



## **Educational Interventions in Adolescents, for the Management of Obesity: A Review of the Literature**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author MACC designed the study. Author XAH searched the literature and reviewed the quality of the selected studies. Author LADB reviewed the selected studies. Author NPR designed the tables. All authors approved the final version of the manuscript.*

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### **ABSTRACT**

**Introduction:** Overweight and obesity is a serious global health problem in minors related to multiple chronic degenerative or fatal diseases.

**Aim:** To analyze the results of available scientific studies of educational interventions in the management of overweight or obesity in adolescents.

**Methodology:** Those studies found in a database between 2014-2019 that performed intervention or management of overweight or obesity in a population between 6 and 18 years of age were included.

**Results and Discussion:** Fourteen studies met the inclusion criteria of which only three performed a probabilistic sampling being these more significant. Different types of interventions were identified from educational, cognitive-behavioral and physical activity promotion. The variables with the

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greatest significant difference were body composition and waist circumference, the Body Mass Index still has no significant difference.

**Conclusion:** Educational interventions achieve an important role in the management of overweight or obesity having significant changes in the short, medium and long term.

*Keywords: Adolescents; educative interventions; overweight; obesity.*

## 1. INTRODUCTION

Overweight and obesity is due to the increase in body weight mainly of adipose tissue being harmful to health [1]. The Center for Disease Control (CDC, 2000) considers people aged 2 to 18 years with the diagnosis of overweight above the 85th percentile and obesity in the 95th percentile or higher [2]. Currently, obesity is a worldwide epidemic that is associated with the sixth leading cause of death and correlates directly with 44% of type 2 diabetes, 23% ischemic heart disease and between 7% to 41% of certain types of cancer, mainly of breast and colon [3]. They are also related to psychosocial problems such as depression, low self-esteem, stress, anxiety, alteration in eating behaviors and / or distortion of body image [4].

This condition is due to an unhealthy lifestyle influenced by multifactorial aspects such as cultural, genetic and environmental [5]. Unhealthy eating and low physical activity are considered the main causes of an increase in body weight. There is currently a higher consumption of foods of high energy density that conditions an increased caloric imbalance coupled with sedentary lifestyle [3].

Data from the National Nutrition Survey (ENSANUT) 2016, in Mexico, reveal a prevalence in adolescents from 12 to 19 years of age with 22.4% overweight and 13.9% obesity [6]. The United Nations Children's Fund (UNICEF) reports that 1 in 3 adolescents is overweight or obese, placing Mexico at the top of childhood obesity worldwide [7]. It has been shown twice the risk of being overweight or obese in adulthood in those schoolchildren who suffered it compared to those who had a healthy BMI [8].

The first level of care for the treatment of overweight or obesity is the change to a healthy lifestyle, through cognitive-behavioural interventions, through food education and physical activity promoting healthy habits [9].

Intervention programs in schools is the appropriate instance to promote a healthy

lifestyle and prevent or treat unhealthy habits, since the greater time in school children spend it there, in addition to the involvement of parents to encourage practice from home [10].

Systematic reviews are important for the analysis and evaluation of scientific evidence in relation to educational interventions in adolescents who are overweight or obese, to determine the effectiveness of each one and to improve subsequent studies to achieve a better impact and stay updated [11].

The objective was to review the efficacy of educative interventions to management of obesity in adolescents, in different populations and context.

## 2. METHODOLOGY

The systematic review was carried out in 6 steps: 1) the purpose of the literature was established, 2) the search inclusion and exclusion criteria were defined, 3) the information required was defined, 4) the articles were analyzed and selected, 5) the selected articles were interpreted and concluded and 6) the results were presented.

The inclusion criteria for the search were in English or Spanish, between 2014 and 2019, access to the full article and covering the variables, and specifically test an intervention to prevent or management the overweight or obesity.

The search was carried out in the electronic database of Pubmed® and Google scholar®, the search gave a total of 16,885 number based on the title, summarized in 26, eliminating 12 studies for not meeting the analysis criteria. The search variables were: overweight, obesity, BMI, Body Mass Index, intervention, adolescence, primary prevention, treatment, education, school.

The level of scientific evidence of the studies proposed by Agència d'Avaluació de Tecnologia Médica (AATM) [12] was determined: I (meta-analysis of randomized controlled trial), II (randomized controlled trial of large sample), III

(randomized controlled trial of small simple), IV (prospective non-randomized controlled trial), V (retrospective non-randomized controlled trial), VI (cohort studies), VII (case-control studies), VIII (uncontrolled clinical series, descriptive studies, expert committees, conference consensus) and IX (anecdotes or unique cases).

Studies that were approved by the ethics committee with informed consent and followed the provisions indicated in the Helsinki declaration were included. Studies without these criteria were excluded.

### 3. RESULTS AND DISCUSSION

The articles that were selected in the systematic review are presented in Table 1 of which five studies conducted in 2014, three in 2015, two in 2016, two in 2017, one 2018 and one 2019.

The systematic review was composed of fourteen studies carried out between 2014 and 2019 conducted five in Mexico, three in Spain,

two in the US, two in Iran, one in Peru and one in Chile. 78.57% of the studies had a level of evidence of IV and 21.42% presented a level III. The sample was non-probabilistic in eleven studies and randomized in three studies.

Table 2 shows the population and age, the measures and instruments, intervention and results. 82.8% (n = 13) of the studies measured the BMI through weight (Kg) / height (m)<sup>2</sup> diagnosed overweight or obesity in the curves of (CDC, 2000) 61.53%(n = 8) studies there was a significant difference, in the studies where no difference in the BMI was found referenced for a short period of time.

Body composition mainly fat mass and muscle mass are measured in 42.8% of studies (n = 6) and in 83.3% (n = 5) there is a significant difference. Another instrument is the waist-to-hip index or waist circumference measured in 42.8% (n = 6) of the studies and in 83.3% (n = 5) there is significance.

**Table 1. Characteristics of the selected articles**

Author and year	Country	Evidence level*	Design	Sampling
Gonzalez E, et al. 2014 [13]	Spain	IV	Quasi-experimental	Non-probabilistic
Gago J, et al. 2014 [14]	Peru	IV	Quasi-experimental	Non-probabilistic
Elizondo L, et al. 2014 [15]	Mexico	IV	Quasi-experimental	Non-probabilistic
Rodríguez M, et al. 2014 [16]	Mexico	III	Clinical trial	Double blind, randomized.
Parks EP, et al. 2014 [17]	USA	III	Clinical trial	Randomized, controlled
Bustos P, et al. 2015 [18]	Chile	IV	Quasi-experimental	Non-probabilistic
Pérez D, et al. 2015 [19]	Spain	IV	Quasi-experimental	Non-probabilistic
Tortosa M, et al. 2015 [20]	Spain	IV	Quasi-experimental	Non-probabilistic
Rivera P, et al. 2016 [21]	Mexico	IV	Quasi-experimental	+Probabilistic for convenience
Benítez V, et al. 2016 [22]	Mexico	IV	Quasi-experimental	Randomized
Mazloomi SS, et al. 2017 [23]	Iran	IV	Quasi-experimental	Non-probabilistic
Kalantari N, et al. 2017 [24]	USA	VII	Case and control	Randomized, controlled
Briones RA, et al. 2018 [25]	Mexico	IV	Quasi-experimental	Non-probabilistic
Sajjadi F, et al. 2019 [26]	Iran	IV	Quasi-experimental	Non-probabilistic

\*According to the Agència d'Avaluació de Tecnologia Mèdica (AATM) [12]

+ Methodological inconsistency if it is probabilistic cannot be for convenience

**Table 2. Relationship between intervention and results**

Author and year	Population, age range, (sample)	Measurement / Instruments	Intervention	Results
Gonzalez E, et al. 2014 [13]	n=91; 15 to 17 años	*BMI, Quick test KrecePlus.	Educational intervention on healthy eating and physical exercise and three educational workshops.	Significant difference in anthropometric measurements and eating habits and no difference in physical activity.
Gago J, et al. 2014 [14]	Intervention group 201; control group 328, with age of 7.8 +-1.87 years	*BMI	Multisectoral intervention in food-nutrition education. Intervention group: proposed food education; control group: educational intervention by PROMSA.	No significant difference of BMI in the intervention group contrary to the control group.
Elizondo L, et al. 2014 [15]	n=304; 14 to 17 years	*BMI, *BF, *WC, Food frequency and *PA.	Healthy habits and intervention activities were promoted through websites and social networks.	Increase in anthropometric measurements, improvement in eating habits and no change in * PA.
Rodríguez M, et al. 2014 [16]	Intervention group 57; 58 control group, from 12 to 16 years	*BMI, *BF, physical condition through the Harvard step.	Intervention group received Cognitive-Behavioral Therapy to lead hypocaloric diet and physical activity development. Control group received indications for hypocaloric diet and physical activity development.	Reduction of anthropometric measures in the intervention group that received * CT

\*BMI: Body Mass Index, \*BF: Body Fat, \*WC: Waist Circumference, \*PA: Physical Activity, \*CT: Cognitive Therapy

**Table 2. Cont...**

Author and year	Population, age range, (sample)	Measurement / Instruments	Intervention	Results
Parks EP, et al. 2014 [17]	n=61; 13 to 17 years	*BMI, *BF, *WC	The effectiveness of sibutramine was tested in half of the participants and the rest with placebo, all participated in the comprehensive family-based behavioural weight control program	In 6 months, they presented the same results in both groups with a significant difference in weight loss and without changes in body composition. At 12 months there were changes in body composition and weight in both groups
Bustos P, et al. 2015 [18]	n=28; 9.5±1.9 years old	BMI, BF, WC, BP, parámetros bioquímicos, Encuesta de Tendencia de Consumo Cuantificada y condición física.	Bright Bodies Program at Yale University: nutrition workshops, behavioural modification and physical activity sessions. Intervention with parents or guardians	Decrease in anthropometric measurements and blood pressure. Improved clinical indicators. Reduction of caloric intake and better physical condition
Pérez D, et al. 2015 [19]	Intervention group 120; control group 220. 8.5 +- 1.46	BMI, WC, diet quality by KIDMED index and physical activity by the scale of physical activity	Intervention from September to June "You decide your health, get to live!"	Significant decrease in BMI in the intervention group and in the control group no. The KIDMED index improved in the intervention group and without differences in physical activity

\*BMI: Body Mass Index, \*BM: Body Muscle, \*WC: Waist Circumference, \*BF: Body Fat, \*BP: Blood Pressure

**Table 2. Cont...**

Author and year	Population, age range, (sample)	Measurement / Instruments	Intervention	Results
Tortosa M, et al. 2015 [20]	*IG 22; *IC 16. 12.95 years	*BMI, *WHR, *VO2max, *BP, *HR	Moderate to vigorous physical activity program in the IG of 90 minutes	Improvement in the * IG of anthropometric measurements, * VO2max, * HR and * BP. In the CG little improvement of VO2max and worsening in the other variables
Rivera P, et al. 2016 [21]	n=54; 11 to 14 years old	Knowledge about nutritional aspects by own source	Educational nursing intervention according to the Clinical Practice Guideline on Nursing Interventions in the prevention of overweight and obesity in children and adolescents in the first level of care	Significant difference in the level of knowledge
Benítez V, et al. 2016 [22]	207 *IG; 161 *CG from 9 to 11 years old	*BMI, knowledge of eating habits and physical activity by the instrument prepared ex profeso	Health education programs with topics on nutrition and physical activity for the intervention group and for the control group addiction prevention issues	Significant difference in BMI in girls in the IG. Increase knowledge in both groups

\*IG: Intervention Group, \*CG: Control Group, \*BMI: Body Mass Index, \*WHR: Waist to Hip Ratio, \*VO2max: Volume Oxygen Maximum, \*BP: Blood Pressure, \*HR: Heart Rate

**Table 2. Cont ...**

Author and year	Population, age range, (sample)	Measurement / Instruments	Intervention	Results
Mazloomly SS, et al. 2017 [23]	n=86 de 13 a 18 años	*BMI, *WC, cuestionario basado en *TPB	Theory of Planned Behavior with educational sessions	Significant difference in anthropometric measurements and increase in knowledge and in the components of the * TPB
Kalantari N, et al. 2017 [24]	*IG 53; 43 *CG 12 to 15 years	*BMI, *BF, *BM	The five dimensions of Ottawa Charter and personalized diet and physical activity were implemented for obese students	Significant decrease of BF in the IG, the other indicators had a minimum of difference or zero
Briones RA, et al. 2018 [25]	*IG 21; *CG 14 from 8 to 11 años	*BMI, *WC, Test de Consumption of sugary drinks with The Beverage Intake Questionnaire.	Physical activity and nutrition program: CYMARRONES AFYN for the * IG and the * CG only carried their normal activities	Increase in body weight and waist circumference in both groups. The BMI remained in the IG and increased in the CG. The daily consumption of total grams of sugar from drinks in the * IG decreased and in the * CG increased
Sajjadi F, et al. 2019 [26]	n=41 de 6 a 18 años que hayan participado en estudio TABASSOM	*BMI, *WHR, *BF, obestatin and adiponectin levels.	Educational and motivational interventions regarding the modification of diet and physical activity	Significant difference in BF and WHR and the BMI was maintained. There were no significant difference of obestatin and adiponectin.

\*BMI: Body Mass Index, \*WC: Waist Circumference, \*TPB: Theory of Planned Behavior, \*IG: Intervention Group, \*CG: Control Group, \*BF: Body Fat, \*BM: Body Muscle, \*WHR: Waist to Hip Ratio

**Table 3. Characteristics of the selected articles**

Author and year	Duration	Number of sessions	Frequency	Effectiveness
Gonzalez E, et al. 2014 [13]	8 months	Not reported	3 per week	Effective
Gago J, et al. 2014 [14]	Not reported	Not reported	Not reported	Effective
Elizondo L, et al. 2014 [15]	Scholar cycle	Not reported	Not reported	Non-effective
Rodríguez M, et al. 2014 [16]	4 months	Not reported	Weekly	Effective
Parks EP, et. 2014 [17]	12 months	25	Weekly, 2 per week, monthly	Effective
Bustos P, et al. 2015 [18]	8 months	24	3 per week	Effective
Pérez D, et al. 2015 [19]	Not reported	Not reported	Not reported	Ineffective
Tortosa M, et al. 2015 [20]	6 months	72	3 per week	Effective
Rivera P, et al. 2016 [21]	Not reported	4	Not reported	Ineffective
Benítez V, et al. 2016 [22]	3 months	Not reported	Not reported	Non-effective
Mazloomly SS, et al. 2017 [23]	3 months	5	Not reported	Effective
Kalantari N, et al. 2017 [24]	3 months	Not reported	Not reported	Ineffective
Briones RA, et al. 2018 [25]	9 months	180	5 per week	Non-effective
Sajjadi F, et al. 2019 [26]	1 year	Not reported	Not reported	Ineffective

Blood pressure was measured in two studies and both show similar results with significant differences.

Dietary aspects in food consumption were measured in 50% (n = 14) and in 85.71% (n = 6) this aspect was improved.

Physical activity or physical condition was evaluated in 21.42% (n = 3) and there was no significant difference in any.

Table 3 shows the characteristics such as duration, sessions, frequency, and effectiveness. Effectiveness is considered according to the significant difference between the study variables. The intervention time was three months until a school year, most of them done three times a week or weekly.

A standardized measure of effectiveness could not be calculated because each study uses different instruments to measure the effectiveness of the intervention. Besides that not all have the same study design. Regarding the sample, it is not significant because they are non-probabilistic and prevent generalizing the results even though they show good results and are valid, with the exception of three studies in which there was randomization.

The most representative studies were those that obtained their random sample [16,17,24] in the three calculated BMI and only in two there is significant difference, they also measure body fat and in all three there is significant difference.

The systematic review demonstrates that educational interventions aimed at food and

physical activity are suitable for the prevention and / or treatment of overweight or obesity. Studies show similar results in school interventions [3]. The integral management in the intervention considering nutritional, psychological or behavioral aspects and physical activity show better results [3]. Anthropometric variables such as BMI show little significant changes, the same results are found in systematic reviews [3], however, the waist-to-hip index or body composition reveals the same significance reported in the review by Waters et al [3]. It is important to standardize the measures of effect on activity or physical condition and on nutritional or dietary aspects, since most studies present different instruments. In the thirteen studies they implement educational and / or behavioural strategies.

An objective of publishing is that other authors replicate the study in other situations and populations. Three of the included studies do not report the duration of the intervention [14,19,21]. Studies that report the duration of the intervention report discordant results; Benítez et al. [22], report a 3-month intervention and did not result in BMI modification; Mazloomly et al. [23] report a 3-month intervention and report its effectiveness on the modification of BMI. Kalantari et al. [24], report a 3-month intervention which did not obtain BMI modification; Rodríguez et al. [16], report a 4-month intervention giving a modification in the BMI; instead, Sajjadi et al. [26] with a 12-month intervention, they failed to modify the BMI. These results are contradictory.

#### 4. CONCLUSION

Because obesity is a chronic, multifactorial and preventable disease, educational intervention is

essential for the prevention and management of overweight or obesity by promoting a healthy lifestyle, as the increase in knowledge about the healthy and what is harmful to health it affects the decision making that induces significant changes in the short, medium and long term. It is important to highlight that future research takes instruments mainly in the consumption of food and physical activity more standardized and that the studies present a random sampling for a better significance.

## CONSENT AND ETHICAL APPROVAL

Studies that were approved by the ethics committee with informed consent and followed the provisions indicated in the Helsinki declaration were included.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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