

# Effects of School-Based Physical Activity Promotion and Dietary Awareness in Obese Children

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## ABSTRACT

**Background:** Obesity is found to be increasing in severity due to the inappropriate energy intake. Schools and child care settings are considered as the best locations to conduct the programs which deal with the prevention and management of childhood obesity. Objective was how the physiotherapy interventions and dietary awareness when given together over a specific time period can be helpful in management of obesity in children.

**Study Design:** Quasi experimental study

**Study Setting:** Primary schools of Gujarat

**Outcome Measures:** Waist circumference, Waist height ratio and Children physical activity questionnaire.

**Methodology:** 30 children were screened between age group of 6 to 9 years. There were 2 group i.e. Experimental group (n=15) and Control group (n=15). In Experimental group, Physical activity along with Diet awareness was given and in Control group only Diet Awareness was given. The treatment protocol was provided for 3 months. Assessment was taken as pre intervention in both the groups. In the Experimental group it was taken at the end of the every week and for control group at every end of the month for 3 months.

**Result:** There was a statistically significant difference showed in waist circumferences and waist height ratio in both the experimental and control group. (p value < 0.005). However, Experimental group was found to have greater effect than control group.

**Conclusion:** The study concluded that 3 months of Physical activity combine with Diet awareness is more effective than the Diet awareness only.

**Key words:** Childhood obesity, School based intervention, Physical Activity Intervention, CPAQ.

## INTRODUCTION

Obesity is found to be increasing in severity and prevalent in the present era due to the lifestyle changes as a result of inappropriate energy intake. Childhood obesity has been associated with increased risk of hyperlipidemia, hypertension, insulin resistance diabetes, low grade chronic inflammation which release cytokines such a tumour necrosis and arteriosclerosis later in life. <sup>(1)</sup> WHO defines Overweight and obesity as an abnormal or excessive fat accumulation that presents a risk to health.

According to CDC 2000; the condition has been classified into obesity and overweight using age and gender specific percentile of BMI. These BMI percentiles between 85th to 94th percentile values is considered as overweight and above 95th percentile as risk of obesity. Recently, obesity category has been further divided into severe obesity > 95th percentile class 1, BMI >120% of 95th percentile as class 2 & >140 % of 95th percentile as Class 3 obesity. <sup>(2)</sup> <sup>(3)</sup> And according to waist height ratio greater than 0.5 category as obesity. Various aetiologies

are responsible for causing obesity like Neuro-endocrine obesity should be carefully diagnosed as it is caused by the abnormal endocrine secretion such as hypothalamic obesity and hypothyroidism. <sup>(4)</sup> Other cause found that changes in the lifestyle is due to urbanization which has reduced the physical effort of an individual, thus lowering the energy expenditure and promoting energy retention leading to obesity. <sup>(5)</sup> Some drugs such as glucocorticoids, antidepressants drugs also promote the sedation and influence the visceral fat deposits by maturation of adiposities result in weight gain. <sup>(6)</sup> More common factors that affect the composition of diet is one of the main reason for the high dietary fat intake & higher glycemic index involves the consumption of small sized but energy dense food which increases the overall calorie intake. Thus, these food items release more glucose rapidly compared to higher fiber intake. <sup>(7)</sup> It has been found that the defect in genes and the coding of amino acid gives rise to obesity. <sup>(8)</sup> Monozygotic twins that 40 to 70% of hereditary chance for common obesity. For the individuals living in lower socio-economic status obesity roots from the nutritional disorders. Also, for those in higher socio-economic class occurrence of obesity as a result of overconsumption of food due to easy availability is observed. <sup>(9)</sup> Prevalence of obesity has been increased in developed and developing countries which is a cause of rising morbidities and mortalities in developing countries. <sup>(4)</sup> The review done by Ranjani et al (2016) studies done in India the prevalence ranged from 25 percent, to 6.3 percent obesity. Marwaha et al, using IOTF classification showed that among children in the upper SES the overweight and obesity of prevalence were more than the lower SES respectively. <sup>(10)</sup> Childhood obesity are top for prophesy future obesity-related health problems and the persistence of obesity into adolescence and adulthood for this simple measure to predict the obesity. <sup>(11)</sup> Childhood obesity measure various outcomes like BMI, Skin

fold thickness, Daxa scan but Kuriyan et al and Martin Calvo et al have measures which are as follow Waist circumference and Waist height ratio is best alternative measurement than the BMI in obesity.

Waist circumference has Interrelation with risk for cardio metabolic heart diseases. It measure abdominal fat which is reflective of risk for obesity related diseases. <sup>(12)</sup> Waist circumference and waist height ratio have been recommended as adiposity related morbidity. <sup>(13)</sup>

The assessment of Physical activity is an important part of knowing the levels at which the child is physically active. There are various methods to assess physical activity in children. Of all the methods, the questionnaires are found to be easy to use, cost effective and reliable. The main components include as sports activity, leisure activity, and in-school activity, outdoor activity and screen time. <sup>(14)</sup>

#### **Intervention strategy:**

Proper intervention is required to treat and prevent childhood obesity from transforming into adult obesity. Schools and child care settings are considered as the best locations to conduct the programs which deal with the prevention and management of childhood obesity. At times, community settings are also favoured wherein; the parents and caregivers are encouraged to participate in the modification of the eating and lifestyle patterns.

Rebison (2000) review that physical activity intervention of obese childhood on combination healthy education and behaviour modification to increase physical activity. <sup>(15)</sup> According to ADA, the school set up is the best intervention of physical activity and healthy diet and physical education about the student. <sup>(16)</sup> School based interventions which are associated with cognitive theory have proved to be effective on the behaviour pattern to the health. <sup>(17)</sup> Class room curriculum which includes the physical education class and food awareness, some campaigns that are more focused on being physically active and

decreased TV viewing time are proved to be more promoting by resource person like teachers and coaches for efficacious in dealing with obesity. <sup>(17)</sup>

### **Dietary intervention:**

Butte et al Introduced as imbalance between energy consumption to energy expenditure as leads to obesity due to improper food consumption habits because of the lack of parents' nutritional behaviors knowledge. Dabas et al (2017) suggests that higher intake of vegetable and fruits and increased water intake has to be adapted if there are plans to reduce the body fat. Consumption of moderate amount of grains and minimal amount of sweet products is also added up in the diet modifications. <sup>(1)</sup> Proper breast feeding practices are advised to the lactating mothers in order to reduce the risk of obesity because there is more protein in breast milk than fat which can protect against obesity. <sup>(1)(6)</sup> The evidences also support that malnourished mother during early pregnancy have higher chances of having children which have obesity. <sup>(2)</sup>

The study significance was able to provide the preliminary data and methodology dealing with School-based interventions which have not been undertaken so far. It may be able to give a further insight into the varieties of programs which can be implemented in schools.

The aim of the study to implement a program dealing with physical activity interventions and dietary awareness which can be taken up together in the treatment of childhood obesity.

The primary objective of the study to evaluate that how the physiotherapy interventions and dietary awareness when given together over a specific time period can be helpful in management of obesity in children.

### **MATERIALS AND METHODOLOGY**

A quasi experimental study design has been conducted for this study. 30 participants were selected from school. Permission of

study obtained by the ethical clearance from institutional review board.

The participants were recruited using a purposive sampling technique. The inclusion criteria selected as obese children between the age group of 6-9 years and both gender where selected. The participants with other medical and surgical conditions which can give rise to secondary obesity and girls between the age group of 6-9 years and whose menstrual cycle has started were excluded in the studies.

In this study, obesity level measured by independent variables in waist circumference and waist height ratio and Physical activity levels (C-PAQ) measure as Dependent variable. <sup>(18)(19)</sup>

With permission from the principal of school, children were screened for waist circumference and waist height ratio among those whose waist circumference and waist height ratio were more than normal was selected for the study. The parents of the children with obesity were contacted. The detailed description of the study was explained to them. After making them clearly understand the study if parents want that children to participate in the study and those falling in eligible criteria, written consent form was obtained from their parents. Children were then recruited through purposive sampling to their respective experimental and control groups according to their parent's choice. The experimental groups were given a physical activity and diet awareness plan and the control group only followed the diet awareness plan.

**Assessment tools:** A Waist Circumference & Waist/Height (WHtR) ratio was calculated as the ratio of the waist circumference (cm) and the height (cm). <sup>(18)</sup> Measurement was performed in accordance with methodology used in the National Health and Nutrition Examination Survey. Waist Circumference was measured with the child in a standing position using a non-stretchable measure tap. The tape is applied horizontally just above the upper lateral

border of the right ileum. Each measurement was done at the end of a normal expiration and recorded to the nearest 0.1 cm.<sup>(18)</sup> Children's Physical Activity Questionnaire (CPAQ) components include as sports activity, leisure activity, in-school activity, outdoor activity and screen time. In case of very young children, the questionnaires are often filled by their immediate caregivers or parents. Children's Physical Activity Questionnaire (CPAQ) is one such questionnaire in which the parents are requested to fill it up. It involves the recall of the activity of last 7 days that the child was involved in. The questions are easy to understand and require 10 minutes of time to fill the answers. Many researchers have provided the validity and reliability of the questionnaire.<sup>(16)</sup> Mode, frequency and duration of physical and sedentary activity were assessed by CPAQ.

**Study protocol:** Participants then underwent for pre intervention baseline assessment for experimental and control group. The study protocol was for 3 months. In experimental group, diet awareness and physical activity performed such as stretching for major muscle, slow marching performed as a warm up periods. Abdominal, lower and upper limb strengthening, Fast Marching, Fast walking, Jumping, Jumping with squatting, free Dancing physical activity and the cool down periods includes Slow walking and Slow marching. Exercises were performed for 3 to 4 days per week for 12 weeks with duration of 45 to 60 minute.

Diet awareness plan given such as encourage for more fibers and low fat diet. Allowed in sufficient fruits and vegetable, Moderates grain, minimal quantity pastries, sweet, cold drink, fried foods, Junk food, Sugar sweetened beverages. For experimental group assessment was taken every end of the week

For control group same study protocol was given for 3 months and only diet awareness plan was given same as given in experimental group. For control group Assessment was taken every month and at the end of post intervention was taken

### Statistical Analysis

Data analysis was done by SPSS 20.0 software. Paired t test was used for Comparison of pre and post intervention score for both the groups, experimental group and control group. Two Sample Independent t test was used for Comparison of post intervention changes between experimental and control group. For all statistical test, significance level was fixed at 5 % i.e., the result was considered statistically significant when  $p < 0.05$ .

### RESULT

Table 1 show that the mean age group value of Experimental group was  $7.6 \pm 1.12$  and mean value of Control Group was  $7.8 \pm 1.14$ . Mean value of Waist circumference of Experimental group and control group was  $78.73 \pm 7.63$  and  $79.33 \pm 8.16$ . Mean value of Waist height ratio of Experimental group and control group was  $0.606 \pm 0.042$  and  $0.59 \pm 0.06$ .

Variables	Experimental group (n=15) Mean $\pm$ SD	Control group(n=15) Mean $\pm$ SD
Age (Year)	7.6 $\pm$ 1.12	7.8 $\pm$ 1.14
Gender	M= 9 F= 6	M= 9 F= 6
Waist circumference (cm)	78.73 $\pm$ 7.63	79.33 $\pm$ 8.16
Waist height ratio	0.606 $\pm$ 0.042	0.59 $\pm$ 0.06

Table 2 shows that in Experimental and Control group Comparison of pre and post intervention Show that in both the groups waist circumference and Waist height ratio

was statistically significant. But in Experimental group p value was 0.0001 in waist circumference and waist height ration and control group p value was 0.004 and

0.003 in waist circumference and waist height ratio. That was suggestive of physical activity and diet awareness was combined

more effective as compared to Diet awareness only.

**TABLE: 2 Comparison of waist circumference and waist height ratio between both the groups using Paired t test**

Group	Outcome measure	Phase of the study	Mean ±SD	Mean Difference	T value	P value
Experimental group	Waist circumference	Pre intervention	78.73(7.63)	12.53	10.491	0.0001
		Post intervention	60.20(7.83)			
	Waist height ratio	Pre intervention	0.606(0.042)	0.144	11.843	0.0001
		Post intervention	0.505(0.042)			
Control group	Waist circumference	Pre intervention	79.33±8.16	1.600	4.583	0.0004
		Post intervention	77.73±7.98			
	Waist height ratio	Pre intervention	0.59±0.06	0.0126	4.750	0.0003
		Post intervention	0.58±0.06			

Table 3 show that there was a statistical difference between the post interventions in experimental and control group.

**TABLE: 3 Comparison of Post intervention between experimental and control group using unpaired t test**

Outcome measure	Phase of the study	Mean ±SD	Mean difference	T value	P value
Waist circumferences (cm)	Experimental Post intervention	66.20 ±7.83	11.53	3.99	0.0004
	Control Post intervention	77.73 ±7.98			
Waist height ratio	Experimental Post intervention	0.50 ± 0.04	0.08	4.18	0.0003
	Control Post intervention	0.58 ±0.06			

**Comparison of pre and post CPAQ in experimental and control group:**

Pre and post intervention of children physical activity questionnaire (CPAQ) in experimental group result showed that the leisure time activity like walking, running and outdoor activities were increasing but there was not any sports activities involvement in before and after intervention.

Control group comparison of pre and post intervention results shows there were no any changes noted in leisure time and sports activities

**DISCUSSION**

The present study was found effectiveness of school based physical activity intervention and dietary awareness in childhood obesity. An attempt was also made to assess the effectiveness of 12 weeks of aerobic training in the same children with obesity.

Purposive sampling was done according to them divide in control and experimental group. In experimental group performed physical activity intervention and dietary awareness. Children in the control group participated exclusively for dietary awareness. There was no dropout till the

end of the study and parents continuously encouraged their children.

**Effect of Physical activity intervention in children with obesity.**

The analysis shows the aerobic and strength training exercise protocol in these children display a significant difference in the outcome measure of waist circumference and the waist height ratio. In the experimental and control group, respectively, pre and post intervention changes was analyzed by paired t-test, and results showed that the waist circumference and waist height ratio has statistically improved in both the groups. In experimental and control group, post intervention changes which was measured using unpaired t test, results showed that the waist circumference and waist height ratio has changed which is also statistically significant.

Children in the study were regularly attending the school for the entire period of study during their evaluation. Here, exercises consisting of warm up and cool down such as slow marching and mild stretching of the major muscle and slow speed walking which gradually progressed to moderate as well as vigorous exercise



like fast marching, jumping with squatting, fast walking, free dancing and abdominal exercise like curl up and side curl up, planks, side planks, supine cycling, mountain climber. <sup>(15)</sup> For the 12 weeks of study, a designed protocol was adopted which gradually increases in duration and intensity of performing exercises according to child's improvement and tolerance level. With childhood adipose, there was significant difference in the waist circumference and waist height ratio; this can be due to the reason that multidisciplinary approaches in the physical activity and dietary awareness and reduced sedentary activity. In this type of exercise like aerobic exercise, free exercise of upper and lower body activates major muscle group. Abdominal strengthening exercises like curl up, side curl up, plank and side planks, supine cycle, mountain climbing, all these exercises help in the involvement of the prime muscle of the abdominal wall, which decreases abdominal fat and also regulation of the adipose tissue. Evidence suggested that the physical activity to improve cardio respiratory fitness, increase the muscle and bony strength also regulate the systemic target organs. <sup>(20)</sup> Evidence suggests that a moderate to vigorous physical activity improves muscle strength and physical fitness. In these muscles, strength is prime because of inactivity during the skeletal growth. It may detritions the skeletal and muscular developmental growth and in improving childhood physical fitness to low moralities in adulthood periods and reduce the metabolic risk factors. <sup>(13)</sup>

### **Effect of Dietary awareness in children with obesity**

In control group, both parameters of waist circumference and waist height ratio measured by paired t- test showed statistically significant difference which could be due to consumption of low fat, carbohydrates diet, these may improve the energy balance. Consumption of a low glycemic index diet may reduce fat

mass and insulin levels. While consumption of healthy diet will improve the Nutritional behavioral and healthy body composition. <sup>(21)</sup>

Previous review suggested that long term protocol is disappointing in adult population, so the protocol of our study design which is short term and the effects of physical activity and dietary awareness intervention are beneficial. <sup>(7)</sup>

### **Limitation**

The result show positive changes after the physical activity and dietary awareness intervention within the group. However, the study had a small sample size and limited range of age groups. For dietary awareness only, guidance was given and steps to ensure implementation of the same were not included. Precise outcome measures are there as compared to what has been used in the study considering feasibility, those outcome measures can be used if feasible

### **Future Recommendation**

A study with a larger sample size and a larger age group population can be conducted.

Study including follow-up program is recommended

### **CONCLUSION**

Hence, the study concluded that both outcomes measures, waist circumference and waist height ratio, showed statistically significant differences in the experimental as well as control group. However, the experimental group intervention showed a better improvement in the form of a more reduction in mean value of waist circumference and waist height ratio at the end of the 12 weeks protocol than the control group. Thus, physical activity intervention and dietary awareness protocol should be recommended as an intervention to control childhood obesity.

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