Journal of Physical Education and Sport ® (JPES), 13(2), Art 24, pp 147 - 152, 2013
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Obesity Prevention for Junior High School Students: An Intervention Programme

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Published online: June 25, 2013
(Accepted for publication March 25, 2013)

DOI:**10.7752/jpes.2013.02024;**

Abstract
Background: Generally, schools are an important setting to provide programmes for obesity prevention for children because the vast majority of children attend school. This study investigates how an intervention programme in the school subject of Physical Education can help reduce obesity for junior high school students in combination with information on dietary and health matters in school and family.
Materials and Methods: A quantitative study for junior high school students (N = 250) and a questionnaire were used as research methods.
Results: A large number of the participants was found to be overweight (24.4%) and the boys outnumbered the girls both in the group of overweight students and the group of obese students. Also, the parents' obesity is an important factor to whether a child will become obese or overweight as the bodymetrics of the parents showed that obese parents tend to have obese children. Finally, physical activity (for an extra two hours per week) and the dietary instructions that the parents give their children can reduce the number of overweight and obese students. Conclusion: Schools and physical activity are crucial factors for childhood obesity prevention strategies.
Keywords: obesity, school-based prevention, physical activity, physical education

Introduction

Obesity is the most common dietary problem in the Western world since obese people represent 7% of the present world population and in fact there is an increase in the obesity percentages worldwide in the last few years (Budd & Volpe, 2006; Chatterjee, Tzetzis, et al., 2005; Hassaridou & Fotiadou, 2001; Vardaki, et al., 2003; Wang, 2001).
Middle school-age children are the largest age group of all overweight and obese children. Their percentage tripled during the last three decades (Hedley, et al., 2004). Selectively, the levels of overweight and obese children in South America doubled during the last two decades (Saridi & Ntokou, 2010; Vardaki, et al., 2003; Wang, 2001). Greece is ranked among the countries with the highest percentage of overweight and obese children worldwide (Philippa & Kanaka-Gantenbein, 2009) and that percentage is continuously increasing while physical activity is being reduced (Savva & Savva, 2000; Vlachopapadopoulou, et al., 2006).
Evidently, childhood obesity has evolved into a chronic pathological condition which correlates with biological, genetic, psychological and social factors (Barlow & Dietz, 2009; Rosenbaum & Leibel, 1998; Strauss, 2000; Vardaki, et al., 2003; World Health Organization, 2003). Obesity-related health consequences for children are well documented (Davis et al., 2002; Frenn et al., 2003). For example, obesity correlates with increased risk of cardiovascular diseases (Freedman, et al., 2001; Must & Strauss, 1999), respiratory, organic and orthopaedic problems (Barlow & Dietz, 2009; Saridi & Ntokou, 2010) and it is a forerunner of increased risk of morbidity and fatality during adulthood (Deckelbaum & Williams, 2001; Freedman, et al., 2001; Guo & Chumlea, 1999; Savva & Savva, 2000; Wang, 2001).
In addition, some studies have shown that behaviour and environmental factors are associated with the behaviour that children exhibit regarding their eating habits and sports activities (Kumanyika & Grier, 2006). Understanding these factors (dietary habits, physical exercise and leisure time) can lead to appropriate prevention strategies (Davis, et al., 1999).

The Role of Parents

It has been proved that the creation of a healthy eating model from parents, which is often influenced by religious, social and other factors, has a great impact on middle school-age children (Wang, et al., 2006). Physical and psychological consequences, enormous financial cost and difficulties encountered in the treatment of obesity released the need for obesity prevention at schools and public settings (Barlow, 2007).

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Parents must understand that their overprotective behaviour and their tendency to feed their children even when they are not hungry correlate with their obesity (Mamalakis & Kafatos, 1998; Vardaki, et al., 2003). We must also consider the psychological factors because childhood obesity leads to low self-esteem and increased sense of sadness and loneliness (Tzetzis, et al., 2005). On the other hand, bad mood facilitates weight gain (Deckelbaum & Williams, 2001; Strauss, 2000; Vardaki, et al., 2003). It seems that parents and children who are not ready to follow a weight control programme are likely to fail and consider this programme too difficult and they even believe that they cannot avoid or change their obesity (Deckelbaum & Williams, 2001). However, a well-structured diet starting at childhood, the weight loss of obese parents and the increase in daily exercise can lead to positive results. For example, physical activity increases energy consumption. However, parents and children must understand that daily exercise does not involve only organized forms of exercise but every day activities as well, such as walking to school or the bus stop, playing, gardening, etc (Barlow & Dietz, 2009). For these reasons childhood obesity prevention has become a priority in social health programmes (Wang, 2001), although it is stated that obesity is one of the most difficult and discouraging diseases to cure (Barlow & Dietz, 2009).

Prevention Strategies

The basis of good health is created with the correct diet during childhood while bad dietary habits lead to children becoming overweight or obese and that is the starting point of many health problems. It has been attested that the application of precautionary measures mostly at schools and families can reduce the problem of obesity (Tzetzis, et al., 2005; Vardaki et al., 2003). Until now, prevention programmes mostly focused on schools because schools can influence the majority of children and have long-term and in-depth contact with them. These school-based prevention programmes have caused changes in children's behaviour even if the impact on body weight or body fatness is less evident. Veugelers and Fitzgerald (2005) found that schools offering two physical education classes per week had fewer overweight children than schools offering fewer classes.

Therefore, the assessment of children and parents' obesity in Greece and the proposal for concrete precautionary measures are imperative needs. However, there is disagreement about childhood obesity and its definition in the international literature (Wang & Wang, 2003).

The purpose of the present study is:

- To explore how an intervention programme in the school subject of Physical Education can help reduce obesity in junior high school students in combination with information on dietary and health matters.
- To record the dietary habits of the students' families and correlate them with their obesity percentages.
- To correlate the overweight and obese students with some predisposition to obesity due to obese parents.

Materials and methods

Participants

250 junior high school students (117 girls and 133 boys) from the District of Larissa participated in this study. The participants were of Greek nationality and they volunteered in this study with signed parental approval. The main reason for the selection of these participants was to scrutinize the obesity indices among Greek children and to record their families' habits. The students did not participate systematically in organized extra curriculum sports activities (athletic clubs, groups) in order for the results of the study to be unaffected by other factors.

Instruments

Electronic flat scales (Seca) with graduation of 100 grams, were used to record body weight and the participants wore light clothes and no shoes. Their height was measured with a telescopic measuring rod that can be fitted (Seca 222), with graduation of 1mm, without shoes and the result was rounded up to the next 0.5 cm. Then, the Body Mass Index (BMI) was calculated for each student. The BMI of the parents was calculated in the same way. The Body Mass Index (BMI) is a simple way of recording obesity and it expresses the body weight, measured in kilograms, divided with the square of the height, measured in meters (kg/m^2). The BMI is a typical index used to estimate obesity in adults and children, ensuring a valid measurement for all age groups. A child is considered overweight when its BMI is greater than >25 and obese when BMI is greater than >30 (Barlow & Dietz, 2009; Guo & Chumlea, 1999; Freedman, et al., 2001; Philippa & Kanaka-Gantenbein, 2009; Pounis, et al., 2008; Vardaki, et al., 2003; Vlachopapadopoulou, et al., 2006). It must be stated than the BMI can falsely define people with increased bone or muscle mass as overweight although this index is preferred in measuring obesity in large groups of people (Savva & Savva, 2000).

Finally, a questionnaire was used to evaluate the dietary habits. The questionnaire consisted of seven closed-type questions based on the general rules of the World Health Organization (WHO, 2003). The questions were about habits, such as if the students have breakfast; if they consider breakfast an important meal; if they have snacks at school, such as chips, cheese pies, etc.; if they have ever been informed about healthy diet instructions; if they know what food is rich in nutritious ingredients; if they consume food rich in animal fats at a percentage >30%

of the total daily energy intake and if they consume about five to six portions of fruit and vegetables on a daily basis.

Measurement and Evaluation Procedure

250 students participated in the prevention programme and they followed the next procedure. First, the students were divided into two groups of 125 members each. The first group would follow the prevention programme (study group) and the second group would monitor the first group (control group).

The co-operation of the study group's parents and their Physical Education teachers was required along with the study group's participation in the school championship tournaments. The bodymetrics of all the students were recorded and the questionnaires were answered a week before the beginning of the school tournaments. The participants were measured in the morning on an empty stomach. After that, the control group continued its previous way of living. The students of the study group would participate in the school championship tournament in order to add two more hours per week to their physical activity in comparison with the control group students who would follow a pre-arranged Physical Education programme at school. Apart from the standard Physical Education programme, the study group students exercised for an extra two hours in the form of training with the school team or they participated in the training for one hour and in the tournament for also one hour for about six months until the end of the school championship tournament.

Finally, a leaflet was handed out to the parents and it included 24 pieces of dietary advice (one piece of advice per week for 24 weeks, lasting about six months) and the parents had to give this advice to their children in random order and they had to try to include it in their every day life.

After six months the procedure was completed with the recording of the bodymetrics of all the students which was done in the morning on an empty stomach and in an environment that was familiar to them.

It must be stated that all the participants, both the control group and the study group, did not know the purpose of this study and there was a personal telephone contact with the study group every two weeks in order to adhere to the protocol.

Statistical Analysis

Descriptive statistics were used to explain the general characteristics of each set of data.

Results

250 students participated in the study as mentioned and 47 of them attended the first grade of junior high school (31 girls – 16 boys), 58 attended the second grade of junior high school (41 girls – 17 boys) and 61 attended the third grade of junior high school (43 girls – 18 boys).

In Table 1 we ascertain that 138 students (55.2%) have a normal BMI with few differences between boys and girls (44.9% for boys and 55% for girls). 61 students (24.4%) were overweight [44 boys (72.1%) and 17 girls (27.86%)]. Also, 29 students (11.6%) were classified as obese [19 boys (65.5%) and 10 girls (34.4%)]. Finally, 22 students were classified as lightweight [14 girls (63.6%) and 8 boys (36.3%)].

Table 1. Classification of the students according to their BMI during their first measurement

Classification	**BMI**	**STUDENTS**		**BOYS**		**GIRLS**	
Lightweight	<18.5	N=22	8.80%	n=8	36.36%	n=14	63.63%
Normal-weight	18.5-24.9	N=138	55.20%	n=62	44.92%	n=76	55.07%
Overweight	25-29.9	N=61	24.40%	n=44	72.13%	n=17	27.86%
Obese	>30	N=29	11.60%	n=19	65.51%	n=10	34.48%

The largest number of overweight and obese students (n=41) was noted in the second grade of junior high school while overweight and obese boys outnumbered overweight and obese girls in every grade (Table 2).

Table 2. Classification of the 90 overweight and obese students per age group and gender

	Total	Boys	Girls
Overweight and Obese	n=90	n=63	n=27
1st grade of junior high school	n=17	n=11	n=6
2nd grade of junior high school	n=41	n=29	n=12
3rd grade of junior high school	n=32	n=23	n=9

The bodymetrics of the parents (Table 3) showed similarities between normal-weight and overweight mothers and their children, whereas the percentage of the obese mothers (15.6%) was higher than the percentage of the obese children (11.6%). Statistically significant indications were depicted in the percentages of the fathers in comparison with the percentages of the mothers and the children [102 overweight fathers (40.8%) and 92 obese fathers (36.8%)]. There were 194 overweight and obese fathers (77.6%).

Table 3. The bodymetrics of the parents

Classification	BMI	MOTHERS		FATHERS	
Lightweight	<18.5	n=4	1.60%	n=2	0.80%
Normal-weight	18.5-24.9	n=141	56.40%	n=54	21.60%
Overweight	25-29.9	n=66	26.40%	n=102	40.80%
Obese	>30	n=39	15.60%	n=92	36.80%

Furthermore, there is a positive correlation of the parents' BMI ($p<0.001$) with their children's BMI. It is clear that overweight and obese parents tend to have overweight or obese children. In a more elaborative way, the percentage of overweight and obese mothers with overweight children is 39% and the percentage of overweight and obese mothers with obese children is 42.4%, whereas the percentage of overweight and obese mothers with normal-weight children is 23.4%. On the other hand, overweight and obese fathers with overweight children reach 52.4%, while overweight and obese fathers with obese children reach 31.1% and overweight and obese fathers with normal-weight children 28.2%.

The results of the questionnaire have shown that there were 90 overweight and obese students from which only 27 (30%) had breakfast in the mornings and 63 (70%) did not have breakfast at all. It is impressive that 51 (80.9%) out of these 63 students stated that they consider breakfast an important meal. Generally, although only 202 (80.8%) out of 250 students consider breakfast an important meal, only 177 (70.8%) of them actually have breakfast every day. When the students were asked if they eat snacks, such as chips, croissants, cheese pies, etc., at school, 83.6% of them (n=209) gave a positive answer. However, statistically there was no significant correlation of this question with the comparison among overweight, obese and normal-weight students. The fact that 79.6% (n=199) of the students – including the 29 obese students (100%) - stated that they have never been informed about healthy diet instructions is disappointing. Moreover, only 29.6% (n=74) of the students knew what kind of food is rich in nutritious ingredients and most of them have normal weight without statistically important differences. Also, 44.8% (n=112) of the students stated that they consume food rich in animal fats at a percentage >30% of the total energy intake and 31.2% of them (78 out of 112 students) are overweight or obese. Finally, only 39.2% (n=98) of the students eat about 5-6 portions of fruit and vegetables daily without important statistical differences among the groups.

After six months the bodymetrics of the two groups were taken again. It must be stated that the percentages of normal-weight, overweight and obese students were at about the same levels with the whole group of participants (Table 4) during the division into smaller groups. There was no statistically significant change in the control group. On the other hand, the percentage of overweight children was reduced almost in half in the study group [6.4% (n=8)] and 7 out of 15 students who lost weight were classified as overweight (n=4) and normal-weight (n=3). There was also a decrease in the percentage of overweight students [13.6% (n=17)] while the percentage of normal-weight students was increased to 68.8% (n=86). There was almost no change in the group of lightweight students (8%) and only one student gained more weight and entered the group of normal-weight students.

Table 4. The bodymetrics of the two groups after 6 months

Classification	BMI	CONTROL GROUP		STUDY GROUP	
Lightweight	<18.5	n=11	8.80%	n=11	8.80%
Normal-weight	18.5-24.9	n=69	55.20%	n=69	55.20%
Overweight	25-29.9	n=31	24.80%	n=30	24.00%
Obese	>30	n=14	11.20%	n=15	12.00%

Discussion

The fact that childhood obesity is rapidly growing leads to discovering various methods to deal with it and prevent it. In the present study an inserting method is presented in order to deal with childhood obesity using simple methods, such as information provided to the family environment and the school's contribution via the subject of Physical Education. The first measurement showed that 24.4% of the students were overweight and 11.6% were obese and these percentages are similar to the percentages of a previous study done among Greek primary school students in the area of Attica (Vlachopapadopoulou, et al., 2006). It is worth mentioning that no other study mentioned the percentage of the lightweight students or even if there were lightweight students and

were excluded from the research. It was noted that boys outnumbered girls both in the group of overweight and obese students. Likewise, in the study of Vardaki, et al. (2003) boys also outnumbered girls although their percentages had very few differences. If we compare the present study to a national study that was held in Great Britain for 20 years, we could say that the percentage of overweight and obese children in Greece is almost three times higher than the British children's percentage (Chinn & Rona, 2001) and higher than the percentages of the American children (Strauss, 2000), the Spanish children (Serra, et al., 2003) and the Cypriot children (Savva & Savva, 2000), all of which had the same age.

It is worth mentioning that the bodymetrics of the parents showed that obese parents tend to have obese children since the BMI of the mothers and the fathers had a significant correlation with the children's BMI and the percentages of overweight and obese fathers were very high. The study of Vlachopapadopoulou et al. (2006) gave similar results concerning the positive correlation of the parents' obesity with the children's obesity in Greece. Based on the above, we could say that the parents' obesity is an important factor to whether a child will become obese or overweight. The reasons for this correlation are various since the tendency to obesity that a child with obese parents has could be either genetic (heredity) or environmental due to possible dietary habits or models in the family. It would probably be important to analyze the factors that predispose obese parents in Greece to have obese children in a future research project because the study of Freedman, et al. (2001) in Americans showed that 77% of the children that were overweight or obese during childhood remained obese throughout their adulthood.

The analysis of the questionnaire shows that although Greek students are aware of the important role of breakfast in every day diet, few of them have breakfast on a daily basis and the percentage gets even smaller among obese and overweight students. At the same time, 83.9% of the students eat many different snacks at school, whereas a large percentage of students does not have basic knowledge about healthy diet. Judging by these results, we could say that the dietary habits of Greek students could be related to obesity.

This observation can be supported even more after the completion of the intervention programme, as seen in the measurements. The percentages of the overweight and obese students were drastically reduced with the increase of physical activity (an extra two hours per week) and the dietary instructions that the parents gave their children.

Conclusion

The solution to the high percentages of obesity in Greece remains in school and family. Informing the parents correctly, urging them to follow simple rules and including them to their daily dietary habits can lead to positive results. The reduction of the course of Physical Education that happened some years ago in Greek schools and the alteration of the school curriculum may have contributed to the reduction of the physical activity of the Greek students and to the encouragement of an inactive way of life and therefore to the increase of the obesity percentages more than expected. In conclusion, more importance should be given to the role of Physical Education at schools and so the students' physical activity will be increased and it could result in the treatment of the plague of obesity in combination with simple dietary advice.

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