or obese children under the age of five. Overweight and obesity, once thought to be a problem exclusive to high-income nations, are now becoming more prevalent in low- and middle-income nations, especially in metropolitan areas. Approximately 30 million overweight children live in developing countries, compared to 10 million in developed countries. The 2007-2008 non-communicable risk factor survey phase 2 in India indicated a higher prevalence of overweight among females than males, more in urban areas than rural, and lower among those with less education or in agricultural/manual occupations.

Overweight is commonly measured using the Body Mass Index (BMI)[2]. The World Health Organization (WHO) categorizes underweight as a BMI < 18.5 kg/m², normal weight as 18.5-24.9 kg/m², overweight as > 25 kg/m², and obesity as a BMI of > 30 kg/m², with extreme obesity at a BMI of > 40 kg/m² [4]. In Ayurveda, conditions like overweight are described as 'Ashtounindita Vishaya,' including 'Ati Sthula' or excessive stoutness. Ayurvedic texts attribute Sthoulya's causation to dietary, lifestyle, psychological, and genetic factors, with Kapha Dosha, Medho Dhatu (fat tissue), and Mandagni (diminished digestive power) as key pathogenic components[5].

If not managed, overweight can lead to obesity, increasing the risk of hypertension, type 2 diabetes, dyslipidaemia, sleep apnoea, fatty liver disease, joint diseases, and certain cancers[1]. At least 3.4 million adult deaths per year are attributed to overweight and obesity, which also bear a large portion of the worldwide burden of diabetes, ischemic heart disease, and certain malignancies. Overweight and obesity are associated with a higher death rate globally than underweight[2].

Effective management and treatment of overweight and obesity, therefore, are crucial.

Management strategies for obesity and overweight focus on weight loss and treating associated co-morbidities. The goals are to prevent further weight gain, achieve a realistic target BMI, and maintain a lower body weight over the long term. Exercise and physical activity play a vital role in weight loss and maintenance. Physical activity is defined as any activity leading to calorie consumption, is essential for increasing energy expenditure[6]. In Ayurveda, managing Sthoulya involves Vatahara Annapana, Shleshma, Medohara panchakarma procedures, and Vyayama(exercise), a physical activity that leads to exhaustion[5]. One effective form of physical activity is 'Dynamic yoga.' Patanjali defines yoga in his Yoga sutras as the control of mental functions. Yoga Vasistha sees yoga as a means to pacify the mind, essentially a process of gaining control over the mind[6]. Various schools of yoga, like Raja yoga, Hatha yoga, and others, offer diverse practices[7]. Patanjali's Ashtanga Yoga, involving Yama, Niyama, Asana, Pranayama, and other elements, forms a comprehensive framework for this study, focusing on Asana and Pranayama. Asanas, stable and comfortable postures, enhance strength and health[6], while Pranayama, the control of breath, aids in mental control and concentration[7]. Suryanamaskara is one such dynamic exercise which involves both yogasana and pranayama. It is a complete exercise for whole body, which not only helps in reducing the weight but also provides strength for the entire body, helps to increase the circulation of blood to the brain and tone up the digestion[8]. As stress is one of the major contributing factors for developing overweight/obesity, this unique yogic practice, helps to provide concentration of mind and eliminates mental depression and anxiety. Thus, Suryanamaskara and other set of dynamic asanas were chosen for this study.

Overweight and obesity may arise from variations in body composition, including fat percentage, muscle mass, bone density, and water content. These parameters can be accurately measured using a Body Composition Analyzer (BCA), which is essential for understanding the nature of overweight conditions. In both Ayurveda and modern medicine, it is acknowledged that effective weight management extends beyond medication. Physical activity is a critical component of treatment, as relying solely on medication can lead to weight regain upon cessation due to decreased energy expenditure. This study, therefore, focuses on incorporating yoga, an integral part of pathya vihara (healthy lifestyle practices) in Ayurveda, as a method to address overweight issues. This approach emphasizes the importance of lifestyle modifications in effective weight management.

AIM AND OBJECTIVES

Aim: The primary aim of this study is to evaluate the impact of a structured yoga regimen on the physical health and body composition of overweight individuals.
Objectives:
1. Assessing changes in body weight, fat percentage, and muscle mass pre-yoga and post-yoga intervention.
2. Comparing the effectiveness of yoga in weight management against traditional methods.
3. Understanding the role of yoga in improving overall physical health among overweight individuals.

MATERIALS AND METHODS

Source of Data
The study was conducted with 30 individuals, selected from the outpatient and inpatient wings of Sri Kalabyraveshwara Swamy Ayurvedic Medical College, Hospital and Research Center, Bangalore, Karnataka, India, based on following criteria.
- Individuals among age group of 18-40 years.
- Not on any medication or supplements.
- BMI between 25-29.9 kg/m^2.
- Individuals who are willing to practice yoga.
- Individuals not participating in any other clinical trials.
- Individuals without any metals in the body.

Written informed consent was obtained from all participants prior to enrolment for the study.

Study was done in accordance with ICH GCP guidelines. Ethical clearance for the study has been obtained from institutional ethics committee of SKAMCH and RC, Bangalore, Karnataka, India. (IEC No. SKAMCH&RC/1EC/03/2023).

Intervention
The Following interventions were implemented 6 times in a week for 1 month (4 weeks) and each session lasted for one hour.
The asana selected for the study were the dynamic set of Asana which includes
- 6 sets of Suryanamaskara
- Followed by 3 sets of continuous
  - Dandasana,
  - Chaturanga Dandasana,
  - Bhujangasana,
  - Parvatasana,
  - Ekapada uttanasana,
  - Veerabhadrasana 1,2 and 3 variants
  - Pavanamukta asana
  - Dhanurasana

The asanas selected for the study were comprehensive body exercises designed to strengthen the body and aid in the weight reduction. For the purpose of creating a dynamic connection between the body and mind, Pranayama such as Nadishodana, Surya Bhedhana, and Bhramari were selected. During the sessions, participants received detailed instruction and demonstrations of all the Asanas and pranayama. They were then guided to practice these themselves. Special emphasis was placed on educating participants about the correct breathing techniques associated with each procedure.

Yoga sessions were held Monday to Saturday, from 4:15 to 5:15 PM. Each session began with a 5-minute warm-up, followed by six sets of Suryanamaskara, holding each pose for 10 seconds. After this, participants relaxed in Shavasana for 2 minutes. This was followed by three sets of dynamic asanas, maintaining each posture for 10 seconds, with a subsequent 2 minutes relaxation in Makarasana. The session concluded with the practice of pranayama, Surya Bhedhana, Nadi Shodhana, and Bhramari, performing five breaths for each.

Assessment via body composition analyser

Height was measured using a measuring tape. The body composition parameters, including weight, fat percentage, muscle mass, bone mass, BMI, calorie intake, metabolic age, water percentage, and visceral fat, were recorded at three intervals: before the intervention (Day 0), mid-intervention (Day 15), and post-intervention (Day 30), between 4:15 to 5:15 PM. Participants, wearing comfortable attire to minimize weight variation, were instructed to step onto the BCA machine and correctly position themselves, ensuring feet were on foot electrodes and hands gripping the hand electrodes. They were asked to maintain a proper posture with arms extended to shoulder

level for accurate measurement. The readings displayed on the BCA device were then meticulously recorded.

Statistical analysis

All statistical analyses were conducted using the t-test, performed manually. The standard deviation (SD) for pre- and post-intervention values of each parameter was calculated using the formula: $SD = \sqrt{\sum(x-\mu)^2/n-1}$. Subsequently, the standard error (SE) was determined with the formula: $SE = SD/\sqrt{n}$. The t-value was then calculated using the formula: $t = \bar{x}/SE$. P-values were obtained from the student's t-table. A P-value of less than 0.05 was considered to indicate statistical significance.

OBSERVATION

A total of 30 patients of overweight fulfilling the inclusion criteria were registered for this clinical study.

26(86.7%) patients belong to the age group of 18-23 years, 4(13.3%) patients belong to the age group of 24-29 years. 21(70%) patients were female and 9(30%) patients were male. 26(86.7%) patients were Hindu, 3(10%) patients were Muslim and 1(3.3%) patient were Christian. 1(3.3%) patient was married and 29(96.7%) were unmarried. All 30(100%) subjects were Undergraduates. 23(76.7%) patients were Lower Middle Class and 7(23.3%) patients were Upper Middle Class. All 30(100%) subjects were Students. 8(26.7%) patients were following vegetarian diet and 22(73.3%) patients were following mixed diet. 21(70%) patients belonged to Kapha Pitta Prakruti, 4(13.3%) patients belonged to Kapha Vata Prakruti, 4(13.3%) patients belonged to Vata Pitta Prakruti and 1(3.4%) patient belonged to Sama Prakruti. All 30(100%) patients were having Pravara vikruthi. All 30(100%) patients were having Madhyama Sara. All 30(100%) patients were having Madhyama Samhanana. All 30(100%) patients were having Madhyama Pramana. 19(63.3%) patients were having Madhyama Satmya and 11(36.7%) patients were having Pravara Satmya. 5(16.7%) patients were Pravara Satva, 22(73.3%) patients were having Madhyama Satva and 3(10%) were having Avara Satva. 2(6.7%) patients were having Pravara Ahara Shakti, 26(86.6%) patients were having Madhyama Ahara Shakti and 2(6.7%) patients were having Avara Ahara Shakti. 1(3.3%) patient was having Pravara Vyayama Shakti, 28(93.4%) patients were having Madhyama Vyayama Shakti and 1(3.3%) patient were having Avara Vyayama Shakti. All 30(100%) patients were belonged to Madhyama Vaya. 30(100%) patients were indulging in both Aharatmaka and Viharatmaka Nidanas, 11(36.6%) patients were having Manasika Nidana and 24(80%) patients were having Beeja doshaja Nidanas as a contribution. 27(90%) patients were giving the chronicity of overweight history in between 1-10 years and 3(10%) patients were in between 11-20 years. Among 30 patients Medopachaya was found in all the patients i.e., 100%, Javoparadha was found in 30%, Anga Chalatva in 90%, Swedaadhikya in 36.6%, Dourgandhya in 43.3%, Dourbalya in 30%, Atikshuda in 26.6%, Atitrishna in 36.6%, Nidradhikya in 23.3%, Alasya in 83.3%, Angashaitilya in 80%, Sukumarata in 40%, Snigdhangata in 33.3%.

RESULT

Parameter	't' value	'p' value	Remarks
Weight	2.294	0.029	statistically significant.
Fat %	1.629	0.114	no statistically significant difference.
Muscle mass	-0.753	0.457	no statistically significant difference.
Bone mass	1.153	0.258	no statistically significant difference
BMI	1.923	0.064	no statistically significant difference.
Metabolic age	2.901	0.007	statistically significant.
Water %	-3.31	0.002	statistically significant.
Visceral fat	-0.123	0.900	no statistically significant difference
Calorie intake	0.057	0.954	no statistically significant difference.

Weight: The 't' value is 2.294 with a 'p' value of 0.029. This is statistically significant (p < 0.05). It suggests that the observed difference in weight is unlikely to have occurred by chance. Fat Percentage (Fat %): With a 't' value of 1.629 and a 'p' value of 0.114, this indicates no statistically significant difference. Muscle Mass: The negative 't' value (-0.753) and the 'p' value of 0.457 imply no statistically significant difference. The negative 't' value may suggest a decrease in muscle mass, but this change is not statistically significant. Bone Mass: A 't' value of 1.153 and a 'p' value of 0.258 again show no statistically significant difference. This suggests that the bone mass between the compared groups or time points does not differ meaningfully. Body Mass Index (BMI): The 't' value is 1.923 with a 'p' value of 0.064. Although the 'p' value is close to the significance threshold, it still indicates no statistically significant difference. Metabolic Age: The 't' value of 2.901 and a 'p' value of 0.007 denote statistical significance. This suggests a meaningful difference in metabolic age, which may have implications for metabolic health or aging. Water Percentage (Water %): A statistically significant negative 't' value (-3.31) with a 'p' value of 0.002 indicates a significant decrease in water percentage. Visceral Fat: The very low 't' value (-0.123) and high 'p' value (0.900) suggest no statistically significant difference in visceral fat levels. Calorie Intake: A 't' value of 0.057 and a 'p' value of 0.954 also indicate no statistically significant difference.

The only parameters showing statistically significant differences are weight, metabolic age, and water percentage. The rest do not show significant changes, implying that for these parameters, any observed differences could be due to random variation rather than a systematic effect.

DISCUSSION

In the contemporary landscape, the rise in the prevalence of obesity and overweight individuals, especially among children and teenagers exposed to modern lifestyles, raises concerns about the potential for later-life chronic non-communicable diseases. This pressing issue necessitates the adoption of proactive measures from an early age to mitigate the risks associated with excess weight that may lead to obesity. Research articles, surveys, and clinical studies have consistently highlighted the efficacy of yoga as a powerful tool for improving body metabolism and facilitating weight reduction, thereby contributing to overall health. This study specifically focused on the impact of yoga on various body composition parameters, including weight, fat percentage, muscle mass, bone density, and other crucial indicators.

In the current investigation, a selection of whole-body exercises, constituting key asanas, were incorporated into the yoga sessions.

These exercises were strategically chosen to strengthen the body system and promote weight reduction. Additionally, pranayama, a dynamic practice that uses controlled breathing methods to integrate the mind and body—was essential to the intervention. Certain pranayamas, like surya bhedhana, nadishodana, and bhramari, were selected because of their possible advantages. Participants in the study were given thorough explanations and examples of every asana and pranayama, with a focus on correct breathing methods. The comprehensive approach aimed to ensure participants' understanding and correct execution of the practices during the sessions.

The intervention extends over a duration of one month, during which participants engaged in regular yoga sessions. Changes in body composition parameters were analyzed by comparing data before and after the study. The results revealed statistically significant changes among individuals who embraced yoga as part of their lifestyles. Following are the discussion on the BCA components Weight: The overall mean weight of participants decreased marginally by 0.64 Kg suggesting a slight reduction in weight after the intervention. Fat Percentage: Noticeable decrease in fat percentage (-0.77%) indicates a positive impact on body composition, reflecting a reduction in body fat. Muscle Mass: While there is a minor increase in muscle mass (0.28 Kg), the change may suggest improved muscle health. Bone Density: The observed increase in bone density (0.24) is a positive indicator of potential bone strength improvement. BMI (Body Mass Index): Despite a minimal decrease in BMI (-0.02), the reduction implies progress towards healthier body weight. Calorie Intake: The overall calorie intake showed a negligible decrease (-5.4 Kcal), possibly indicating a shift towards a healthier dietary pattern. Metabolic Age: The small decrease in metabolic age (-0.18 years) suggests potential improvements in metabolic efficiency. Water Percentage: The water percentage remained relatively stable, with only a slight decrease (-0.6 %). Visceral Fat: It showed a marginal decrease (-0.57), indicating a potential reduction in the future metabolic diseases. Overall Trends: While individual variations exist, the aggregated data suggests a positive trend in body composition parameters.

The statistical insights indicate promising improvements in body composition parameters following the intervention. While the changes are modest, they collectively suggest a positive impact on participants' health. The slight reductions in weight, fat percentage, and visceral fat, coupled with the increases in muscle mass and bone density, underscore the potential effectiveness of the intervention. The statistical analysis adds quantitative support to the qualitative observations, reinforcing the importance of incorporating yoga into lifestyles for holistic well-being.

CONCLUSION

This study contributes to the growing body of evidence supporting the effectiveness of yoga as a valuable and holistic approach to managing weight among overweight individuals. The results underscore the potential of integrating yoga into routine practices to address the complex challenges associated with obesity and overweight conditions. As society grapples with the consequences of sedentary lifestyles, the incorporation of yoga emerges as a promising strategy for promoting healthier living and preventing the onset of chronic diseases associated with excess weight.

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