

Effect of Yoga for Reducing the Male Obesity and Weight Related Psychological Problems among College Students

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ABSTRACT

Background & Objectives: Obesity is a rising pandemic in childhood and adult. There is scarcity of evidence on the efficacy of yoga in achieving weight loss in overweight/obese children. The objective of this study was to assess the efficacy of family-based comprehensive yoga intervention in the reduction of body mass index (BMI) in overweight/obese children and adult too in comparison to standard dietary and lifestyle counseling and control group.

Methods: This was an open-label randomized controlled study. College students aged 18-25 yr who were overweight or had obesity were randomized to one of the three arms for 14 wk; standard weight management (group 1), yoga with dietary modification (group 2) and control (no intervention; group 3). Reduction in BMI and improvement in physiological, biochemical and psychological parameters from baseline to 14 wk was compared between the three arms. Late follow up was also done at 3-06 months.

Results: A total of 100 youth with mean $\pm$ standard deviation (SD) age of 18.6 $\pm$ 25yr and mean BMI 26.3 $\pm$ 4.2 kg/m² were enrolled. Outcome analysis at 14 wk was performed for 75 youth. Improved diet quality and reduced intake were observed in both intervention arms. The median (IQR) reduction in BMI in standard and yoga arms was similar [-1.4 (-3.1, -0.5) kg/m² and -1.2 (-2.3, -0.6) kg/m², respectively], while it increased by +0.3 (-0.3, 0.1) in the control arm. In the yoga arm, mean systolic BP reduced from 118 (10) to 114 (8) mmHg, (P=0.019). In the standard arm, significant improvement in psychological scores was noted. In group 3, the mean fasting glucose increased from 93 $\pm$ 10 to 102 $\pm$ 12 mg/dl (P<0.001).

Interpretation & conclusions: The findings of the present study suggest that yoga in conjunction with dietary modification is equally effective as the standard weight management for BMI reduction in the pediatric age group.

Keywords: Body mass index; body shape; diet; hypertension; insulin resistance; lifestyle; obesity; weight loss.

Introduction

Obesity is a condition of excessive fat accumulation and is a major risk factor for a number of chronic diseases. It is a health disorder and is growing in high income countries, as well as in low and middle income countries. This health problem is increasing in cities like Mumbai in India and the causes are

urbanization and life style changes, among other factors .The previous studies showed that among the Asian Indians, the prevalence of obesity is high in male populations.

BMI (Body Mass Index) is considered as a measure of obesity. It was observed that for Asian Indians, BMI cut-off points are to be considered much lesser than the WHO standards for categorizing the obesity In our study, subjects with BMI of 25kg/m² or above were considered as obese.

The obesity occurrence in men was trending upward with respect to overweight/obesity and for grade 1 and 2 obesity, but not for abdominal obesity. However, the obesity trends in women were leveling off from overweight/obesity, grade 1 obesity, and abdominal obesity measures. **Shin HY, Kang HT.**

In general, obesity is caused by an unbalance in the energy intake and energy expenditure, the causes of obesity are not fully understood but it is a multi factorial disorder. The present options for controlling obesity are inadequate and have adverse effects Yoga is an ancient therapeutic practice based on Patanjali yoga sutras The Integrated Approach of Yoga Therapy (IAYT) consists of yogic practices based on ancient yoga texts and addresses the mind and body in a holistic way. The earlier studies showed that Yoga practice is useful for stress reduction, awareness on satiety, awareness on over eating and weight reduction The long term effect of yoga after imparting the training is required to be assessed. The aim of this study was to assess the final outcome after 3 months, of obesity parameters, after giving 14 weeks of IAYT training, for adult male, in an urban setting.

Materials and Methods

Participants

The study was a parallel group study with Yoga and Control groups. After training 14 weeks the Yoga group continued practice of yoga, for the next 3 months. The Control group was not given any kind of training.

The participants were from north east part of kerala. Advertisement was done and total 80 subjects were enrolled based on inclusion criteria. After randomization with minimization of co-factors, 40 subjects were assigned in each group. The IAYT training was given to Yoga group for 14 weeks and assessments outcome were reported in an earlier paper Further the study was continued and the final results were taken and the outcome is presented in this paper.

The most commonly reported approach was exercise, which included fitness, yoga, biking, and other physical activities (74.7% of respondents), and the second most commonly reported approach was decreased food intake (69.6% of respondents). The use of approaches differed according to respondents' demographic characteristics. **Sang dol Kim**

According to body weight status, there was a significant difference in the prevalence of depression (underweight: 16.2%, normal weight: 5.5%, overweight: 4.3%, obese [BMI ≥30]: 6.9%). Compared with the normal weight group, the underweight group had a higher adjusted odds ratio (OR) for depression (OR = 3.27, 95% confidence interval [CI]: 1.22, 8.75 in men; OR = 2.00, 95% CI: 1.12, 3.57 in women). **Oh J, Chae JH, Kim TS.**

The trial profile is shown in Open source software, titled MinmPy, was used for randomization with minimization of co factors In the inclusion criteria, BMI was from 23 to 35 kg/m², and age was from 18 to 25 years. All the participants were male. The subjects who had any surgery during previous six months were excluded. Each participant was given an alpha numeric code to remove all personal identities.

Intervention

The IAYT yoga training consisted of Lecture, Loosening Exercises, Suryanamaskara, Asana, Pranayama and Meditation. All practices were introduced in a slow and progressive manner. Yoga training was for 90 minutes, for five days in a week. After the 14 weeks training Yoga group continued their practice at their home. Regular e-mail, once in a week, was sent to them as a reminder to do yoga practice and requested them to maintain the food log as done during the yoga training. During the final assessment of anthropometric and psychological parameters, after 3 months, all subjects self reported that they were performing yoga practice. The control group was not given any specific physical exercise but they were asked to continue their regular physical activities. The details of the yoga intervention are shown. The intervention was during May to September 2024.

[Table/Fig-2]:

Five part yoga training details.

Sr. No.	Yoga practice	Duration in Minutes
1	Lecture & Counseling	10
2a	Loosening Exercises	10
2b	Suryanamaskara	10
3	Asana	30
4	Pranayama	15
5	Meditation	15
	Total duration	90

Components across both the Groups

All participants were given their respective measurement records (Pre and Interim at 14 weeks) and the sample meal plan applicable for sedentary male adults, based on guidelines of National Institute of Nutrition Hyderabad

Assessments

The Wt (Body Weight), BMI, WC (Waist Circumference), HC (Hip Circumference), WHR (Waist hip Ratio), A Body Shape Index (ABSI), Skin fold thickness (SKF) at 4 body points applicable for men and Mid Upper Arm Circumference (MAC) of left and right arms were taken. ABSI was calculated based on WC height and BMI

The scores of Perceived Stress Scale (PSS) and Acceptance and Action Questionnaire for Weight Related Difficulty (AAQW) were taken. PSS is a validated scale for perceived stress. The AAQW is a validated scale which assesses the experience based avoidance and psychological inflexibility associated with food habits and obesity

For assessing the SKF, skin fold thickness caliper was used The assessments were done at four locations applicable for male The table applicable for men was used for calculating Percentage Body Fat (PFC), based on the cumulative value of skin fold thicknesses The four measures of SKF were at biceps, triceps, sub scapular and suprailiac sites. Each SKF was calculated from the average of three readings. The

cumulative SKF was found from sum of the four SKFs. The Wt was measured in electronic weighing scale and circumferences were measured using non elastic tape.

Ethical Clearance

The Institutional Ethical Committee (IEC) clearance was taken.

Informed consent

The informed consent from participants was obtained before recruitment.

Statistical Analysis

Analysis was performed using SPSS software, version 21.0 The normality test was done by Shapiro wilk test. The Paired sample t-test was done for all the parameters, for the first and final values, of both groups, which were found normally distributed. For not normally distributed parameters, the Wilcoxon signed ranks test was done. The Between group analysis was done by independent sample t-test. To find the relative improvement, from Pre to Final values, among the variables, the differences of Pre to Final values were correlated, among each other. A two sided, value of $p < 0.05$ was considered statistically significant.

Results

The base line demographic data of age, height and BMI of the groups are given in]. The outcome of within group analysis of anthropometric parameters, for the Yoga and Control groups are given] respectively. The between group analysis at 6 months, is given in]. The relative improvements (from Pre to Final) among the variables are given in [The comparative data of Pre, Interim and Final are given in In each group, 50% of the total subjects was having educational qualification between 12th standard to graduates and 50% was post graduates. Also in each group 50% was in age group of 18 to 22 and 50% was in age group of 22 to 25 years. In each of the groups, all the subjects were having BMI above 25 Kg/m². The minimum age in Yoga group was 18 and maximum was 25 whereas in Control group, minimum was 21 and maximum 25. Thus minimization of co factors was done None of the subjects reported any adverse events due to the intervention.

The combined Pre, Interim and Final results show that some of the gain in the interim values was lost during the final results.

Anthropometric Parameters

All parameters except WC, WHR, PFC and SKF of biceps were normally distributed.

There was consistent improvement from Pre to Interim to Final result, in the parameters of Wt, HC, BMI, Cumulative skin fold thickness (SKFT), SKF of biceps (SKFraf) and SKF of suprailiac (SKFstof) for both the groups. The Skfstof was improved from Pre to Interim ($p < 0.002$) & Interim to Final ($p < 0.001$) in the Yoga group. In the Yoga group the improvement in SKFT, in Pre to Final was more significant ($p < 0.001$) than in Pre to Interim ($p < 0.05$). In Yoga group alone, MACL and MACR were improved consistently from Pre Interim to Final ($p < 0.001$ for both MACL and MACR for pre-final). Control group did not improve in these parameters in the final result. The WC ($p < 0.001$), WHR, and PFC ($p < 0.001$) were improved from Pre to Interim and to Final in Yoga group but in Control group the

gain was lost in the final result. The PFC of Control group was increased in the Final (increase was not significant).

The SKF of triceps (SKF_{trab}), in Control group reduced in Interim but increased in Final. In the Control group, the SKF of sub scapular (SKF_{shob}) increased in Interim and remained almost same in the Final.

The Final results, with respect to the Pre values were as below:

The Wt in the Yoga and Control groups were decreased during the 3 months. The Wt reduction in Yoga group alone was significant ($p < 0.007$). The upper mid arm circumference of right arm (MACR) and upper mid arm circumference of left arm (MACL) were reduced in both the groups but change in Yoga group alone was significant ($p < 0.001$). The WC was reduced in both the groups (yoga $p < 0.001$ and control $p < 0.002$). WHR remained same in yoga, increased in control but not significant. In Yoga, the PFC, based on chart, was decreased and was significant ($p < 0.001$) [35]. In the Control group it was increased but was not significant. HC was reduced and was significant in both the groups ($p < 0.001$). The cumulative skin fold thickness was reduced in both the groups but was significant ($p < 0.001$) in Yoga group alone. The SKF_{trab} ($p < 0.001$) SKF_{shob} ($p < 0.002$) and SKF_{stof} ($p < 0.001$) and SKF_{raf} ($p < 0.02$) were reduced in Yoga group. In control group SKF_{stof} and SKF_{raf} reduced but were not significant. SKF_{trab} and SKF_{shob} were increased but changes were not significant. The BMI was reduced in both the groups with significance ($p < 0.009$) in Yoga group alone. The cumulative Skin Fold Thickness (SKFT) reduction was significant ($p < 0.001$) in the Yoga group alone.

Psychological Parameters

The PSS was improved consistently from Pre Interim to Final in the Yoga group alone ($p < 0.001$). The AAQW was improved in Control group in the Pre-Interim (but not significant) and improved during Pre to Final ($p < 0.05$).

In Yoga group, AAQW was improved during the Pre-Interim but was increased (worsened) in Final ($p < 0.001$ for Pre-Interim, $p < 0.05$ for Pre-Final).

Compared to Pre values, the improvement in PSS was significant in the Yoga group ($p < 0.001$) alone. In both the groups (compared to Pre values) the AAQW improvement was significant (Yoga $p < 0.02$ and Control $p < 0.01$).

Correlations

The correlations results with respect to, Pre to Final were as below:

BMI was positively correlated to WC ($r = 0.509$, $p < 0.01$), SKFT ($r = 0.443$, $p < 0.01$), HC ($r = 0.47$, $p < 0.01$) and AAQW ($r = 0.348$, $p < 0.01$). The PSS was not much correlated to BMI. The PSS was negatively correlated to MACL ($r = -0.291$, $p < 0.01$) and MACR ($r = -0.300$, $p < 0.01$).

Discussion

There was improvement in anthropometric parameters and this was supportive of the earlier studies. In the Yoga group, PFC decrease (improvement) was significant ($p < 0.001$) considering the Pre Final values, though decrease of PFC was not significant during Pre to Interim. This shows that the 14 weeks IAYT training had effect in the Final values. The weight reduction was more significant in Pre to Final than in Pre to Interim, and the weight reduction was consistent. This indicates that the reduction of weight was due to fat reduction.

The MAC was measured as part of anthropometric measurement in the earlier studies also. But we assessed both the right and left MAC. In our study MAC reduction was significant for Yoga group alone ($p < 0.001$) both during Pre Interim and Pre Final, which shows some reduction of fat or skin muscle in the upper limb similar to the earlier short duration studies .

The SKFT was significant in the Yoga alone ($p < 0.05$ in Pre Interim and $p < 0.001$ in Pre Final). This supports that there is reduction in MAC skin fold muscle or fat in the upper arms due to yoga practice which included the Suryanamaskara and Asana requiring active movement of upper arms, for one third of the yoga duration. The consistent reduction of fat/muscle in upper arms in Final value also shows the effectiveness of IAYT for obesity control.

This also shows that in long term yoga practice can give more balanced reduction at different parts of the body like upper arm and waist, compared to the Control group. In the Control group, reduction in waist area was lesser and also there was lesser reduction in upper arms. This may be due to their varied regular physical activities. In our study, Yoga group SKFT and PFC reduced consistently from Pre Interim to Final unlike in the Control group and the anthropometry and skin fold thickness give the best predictors for obesity assessment.

In Yoga group SKFraf, SKFraf, SKFshob and SKFstof were also consistently reduced from Pre Interim to Final value. In the Control group SKFraf, SKFshob and SKFstof reduced but SKFraf got increased from Interim to the Final. This may be due to lesser physical activities using hand and shoulder. The reduction in weight in the Yoga group was in all parts. The Control group, doing their regular physical activities like walking etc. did not get weight reduction in all parts.

Previous studies showed that short and long term yoga interventions reduce anxiety and mood changes. The psychological stress increases cortisol secretion and abdominal fat in an RCT on female [51]. The mindfulness practices modify eating disorders. Our study support that the reduction of abdominal fat in male is consistent with reduction in perceived stress reduction.

Conclusion

The anthropometric parameters and percentage body fat showed improvement in the Final result. Some of the improvements including AAQW score obtained during the 14 weeks training was lost in the Final value. The PSS score was improved consistently. The fat reduction was effective at central and peripheral parts in the Interim to Final result. Reduction of abdominal fat on male is correlated to reduction in perceived stress. The yoga practice is effective for obesity control for adult male in urban setting.

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