

Rapid Communication

Nutrition Health Education as Model to Reduce Overweight and Obesity in Adolescents

Romeo IM and Tucci P*

Department of Pharmacy, Health and Nutritional Sciences, University of Calabria, Italy

*Corresponding author: Paola Tucci, Department of Pharmacy, Health and Nutritional Sciences, University of Calabria, 87036 Rende (CS), Italy

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Abstract

Background: Adolescent is a critical age characterized by deep physiological, psychological, and social changes. It is also considered a nutritional risk period since high intake of processed or sugary foods, long gaps between meals and low consumption of fruits and vegetables could result in overweight and obesity. Nutrition interventions are a cost-effective way to promote health behaviors and reduce obesity and chronic diseases among teens. Thus, the aim of this study was to improve adolescents' nutrition knowledge and to examine the effect of such interventions in adolescents aged 9-13, who were recruited from a public school in a small town in Calabria, Italy.

Methods: The methodological approach, lasted one year, was based in nutritional information and health-related behaviour (habits, lifestyle...), through a structured questionnaire, in measuring different nutritional parameters including height, weight, waistline and body mass index (BMI), and then in several classroom meeting with teens and their families.

Results and Conclusion: The results showed that nutrition health education had a positive impact on health in terms of measured anthropometric parameters, and that parental support had an important role in adolescents' healthy eating habits and food choices.

Keywords: Adolescence; School; Nutrition; Diet; Health

Introduction

Overweight and obesity among children and adolescents is one of the most serious public health issue of the 21st century with about 170 million overweight children globally under the age of 18 [1]. In Europe, in spite of the "Mediterranean Diet", the highest prevalence of childhood overweight is in Italy, especially in the Southern part. The health consequences are extremely serious, as an obese child is very likely to be an obese adult. Raised Body Mass Index (BMI) is a major risk factor for diseases such as cardiovascular disease, type 2 diabetes and many cancers, including breast, colorectal, kidney and oesophageal cancer [2,3]. These diseases not only cause premature mortality, but also long-term morbidity. In addition, overweight and obesity in children are associated with significant reductions in quality of life and a greater risk of teasing, bullying and social isolation [4].

Diet, along with the environment in which children grow up, to lifestyle behaviours and physical activity, contribute to the risk of becoming overweight or obese affecting health status in adulthood.

Thus, the aim of this study was to examine the impact of a nutrition education and relative life-style interventions among teens in a small city of the South Italy.

Materials and Methods

Subjects and study design

The present study was conducted among adolescents aged 9-13, who were recruited from a public school in Mammola (RC), a small town in the South of Italy. Before carrying out the study, permission

was obtained from the head of the school, and written consent was also received from each student's family before taking part.

The methodological approach, lasted one year, was divided in two phases: pre-intervention and post intervention. Each phase consisted in a questionnaire, a food diary and in anthropometric measurements. Between them a series of classroom meeting with teens and their families were held.

Questionnaire, Interviews and analysis

To collect dietary pattern-related information in youth we formulated a questionnaire, divided into three sections: (1) sociodemographic characteristics (gender, age, residence, attended school, and class); (2) eating habits (consumption of breakfast, types of food/beverages consumed and their frequency, frequency of consuming takeaway meals and meals out with diet quality); (3) lifestyle (sleep time, free time, physical activity, time spent in front of PC/TV/smartphone). The questionnaire, filled in by the students anonymously, was assessed pre- and post-intervention. In addition, children kept a food diary for the entire duration of the project.

Anthropometric measurements were carried out following a standardised protocol [5] for height, weight, abdominal, waist- and flanks- circumferences, and BMI. In children and adolescents, this kind of measure are simple ways of assessing nutritional status. Participants were asked to wear light, indoor clothing without coats and shoes, and stand with feet adjacent and in an upright position. Weight was measured using a portable digital scale (Seca 877) with 0.1g precision; height was measured using a portable stadiometer

Table 1A: Teens were categorised based on the BMI percentile into two weight status categories: underweight/normal weight and overweight/obese, pre- and post- intervention.

	PRE-INTERVENTION	POST-INTERVENTION
Underweight/ Normalweight	44.60%	60%
Overweight/Obese	55.4%	40%

Table 1B: Schematic summary of the questionnaire's results. The consumption of breakfast, fresh fruit and vegetables, sugar-drink and junk food during a normal week was obtained through a qualitative food frequency questionnaire. Responses included four frequency categories of consumption: 'never/once a week', 'some days (1–3 days)', 'most days (4–6 days)', 'every day'. In Table 1B is reported the food frequency among teens (weekly), regular physical activity (twice a week), and time spent in front of PC/TV/smartphone (more than 3 hours/day), both pre- and post-intervention. Junk food (high fat/high sugar) include: savoury and sweetie snacks, chips, cookies, candy, ice cream. For more details, see also Supplementary Table 1 and 2.

	PRE-INTERVENTION	POST-INTERVENTION
Daily breakfast	33%	73.8%
Fresh fruits and vegetables	13.8%	37%
Sugar-drink	49.2%	10.7%
Junk food	64%	18.6%
Regular physical activity	18.5%	93.8%
Time spent in front of PC/TV/ smartphone	83%	80%

(Seca 217) with 0.1cm precision; BMI was calculated from the formula: weight (kg) divided by height squared (m²).

Between the two phases, we conducted several meeting (1-2 per month) with teens and their families in the school, based on guidelines and recommendations for a correct nutrition and healthier lifestyle. In this regard, the Mediterranean Diet, characterized by a high consumption of whole cereals, legumes, fresh fruits and vegetables, olive oil, a moderate to high consumption of fish, a moderate consumption of dairy products, a low consumption of red meat, has been indicated as one of the healthiest dietary patterns [6]. Moreover, the component of this diet are rich in minerals and vitamins, including iron, calcium, iodide, vitamin A and D, essentials for their age, and for decreasing the risk of micronutrient deficiency. Thus our approach was based on environmental support for healthy diets (eating more fruit and vegetables, cutting the amount of fatty, sugary foods in the diet) and on regular physical activity (engaging in daily moderate physical activity for at least 30 minutes).

Statistical analysis

Data were summarized into frequencies and percentages, or as mean value \pm SD. Stata version 14 statistical software package was used in conducting all data analyses [7].

Results and Discussion

In total 130 adolescents, aged 9-13 years, participated to the study. Anthropometric measurements were performed and weight status was categorized based on the BMI percentile: underweight (<5th percentile), normal weight (5th to <85th percentile), overweight (85th to <95th percentile), and obese (\geq 95th percentile). Then teens were categorised into two weight status categories: underweight/normal weight and overweight/obese (Table 1A pre-intervention).

The questionnaire investigated the food habits of the teens and

the socio-environmental factors (i.e., family meals, home availability of healthy/unhealthy foods, physical activity). From the analysis of the questionnaire emerged that the dietary behaviours of the participants were based on refined carbohydrates, added sugar, fats, and salt, large consuming of high-calorie or low-nutrient foods (Table 1B pre-intervention and Table S1). Moreover, only 33% of the teens eating breakfast, and there was a general tendency to be less physically active. In general, teens who are overweight/obese reported consume and habits similar, respect than their normal weight counterparts. Also, the school environment has been studied, as adolescents spend much of their time there. Availability of healthy and unhealthy food items for purchase in schools led to increased consumption of those items. A less healthy diet combined to physical inactivity could lead to energy imbalance and obesity. Thus, interventions were designed to modify diet and lifestyle. After the intervention (Table 1B post-intervention and Table S2) we noted that more teens have breakfast in the morning (73%), the daily consumption of fruit and vegetables has increased slightly (from 13.8% to 37%), while those of sugar-drink and junk food has decreased more (above of 38% and 45% respectively), as we promoted low-fat and low-sugar alternatives, including low-fat yogurt, fresh fruits or 100% fruit juice. The time spent in front of PC/TV/smartphone remained high but on the other hand we noticed more frequent attendance to sports/dancing club during the week (Table 1B post-intervention and Table S2).

For as concern the anthropometric parameters, after the intervention the teens with normal weight rose to 60% while those overweight/obese were reduced by 15% (Table 1A post-intervention).

It was been possible to observe an increases in height both in the underweight/normal weight and in the overweight/obese teens and consequently an decrease in BMI (Table 1C post-intervention). The weight and the body circumference of teens were increased, but this can be justified by the fact that they have grown (Table 1C and Tables S3-S4).

In fact, adolescence represents and this was confirmed by the study, a phase of intense growth and development for a human being.

Conclusion

Adolescence is an important stage of growth and development and, in addition to biological changes, it is a period of social and psychological transition. Since a good nutrition in schoolchildren affect their health, cognition and subsequent educational achievement, understanding the changes in dietary patterns occurring during this time and factors that impact on these dietary patterns is essential to develop effective interventions with preventative health strategies. The results of this study showed that promoting a correct nutrition among teens and encouraging physical activity, had a positive impact on health in terms of measured anthropometric parameters, cognition development, linear growth and other health outcomes. Also, they indicated that adolescents are motivated to learn and improve diet behaviours, and benefit from team-based nutrition interventions, and that parental support had an important role in adolescents' healthy eating habits and food choices.

In conclusion, overweight/obesity is a primary health problem and must be addressed in schoolchildren. Our findings support the effectiveness of a nutrition intervention program among adolescents,

Table 1C: Summary of the anthropometric measurements of the analysed subjects (n=130) carried out pre- and post-intervention. Data are expressed as mean value \pm SD. See also Supplementary Table 3 and 4.

PRE-INTERVENTION							
	GENDER		MEAN HEIGHT (cm)	MEAN WEIGHT (kg)	ABDOMINAL CIRCUMFERENCE (cm)	WAIST CIRCUMFERENCE (cm)	FLANKS CIRCUMFERENCE (cm)
	M	F					
Underweight/ Normal weigh	19	39	139.64 \pm 10.30	44.70 \pm 8.84	68.33 \pm 7.46	66.82 \pm 7.16	78.01 \pm 9.62
Overweight/Obese	45	27	152.49 \pm 11.50	57.20 \pm 14.15	77.95 \pm 10.33	75.86 \pm 10.55	86.11 \pm 12.71

POST-INTERVENTION							
	GENDER		MEAN HEIGHT (cm)	MEAN WEIGHT (kg)	ABDOMINAL CIRCUMFERENCE (cm)	WAIST CIRCUMFERENCE (cm)	FLANKS CIRCUMFERENCE (cm)
	M	F					
Underweight/ Normal weigh	33	44	153.90 \pm 10.92	47.36 \pm 9.52	69.91 \pm 8.07	67.87 \pm 7.94	79.15 \pm 10.14
Overweight/Obese	30	23	154.41 \pm 10.80	55.35 \pm 13.26	78.94 \pm 8.97	77.18 \pm 8.17	87.44 \pm 10.29

that, conducted regularly in all schools, and supported at home by families, may represent a promising strategy in improving healthier.

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Authorship

All authors contributed to each stage of the design of the project. IMR conducted the interviews, the physical examinations, and collected data with guidance from the other author. PT provided expertise relating to the nutritional interventions adopted, analysed and interpreted data, and prepared the manuscript. Both authors critically reviewed the manuscript and approved the final version submitted for publication.

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