International Journal of Contemporary Pediatrics
Pappiya EM et al. Int J Contemp Pediatr. 2019 Nov;6(6):2379-2384
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20194702

Original Research Article

Effectiveness of healthy eating and active lifestyle intervention program on physiological parameters among children with obesity

Ester Mary Pappiya[1]*, Sumathi Ganesan[2], Ibrahim Mubrak Al Baalharith[3]

[1]Regional Nursing Administration, Directorate of General Health Affair, Najran, Saudi Arabia
[2]Department of Nursing, College of Nursing, Prince Sattam Bin Abdulaziz University, Wadi Aldawasir, Saudi Arabia
[3]Director, Regional Nursing Administration, Directorate of General Health Affair, Najran, Saudi Arabia

Received: 29 January 2019
Revised: 22 May 2019
Accepted: 30 May 2019

***Correspondence:**
Dr. Ester Mary Pappiya,
E-mail: easterbala@gmail.com

ABSTRACT

Background: The aim of the study was to investigate the effectiveness of Healthy Eating and Active Lifestyle Intervention Program (HEALIP) on physiological parameters among children with obesity.
Methods: True experimental research design was adopted with 200 children between the age group of 12-18 years who met the inclusion criteria from four different schools in Chennai, Tamil Nadu, India. Samples were allocated into experimental group (n=100) and control group (n=100) by random sampling technique. Children were screened for weight, height, body mass index, and blood pressure were measured before as well as after the intervention. Healthy eating and active lifestyle intervention program were administered for the experimental group for 16 weeks, whereas the control group received routine practices. Post-test was conducted at the end of the 16th week for the both groups. Data were analysed using SPSS.
Results: There was a difference in the pre-test systolic blood pressure (128.4±1.3) and post-test (118.6±0.7) and in the pre-test diastolic blood pressure (78.8±0.6) and post-test (72.8±0.6) mean value in the experimental group and found statistically significant at the level of $p < 0.001$. It was also observed the significant difference between the experimental and control group.
Conclusions: The finding of the study concluded that healthy eating and active lifestyle intervention program has proved the beneficial effect in maintaining the physiological parameters. Hence, it was concluded that there is a need to educate the children about the obesity and its complications. The study findings ensure that periodic monitoring of the basic physiological parameters among obese children will prevent the furthermore complications.

Keywords: Children, Healthy eating and active lifestyle intervention, Obesity, Physiological parameters

INTRODUCTION

Overweight and obesity among school children are emerging public health problem. World health organization reported that the childhood obesity is one of the serious public health challenges and affecting many low- and middle- income countries, particularly in urban settings. Globally the prevalence of overweight and obesity are increasing at an alarming percentage. In India the magnitude of overweight ranges from 9 to 27.5% and obesity ranges from 1 to 12.9% among school children. The projected number of overweight and obesity were 43 million in 2010 and expected to rise to 60 million in 2020.[1] The prevalence was increased from 4.2% to 6.7% and expected to rise 9.1% by 2020.[2]

Overweight and obesity children are at risk of developing high blood pressure and cardiovascular diseases. The

body system becomes affected due to excessive deposition of fat in the blood vessel. Arterial blood pressure increased through Systemic Vascular Resistance (SVR) or cardiac output.[3] Hypertension often associated with positive family history of hypertension or cardiovascular disease (CVD) and obesity.[4] CVD risk factors are not only associated with heart disease in childhood but also increased in adulthood. Childhood obesity is the risk factor for many cardio vascular diseases and leads to high mortality and morbidity among the children.[4] Data obtained on school health screening programs and depicted that the prevalence of hypertension increases progressively with increasing body mass index and hypertension is detectable approximately 20-24 percent in overweight children with BMI, 95th percentile.[5]

The primary causes of hypertension among obese children are due to lifestyle changes. Children with hypertension, diabetes or hyperlipidaemia are at risk for developing the cardiovascular disease and these children need early assessment and management.[6] The overweight and obese children are exposed to numerous health problems includes diabetes mellitus, cardiovascular disease, respiratory diseases and several orthopedic disorders and also reported to have increased heart rate variability and blood pressure variability.[7,8] American Academy of Pediatrics (AAP) emphasized to conduct regular screening for obese children to identify the primary hypertension.[9]

Early identification of hypertension among obese children is an important strategy to control, manage and prevent the complications.[10] Management of hypertension among obese children includes dietary modifications and physical activity. Weight loss is the first-line of management for children with obesity-related hypertension and decrease in sympathetic nerves system activity which has direct effects on arterial pressure (decreased peripheral vasoconstriction) and indirect effects on arterial pressure (improved pressure natriuretic resulting in lower intravascular volume), and to decrease in renin release from the kidney.[11,12]

Dietary modifications and physical activities are the important measures to control the children with obesity. Weight loss up to 0.5 kg/week, ensuring adequate protein intake of 0.8 to 1 mg/kg/day, increased intake of fresh vegetables, fruits, and low-fat dairy reduced carbohydrate, fat and processed dietary fiber content (age+5=number of grams/day up to 14 g/1000 kcal).[13] Avoidance of sugar-sweetened intake-limited/avoidance of sugar-sweetened beverages.[14] Intake of fibers and beverages which influence the weight loss among children and independently associated with blood pressure reduction in adults.[15] Physical activity has an important role in maintaining the physiological parameters within the normal limits. Regular exercise helps to maintain a healthy weight which has another important way to control blood pressure. Exercise makes the heart to pump more blood with less effort that will decrease the workload of the arteries and lowering the blood pressure. Aerobic exercise increases energy expenditure and anaerobic exercise helps build muscle. Regular 60 minutes exercise is the key element to reduce the body weight and regulates the blood pressure.[17] The present study was conducted to prevent the non-communicable disease among obese children. Primordial prevention is very essential. So, the investigator decided to measure the effectiveness of healthy eating and active lifestyle intervention program on physiological parameters among children with obesity.

METHODS

The present interventional study was carried out among school children in the age group of 12 to 18 years. It was conducted at four different schools in Chennai, Tamil Nadu, India after obtaining formal permission from the school authority.

Study was ethically approved. The investigator explained about the study and obtained the informed consent from the parents and assent was taken from the study participants.

The samples who included in the study were children with overweight and obese between the age group of 12-18 years of both genders and the obese children with or without complications and children who attend the schools regularly were included in the study. The data collection was carried out on anthropometry measurements like height, weight, body mass index (BMI), waist circumference (WC), hip circumference (HC) and waist hip ratio (WHR) were measured. Height was measured to the nearest centimetre using a tape measure and noted in meters. Weight was measured using a balance scale and noted in kilograms by using the standardized weighing scale and the calibration of the weight machine was done periodically. The BMI was calculated as a ratio of weight in kilogram by the square of height in meters. BMI interpretation was done based on the World Health Organization.[18] Blood pressure was measured by using an electronic machine (Omron Corporation). Measurements were taken on the right on three different occasions in those participants in whom blood pressure was more than normal during the first reading. Average of all three readings was taken as final observation. The participants were classified according to the NHBPEP 19 (National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents, 2005).The intervention was administered to the experimental group children for the period of four months after that post-test was conducted.

The Healthy Eating Active Lifestyle Intervention Program (HEALIP) was school based intervention program and consist of four components include healthy

eating habits, physical activity program complication prevention and parental involvement.

Healthy eating habits

The healthy eating was explained to the children by using power point presentation and consisted of balanced diet, classification of foods, diet plan, and dietary pyramid and healthy food habits, avoidance of unhealthy foods, processing and readymade foods and low glycaemic index foods.

Physical activity program

Planned physical activity program consisted of five times a week during the last hour, 3.30 pm to 4.30 pm with moderate or vigorous intensity activity for 30-45 minutes depended on the tolerance of the children and demonstrated with moderate intensity activity to severe intensity activities include endurance activity, muscle strengthening exercise and bone strengthening exercise. Endurance activities like brisk walking, running, cycling and the muscle-strengthening exercise includes squatting exercises, push up exercise and toe standing exercise. Bone strengthening activities includes jumping, running and jumping rope activities. Each exercise has a rhythmic movement, with breathing and it has 4-8 steps and repeated for 5-10 times alternatively for right and left side body movement.

Education on complication prevention

Children were educated about complication prevention for 30 minutes and they were divided into several groups and informed about the date, time and venue. The classes were taken in both languages and the content was well organized with pictorial explanations.

Parental involvement

Every alternate month in fourth Saturday participant's parents were called for a meeting with help of their class teacher and they were explained about the obesity, and its causes, consequences, management and their roles and responsibility in weight reduction program.

Statistical analysis

The data was analysed by using the parametric and non-parametric test. The data was expressed as mean and standard deviation and paired, and unpaired "t" test was used for the comparison of means of physiological parameters between control and experimental groups.

The relationship between obesity and physiological parameters were assessed by using Karl Pearson's coefficient of correlation. The statistical operations were done through SSPS 2012. USA $p < 0.05$ was considered to be significant.

Ethical approval from the Institutional Human Ethics Committee of Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India.

RESULTS

Table 1 explains the effectiveness of healthy eating and active lifestyle intervention program on physiological parameters among control and experimental group children.

Table 1: Effectiveness of healthy eating and active lifestyle intervention program on physiological para meters among control and experimental group children.

Parameters	Group	Mean±SE	Significance unpaired t-test		Significance paired t-test	
			Con-Exp Pre-test	Con-Exp Post- test	Control Pre- Post-test	Experimental Pre-Post test
Systolic blood pressure	Cont-Pre- test	128.6±4.1	t=0.681 P=0.946	t=4.697 P <0.001	t=5.020 P <0.001	t=10.448 P <0.001
	Cont-Post -test	126.3±0.6				
	Exp-Pre -test	128.4±1.3				
	Exp-Post -test	118.7±0.7				
Diastolic blood pressure	Cont-Pre- test	75.1±0.6	t=5097 P <0.001	t=1.857 P=0.065	t=1.585 P=0.116	t=5.134 P=0.195
	Cont-Post -test	74.4±2.6				
	Exp-Pre -test	78.8±0.6				
	Exp-Post -test	72.8±0.6				

The pre-test mean systolic blood pressure in the control group was 128.6 mmHg and decreased to 126.3 mmHg, during the post-test. Whereas in the experimental group pre-test mean systolic blood pressure was 128.4 mmHg and slightly decreased to 118.7 mmHg during the post-test. The results revealed that there was no significant difference between the pre-test test and post-test in the control group (p=0.946). There was a significant change

noticed in the experimental group after the intervention. The mean diastolic blood pressure was 75.1 mmHg in the control group during the pre-test and remains same in the 74.4 mmHg in the post-test. In the experimental group, the mean diastolic blood pressure was 78.8 mmHg in pre-test and it was slightly decreased from to 72.8 mmHg in the post-test the calculated "t" value to find the difference between pre-test and post-test revealed that there was no significant difference in diastolic blood pressure between these two groups (p=0.065). The result of paired "t" test showed that there was no significant difference in the control group whereas in the experimental group a significant difference was noticed between the pre-test and post-test (p <0.001). Hence, it can be concluded that healthy eating and active lifestyle intervention program was effective in maintain the physiological parameters within the normal limits among the experimental group children.

Table 2 describes the correlation and coefficient between the body mass index and the systolic and diastolic blood pressure among control and experimental group children.

Table 2: Correlation between obesity and the selected physiological variables in pretest, and post-test.

Parameters	Pretest		Post-test	
	Control group	Experimental group	Control group	Experimental group
Systolic blood pressure	r =0.712 P<0.001	r =0.577 P<0.001	r =0.600 P<0.001	r =0.335 P<0.001
Diastolic blood pressure	r =0.103 P=0.310	r =0.306 P<0.001	r =0.256 P<0.001	r =0.184 P=0.0685

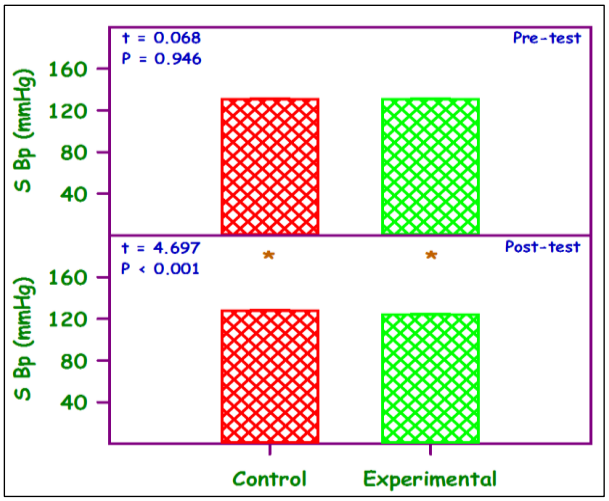

Figure 1: Systolic blood pressure (SBp) of obese children in control and experimental groups, in the pre-test and post-test following HEALP Intervention.

There was a significant positive correlation identified between the body mass index and the diastolic blood pressure of the control group in the pre and post-test (r=0.712, p <0.001, r=0.600, p <0.001). Similarly, in the experimental pre and post-test also showed the positively significant correlation (r=0.577, p <0.001, r=0.335, p <0.001). In relation to diastolic blood pressure positive correlation was observed with body mass index. The study results concluded that there was a significant correlation between the body mass index and the blood pressure. When the body mass index increases the blood pressure also increased while the body mass index reduces the blood pressure also reduced. Hence, it can be concluded that there was a significant correlation between the body mass index and blood pressure.

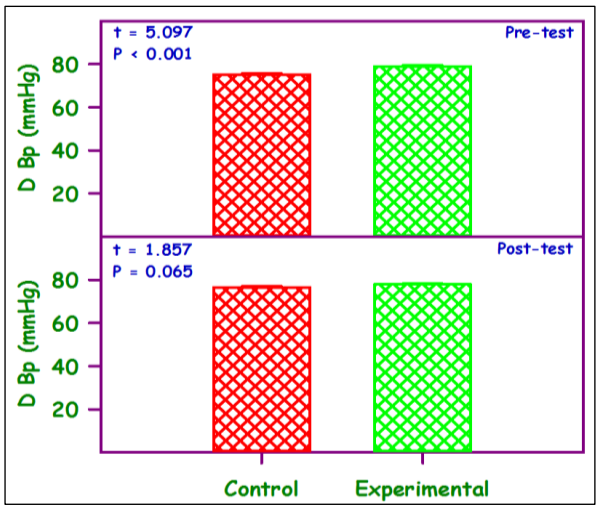

Figure 2: Diastolic blood pressure (DBp) of obese children in control and experimental groups, in the pre-test and post-test following HEALP Intervention.

DISCUSSION

Overweight and obesity among children are the current epidemic problem of this century. The management of obese children required regular monitoring and follow up care. The primary responsible for health care provider is early assessment of obese children and prevent the complications associated with obesity and promote wellbeing and quality of life of the children with obesity. The present study, 200 school children were screened for the basic physiological parameters and they were divided

into control group (n=100) and experimental group (n=100). The obese children in experimental group were demonstrated about the health eating and active lifestyle intervention program.

Childhood obesity is the risk factor for many cardiovascular diseases which cause the high mortality and morbidity among the children. Many studies reported about the school-based intervention is more effective in maintaining the physiological parameters. In the present study, healthy eating and active lifestyle intervention program was more effective in maintaining the physiological parameters in the experimental group than the control group. The present study findings showed that there was no difference between the control and experimental group pre-test systolic blood pressure among the obese children but in the post test systolic blood pressure showed significant reduction in experimental group. These findings were supported by study was conducted among hypertensive adults in Mangalore to determine the effectiveness of Jacobson's progressive muscle relaxation on hypertension and health related stress. JPMR was taught and practiced daily morning and evening for 20 minutes for four days and reported that there was a reduction of systolic blood pressure (pre systolic 155.8+10.14, post systolic 121.7+4.47) and 13 mmHg reduction in diastolic blood pressure (pre diastolic 92.7+4.52, post systolic 79.9+6.26) which was statistically significant. The study findings concluded that JPMR was effective in reducing blood pressure and health related stress among adults.[21,22]

The present study findings showed that there was no significant difference between the diastolic blood pressure among control and experimental group children in the pre-test but in the post test diastolic blood pressure showed that there was a significant reduction in experimental group diastolic pressure while compared to the control group.

The study findings were supported by a cross-sectional study was carried out among private school children between 12-17 years of age group. The basic physiological para meters like height, weight, and body mass index along with blood pressure were measured. School based intervention was program was administered for the hypertensive children and the results reported that school-based intervention program was effective in reducing the blood pressure.[23]

The present study also reported that there was a significant positive correlation between the body mass index and blood pressure. When the body mass index increases the blood pressure also increase and also no significant difference between hypertension and variables like gender, obesity and family history suggesting the need for periodic measurement of blood pressure at schools to identify the high-risk group. The results were supported by a study was conducted to identify the relationship between obesity and hypertension among school children and concluded that there was high significant relationship between the obesity and blood pressure.[24] Similarly, a cross-sectional community-based case control study was conducted and the results revealed that mean blood pressure (MBP) showed significant correlation with age. MBP and prevalence of hypertension increased with social class, salt intake, parental history of hypertension, weight, height and body mass index among these, body mass index and higher salt intake emerged as independent predictors by multivariate analysis.[25] Similarly, a comparative study was carried out on BMI, age at menarche and socio economic status. The girls were divided into three groups based on socio economic status. The sample further classified based on BMI (underweight/normal weight/overweight) and age at menarche (early/on-time/late). The finding showed that inverse correlation between the Body mass index and age at menarche and the relationship between the BMI and age at menarche occurs regardless of socio-economic status.[26]

There are certain limitations in the present study the body mass index, waist hip ratio, and systolic and diastolic blood pressure were measured not furthermore assessment on salt intake and the intervention was limited for 16 weeks only.

CONCLUSION

There is an urgent need to meet the challenges of the childhood obesity. It was also felt that childhood obesity is a serious threat to the individual, family and the community. Hence, it was concluded that there is a need to educate the children about the obesity and its complications. The study findings ensure that there is a need for periodic monitoring of body mass index, blood pressure, blood sugar, among children to prevent the complications resulting with obesity. Every parent must take initiative to screen their children for the basic physiological measurements and the school health nurse need to be appointed in all the school health organizations both private and government to monitor for the basic parameters. Effective school-based intervention will reduce the global burden of the obesity among school children ultimately the country will have healthy children.

ACKNOWLEDGEMENTS

Authors would like to thank all the children for participating in this research study and school authority for their cooperation and support to complete the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Human Ethics Committee of Saveetha Institute of Medical and Technical sciences, Chennai, Tamil Nadu, India

REFERENCES

1. World Health Organization. Global Action Plan for the Prevention and Control of Non Communicable Diseases; 2014:2013-2020.
2. Maïano C, Hue O, Morin AJ, Moullec G. Prevalence of overweight and obesity among children and adolescents with intellectual disabilities: a systematic review and meta-analysis. Obese Rev. 2016;17(7):599-611.
3. Hinkle JL, Cheever K. Brunner and Suddarthk's Textbook of Medical Surgical Nursing. 13th ed. Lippincott Publishers; 2014.
4. Park K. Epidemiology of chronic non communicable diseases and conditions. Park's Textbook of Preventive and Social Medicine. 23rd ed. Jabalpur, India: Banarsidas Publishers; 2017: 315–316.
5. Goyal JP, Kumar N, Parmar I, Shah VB, Patel B. Determinants of overweight and obesity in affluent adolescent in Surat City, South Gujarat region, India. Indian J Comm Med. 2011;36(4):296-300.
6. Park K. Epidemiology of chronic non communicable diseases and conditions. Park"s Textbook of Preventive and Social Medicine. 23rd Edition, Jabalpur, India: Banarsidas Publishers; 2017:315-316.
7. Gortmaker SL, Dietz WH, Cheung LW. Physical inactivity, diet and the fattening of America. Am Diet Assoc. 1990;90:1247-55.
8. Riva P, Martini G, Rabbia F, Milan A, Paglieri C, Chiandussi L. Obesity and autonomic function in adolescence. Clin Exp Hyperten. 2001;23:57-67.
9. Children RR. Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents: summary report. Pediatrics. 2011;128(5):S213.
10. Desh Pande AV. Study of prevalence of hypertension in adolescent in Central India. Int J Basic Medicine Clinical Resear. 2014;1(3):66- 70.
11. Berenson GS, Srinivasan SR, Bao W, Newman WP, Tracy RE, Wattigney WA. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. New England J Med. 1998;338(23):1650-6.
12. Freedman DS, Mei Z, Srinivasan SR, Berenson GS, Dietz WH. Cardiovascular risk factors and excess adiposity among overweight children and adolescents: The Bogalusa Heart Study. J Pediatr. 2007;150:12-7.
13. Jaganathan D, Mathew MM. Dietary pattern of obese children in Erode District of Tamil Nadu. Int J Heal Sci Res. 2012;1(2):74-81.
14. Ebbeling CB, Feldman HA, Chomitz VR, Antonelli TA, Gortmaker SL, Osganian SK, et al. A randomized trial of sugar-sweetened beverages and adolescent body weight. N Engl J Med. 2012;367:1407-16.
15. Ruyter JC, Olthof MR, Seidell JC, Katan MB. A trial of sugar-free or sugar-sweetened beverages and body weight in children. N Engl J Med. 2012;367:1397-406.
16. Bernhardt DT, Gomez J, Johnson MD. Strength training by children and adolescents. Paediatrics. 2001:107:1470-2.
17. Ainsworth BE, Haskell WL, Whitt MC. Compendium of physical activities: an update of activity codes and MET intensities. Med Sci Sports Exercise. 2000;32(9):S498-S516.
18. World health Organization. 2007. Growth reference data for 5- 19 years.
19. Falkner B, Daniels SR, Flynn JT, Gidding S, Green LA, Ingelfinger JR, et al. The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. Pediatrics. 2004;114(2):555-76.
20. Soudarssanane MB, Karthigeyan M, Stephen S, Sahai A. Key predictors of high blood pressure and hypertension among adolescents: a simple prescription for prevention. Indian J Comm Med. 2006;31(3):164.
21. Kavitha B, Bhuvaneswari VK. Prevalence of sustained hypertension among adolescent school children in Pondicherry. Indian J Basic Applied Med Res. 2016;5(4):649-55.
22. Kumutha V, Aruna S, Poongodi R. Effectiveness of progressive muscle relaxation technique on stress and blood pressure among elderly with hypertension. IOSR J Nurs Heal Sci. 2014;3(4):01-6.
23. Goud TG, Kumar KP, Ramesh K. Risk factors of non- communicable disease among adolescents. Int J Current Res Acad Rev. 2014;2(9):281-5.
24. Soudarssanane MB, Karthigeyan M, Stephen S, Sahai A. Key predictors of high blood pressure and hypertension among adolescents: a simple prescription for prevention. Indian J Community Medicine. 2006 Jul 1;31(3):164.
25. Gupta GK, Agarwal D, Singh RK, Arya RK. Prevalence, risk factors and sociodemographic co-relates of adolescent hypertension in district Ghaziabad. Indian J Commun Health. 2013,25(3):293-8.
26. Ezzati M, Bentham James. Worldwide trends in body mass index, underweight, overweight, and obesity among the children between the 12 to 19 age group. J Paediatrics. 2017;3:213-7.

Cite this article as: Pappiya EM, Ganesan S, Baalharith IM. Effectiveness of healthy eating and active lifestyle intervention program on physiological parameters among children with obesity. Int J Contemp Pediatr 2019;6:2379-84.