

## CHAPER EIGHT

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# APPRAISAL

## 8.1 SUMMARY OF THE FINDINGS

IAYT for obesity was derived based on the literature review of classical texts and recently published research articles. It was validated by 16 subject matter experts. Pilot study which is a prospective RCT (randomized controlled trial) was conducted for 1 month on overweight & obese adolescent subjects. The finding with the subjects doing yoga was fascinating. There was significant reduction in BMI, pulse rate, hip circumference, and serum total cholesterol. There is non-significant reduction in low- density lipoprotein. There was significant reduction in weight, diastolic blood pressure, fasting blood sugar, very low- density lipoprotein, serum triglycerides after intervention. There is significant increase in mid-arm circumference. There is non-significant reduction in systolic blood pressure, waist circumference & high-density lipoprotein. Percentage of improvement of weight & serum cholesterol, waist circumference, hip circumference, serum cholesterol, low- density lipoprotein, high- density lipoprotein is more in yoga group than that of control group. Finding suggests that IAYT for adolescent obesity is effective to manage obesity.

In the main study which was conducted on a larger sample size along with variables like anthropometric measurements, additional assessments like psychological and cognitive tools were used. Abdominal circumference is reduced significantly in yoga group and without significance in the control group. Yoga group has improved significantly better in this assessment than control group.

Obesity especially abdominal is related to academic achievement and cognitive functions in children. Visceral adipose tissue have negative impact on cognitive functions leading to decreased academic performance among children with obesity because of its dangerous metabolic nature (Ontology, 2018).

Excessive adipose tissue also affects the physical inactivity leading to psychological increased sensitivity. These children with obesity had poorer cognitive function results in decreased measures of intra individual response, even after accounting for intellectual abilities, aerobic fitness so focus of this study was to evaluate the yoga based validated intervention on anthropometric and physical variables in adolescent obesity.

Specific anthropometric and physical tests are selected as variables were selected in order to conserve comfort and convenience of the participants with average age of  $11 \pm 1.4$  years. Hip

circumference, total body fat percentage, subcutaneous fat of trunk and legs whereas these parameters is reduced in control group but without significance. Subcutaneous fat reduction leads to significant increase of muscle percentage of trunk and leg region. This provides evidence of efficacy of validated yoga based intervention on reduction of adipose tissues in hip, trunk and leg region resulting in reduction of total body fat percentage and overall body weight.

The perception of bodily awareness has increased in the Yoga group. Yoga group participants became more physically active due to intervention. So body awareness questionnaire scores improved well.

In the Yoga group, it is seen that self esteem increased than that of control group as Yoga intervention has positive impact on will power building leading to increased self esteem.

The child eating behaviour questionnaire, CEBQ was studied in this study; associations were examined between three CEBQ scales, satiety responsiveness, SR; food responsiveness, FR; enjoyment of food, EF and four aspects of eating behaviour like eating without hunger, caloric compensation, eating rate and energy intake at a meal. Emotional over eating, enjoyment of food, desire to drink, food fussiness, and satiety responsiveness reduced in the yoga group compared to control.

Yoga is associated to improve cognitive functions like perception; quickness of alertness. It can improve cognitive functions such as remote memory, mental balance, attention and concentration, delayed and immediate recall, verbal retention and recognition tests.

Analysis of in between yoga and control group states that DLST of yoga group is increased than that of control group but without significance. SLCT of yoga group is increased than that of control group with significance.

In this study SLCT & DLST improved well with Yoga group both tools needs good concentration, memory and attention. Yoga improves emotional wellbeing in children. Yoga had been reported to have shown the beneficial effects on different psycho-physiological variables.

We found improvement in most of the variables in yoga group in a short duration of 5 weeks.

## **8.2 CONCLUSIONS**

Integrated Yoga therapy Approach protocol having practices for long term holistic changes at all the based on 5 aspects of personality was prepared for obesity. Module was designed on the basis of literature review which was also validated by 16 Yoga experts. It is effective in management of weight, serum triglycerides & very low - density lipoprotein, hip circumference & serum cholesterol. Yoga based intervention is effective to reduce obesity in adolescent children with respect to anthropometric, physical, psychological & cognitive assessments. This study provides evidence to prove efficacy of Yoga to manage increased subcutaneous adiposity in trunk, hip and leg region resulting in weight reduction in adolescent children. Abdominal circumference is reduced significantly in Yoga group. Emotional over eating, enjoyment of food, desire to drink, food fussiness, and satiety responsiveness reduced in the yoga group compared to control. The perception of bodily awareness has increased in the Yoga group. In the yoga group good concentration, memory and attention were reported. Yoga improves emotional wellbeing in children. Yoga had been reported to have shown the beneficial effects on different psycho-physiological variables.

Yoga group has improved better than control group with integrated approach of yoga therapy. This module has proved efficient in the management of adolescent obesity.

## **8.3 IMPLICATIONS OF THE STUDY**

Yoga is an ancient Indian science which helps to improve physical, mental, social and spiritual health. But many consider yoga as an alternate to exercise. There is a need to show that yoga is not merely an exercise system but it has many more health benefits. Our IAYT for adolescent obesity strictly follow this discipline. In our module, all *Panchakoshas* have been equally accessed which could be a guide for further studies.

## **8.4 APPLICATIONS OF THE STUDY**

The validate IAYT for adolescent obesity is easily applicable at any age of adolescence without disturbing their academic, social & cognitive development. On the contrary, it helps to improve these domains in the life of an adolescent child. It also provides firm foundation to the personality in the growing age. Yoga including *Jnanayoga*, *Rajayoga*, *Bhaktiyoga* & *Karmayoga* has been proved its efficacy in the overall development of the adolescent child along with management of the obesity parameters. Regular application of IAYT can lead to

better management of adolescent obesity than any other streams of treatment. Yoga as a therapy has preventive and curative effects on Obesity and other non communicable stress related disorders.

## **8.5 STRENGTH OF THE STUDY**

This is a unique study on adolescent obesity with control group which is an RCT.

IAYT module is validated by using Lawshe's content validity formula only. Also, all the panelists of SMEs were from same school of Yoga (S-VYASA, Bangalore).

This study provides a validated Yoga module for obesity in adolescents with a pilot study for the feasibility of the IAYT module. It is found that integrated approach of yoga therapy has been proved effective in obesity parameters management. Further both the groups were belonging to similar age limits which leads to reduction of confounding factors. The food plan was same for both the groups.

In the main study which was conducted on a larger sample size along with variables like anthropometric measurements, additional assessments like psychological and cognitive tools were used. Abdominal circumference is reduced significantly in Yoga group and without significance in control group. Yoga group has improved significantly better in this parameter than control group.

Current study confirms that the one hour integrated approach of yoga therapy is an effective alternative.

## **8.6 LIMITATIONS OF THE STUDY**

We did not conduct other validity and reliability tests for obesity in adolescents. Also, all the panelists of SMEs were from same school of Yoga (S-VYASA, Bangalore).

Further study can be planned with reliability test on Yoga module for obesity in adolescents. It is found that integrated approach of yoga therapy has been proved effective in obesity parameters management.

Further both the groups were belonging to similar age limits which leads to reduction of confounding factors.

Blind study was difficult as participants of both the groups were studying in same campus. The food plan was same for pilot study, it being a residential school.

In the main study proposed serum leptin levels could not be checked due to non consent by school management and parents.

Academic performance could not be measured and compared as the school management was not ready to share academic results.

The duration of the intervention could not be longer as the school had mid term examinations, vacations and other academic activities.

Current study confirms that the one hour integrated approach of yoga therapy is an effective alternative in adolescent obesity.

Larger sample study, longer duration of three months along with bio chemical markers are needed to strengthen its efficacy as a primary intervention.

It would have been better if it was a multi centric trial.

## **8.7 DISTINCT FEATURES OF STUDY**

The current study is distinct from earlier existing literature in many ways.

1. Validated IAYT module used in current study has a holistic approach with multidimensional interventions at physical, mental, emotional, intellectual and spiritual levels in keeping with the WHO definition of health.
2. Yoga proposes a model of prāṇa imbalance that is to be understood in the light of the concepts portrayed by the introspective masters. Using several scriptural references and personal discussions with the expert yoga practitioners, IAYT intervention based on Panchakosha concept from the traditional yoga texts was the uniqueness of the present study. We propose the validated yoga module, IAYT. Designing of Module: In first step we have designed IAYT, Integrated Approach of Yoga Therapy.
3. In second step IAYT module is validated by 16 experts of the same school.
4. In third stage pilot Study was conducted and uniqueness of pilot study with randomisation two groups Yoga & control, to check the feasibility of module with bio chemical marker.

5. Monitoring: In pilot study the daily progress was monitored by a team of well-trained yoga therapists, and counsellors. Also their lifestyle including simple vegetarian wholesome diet as per their calorie requirement and regular hours of sleep (early to bed and early to rise etc) was easy to ensure as both the groups were students of a residential school.
6. In forth step we conducted the main study in Pune, Maharashtra. In the main study also, the daily progress of intervention was monitored by a team of well-trained yoga therapists and counsellors as the daily one hour intervention was provided in the school premises as part of the student's daily routine activity unlike most of the previous studies where dietary modules or exercise modules were provided to take home and visit to investigator was only for follow up.
7. Assesments includes Anthropmetric, BMI, Phigiology, Physical Tests, Psychological test & cognative test.
8. The difference in these remarkable observations of the present study as compared to earlier ones is because of:
  - a. Daily actively supervised practice as compared to take home modules or follow up supervision of the interventions.
  - b. Holistic approach: The integrated yoga module used in this study included āsanas, prāṇāyāma, meditation, deep relaxation, chanting and personalized counselling sessions thus taking in consideration not just the physical need for weight loss but also involving the components for emotional intellectual and spiritual needs.
  - c. Implementation of 27 rounds of surya anulom vilom pranayama, four times a day before four meals (breakfast, lunch, evening snack & dinner) was possible in pilot study as residential school. In mess separate arrangement was made in pilot study for participants to practice of surya anulom vilom pranayama. This practice is useful in reducing weight. It increases metabolic rate and hence burns calories and reduce weight (Nagarathna & Nagendra, 2014).
  - d. For Pre & Post data collection & assesments which is the base of study. We have appointed experts from the field. Medical Professional, M.D in Yoga, Ph.D in Yoga.

## 8.8 SUGGESTIONS FOR FUTURE STUDIES

- a. We propose that Yoga session of 45 minutes like PT class should be incorporated in school syllabus.
- b. We suggest that as school children require a creative, interactive session, in the learning process as for all subjects smart schools & e-learning solutions are available & implemented. The same is applicable for learning Yoga too. If we can communicate with children and adolescent effectively, they can adopt Yoga as a powerful tool for themselves to reduce stress & control obesity.
- c. We are proposing to develop Audio-Video Interactive module based on latest multimedia techniques & animation for children and adolescent so they can enjoy learning Yoga practices and use it in daily life to adopt as a life style.
- d. As stated in case studies, practicing Yoga has the potential to improve the mental health of children and adolescent. We have argued that children and young people who possess the evolving capacity to develop the self and society. Yoga is a means to attain holistic well-being for both.
- e. We propose longer intervention with follow up with Anthropometric, Psychological, Physical fitness tests and latest Biochemical markers like Fasting Insulin, Serum Leptin levels by convencing parents for consent .
- f. A long-term follow-up and measures of cognitive changes may be studied.
- g. Along with Yoga a balanced diet plan & diet intake record if kept to monitor diet & diet counseling will help.
- h. We propose to include objective and subjective measures of stress at school & at home that may help in understanding the mechanisms.