

Effectiveness of an intensive lifestyle modification program in reducing the weight of obese children aged 12-18 years

Reetha Gopinath, Ambili Susan Jacob

From Department of Pediatrics, Pariyaram Medical College, Kannur, Kerala, India

Correspondence to: Reetha Gopinath, Department of Pediatrics, Pariyaram Medical College, Kannur, Kerala, India.

E-mail: drreethag@gmail.com

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ABSTRACT

Objective: To find out the effectiveness of an intensive lifestyle modification program in reducing the weight of obese children aged 12-18 years. **Material and Methods:** Quasi-experimental single group pre-test/post-test study was conducted for 1 year in the outpatient unit of a tertiary care hospital. Obese children aged 12-18 years who gave consent to participate in the study were included as the study subjects. Obesity was diagnosed based on revised Indian Academy of Pediatrics (IAP) 2015 reference percentiles that have been proposed for Asian Indian children with a body mass index (BMI) >27 kg/m² adult equivalent cut-off taken as obesity. Intervention done was lifestyle modification including diet and moderate aerobic exercises under supervision thrice a week, 1 h each day. **Results:** A total of 72 children were initially enrolled, and final analysis was performed on 58 children. After completing the 6 months program, the mean BMI reduced from 29.31±4.83 kg/m² to 27.27±4.46 kg/m². The mean weight of the study participants decreased to 70.82±16.43 kg from 76.1±17.98 kg, both of which were statistically significant. **Conclusion:** Study shows the effectiveness of an intensive lifestyle modification program of diet and exercise in reducing the weight of obese children.

Key words: Children, Intensive intervention, Obesity

There has been a global increase in the prevalence of overweight and obesity among children all over the world. The number of overweight or obese infants and young children globally increased from 31 million in 1990 to 42 million in 2013 as per the World Health Organization update in 2015 and also it was predicted that if the current trends continue, the number of overweight or obese infants and young children globally will rise to 70 million by 2025 [1]. Data regarding burden of overweight and obesity among children in Indian scenario are very few. A study from South India among school children showed that the proportion of overweight children increased from 4.94% in 2003 to 6.57% in 2005, demonstrating the time trend of this rapidly growing epidemic [2]. In a systematic review by Ranjani et al., the pooled data after 2010 estimated a combined prevalence of 19.3% of childhood overweight and obesity in India [3]. Although the data regarding the increasing trend of obesity is alarming, very little is being done to curb the rise. Environmental factors and lifestyle play pivotal roles in the rising prevalence of obesity worldwide. Overweight and obesity are the results of an increase in caloric and fat intake. On the other hand, there are supporting evidences that junk food and steady decline in physical activity have been playing major roles in the rising rates of obesity all around the world [4]. Lifestyle modifications for reducing the weight have been found to be an effective strategy as reported by researchers [5,6]. As there are no studies reported from the northern part of Kerala regarding

any lifestyle intervention done for obese children, it was felt that a study conducted in this area would throw light on the role of lifestyle modification when dealing with obesity in children. We planned this study to evaluate the effectiveness of intensive lifestyle modification on the weight of obese children between 12 and 18 years of age.

MATERIALS AND METHODS

Quasi-experimental single group pre-test/post-test study was conducted at the outpatient clinic of pediatric endocrinology department of a tertiary care hospital in North Kerala. Obese children between the ages of 12 and 18 years attending the clinic during a period of 1 year from January to December 2016 who gave consent to participate in the study were included. Children with coexisting obesity syndromes and other medical conditions causing obesity, and children who dropped out from the study were excluded from the study. Institutional Ethics Committee approval was obtained for the study. A detailed informed consent was taken from the parents for participation of their children in the study. Obesity was diagnosed based on revised IAP 2015 reference percentiles that have been proposed for Asian Indian children with a body mass index (BMI) >27 kg/m² adult equivalent cut-off taken as obesity [7].

The baseline characteristics of the subjects were recorded before starting the intervention. A detailed medical history

and physical examination were done. Height was measured in standing position using a stadiometer and was measured by a single observer. Weight was taken on an electronic weighing scale and was measured by the same observer. BMI was measured as weight in kilograms divided by height in meter². Those, who were obese, were enrolled as and when they came and each child was followed up for 6 months. Those children who were included initially but later dropped out of the intensive lifestyle modification program were excluded from the final evaluation.

Intensive Lifestyle Modification Program

Diet modification and physical exercise formed the main constituents of this program. Initially, the participants were interviewed along with their parents. Information was obtained regarding their eating habits, especially the habit of eating rice three or four times daily, eating out, consumption of chocolates, ice creams, burgers, etc. Approximate calories consumption was calculated for each child. Details of daily physical activity were enumerated. Time spent on seeing television and use of other electronic gadgets such as computers and mobile phones were also noted. A dietician then prepared a personalized diet chart for each study subject. The main principle followed for this was that children aged 16-18 years were given a calorie-restricted diet of 1600 kcal/day and children between 12 and 15 years of age were given 2000 kcal/day. Those children in the 12-15 years age group who had a BMI of >30 kg/m² were given 1800 kcal/day. This calorie chart was given as more calories cannot be restricted in younger children who are growing, but older children can be given a weight reducing calorie restricted diet. Diet included cereals, pulses, egg, fruits, vegetables, sprouts, salads, and skimmed milk. Furthermore, oil intake was restricted to 20 g/day. An average intake of 1.5-2 l of water daily was also recommended.

A trained physiotherapist designed a physical activity program for the study subjects which consisted of moderate intensity aerobic exercises for 1 h. This was done in the hospital as a group activity supervised by the physiotherapist. The frequency of this activity was 3 times a week, and the duration of the physical exercise program was for 6 months. These children were reviewed by the clinician once weekly, on Saturdays and their weights were recorded on the same electronic scale by the same observer. Personalized diet chart was given to each child, and it was reinforced during each visit. The dietician reviewed the diet schedule once every month and suggested necessary modifications if needed. Strict instruction was given to avoid junk food items, and this was reinforced during the follow-up visits. Parental participation was ensured during each visit to the hospital. This was done to increase the parent's awareness of their child's problem and provide them with advice on how to help their child change his or her lifestyle behavior. The responsibility of the parents as a role model for their children was stressed on by the clinician.

The data were entered using Microsoft Excel 2010, and statistical analysis was performed using the SPSS (version 13.0). Pre-intervention variables and the post-intervention variables

after 6 months were compared using the paired t-test and a $p < 0.05$ was taken as statistically significant.

RESULTS

A total of 72 children were enrolled in the study based on the selection criteria, but 14 children were excluded from the final analysis because they dropped out from the exercise program after 1 or 2 months, mainly because of the difficulty in travelling. Final analysis was performed on 58 children who completed the intensive lifestyle modification program. The age of the children ranged from 12 to 18 years with a mean of 14.36 ± 1.97 years. Out of them, 27 were males (46.5%) and 31 were females (53.5%).

The initial weight of the study participants varied from 43.4 to 147 kg with a mean of 76.1 ± 17.98 kg (Table 1). The initial BMI of the group was 29.31 ± 4.83 kg/m² (range - 21.9-48.6 kg/m²). After completing the 6 months program, the mean BMI reduced to 27.27 ± 4.46 kg/m². This difference was statistically significant, using paired t-test ($t = 20.11$, $p < 0.001$). The mean weight of the study participants decreased to 70.82 ± 16.43 kg which was statistically significant ($t = 18.83$, $p < 0.001$). There was 6.94% reduction in mean weight of the study participants. The figure below depicts the average weight of the participants at each month during the lifestyle modification program.

As shown in Figure 1, the mean weight of the participants decreased at each month, from the start up to the 6 months. A one-way repeated measures Analysis of Variance showed that the difference in the mean monthly weights of the participants was statistically significant ($F = 253.94$, $p < 0.001$). This was followed by a *post hoc* test using Bonferroni correction, which revealed that the pairwise difference between any 2 months was also statistically significant ($p < 0.001$); thus, showing that study group had a significant decrease in their mean weights during each month of participation in the intensive lifestyle modification program.

DISCUSSION

Overweight and obese children are at a greater risk for health problems compared with normal children of the same age and

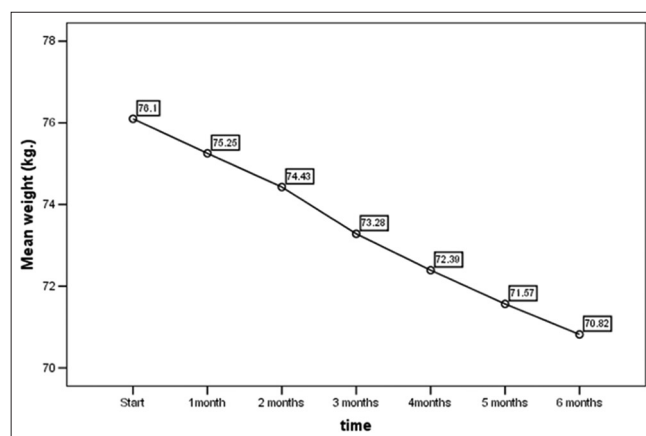


Figure 1: Month wise distribution of mean weight

Table 1: Mean and SD of weight month wise

| Variable | Minimum | Maximum | Mean±SD |
|----------|---------|---------|--------------|
| Age | 12 | 18 | 14.36±1.97 |
| Weight | 43.4 | 147 | 76.10±17.97 |
| Height | 130 | 180 | 160.53±10.97 |
| BMI | 21.9 | 48.6 | 29.31±4.83 |
| 1 month | 43 | 145 | 75.25±17.66 |
| 2 months | 42.3 | 142.5 | 74.43±17.45 |
| 3 months | 41.5 | 140.3 | 73.28±17.08 |
| 4 months | 41 | 137.4 | 72.39±16.74 |
| 5 months | 40.7 | 136 | 71.57±16.49 |
| 6 months | 40 | 135 | 70.82±16.43 |

BMI: Body mass index, SD: Standard deviation

are likely to become obese adults. It is well known that poor lifestyle is one of the most significant factors contributing to adolescent obesity. So identification of effective interventions leading to improve as well as long lasting changes in adolescent lifestyle is very important [8,9]. It has been recommended by the World Health Organization and National Institute of Health that a reduction of body weight by 10% leads to a reduction of the comorbid conditions related to obesity [10,11]. A comprehensive program of lifestyle modification is considered as the first and the best option for achieving this goal [12,13]. There are several studies which support the short-term benefits of behavioral interventions in reducing the weight of overweight and obese adolescents [14]. Most of the comprehensive lifestyle modification programs provide weekly, individual or group treatment sessions designed to modify eating habits and physical activity [15].

Our study was intended to assess the effectiveness of an intensive lifestyle modification on the weight of obese children. We could demonstrate a statistically significant reduction in BMI and weight after 6 months of the intensive intervention. In the look action for health in diabetes (AHEAD) study; the researchers could demonstrate 4.7% reduction in weight over a period of 4 years by intensive lifestyle intervention. At the end of the 1st year, the children in the study group lost 8.6 kg [16]. The average weight loss that could be achieved in this study was 5.28 k after 6 months, which amounts to a reduction of weight by 6.94%. In a review article by Wadden et al., it was seen that a comprehensive lifestyle modification program induced a loss of approximately 10% of the initial weight in 16-26 weeks by a group or individual treatment delivered on-site [17]. Ho et al. in a systematic review of 15 articles, found that either diet alone or diet and exercise combination is effective in reducing the weight on a short-term basis [18]. The same researchers analyzed the effects of 33 lifestyle interventions on cardiometabolic outcomes in overweight children and concluded that interventions produced significant weight loss with a mean decrease in BMI of 1.25 kg/m² [19]. We could demonstrate a slightly higher reduction of BMI of 2.04 kg/m².

One interesting effect that was noticed among the study group was that children did not feel hungry even on the reduced calories that were prescribed. Furthermore, most of them reported reduced

craving for certain food items like non-vegetarian food which they could not resist earlier.

Jamal et al. studying the effectiveness of group support lifestyle medication revealed that the success of the intervention also could be attributed to the group exercise activity which was followed and all the participants reported interest and enthusiasm in exercising as a group. The psychological improvement in the intervention group was sustained post-intervention also. Several other studies have also supported group interventions as well as family support in the success of weight loss programs [19-21]. This study also observed the positive psychological effect of exercising as a group.

Pharmacological therapy has been studied by several observers for reducing weight in obese adolescents. A systematic review of metformin in treating obesity in children looking into 14 randomized clinical trials, 12 of which included a lifestyle component, concluded that metformin provides a modest reduction in BMI of 1.38 kg/m². A 6-month metformin and lifestyle intervention in obese insulin resistant adolescents demonstrated an improvement in insulin resistance but no change in BMI [22,23]. Although pharmacological therapy was not tried in this study group comparable weight reduction could be achieved with lifestyle modification alone.

Although the results of the study are quite promising, further follow-up is needed monitor whether the decrease in weight is being maintained [24]. In the look, AHEAD study group, follow-up for 8 years in the intensive lifestyle modification trial could show ≥5% weight loss at 8 years in 50% of participants [25]. Nearly, 40% of the participants who lost 10% of weight initially maintained this at year 8 also. This clearly demonstrates that teaching weight loss skills helps in long-term weight maintenance. This study group needs to be followed up further. If significant weight maintenance and lifestyle change can be demonstrated during the follow-up period as well, this intensive lifestyle modification program can be used as a method to treat as well as prevent the alarming epidemic of obesity among children and adolescents.

Obesity in childhood cannot be curbed without parental support. Teaching parents about healthy eating habits, combined with promoting a healthy family lifestyle may be an effective approach to weight management in children [26]. The main limitation of this study is the small sample size. Furthermore, there was no control group.

CONCLUSION

This study shows the effectiveness of an intensive lifestyle modification program in reducing the weight of obese children. Both weight and BMI of the study participants were found to have a significant decrease. Such lifestyle modification programs can have a significant impact on children and will help in reducing the alarming rise in obesity.

REFERENCES

1. Commission on Ending Childhood Obesity. World Health Organization; 2017. Available from: <http://www.who.int/end-childhood-obesity/en>. [Last

- cited on 2017 May 05].
- Raj M, Sundaram KR, Paul M, Deepa AS, Kumar RK. Obesity in Indian children: Time trends and relationship with hypertension. *Natl Med J India*. 2007;20(6):288-93.
 - Ranjani H, Mehreen TS, Pradeepa R, Anjana RM, Garg R, Anand K, et al. Epidemiology of childhood overweight and obesity in India: A systematic review. *Indian J Med Res*. 2016;143(2):160-74.
 - Sahoo K, Sahoo B, Choudhury AK, Sofi NY, Kumar R, Bhadoria AS. Childhood obesity: Causes and consequences. *J Family Med Prim Care*. 2015;4(2):187-92.
 - Wadden TA, Butryn ML, Byrne KJ. Efficacy of lifestyle modification for long-term weight control. *Obes Res*. 2004;12 Suppl:151S-62.
 - Nair A, Nambisan B, Radha S, Leelamma J. Effectiveness of lifestyle modification package among overweight and obese adolescent girls between 15-19 years with polycystic ovarian syndrome. *Int J Community Med Public Health*. 2016;4(1):84.
 - Indian Academy of Pediatrics Growth Charts Committee, Khadilkar V, Yadav S, Agrawal KK, Tamboli S, Banerjee M, et al. Revised IAP growth charts for height, weight and body mass index for 5- to 18-year-old Indian children. *Indian Pediatr*. 2015;52(1):47-55.
 - Franks PW, Hanson RL, Knowler WC, Moffett C, Enos G, Infante AM, et al. Childhood predictors of young-onset Type 2 diabetes. *Diabetes*. 2007;56(12):2964-72.
 - Sung RY, Tong PC, Yu CW, Lau PW, Mok GT, Yam MC, et al. High prevalence of insulin resistance and metabolic syndrome in overweight/obese preadolescent Hong Kong Chinese children aged 9-12 years. *Diabetes Care*. 2003;26(1):250-1.
 - WHO Consultation on Obesity (1997: Geneva S, Diseases W, World Health Organization. Programme of Nutrition F. Obesity: Preventing and managing the Global Epidemic: Report of a WHO Consultation on Obesity, Geneva, 3-5 June 1997. *Who.int*; 2017. Available from: <http://www.who.int/iris/handle/10665/63854>. [Last cited on 2017 May 05].
 - Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults - The evidence report. National institutes of health. *Obes Res*. 1998;6 Suppl 2:51S-209.
 - Diabetes Prevention Program (DPP) Research Group. The Diabetes Prevention Program (DPP): Description of lifestyle intervention. *Diabetes Care*. 2002;25(12):2165-71.
 - Poirier P, Després J. Exercise in weight management of obesity. *Cardiol Clin*. 2001;19(3):459-70.
 - Whitlock E, O'Connor E, Williams S, Beil T, Lutz K. Effectiveness of weight management interventions in children: A targeted systematic review for the USPSTF. *Pediatrics*. 2010;125(2):e396-418.
 - Wadden T, Webb V, Moran C, Bailer B. Lifestyle modification for obesity: New developments in diet, physical activity, and behavior therapy. *Circulation*. 2012;125(9):1157-70.
 - Wadden T, Neiberg R, Wing R, Clark J, Delahanty L, Hill J, et al. Four-year weight losses in the look AHEAD study: Factors associated with long-term success. *Obesity*. 2011;19(10):1987-98.
 - Wadden TA, Butryn ML, Wilson C. Lifestyle modification for the management of obesity. *Gastroenterology*. 2007;132(6):2226-38.
 - Ho M, Garnett SP, Baur LA, Burrows T, Stewart L, Neve M, et al. Impact of dietary and exercise interventions on weight change and metabolic outcomes in obese children and adolescents: A systematic review and meta-analysis of randomized trials. *JAMA Pediatr*. 2013;167(8):759-68.
 - Ho M, Garnett S, Baur L, Burrows T, Stewart L, Neve M, et al. Effectiveness of lifestyle interventions in child obesity: Systematic review with meta-analysis. *Pediatrics*. 2012;130(6):e1647-71.
 - Vannucci A, Wilfley DE. Behavioral interventions and cardiovascular risk in obese youth: Current findings and future directions. *Curr Cardiovasc Risk Rep*. 2012;6(6):567-78.
 - Jamal SN, Moy FM, Azmi Mohamed MN, Mukhtar F. Effectiveness of a Group Support Lifestyle Modification (GSLiM) programme among obese adults in workplace: A randomised controlled trial. *PLoS One*. 2016;11(8):e0160343.
 - McDonagh MS, Selph S, Ozipinar A, Foley C. Systematic review of the benefits and risks of metformin in treating obesity in children aged 18 years and younger. *JAMA Pediatr*. 2014;168(2):178-84.
 - Wiegand S, l'Allemand D, Hübel H, Krude H, Bürmann M, Martus P, et al. Metformin and placebo therapy both improve weight management and fasting insulin in obese insulin-resistant adolescents: A prospective, placebo-controlled, randomized study. *Eur J Endocrinol*. 2010;163(4):585-92.
 - Look AHEAD Research Group. Eight-year weight losses with an intensive lifestyle intervention: The look AHEAD study. *Obesity (Silver Spring)*. 2014;22(1):5-13.
 - van der Heijden LB, Feskens EJ, Janse AJ. Maintenance interventions for overweight or obese children and adolescents who participated in a treatment program: Study protocol for a systematic review. *Syst Rev*. 2014;3:111.
 - Golley R, Magarey A, Baur L, Steinbeck K, Daniels L. Twelve-month effectiveness of a parent-led, family-focused weight-management program for prepubertal children: A randomized, controlled trial. *Pediatrics*. 2007;119(3):517-25.

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