ORIGINAL ARTICLE

# Yoga: Managing overweight in mid-life T2DM

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## ABSTRACT

**Background:** The dramatic rise in the prevalence of obesity and type 2 diabetes mellitus (T2DM) is associated with increased mortality, morbidity as well as public health care expenses worldwide. Previous research suggests that yoga holds promise for obesity and T2DM management.
**Objective:** The objective of the present study was to assess the effect of intensive integrated approach of yoga therapy (IAYT) on body fat and body mass index (BMI) and resting metabolism in mid-life overweight patients with T2DM (BMI, Mean ± SD, 27.05 ± 4.51).
**Materials and Methods:** Twenty-four mid-life patients (6 females) with T2DM (Age, Mean ± SD, 55.38 ± 7.96 years) participated in the study and practiced IAYT for 7 days. The IAYT works at five layers of human existence (physical, vital, mental, intellectual and bliss) to bring positive health. The body fat and BMI and resting metabolism were recorded before and after IAYT using Karada Scan body composition monitor HBF-375 from Omron Healthcare Singapore PTE LTD.
**Statistical Analysis:** SPSS-16 was used to analyze the data. Shapiro-Wilk test showed that the data was not normally distributed. Further, the Wilcoxon signed-ranks test was used to analyze the change in means of pre- and post-measurements.
**Results:** Data analysis showed that there was a significant decrease in body fat and BMI and resting metabolism (in all assessments, $P < 0.001$).
**Conclusion:** The present study suggests that 7 days practice of IAYT has a great promise for the management of overweight in mid-life patients with T2DM. Additional well-designed studies are needed before a strong recommendation can be made.

**Key Words:** Body composition, mid-life, overweight, type 2 diabetes mellitus, yoga

## INTRODUCTION

In spite of all new drugs that are now available, type 2 diabetes (T2DM), which is a lifestyle-related disease and a major health and socioeconomic problem worldwide[1,2] has drawn attention to the research on effects of yoga in diabetes prevention and treatment.[3] The rapid increase in T2DM can be attributed to adverse lifestyle such as physical inactivity and obesity, which are also key components for development of insulin resistance.[4] This condition of insulin resistance or pre-diabetes can be detected,[5] and if managed with dietary,[2] lifestyle modification practices[6] like yoga[7] can delay if not prevent the onset of T2DM. This low level of insulin in T2DM causes decreased utilization of glucose by body cells, increased mobilization of fats from fat storage cells and depletion of proteins in the tissues of the body, keeping the body in crisis.[2] Therefore,

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a maneuver to prevent increase of T2DM holds great significance. T2DM and overweight are closely associated.[8] In the process of assessing overweight severity, the body mass index (BMI) is useful to categorize under and over-nutrition. It is the weight in kilograms divided by the height in meters, squared.[9] Two related markers of physical well-being in adults are BMI and medication use.[10] Overweight (BMI 25.0 to 29.9 kg/m$^2$) and obesity (BMI ≥ 30.0 kg/m$^2$) are associated with increased all-cause mortality.[11] Mid-life women are particularly vulnerable to overweight and obesity. Patients with T2DM are usually obese and there are an estimated 51 million people with diabetes in India, and this number is projected to increase to 80 million by 2030.[12] Impaired fasting glucose along with deranged waist hip ratio and BMI play a significant role in predicting potential diabetics.[3] It was reported that yoga offers a promising lifestyle intervention for decreasing weight-related T2DM risk factors and potentially increasing psychological well-being.[7] Similarly, yogic lifestyle modification can make an appreciable contribution to primary prevention as well as management of lifestyle diseases.[13] There was no previous study that has reported systematically the effect of intensive IAYT on body weight, body fat and BMI in mid-life overweight patients with T2DM.

### Objectives

The study was designed to assess the effect of IAYT on body weight, body fat and BMI in mid-life overweight patients with T2DM.

## MATERIALS AND METHODS

### Subjects

Twenty-four mid-life patients (6 females) with T2DM (Age, Mean ± SD, 55.38 ± 7.96 years) were participated in the study and practiced IAYT for 7 days. [Table 1] Data derived from the previous study with similar design on yoga[14] has been used to calculate the effect size. The power analysis (Alpha = 0.05, Power = 0.5, Effect Size = 0.51) had yielded sample size of total 24 subjects.

#### *Inclusion criteria*

Mid-life patients (age ranging from 43 to 68 years) with T2DM, both males and females, non-smokers

#### *Exclusion criteria*

Those with orthopedic, with complications (like unstable angina, proliferative retinopathy, severe peripheral vascular disease), those who have regularly been practicing yoga and/or on Ayurveda treatment from prior three months who may carry over effect of such previous therapies.

**Table 1: Details of the subjects**

| Subjects | Numbers of subjects | Age range | Age in mean ± SD |
|---|---|---|---|
| 7 days program of yoga | 18 Males 6 Females | 43 – 68 years | 55.38 ± 7.96 years |

#### *Source of subjects*

The subjects for the present study were selected from the health home of Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA) University, Bangalore.

#### *Ethical consideration*

An informed consent was obtained from all the participants to take part in the study and this study was approved by the institutional review board of S-VYASA University, Bangalore

#### *Design*

Single group pre-post study. Pre-----7 days IAYT -----Post

### Intervention

The IAYT program[15] of 7 days duration was administered to mid-life patients with T2DM who were participated in the study. *Sukma Vyayama* (loosening and stretching practices), *Yogasanas* (physical postures), *Pranayama* (breathing techniques), *Dhyana* (meditation), *Kriyas* (cleansing techniques), devotional session, *Sattvic* diet (high-fiber low-fat vegetarian and balanced diet), yogic games and lectures from the experts were the key essence of this IAYT program. This IAYT program, conducted in a serene and peaceful atmosphere of S-VYASA University's health home was a residential setup with a daily schedule starting from 5 AM to 10 PM.

### Assessment

The Karada Scan body composition monitor HBF-375 from OMRON HEALTHCARE SINGAPORE PTE LTD was used to collect data of different body compositions: Weight, fat, visceral fat, resting metabolism, BMI, body age, subcutaneous whole body, subcutaneous trunk, subcutaneous arms, subcutaneous legs, skeletal whole body, skeletal trunk, skeletal arms and skeletal legs. This machine is useful for a more accurate and precise body composition measurement.[16,17]

### Data extraction and analysis

The data for different body compositions were taken before and after the 7 days IAYT program for mid-life patients with T2DM. The Statistical Package for the Social Sciences (SPSS) software version 16 was used to analyze data. Shapiro-Wilk test showed that the data is not normally distributed. Further, the Wilcoxon signed-ranks test was used to analyze the change in means of pre- and post-measurements.

## RESULTS

The data analysis of 7 days IAYT program showed that there was a significant decrease ($P < 0.001$) in all the variables of body compositions.[Table 2] It was noted that there was 1.06% decrease ($P < 0.001$) in weight, 4.20% decrease ($P < 0.001$) in fat, 2.78% decrease ($P < 0.001$) in visceral fat, 1.08% decrease ($P < 0.001$) in resting metabolism, 1.10% decrease ($P < 0.001$) in BMI, 1.58% decrease ($P = 0.005$) in body age, 3.20% decrease ($P = 0.036$) in subcutaneous whole body, 2.54% decrease ($P = 0.036$) in subcutaneous trunk, 2.84% decrease ($P = 0.036$) in subcutaneous arms, 2.78% decrease ($P = 0.036$) in subcutaneous legs, 1.60% decrease ($P = 0.036$) in skeletal whole body, 3.71% decrease ($P = 0.036$) in skeletal trunk, 1.54% decrease ($P = 0.036$) in skeletal arms, and 1.32% decrease ($P = 0.036$) in skeletal legs.

## DISCUSSION

A typical yoga program usually consisting of *Asana*, *Pranayama*, *Kriya*, deep relaxation and meditation has a combined effect of relaxation of body, slowing of breath and calming of mind. This effect in turn leads to reduction in oxygen consumption and metabolism thereby balancing the homeostasis.[18,19] An understanding of metabolism at different times of the day has significant implications due to its link to sleep, health, stress and fatigue, ultimately determining the quality of life. The earliest study on metabolism by Anand *et al*.,[20] has demonstrated that a yogi could reduce oxygen consumption while sealed in an airtight box for nearly 10 hours, thus changing metabolism at will. Wallace *et al*., have reported the effect of acute practices resulting in the reduction in metabolic rate in meditation as compared to sleep.[21,22] The reduced body weight in the present study suggests greater metabolic efficiency, which is consistent with the previous studies.[14,18] The high-intensity exercises increase the basal metabolic rate in subjects aged from 59 to 77[23] years, whereas low and moderate intensity exercises do not have any effect on these rates.[24,25] All these exercises are mainly related to central or sympathetic activation,[26] whereas yoga reduces sympathetic activity.[27,28] It is believed that all these changes must have some positive and permanent effect on metabolism when practiced over a period of time, leading to efficiency and relief from stress, thereby resulting in certain changes in the diurnal metabolism, basal metabolic rate and sleep. The present study endorses this view and adds that IAYT can bring significant decrease in resting metabolism, BMI and body fat after 7 days. This may be due to reduced sympathetic activity and/or stabilized nervous system.[29]

## CONCLUSION

The IAYT has a great promise for management of overweight in mid-life patients with T2DM. Additional well-designed studies are needed before a strong recommendation can be made.

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**Table 2: Data analysis**

| Body compositions | Mean ± SD | | % decrease | *P* |
|---|---|---|---|---|
| | Pre | Post | | |
| Weight | 72.26 ± 13.26 | 71.49 ± 12.72 | 1.06 | <0.001*** |
| Fat | 32.66 ± 6.93 | 31.28 ± 7.01 | 4.20 | <0.001*** |
| Visceral fat | 12.49 ± 5.54 | 12.14 ± 5.39 | 2.78 | <0.001*** |
| Resting metabolism | 1533.78 ± 210.66 | 1517.17 ± 199.52 | 1.08 | <0.001*** |
| Body mass index | 26.70 ± 4.68 | 26.41 ± 4.60 | 1.10 | <0.001*** |
| Body age | 57.86 ± 12.68 | 56.94 ± 12.68 | 1.58 | <0.001*** |
| Subcutaneous whole body | 24.96 ± 8.10 | 24.16 ± 7.89 | 3.20 | <0.001*** |
| Subcutaneous trunk | 22.50 ± 7.45 | 21.93 ± 7.45 | 2.54 | <0.001*** |
| Subcutaneous arms | 34.17 ± 11.59 | 33.20 ± 11.42 | 2.84 | <0.001*** |
| Subcutaneous legs | 32.16 ± 9.46 | 31.26 ± 9.62 | 2.78 | <0.001*** |
| Skeletal whole body | 26.17 ± 3.93 | 25.75 ± 3.87 | 1.60 | <0.001*** |
| Skeletal trunk | 18.96 ± 3.88 | 18.25 ± 3.80 | 3.71 | < 0.001*** |
| Skeletal arms | 29.84 ± 7.77 | 29.38 ± 7.75 | 1.54 | < 0.001*** |
| Skeletal legs | 42.14 ± 5.64 | 41.58 ± 5.69 | 1.32 | < 0.001*** |

***Significant at $P < 0.001$ (Wilcoxon signed-ranks test)

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## Conflict of interest

There are no conflicts of interest.

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