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Multidisciplinary approach in combating childhood obesity

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ABSTRACT

The study demonstrated the beneficial effect of a multidisciplinary dietary-behavioral-physical intervention on childhood obesity among totally selected 618 school children. Children were classified as Group-I who received both education program and fitness exercise (N=228- Long-term behavioral intervention) and Group-II who were exposed only to education program (N=390 Short-term behavioral intervention). It was found that 28.3 per cent were overweight and 7.9 per cent were obese as per International Obesity Task Force (IOTF) standards at the beginning of study. The initial mean Body Mass Index (BMI) was 21.6±3.9 in Group-I and 21.9±3.4 in Group-II. The BMI reduced to 21.4±3.8 in Group-I and 21.8±3.5 in Group-II after six months at the first phase. After one year, the mean BMI of Group-I reduced significantly to 20.8± 3.5 (P = 0.0001) due to long-term interventions, whereas the mean BMI of Group-II increased after one year. There was significant reduction in Waist Hip Ratio from initial to final among Group-I alone. There was no significant change

in the Pulse Rate among both groups at the end of the study. After one year, among Group-I children, 6.6 per cent with high Blood Pressure and 4.4 per cent who had low BP shifted to normal BP showing a significant change whereas there was no significant change in Group-II. Peak expiratory flow rate improved significantly only in Group-I. There was significant influence of fitness exercise intervention on the fitness level test scores among Group-I after one year but there was no significant changes in Group-II. Thus the study revealed that only long-term combined multidisciplinary interventions can have positive influence in combating childhood obesity than short-term interventions.

Keywords: *Child care, obesity, healthcare, child development*

INTRODUCTION

Obesity has serious long-term consequences. This problem is confined not only to adults but also the prevalence of overweight / obesity among children and adolescents has been documented over the last few decades and 30 per cent of obesity begins in childhood. The global prevalence of obesity in children is 10 per cent as estimated by International Obesity Task Force - IOTF (Bhave *et al.,* 2004). Notably, 50 to 80 per cent of obese children become obese adults and complications of adult obesity are made worse due to childhood obesity. Childhood obesity is not an immediately lethal disease in itself, but is a significant risk factor associated with a range of serious non-communicable diseases and other diseases too. Prevention is the only viable long-term strategy to tackle the problem at its origin. School based interventions provide a great opportunity to enhance the health and well-being of our future citizens. The present study was undertaken to assess the impact of fitness regimen in the selected children and to compare the effect of long-term ie., both education program and fitness regimen versus short-term interventions ie., only education program on the selected children.

METHODOLOGY

Children in the age group of 12 to 15 years were selected for the present study to impart healthy improved lifestyle practices to prevent obesity and nutrition related chronic diseases. the study was conducted in Madurai district of Tamil Nadu. All the children in the seventh, eighth and nineth standards were selected for the study. Children were classified as Group-I of 228 children and were given long-term behavioral intervention which comprised of health and nutrition education program for six months and were taught fitness exercises for the next six months. Group-II of 390 children were given short-term behavioral intervention that is only the education program. The impact of short-term (First phase of six months – education alone) and long-term interventions (First phase of six months – education and second phase of next six months-fitness exercises) were studied periodically and compared among both the groups. A fitness regimen was designed for weight- loss, to increase concentration power and to increase fitness level in children thereby making them healthy. Fitness regimen was planned, sequenced and finalized with the help of a pediatrician, sports physiotherapist and acupressurist in six categories namely warm up exercises, fitness exercises, yogasanas, acupressure, warm down exercises and walking.

Group-I children were given fitness interventions for five days a week with duration of 45 minutes (30 minutes of fitness regimen interlaced with motivational health and nutrition talk in school and 15 minutes of walking at home) for a period of six months at the second phase. IOTF has endorsed age and sex specific BMI cut off points for identifying childhood overweight and obesity. In this study, IOTF standards were used to classify the children as overweight or obese (Cole *et al.,* 2000)

In the present study, Body fat analyzer scale (Omron HBF-200) was used to measure body fat percentage in the selected children. Body fat percentage is an estimate of the fat mass or adipose tissue rather than lean body mass (muscle, bone, organ tissue and blood). As a measure of excess body weight, body fat percentage is far more reliable than BMI

because body fat percentage makes a distinction between the weight of muscle mass and that of the fat mass. (Prentice and Jebb, 2010).

Waist-Hip Ratio (WHR) was calculated for each individual and was classified based on the revised classification advocated by WHO (2004) for both boys and girls. Resting metabolic rate (RMR) is the energy required to perform vital body functions such as respiration and heart rate while the body is at rest. Omron body fat analyzer was used to measure RMR in children in this study. A person with a high percentage lean body mass (i.e., low body fat percentage) tend to have high resting metabolic rate because muscle is metabolically more active than fat. In simple words, a person with high body fat percentage tends to have lower RMR (Jackson et.al, 2007).

An evolving epidemic of cardiovascular risk in children and adolescents has been evidenced by an increase in the prevalence of overweight and obesity. Hypertension in children aged 12-15 years is a condition in which systolic pressure exceeds 136mmHg and diastolic pressure exceeds 86mmHg. When the heart beats, it requires extra efforts to supply blood for the body and hence higher pulse rate is considered unhealthy. The normal pulse rate in children aged 12-18 years is 60-100 per minute (Mohanty, 2008). In the present study, a digital Omron HEM – 7111 automatic blood pressure monitor was used to check the blood pressure and pulse rate of the selected children.

Obesity has emerged as an important risk factor for Chronic Respiratory diseases like Chronic Obstructive Pulmonary Disease (COPD) and asthma, which is currently the fourth leading cause of death in the world (Story, 2007). In this study Mini-Wright EN-13826 peak flow meter was used for diagnosis and monitoring reversible airway disease in children. Fitness tests helps to determine the overall health status and physical fitness of an individual. A set of eight fitness tests (designed by Pranab, 2008) for children aged 10-15 years were conducted in the selected children.

Fitness tests were conducted among Group I (228) children with the help of a Sports Physiotherapist. However, periodical (once in three months) fitness tests were conducted

in both Group-I & II children to screen the impact of fitness intervention among the target group.

The data gathered were subjected to analysis by using Epidemiological Information Package (EIP), 2010 version software developed by centre for disease control and prevention, Atlanta, USA. The statistical tools used were frequencies, percentage, mean, standard deviation, chi square and Pearson's correlation co-efficient. Kruskal–Wallis one-way analysis of variance and Yates' corrected chi square tests were used for qualitative variables by giving scores based on weightage of the variables. For test of significance, 0.05 was calculated as significant and when the results were not significant it was denoted as NS.

RESULTS AND DISCUSSION

Initially the mean BMI was 21.61 in Group-I and 21.93 in Group-II. The mean BMI was 21.45 in Group-I and 21.83 in Group-II after six months, which may be due to attitude change in lifestyle practices in both the groups due to the education programme on health and nutrition. The mean BMI of Group-I was 21.18 showing weight reductions due to the fitness intervention after nine months (i.e. assessment after three months of exercise). The mean BMI of Group-I after one year was 20.89 and difference of mean (0.72) from initial to final was statistically highly significant (P = 0.0001) in Group-I.

It was clear that Group-I children received both education programme and fitness intervention for a period of one year and this may be the reason for their change in BMI due to the attitude and practice of healthy lifestyle. In Group-II, the mean BMI increased to 21.93 (similar to the initial BMI of 21.93) after nine months. Again the mean BMI of Group-II increased to 21.94 revealing that they gained weight after one year (P=0.06) because this group did not undergo any fitness intervention. Actually, Group-II children increased their weight from one to four kg. The results revealed that physical fitness intervention, combined with a long-term behavioral intervention had significant impact on the BMI of children rather than education programme alone.

It was observed that 59 per cent of children in Group-I shifted from overweight / obese WHR category to normal WHR category. In Group-II five per cent of the children who belonged to overweight -WHR category shifted towards obese-WHR category. It was found that there was high significance (P = 0.0001) in the change of WHR from initial to final among the Group-I children. The present study inferred that physical fitness intervention had good influence on the WHR because fitness regimen given to the Group-I children for a period of six months comprised of many of the abdomen, spine and hip stretching exercises, which are known to strengthen the abdomen, waist, hip and spinal muscles.

It was observed that 14 per cent of the Group-I children were classified as underweight, 65.8 per cent of them were normal weight, 7.5 per cent were overweight and 12.7 per cent were obese based on the fat percentage. In Group-II children, 9.5 per cent were underweight, 53.8 per cent were normal weight, 13.3 per cent were overweight and 23.3 per cent were obese based on the fat percentage. In the Group-I children, the mean fat percentage was 19.49 per cent initially which reduced to 19.36 after six months. This may be due to the impact of education programme in both the Group-I and Group-II (21.65 to 21.46 per cent). The fat percentage reduced to 19.33 per cent after nine months and 18.64 per cent after one-year in the Group-I children. But in the Group-II children the fat percentage increased to 21.5 per cent after nine months and remained the same after one year follow up. Statistically the fat percentage of children in both Group-I and Group-II had significant reduction.

It was observed that the initial RMR was lower in 35.9 per cent in Group-I and 41.5 per cent in Group-II. After one year among Group-I, there was a shift of 35.9 percent of lower RMR to normal (12.7%) and healthy range (27.6%) of RMR showing highly significant changes due to long-term interventions (P=0.0001). However, there were no significant changes in RMR among Group-II children (P=0.9816).

It was understood that 2.6 per cent children of the Group-I and one per cent children of Group-II had high blood pressure initially. Initially 4.4 per cent children of

Group-I and 6.7 per cent children of Group-II had low blood pressure. After six months when both the groups were given only education program there was no change in the blood pressure. The result revealed that after one year of intervention there was a shift of 6.6 per cent children with high blood pressure and 4.4 per cent children with low blood pressure to normal blood pressure showing a significant change (P=0.0005) in Group-I. In Group-II after one-year follow-up, there was no shift of children from high blood pressure (>136/86 mmHg) to normal blood pressure. Physical intervention combined with education programme brought forth good change in the blood pressure among Group-I children. From the result was inferred that interventions on improvement of physical exercises and healthy dietary practices might be the reasons for the changes in blood pressure. It was found that 3.1 per cent from Group-I and 2.1 per cent from Group-II children had high pulse rate or heart rate initially. When the heartbeats fast, it requires extra efforts to supply blood the body and hence higher pulse rate is considered unhealthy. It was noted that 10 per cent of the Group-I children shifted from normal pulse rate and high pulse rate to low pulse rate all within normal range of 60-100 beats/minute. Statistically there was no significant change in the pulse rate. In Group-II children, also seven per cent of the children got a low pulse rate but there were no significant changes.

This might be because, there was no impact of fitness exercise on the heart rate or pulse rate and thus it can be inferred that fitness intervention needs to be given for longer period (more than two years for effective changes).

It was observed that the initial PEFR ranged below normal of 83.3 per cent in Group-I and 81.5 per cent in Group-II, which revealed that majority of the children, had signs of respiratory problems. Group-I recovered from the respiratory problems due to the fitness intervention given for six months, especially due to the breathing exercises. None of the children recorded PEFR below the normal range (after six months of fitness intervention) which was a total reverse in the PEFR from initial to final. It was observed that 33.3 per cent of the children recorded normal PEFR and majority of the children 66.7 per cent recorded excellent PEFR range in Group-I after six months of intervention. The changes were statistically significant in the Group-I children (P=0.0001) after one year. In

Group-II, majority of the children (81.5%) recorded poor PEFR initially and remained the same from initial to the end of study. There was no significant impact due to the education programme alone on the Group-II (P=1.0) regarding PEFR.

From the above results, it can be inferred that regular physical fitness exercises had greater impact on the treatment of respiratory problems like cold, cough, sinus, eosinophilia, asthma, wheezing and other breathing disorders.

A set of eight fitness tests were conducted in Group II children periodically from initial to final and the results are given.

Changes in fitness level scores due to interventions

S.No	Particulars	Fitness level scores (out of 8)				
		Group-I (n=228)		Group-II (n-390)		'P' value
		Mean	SD	Mean	SD	
a.	Initial	2.02	1.17	2.01	1.3	0.1976^{NS}
b.	After 6 months	2.03	1.17	2.01	1.3	0.1911^{NS}
c.	After 9 months	3.85	1.03	2.01	1.3	0.0001**
d.	After one year	5.14	1.16	2.01	1.3	0.0001**
Changes from initial to final		3.12	1.69	-	-	0.0001**
'P'value between initial and final		0.0001**		1.0(NS)		

** - Highly Significant, * - Significant, NS- Not Significant

Fitness level scores (totally 8.00 scores) indicated the fitness level of the selected children before and after fitness regimen interventions. The mean fitness scores obtained initially was poor both in Group I (2.02/8.00) and Group II (2.01/8.00). This revealed that the selected children were poor in their physical fitness initially. It was found that physical fitness intervention given to Group-I children had evident effect on their mean fitness level score (3.85) after three months of fitness exercises. There was a high positive impact after six months of fitness exercise among Group-I children showing a mean score of 5.14. The mean difference in the fitness scores from initial to final was 3.12 in Group-I.

The results showed a statically significant (P=0.0001) impact of physical fitness exercise intervention combined with education programme among Group-I children. The

same level of fitness scores was observed in Group II from the initial to final assessment period of the study. This reveals that the education programme alone given to the children for first six months had no impact on both the groups of the children. The highlighting factor in this study is the impact of fitness regimen on the Group I children when combined with the complimentary education intervention.

CONCLUSION

Fitness regimen designed in this study was to bring about a positive outcome in overall physical fitness rather than weight loss alone. Fitness regimen given in this study had a profound influence in weight reduction and improvement of fitness levels among children. Nowadays children do not take-up even simple physical activities leading to tightening of muscles, tendons and ligaments thereby resulting in poor health and poor physical fitness throughout life. poor physical fitness in children is the major causative factor for the childhood obesity. Dietary intervention alone may not be effective when opted as a single measure for preventing childhood obesity because it can only act as a complimentary program along with fitness exercises. Insofar as physical exercise has been associated with increased academic performance, self-concept, mood, and mental health, the promotion of physical activity and exercise may also improve quality of life. Thus, Schools should promote physical exercise combined with dietary interventions in their curriculum which can have a significant impact on reducing childhood obesity.

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