e-ISSN 3026-2356
p-ISSN 3026-4731
Article Review

Blambangan Journal of Nursing and Health Sciences (BJNHS)
https://blambangan-scholar.com/index.php/BJNHS
Vol. 2 No. 1 (2024): March

Effects of Physical Activity and Diet as Weight Loss Interventions in Children with Obesity: A Literature Review

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Abstract

Background: Weight management in children is a complex issue that requires serious and comprehensive multidisciplinary intervention. It is hoped that through appropriate interventions, children can overcome the problem of obesity and improve their health and quality of life. These interventions should be implemented to change the child's behavior and home environment. Ways that can be done include changing children's eating habits to a healthier lifestyle, increasing children's physical activity, providing positive family support, and reducing children's exposure to unhealthy foods.
Aims: This study aims to explain the effect of physical activity and diet as an intervention for weight loss in children with obesity.
Methods: The research design is a literature review. The database uses Google Scholar and PubMed with the PICOS framework approach. Five published articles for 2017-2021 were identified according to the criteria.
Results: The five articles state that physical activity and dietary interventions are carried out in combination. The main objectives of dietary interventions are regulating energy intake, increasing consumption of vegetables, fruits and fiber and reducing unhealthy eating habits. While physical activity is mainly aimed at reducing the sedentary lifestyle. Physical activity and eating habits affect weight loss in obese children. This procedure can reduce waist circumference by 0.1 to 0.5 times. There is a 0.127-fold effect on body mass index with a z-score of -0.15. Able to lose weight up to 1.8 times. The concentration of high-density lipoprotein (HDL) increased 0.87-fold after surgery, accompanied by a 1.24-fold decrease in fasting blood sugar (FPG).
Conclusion: Physical activity and diet ensure physical fitness while reducing the risk of obesity. Physical activity contributes to bone density. Diet management will be very important in reducing risk factors, helping to maintain weight loss.
or outcomes of the work you have done so far.
Conclusion: Finally, your abstract should close with a statement of overall results in a nutshell as well as the research's implications and contributions to its field. It should convince readers that the research is interesting, valuable, and worth investigating further. The abstract should consist **Background** of approximately 200 words

Keywords: physical activity; diet, obesity, children, a literature review

INTRODUCTION

Childhood obesity is becoming a matter of global concern by having a number of short- and long-term health consequences (Maria & Gonzalez, 2020). Obesity in childhood has been associated with some negative consequences (Danquan & Akuffo, 2020). These consequences include cardiovascular risk, the development of type 2 diabetes, bronchial asthma, *sleep apnea*, and *faty liver disease* (Nahhas & Asamoah, 2018). In addition, childhood obesity is also responsible for several psychological problems such as discrimination, low self-esteem, depression, body image disorders, rejection by peers, impaired quality of life, and stigmatization so that further intervention is needed as an effort to prevent childhood obesity (Melinda & Sharma, 2017).

Cesare & Bovet, (2019) reported that at the global level between 1980 and 2015, the prevalence of childhood obesity increased from 3.9 to 7.2% in boys and from 3.7 to 6.4% in girls aged 2-4 years. In 2016 the highest obesity rates were in America,

where about 50% of girls and boys in this age group were obese. More than one in three girls are obese in Kiribati and more than one in four in Samoa and Kuwait (Janaina *et al.*, 2019). The incidence of obesity among Indonesian children in 2018 aged 5-12 reached 8-19.6% of 30.83 million children (Hendarto, 2019).

In general, obesity is an imbalance between calorie intake and expenditure, it is associated with an increase in the number of calories consumed, and is often related to lifestyle and food intake. Ecological model, as described by Davison (2001) In showing that high risk factors in obese children are food intake, physical activity, and sedentary behavior or *sedentary lifestyle* (Sahoo et al., 2015). *Sedentary lifestyle* is a behavior associated with obesity in children. Each additional hour of television viewing per day increases the prevalence of obesity by 2%. Television watching is among children and has increased dramatically in recent years. An increase in the amount of time spent in sedentary behavior has decreased the amount of time spent in physical activity so comprehensive weight control management is needed (Justin *et al*., 2020)

Maintaining physical activity and regulation of nutritional intake throughout childhood is important for promoting lifelong health and reducing the impact of obesity and overweight in children (Li & Xiang, 2020). Therefore, management interventions in the care of children with obesity have focused on regulating food intake and increasing physical activity (Marchand & Corcoran, 2017).

Interventions to regulate physical activity and eating patterns are management of obersity control in children. However, the intervention also considered setting habits at home. Parents play an important role in determining what foods are available to their children and shaping their eating behavior and physical activity. In addition, because children model the physical activity and nutritional behaviors of family members, it is important to include caregivers in intervention efforts. This is a logical reason that obesity control programs involving caregivers have a greater impact than those without family or parents. Based on this, a study is needed using a *literature review* in the form of the influence of physical activity and diet as a weight loss intervention in children with obesity.

The purpose of this literature review is to determine the effect of physical activity and diet as a weight loss intervention in children with obesity.

METHOD

This study contains a comprehensive summary in the form of a literature review on the effect of physical activity and diet as a preventive measure for obesity in children. There is a registration method in literature search in the form of the framework used, keywords, databases or search engines.

Design

PubMed, Elsevier. Article or journal search uses keywords and boolean operators (and, and or, and, or, and not) which are used to expand or specify the search, making it easier to determine the article or journal used as follows:

Table 1. keyword

Physical Activity	**Diet**	**Obesity in children**
	OR	*OR*
Physical activity	*Nutritional behavioral*	*Chilhood Obesity*
	OR	*OR*
Physical exercise	*Diet*	*Obese pdiatric*
	OR	*OR*
Physical Fitness	*Nutritional intake*	*Obesity in children*

Sample

Strategi yang digunakan untuk mencari artikel menggunakan PICOS framework yang diuraikan dalam table sebagai berikut:

Table 2. PICOS

Criterion	Inclusi	Exclusion
Population/ Problem	Children with obesity	Obese children with comorbidities, juvenile obesity, endocrine disorders
Intervention	physical activity and diet	In addition to physical activity and diet
Comparation	Comparators can be control and treatment groups, comparisons based on physical activity and diet	-
Outcome	There is an influence of physical activity and diet on the weight of obese children	The article does not contain the proportion of each variable
Study design	Quantitative, mainly *preexperimental, quasy experiment,* and or *experiment*	*Literature review, systematic review,* all kinds of qualitative research
Tahun	2017-2022	Before 2017

Data analysis

Based on the results of literature search through publications and using keywords in accordance with boolean operators obtained through google scholar as many as 73 articles related to physical activity intervention and diet regulation in obese children, based on initial identification there are 15 articles relevant to the theme. Through PubMed, 2 were found related to physical activity, nutritional behavioral, chilhood obesity based on the identification of no articles relevant to the theme. Through Elsevier, 53 articles related to physical activity, nutritional behavioral, chilhood obesity were obtained based on the identification of 5 articles relevant to the theme. Based on abstract identification in article search results through the google scholar database, PubMed, Elsevier, 128 articles were obtained, but only 20 articles were relevant to the theme. The results of the study article selection can be illustrated in the flow diagram below:

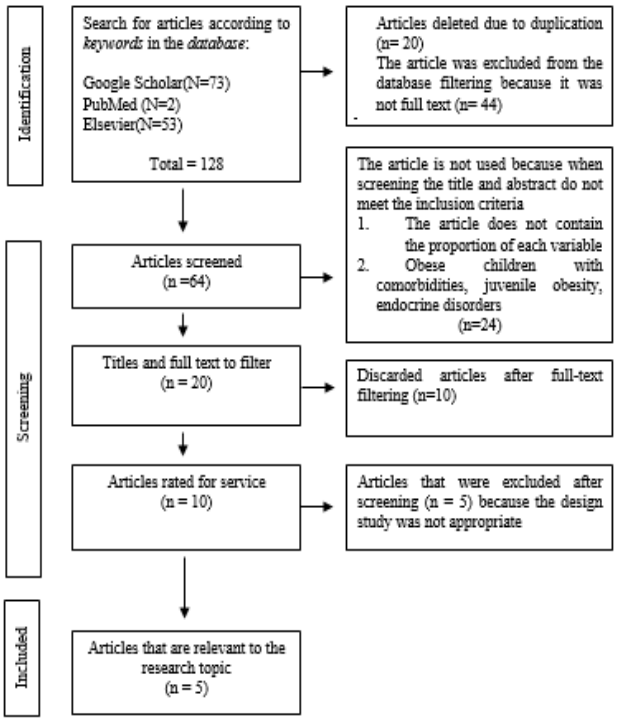

Image 1. PRISMA Flow Chat

RESULTS

The results of the analysis are described sequentially starting from the form of intervention given, conditions before the intervention, and outcomes produced after the intervention. The results are as follows:

Table 3. Description of the results of identifying forms of weight loss interventions in obese children

Main Emperis Sources	Intervention
Florence (2020)	**Diet:** Done by educational methods by promoting fruit, vegetable food intake, and fast food restrictions **Physical activity:** Regular physical exercise is done for 40 minutes every week, reducing sedentary activity

	Follow up: 6 bulan
Haiquan (2017)	**Diet:** Nutrition courses are given to parents, children and teachers. Children are asked to consume food according to the pagoda of healthy food and are evaluated regularly **Physical activity:** Physical activity is carried out with the term Happy 10 which is done every day with moderate activity for 10 minutes. Physical activity is carried out by imitating animal movements, squatting, jumping rope, rhythmic gymnastics. **Follow up:** 1 tahun
Wang (2018)	**Diet:** n/a **Physical activity:** do homework every week; walk to Sekulah and home; not watching TV for a week; Create a resume of the week of top weight loss achievements **Duration of intervention:** 1 year
Hong (2020)	**Diet:** promote healthy food intake and develop healthy eating habits. At least five servings of fruit and vegetable consumption every day **Physical activity:** compulsory daily exercise on the school day and lifestyle modification in participants. It consists of a 20-minute class break in the morning in the form of jogging. One additional exercise class (40 minutes) after school in the afternoon includes three forms of exercise (jumping rope, badminton, and 200 m relay running). no more than 2 hours/day on screen (avoid sedentary) **Duration of intervention:** 8 months
Bagherniya (2018)	**Diet:** using and interpreting food labels, and the concept of energy balance with the aim of improving their capabilities. nutritional knowledge, changing their attitudes and practices. In addition, in each session, the instructor focuses on the positive outcomes of following a healthy diet and maintaining a healthy weight. Parents and teachers are taught to reward children who improve their nutritional behavior. **Physical activity:** N/a **Duration of intervention:** 7 months (30 weeks)

Table 3 shows that most articles on weight loss interventions in children with obesity are collaborative between dietary management programs and physical activity programs. The diet management program is implemented by strictly recording and recalling involving parents, teachers and children themselves by implementing balanced consumption with increased intake of vegetables, water, fruit and restrictions on fast food and sugary drinks. For physical activity is carried out in conjunction with school activities and emphasizes sedentary restrictions. Generally, interventions are carried out for at least six months to three years of evaluation.

Table 4. Description of the results of weight identification in obese children

Main Emperis Sources	Result
Florence (2020)	The average body weight of obese boys was 57.6 (SD±0.1) Kg, and in girls 53.5 (SD±0.8) Kg.
Haiquan (2017)	The average proportion of child weight in the control group who were obese was 22.7% and in the intervention group was 23.6%
Wang (2018)	The average excess weight in obese boys was 35%, and in girls as much as 34.2%
Hong (2020)	The average proportion of children's body weight in the obese control group was 51.9 (SD±6.7) and in the intervention group was 50.6 (SD±7.5)
Bagherniya (2018)	The average proportion of children's body weight in the obese control group was 27.7 (3.9) and in the intervention group was 27.2 (2.9)

Table 4 shows that most articles state that the proportion of excess body weight in obese children reaches 23.6% to 40.9% where the proportion of excess weight is generally dominated by boys.

Table 5 shows most articles reveal that abdominal circumference in obese children reaches 57 – 89 cm, where greater abdominal circumference is generally found in boys.

Outcome indicators used to evaluate the results of weight loss interventions in obese children include waist circumference, average weight, body mass index, average z-score, proportion of overweight, metabolism in the form of high-density lipoprotein (HDL) and fasting plasma glucose (FPG) values.

The five articles show that there is an effect of interventions in the form of diet and physical activity on weight loss in obese children. As revealed by Florence (2020) that the abdominal circumference in the control group was greater compared to the intervention group (p-value 0.001). Haiquan (2017) found that abdominal circumference in the intervention group was smaller than in the control group (-0.50) and similarly the z-score in the intervention group was lower than in the control group (-0.15). Wang (2018) found that there was a difference in body mass index in the control and intervention groups (p-value = 0.001), with body weight in the intervention group lower than in the control group (p-value = 0.03), where the effect of intervention was 0.8 times.

Hong (2020) found that the abdominal circumference intervention group was smaller than the control group with the effect of the intervention to reduce bed weight by 0.10 times (p-value = 0.001; OR=-0.10). High-density lipoprotein (HDL) was higher in the intervention group where the intervention increased high-density lipoprotein levels by 0.87 times (p-value = 0.001; OR=0.87). Also, lower fasting plasma glucose (FPG) values were obtained in the intervention group where

the intervention decreased 1.24 times plasma glocosa (p-value = 0.001; OR=-1.24). Bagherniya (2018) found that the value of abdominal circumference in the intervention group was smaller than the control group (p-value = 0.001) where the effect of the intervention was 0.5 times on abdominal circumference. The body mass index in the intervention group showed lower than the control group (p-value = 0.001) with the effect of the intervention on the body mass index of 0.127.

Table 5. Results of identification of abdominal circumference (waist circumference) in obese children

Main Emperis Sources	Result
Florence (2020)	The average abdominal circumference of obese children in men is 76.5 (0.7) cm and in women is 74.7 (0.1) cm
Haiquan (2017)	The average abdominal circumference of obese children in the control group was 57.5±8.9 cm and in the intervention group was 57.5±8.8 cm
Wang (2018)	n/a
Hong (2020)	The mean abdominal circumference of obese children in the control group was 82.4 (5.7) cm and in the intervention group was 81.5 (6.6) cm
Bagherniya (2018)	The mean abdominal circumference of obese children in the control group was 84.4 (6.7) cm and in the intervention group was 89.6 (2.9) cm

DISCUSSION

The literature review found that three articles contained intervention programs involving a combination of dietary regulation and physical activity regulation. One article contains an eating regulation program and one article contains a physical activity regulation program. The diet regulation program is carried out by making a daily recall of the number of calories consumed and by involving a vegetable and fruit consumption program in accordance with balanced nutrition. The program is closely monitored by parents and teachers. For physical activity programs carried out routinely every week where physical activity is carried out by doing gymnastics, walking to school and after school, and strict restrictions on sedentary activities.

According to Damayanti *et al.*, (2017) Diet is a variety of information that provides an overview of the amount and type of food eaten every day by one person and is characteristic for a certain community group. Diet is also said to be the way a person or group of people or family chooses food in response to physiological, psychological, cultural and social influences. According to Oshima *et al*., (2015) physical activity is defined as any body movement produced by contraction of skeletal muscles that results in a substantial

increase during resting energy expenditure. Exercise is a type of physical activity consisting of planned, structured, and repetitive body movements performed to improve or maintain one or more components of physical fitness. It is important to determine the range of intensity associated with physical activity. Physical activity is any body movement that can increase energy or energy expenditure. Examples of physical activity include sports, cleaning the house, washing, gardening, cooking, ironing, washing vehicles, and so on as long as the activity moves the body.

Dietary and physical activity interventions are depictions of the concept of behavior modification. According to Pedro (2017), the concept of behavior modification in individuals with obesity refers to the construction of *the Behavior Change Theory theory*. The study found that interventions in the form of dietary regulation and physical activity should be carried out systemically by involving all components of support for children, namely parents, teachers, and programs in the school curriculum. Consistently, this study is in line with a review by Kelley &; Sbrocco, (2016) that intervention in children with obesity involves collaborative intervention (*Collaborative goal setting*).

Consistent with the results of *this review*, a study by Kim (2019) that nutrition regulation in children with childhood obesity exerts a significant influence on weight control. This provides common interventions for dietary management including first regulating the amount of energy (*energy and nutrition intake*), increasing consumption of vegetables and fruits and fiber (*consumption of fruits, vegetables, and dairy products*), and reducing *unhealthy food habits (unhealty dietary behavior*). Interestingly, this study also found that in addition to dietary regulation, interventions were also implemented with programs to increase activity in children with obesity. Referring to a study by Hills & Andersen (2021) that physical activity is an essential factor in children's growth and development during their developmental phase. Interestingly, in this review we also found an outcome on improving blood glucose values and good fat levels in children carried out this combination of interventions.

This review provides a logical view that physical activity, and dietary regulation are the cornerstones of obesity prevention and management. The organization of an optimal diet and its combination with regular physical activity during the growing years increases the likelihood of a healthy pattern of physical maturation. Physical activity and healthy eating have many health benefits, although we found a drawback that these interventions must be carried out consistently with the involvement of all parties including relatively long periods of time. Nevertheless, it provides an important understanding that interventions, physical activity and proper dietary arrangements can provide fitness while lowering the risk of obesity and the health risks associated with increasing obesity. Physical activity contributes to greater bone density. Dietary regulation will have implications for reducing risk factors that together will improve body composition and help maintain weight loss.

Based on the results of the review we found that the focus of interventions on weight loss emphasizes looking at eating and exercise as choices in living life. Interventions through dietary management provide understanding to recognize high-calorie, high-carbohydrate or high-fat food choices and consumption accordingly. Participants kept diaries of food consumption and engaged in a moderate physical activity program, starting with walking per day and gymnastics per week.

Dietary and physical activity management interventions moderate calorie restriction through small changes in eating and exercise.

CONCLUSION

The literature review shows that physical activity and dietary interventions are performed in combination. The main focus on dietary interventions is on regulating the amount of energy (energy and nutrition intake), increasing the consumption of fruits, vegetables, and dairy products, and reducing unhealthy dietary habits (unhealty dietary behavior). While the main focus on physical activity is on reducing sedentary lifestyle. a combination of interventions in the form of dietary regulation and physical activity is effective in losing weight in children with obesity who are observed in measuring abdominal circumference, body mass index, high-density lipoprotein (HDL), fasting plasma glucose (FPG).

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