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Can we Introduce an Effective Lifestyle Modification Intervention among Children at Risk of Overweight and Obesity in the Conditions of Family Practice?

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Abstract

Background: Diet and physical activity are crucial in management of pediatric overweight and obesity, however family involvement has not been adequately studied in primary care.

Goal: Assessment of the effectiveness of lifestyle modification intervention among overweight and obese children, addressing parental adherence.

Methods: During the period of the study (from October 2013 until June 2014) 588 children have visited the family practice involved in the study because of many different reasons. Each child of this group of 588 children was screened for the risk of abdominal obesity. 106 children have matched the criteria of the risk of abdominal obesity. An intervention - "3-color signaling" diet and increased physical activity was implemented for 24 weeks in a group of 106 subjects, aged 2-17, with waist circumference (WC) ≥ 75 percentile (in industrial region of Poland). Anthropometric parameters (BM, BMI and WC), blood pressure, fasting lipid fractions (TG, HDL-C) and plasma glucose (FPG) levels were measured before and after the intervention, and parents were filling out the survey, assessing their adherence to the program.

Results: After 24 weeks, in all the subjects, regardless of their age and gender, the mean values of BMI, WC, and BP were statistically significantly lower ($p<0.01$) than their baseline parameters, and the HDL-C levels were higher. The parental survey revealed that 77.3% were adherent to the dietary (20.7% for 24 weeks), and 55.7% – to the physical activity recommendations (25.5% continuously).

Conclusions: Lifestyle modification intervention that targets overweight and obese children and adolescents and their families, reinforcing weight loss goals is helpful in improving anthropometric and HDL-C results. The whole family needs to accept and adhere to the recommended diet and physical activity changes for at least 6 months. A parental perspective of barriers to compliance needs to be considered in designing an effective weight management intervention in primary care.

Keywords: Overweight; Obesity; Lifestyle modification; Dietary interventions; Adherence

Background

Overweight and obesity represent one of the most prevalent nutrition-related body mass disorders in children. Childhood obesity is a major public health concern, since children who are obese are more likely to develop cardiometabolic diseases, sleep apnea, and many other medical problems in adulthood [1,2]. Regardless of genetic predispositions, overweight and obesity develop when amount of the consumed energy exceeds actual caloric needs of the organism. Unhealthy lifestyle, including abnormal nutritional habits and lack of sufficient physical activity, starting in childhood, is an important risk factor of future metabolic and cardiovascular diseases (CVD) and its complications. Initially, it can be characterized by different metabolic derangements, such as impaired glucose tolerance (IGT), elevated blood serum levels of LDL- cholesterol (LDL-C) or triglycerides (TG), and reduced HDL-cholesterol (HDL-C). It can also be manifested in different clinical outcomes, including arterial hypertension (HTN) or type 2 diabetes mellitus (T2DM), in addition to excessive body mass and adiposity. All of these abnormalities should be evaluated early in life, and then appropriate strategies should be implemented. Also, it seems optimistic that this category of risk factors can be modified upon properly designed and regularly implemented interventions. However, a recent meta-analysis by Stice et al. revealed that the majority of such programs, among many ethnic groups including Caucasians, did not bring statistically significant prevention of the weight gain [3]. Evidence from research studies conducted in some Western countries indicate that well designed, lifestyle- oriented, preventive actions, can translate into objectively measured, positive health-related outcomes. This has been illustrated by the Finish North Karelia Youth Project that was aimed at children and adolescents aged 13-15 years [4]. Another Scandinavian program-the Oslo Youth Study also revealed benefits of promoting healthy eating, smoking cessation, and increased physical activity [5]. These two programs were reported in 1990, by the WHO, as exemplary models of CVD prevention in the young population [6]. The experience gained from these projects

indicates that the preventive and therapeutic actions should be conducted early in life, starting from childhood, not only by pediatricians but also by family practice (FP) physicians. This is due to the fact that a relationship between FP doctors and their patients and families is not a casual one. In fact, this particular connection has been created for many years, representing one of the highest principles of family medicine. This professional relationship, during each medical consultation is being transformed into a therapeutic contract, allowing doctors and patients to manage together all the health-related problems. This partnership type of agreement should increase the patient's adherence to the FP doctor recommendations. In addition to this model of therapeutic relationship, behavioral interventions, including dietary recommendations, physical activity and/or reduced sedentary behavior as well as lifestyle modification targeted at both children and their parents were reported as the most effective therapeutic modalities for pediatric obesity [7].

Unfortunately, noncompliance is very common, and it can be attributed to lack of detection of the problem or to treatment-related ambivalence. Thus, it is considerable that a patient oriented consultation, in which the patient is a center of attention might enable parents to express their concerns, uncertainties, fares and various emotions, related to their child treatment. At the same time, using a valuable insight from parents and care-givers, FP doctors could possibly improve effectiveness of their therapeutic performance, adjusting it to the patients' individual needs. Since research is limited on this particular subject, in primary care settings in Poland, we have designed a study to investigate the effects of lifestyle modification interventions on selected anthropometric and metabolic parameters, in the young population with excessive body mass, in conjunction with an assessment of the level of parental adherence to the physician's advice.

Methods

Study participants

From a total number of 1006 children, who were registered in FP out-patient facility (Sanprom Family Practice Center in Zabrze) in Silesia (an industrial region of Poland), 588 children and adolescents, aged 2-17 years, underwent an initial obesity screening, from the months of October 2013 to June 2014, who have visited the practice because of many reasons. The proportion of children (about one third of the entire out-patient-base) is consistent with a typical demographic practice structure in Poland. Young patients with waist circumference (WC) ≥ 75 percentile were invited to the study by the medical personnel (Figure 1) The following individuals were excluded: 166 children below 2 and 38 adolescents over 17 years of age. Individuals with waist circumference<75 percentile were excluded from the study, and 214 children and adolescents could not participate in the study due to refusal of parental informed content. Subsequently, 106 subjects with WC ≥ 75 percentile, were qualified for the next step of the study. Parents or legal guardians signed an informed consent form to participate in the study (which consisted of four visits) on behalf of the children. The study protocol complied with the Declaration of Helsinki and was approved by the Bioethical Committee (KNW/0022/KB1/30/14) according to the current requirements related to enrolling of the physician's own practice patients into the research study.

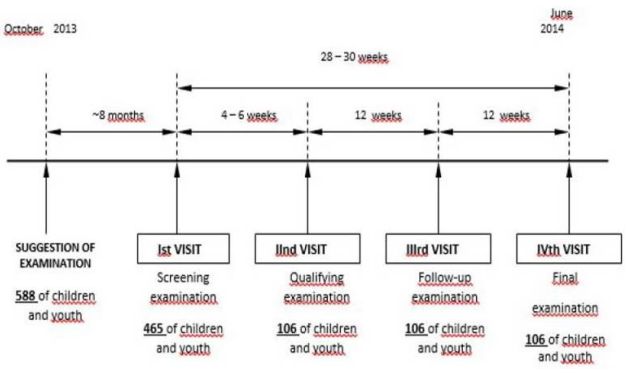

Figure 1: Schematic diagram of medical examination in children and youth in Family Practice.

Intervention - lifestyle modification based on "nutritional signaling" diet

Prior to data collection, all the parents were given materials allowing them to conduct an independent control of the participants' caloric intake. In addition, all the parents received individual instructions, regarding practical use of the "nutritional signaling" diet that essentially included avoiding in the diet all the products marked in the red color ("avoid eating", e.g.: whole egg pasta, sweets, pork, potato chips and any kind of highly processed, fast food products), taking less frequently products marked in yellow ("eat more rarely", e.g.: white bread or rolls, beef or fruit juice), and preferring products from the "green" group ("eat always", e.g.: fruits, vegetables, whole grain, dark bread, skimmed milk (0.5% of fat), fish, poultry without skin or turkey ham). In all the participants eligible for the next step of our study, a lifestyle modification intervention was implemented, through diet and increased physical activity, and daily caloric requirements were estimated. The children were recommended to engage in moderate physical activity, for at least 40 minutes daily, 4 days per week, and were advised to shorten their time spent in front of the computer monitor, as well as limit their TV watching to only 1 hour per day.

Anthropometric, physical and metabolic outcome measures

For every child, anthropometric parameters (height, body mass-BM, calculated body mass index-BMI, and waist circumference-WC), systolic (SBP) and diastolic (DBP) blood pressure (BP) (in resting position, using a standard medical sphygmomanometer with a pediatric cuff size) measurements were performed. Moreover, selected parameters of blood lipid profile (triglycerides-TG and HDL-cholesterol-HDL-C) and carbohydrate metabolism (fasting plasma glucose-FPG) were tested twice (before-as a baseline, and after-at the end of the study intervention). Weight and height were measured without heavy clothing and shoes, and WC was measured with a medical centimeter tape, over the unclothed abdomen at a level of the midpoint between the lower margin of the ribs and the anterior superior iliac crest spine. Venous blood samples were taken from patients fasting for ≥12 h, and the analyses were performed in a central laboratory (Silesian Analytical Laboratories, Zabrze, Poland), within 12h after drawing. HDL-cholesterol (HDL-C) and triglycerides (TG) were determined by standard colorimetric-enzymatic methods. FPG

concentration was measured using a standard glucose oxidase/peroxidaze method. During all four study visits with young patients and their parents, an educational and motivational conversation was conducted, by a study physician, during which strategies related to the dietary changes, and increase of physical activity were repeated, and each time, an information about obesity-related cardio-vascular (CV) risk factors was reinforced. The study duration was 24 weeks, and at the end of this period, the parents or guardians filled out the study survey, aimed at assessment of a degree of parental adherence to the proposed intervention.

Statistical analysis

Statistical analyses was conducted using the Statistica 6.0 PL software. The data were presented as arithmetic mean ± standard deviation (SD), and the level of significance was accepted at $p<0.05$, for all the analyzed data. In order to compare the examined parameters among the distinguished study groups of children and adolescents, an analysis of variance with single classification (ANOVA), and post-hoc RIR Tukey′ s test for the normal data distribution were used. For non-parametric data distribution, the Kruskal-Wallis test was used. A comparison of dichotomic variables was conducted using the Student's t-test or U Mann-Whitney test.

Parameters	Girls	Boys	P value
Number of children	34	72	-
Age (years)	10,6±4,3	10,7 ±3,5	ns
Height (cm)	143,4±19,9	150,6 ±20,1	ns
Body mass (BM) (kg)	49,4 ± 17,8	57,5 ± 23,6	ns
WC (cm)	73,3±9,9	79,8 ± 14,8	p<0,05
BMI (kg/m2)	23 ± 3,2	24 ± 4,8	ns
SBP(mmHg)	109,4 ± 11,5	116,7 ± 13,4	p<0,01
DBP(mmHg)	69,7 ± 10,2	71,7 ±9,3	ns
TG (mg/dl)	86,1 ± 37,8	93,5 ± 44,4	ns
HDL- C (mg/dl)	54,4 ± 14,3	50,7 ± 10,9	ns
FPG (mg/dl)	75,2±9,5	77,9 ±9,4	ns

Values are presented as means ± standard deviations for continuous variables; Body mass (BM) (kg); BMI-body mass index; WC-waist circumference; SBP-mean systolic blood pressure; DBP-mean diastolic blood pressure; TG-triglycerides; HDL-C-HDL cholesterol fraction; fasting plasma glucose-FPG; p<0,05-statistically significant result ; ns-no statistical significance .

Table 1: Anthropometric and biochemical parameters of participants (girls and boys) of the study.

Results

Detailed characteristics of the study group are presented in Table 1. In the study group of 106 children and adolescents, regardless of their age and gender, the mean values of anthropometric parameters, including BM, BMI, WC, arterial SBP and DBP measurements, at the end of the 24-week period (of using a "nutritional signaling" diet and following recommendations of increased physical activity) were statistically significantly lower ($p<0.01$) than the baseline parameters prior to the intervention (Table 2). In addition, a statistically significant elevation of serum HDL-C level after this intervention was observed. In contrast, no statistically significant correlations between fasting serum TG and FPG levels were observed after implementation of this intervention.

Study parameters	Before lifestyle modification intervention (n=106) (mean; ± SD)	After lifestyle modification intervention (n=106) (mean; ± SD)	p
Body mass (BM) (kg)	54,9 ± 22,2	53,7 ± 21,0	p<,001
BMI (kg/m^2)	23,7 ± 4,4	23,3 ± 4,1	p<,001
WC (cm)	77,8 ± 13,8	76,3 ± 12,8	p<,001
SBP*(mmHg)	115,1 ± 13,2	111,8 ± 11,1	p<,001
DBP**(mmHg)	71,3 ± 9,6	68,9 ± 8,3	p<,001
TG (mg/dl)	91,1±42,3	91,9 ± 37,5	ns
HDL-C (mg/dl)	51,9 ± 12,2	53,6 ± 11,9	p<,001
FPG (mg/dl)	79,1 ± 9,5	77,1 ± 9,4	ns

Values are presented as means ± standard deviations for continuous variables; abbreviations are the same as in Table 1; p<0,01 - statistically significant result; ns-no statistical significance.

Table 2: Anthropometric and biochemical parameters of participants before and after lifestyle modification intervention.

At the end of the study, 106 parents or guardians of the participants filled out the study survey. The mean age of the respondents was for mothers 36.6 ± 4.2 years, and for fathers 38.9 ± 1.9. The mothers (94%) filled out the survey much more often than the fathers (6%). The study survey consisted of 8 questions, in which 5 initial ones were related to "the nutritional signaling diet", and 3 subsequent ones were related to the recommendations of increased physical activity.

Adherence to the physician's recommendations related to the children's diet

Results of the study survey indicated that 7.3% of the caretakers (parents or guardians) responded "yes" to the question whether they were adherent to physician's recommendations related to their children's diet. An analysis of responses to a question related to the time period of their adherence to the physician's recommendations indicates that only 20.7% of them regularly and continuously (during the entire period of 24 weeks) were adherent to these dietary recommendations. In contrast, 36.8% of the respondents admitted that they only sporadically were adherent to these recommendations (Figure 2).

As reasons for their non-adherence to the physician's recommendations related to the child's diet, the majority of caretakers (41.6% of the surveyed respondents) concluded that the "lack of time" was the main cause of their non-compliance. In contrast, 20.9% of them indicated lack of financial funds, as the main factor, determining their dietary non-adherence (Figure 3).

In total, 97.2% of the surveyed caretakers responded "yes" to a question concerning their understanding of the instructions and rules concerning the "3 colors: red, yellow, green - nutritional signaling diet".

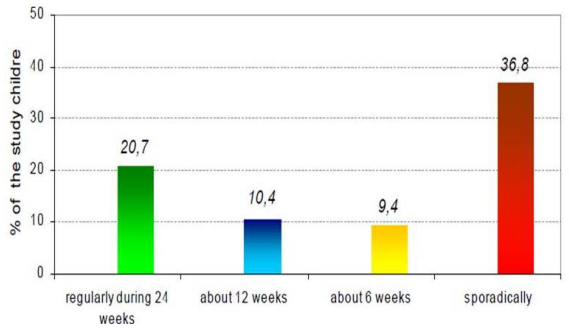

Figure 2: Time of adherence to the physician's recommendations related to the child's diet.

Adherence to the physician's recommendations related to the children's physical activity

The majority of the study caretakers (55.7%) adhered to the physician's recommendations related to their child's physical activity. However, only 25.5% of them were so doing regularly during the entire study period, and 13.2%-only sporadically (Figures 4 and 5).

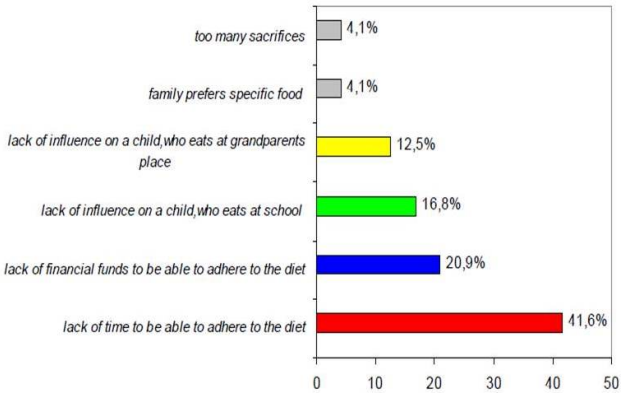

Figure 3: Reasons for non-adherence to the physician's recommendations related to the child's diet.

Discussion

Abnormal parameters of body mass in children do not necessarily mean that an individual is "destined" to permanently remain overweight and obese. This is a very important message for parents, caretakers and doctors, who should encourage children to be more physically active, and verify eating habits of the whole family. The main recommendations related to nutritional requirements of children and adolescents include a daily intake of at least five portions of fruits and vegetables, as well as increased intake of whole-grain food. It is also recommended to avoid sweets, carbonated beverages, and other products that are sources of so called "empty calories". Recent studies indicate that the nutritional patterns and eating behaviors of children and adolescents are inappropriate [8-10]. One of the frequently repeated nutritional errors, both in the U.S. and in Europe is consumption of the "fast-food" type products [11,12]. In consequence, this dietary pattern is related to increased energy intake, derived from excessive consumption of the most unhealthy products such as saturated fatty acids, trans-fats, salt, and table sugar (sacharose). At the same time, a decreased intake of heart-healthy mono- and polyunsaturated fatty acids (e.g.: olive oil, canola oil or omega-3 essential fatty acids), milk, fruits and vegetables has been observed. It should be emphasized that the television plays a significant role in "fast- food" promotion. In particular, studies conducted in Germany have revealed that children aged 5-7 years, who watched TV more than one hour daily, displayed an increased consumption of the promoted unhealthy products, in combination with restricted physical activity. Even a relatively short period of the decreased physical activity could lead to overweight and obesity, and in consequence to the development of insulin resistance [13].

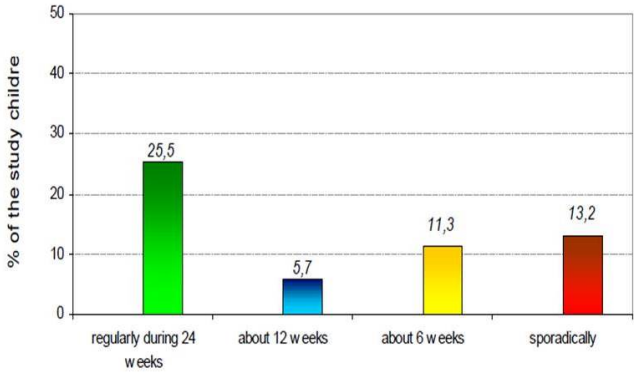

Figure 4: Adherence to the physician's recommendations related to the children's physical activity.

Main findings

Findings reported in our study are consistent with the existing research data in this area. In particular, our study revealed that despite the conducted intensive educational and motivational activities, it was very difficult to convince parents or caretakers to modify their children diet and physical activity. Also, to transform eating habits of the whole family was not an easy task. Even in some cases, when the parents were declaring making some changes in the eating patterns of their children, they were not able to comply with the doctor's recommendations on a regular basis. An analysis of our study questionnaire revealed that from 77.3% of the parents, who declared their adherence to the physician's recommendations related to their children's diet, only about 20.7% complied with these recommendations regularly. Almost 37% of the surveyed respondents, only sporadically were adjusting their children's diet. They listed the following reasons, precluding their adherence to the physician's recommendations: lack of time (41.6%), lack of funds (20.9%), and lack of influence on kind of meals served to their children at school (12.5%), or by grandparents (12.5%). In addition, according to our study, the parents' awareness of the health benefits, related to the increased physical activity of their children has been insufficient.

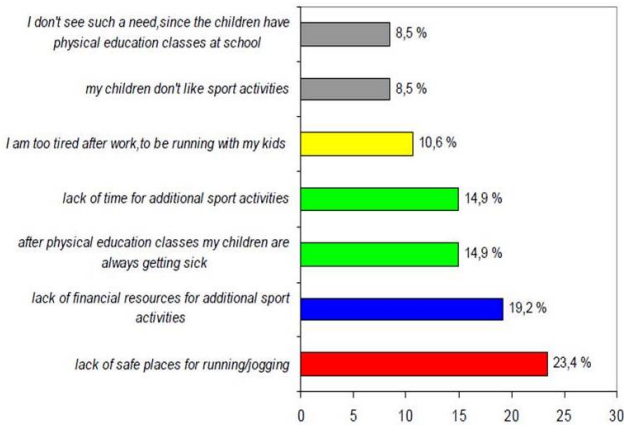

Figure 5: Barriers to compliance with physician's recommendations, concerning physical activity and exercises of the children.

We report that the physical activity level of the study children and adolescents turned out to be low. Only half of the surveyed parents, declared their adherence to the physical activity recommendations of their children. In addition, it is disturbing that only 25.5% of them adhered to the physician's recommendations for the entire study period (24 weeks). As main reasons for their non-adherence the parents listed: lack of safe places for running/jogging (23.4%), lack of financial means for additional sports activities (19.2%), frequent infections of the children after physical education classes at school (14.9%), lack of time for additional sport activities (14.9%), and dislike of sports activities by the children (8.5%).

Nevertheless, our study has revealed that the implemented lifestyle modification intervention had a substantial influence on the anthropometric and biochemical parameters of our study participants. In particular, in our group of 106 children and adolescent it was reported that the mean values of their body mass, BMI, WC, and BP measurements were reduced, while HDL- C serum level was increased, and these differences were statistically significant after the study intervention, comparing to the baseline. We have observed that the dynamics of lowering of the anthropometric parameters in our study subjects was not spectacular. However, as a result of the applied intervention, a decrease of the mean body mass by 2.2%, BMI by 1.8%, and WC by 2.0% were reported, in comparison to the baseline values.

Comparison with other studies

In general, our study design and results are consistent with the ones included in Cochrane Database Systematic Review of 2005 that was focused on dietary or physical activity approaches [14]. In the study related to lifestyle interventions, Knowler et al. have indicated that lowering of the BM by approximately 5% to 10% enable to decrease the risk of type 2 diabetes mellitus by 50% [15]. In comparison to their study, lowering of the BM by only 2.2% in our subjects may be explained by a relatively short, 24-week observation period of our study. Results of the study by Kalarchian et al. are in many ways convergent with ours [16]. They examined the effect of a family-based, behavioral weight control in the management of severe pediatric obesity, and found out that it was associated with significant short-term reductions in obesity, and improvements in medical parameters such as percent overweight, BP, WC, and health related quality of life (HRQoL) [16]. According to the reviews conducted by Doak et al., it has been suggested that family-based interventions, which include education and behavioral modification have been successful, while utilizing interventions that combine both physical activity and diet [17]. Also, in a randomized controlled trial of daughters and their parents or guardians, conducted by Robinson et al., reductions in sedentary behaviors and increases in physical activity were targeted among African American girls, by incorporating dance classes, lessons on reducing TV viewing (to the girls and their family members), and by sending pertinent newsletters to parents or guardians [18]. These combined interventions resulted in beneficial outcomes [18]. Our findings concur with approaches presented in these studies. According to Trevino et al., school-based interventions such as the Pathways initiative (a 3-year, multi-site study) that used a multilevel strategy, involving individual behavior change and environmental modifications, have revealed that school activities promoting healthy eating behaviors and increased physical activity, focused on augmenting energy expenditure during physical education classes resulted in reduction of the percent of body fat in American Indian children [19]. Although, the Pathways' study design was more comprehensive and longer than ours, our concept of the "signaling diet" was in principle convergent with its their dietary strategies. In a study by Johnson et al., Mexican American students were randomized to participate in a weight management or a self-help program [20]. The control group participated in a community health education program and received newsletters, and the study group was involved in the intervention that was culturally tailored to the individual preferences for food and physical activity. In addition, the program materials in the study group were culturally targeted for students and their families. The outcome of this study was beneficial, showing a significant decrease in BMI in the study group, comparing to the self-help program in the controls. Although our study design did not contain a control group, the anthropometric results of our subjects support their outcomes.

Limitations and strengths

We are aware of some limitations of our study. First, the study population was small, and the intervention period was relatively short, with no follow-up, and therefore, we were not able to assess the long-term impact of our intervention on anthropometric and metabolic parameters of our subjects. Secondly, we were not able to verify the exact efforts related to lifestyle modification, actually undertaken by children, adolescents, and their parents, since it was not possible to supervise the patients and their families at home. These patients, who remain in care of their FP doctors, interact with them only for a limited time of the consultation visit, but spend most of their time with parents, caregivers or peers, being exposed on many distractions or ideas that are opposite to our study instructions. Even with good parental cooperation, it is very difficult to achieve weight reduction goals under these circumstances. However, this specific issue is very difficult to resolve by any research design. We attempted to improve this situation by creating a good relationship between young patients, their families and their FP physicians, which would be conducive to mutual understanding, truthfulness, expressing concerns, overcoming obstacles, and increasing adherence do the doctors' recommendations.

The strong feature of our study is the fact that it investigated a netural home and school environment, which might have different and usually less favorable weight reduction and other relevant health outcomes, comparing to the "unnatural", rigorous control of dietary habits and physical activity that can be conducted in in-patients

facilities, with constant supervision, where it can be easier to strictly implement certain interventions, and to achieve specific targets of weight loss. It is understandable that in our study, representing typical ambulatory FP settings, such a close monitoring was simply not feasible. A design of our study, including 4 visits that allowed reinforcement of the lifestyle related recommendations was definitely an advantage. Also a set-up, in which the same study physician was continuously interacting with all the young patients and their families was helpful in minimizing bias as well as in improving flow of information, and reinforcing the participants' compliance. It was beneficial that the study was conducted in FP practice settings, in which the continuity of care has been traditionally provided, based on a professional doctor - patient relationship.

Implication for clinical practice and further research

Management of patients in the developmental age, with overweight and obesity, has several obstacles, including difficulties related to implementation of the rules of healthy nutrition and lifestyle modification not only of a child or adolescent, but also of a whole family [21]. Therefore, changing of the harmful dietary patterns in the family represents the top priority.

Nutritional education conducted by a FP physician and his/her team appears to be the most appropriate way of weight management, including reinforcement of the therapy goals and providing constant support to the overweight and obese young population. Results of our study revealed that even a small degree of reduction of the excessive body mass has a positive impact both on serum lipid profile and values of the arterial blood pressure. In addition, our findings indicate that there is a need of implementation of specific, well designed, long-term (at least 1-2 years) prophylactic actions in FP out-patients settings. Lifestyle modification should be a fundamental element of preventive care among children and adolescents with excessive body mass, who are at risk for development of the atherogenic lesions, and subsequent, adverse cardiovascular events and T2DM in adulthood [22,23]. Based on the medical literature, it has been revealed that the most successful interventions to date have incorporated socio-culturally relevant therapeutic components, related to diet, physical activity, and family engagement [21,23]. Detecting and removing barriers to treatment adherence in families with obese children and adolescents in PC or FP involves an integration of cultural, economical and cognitive approaches to reducing obesity. In addition to identifying effective intervention strategies, it is important to focus on individual differences in traditional beliefs of the families, and their motivational readiness for challenge of weight reduction. Only a limited number of studies that target obesity- related dietary and behavioral activities, and its outcomes in children in PC\FP has been conducted. Therefore, further research, focused on short and long-term effectiveness of the proposed lifestyle modification program, in families suffering from childhood obesity-related health problems is certainly merited.

Conclusions

Lifestyle modification intervention that simultaneously targets overweight and obese children and adolescents, and their families is helpful in improving anthropometric parameters and HDL-C serum concentrations of the patients. To improve adherence to the physician's recommendations, the whole family needs to fully accept and adopt the lifestyle modification plan (focused on diet and physical activity) and be involved in it for at least 6 months, utilizing all the available medical, educational and community resources. Primary care and family physicians should regularly monitor the weight management progress, rewarding even the smallest achievements of their patients, and repeating the program goals. It is necessary to design and implement, in primary care setting, an effective weight management strategy that will incorporate awareness of realistic limitations and socio- cultural barriers to successful weight loss in overweight and obese children and adolescents, from their parents or caretakers perspective.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

EM was involved in patient recruitment and data collection. WD and IB provided help with statistical analyses and data collection. EM, HM-Z,KS was involved in writing of the manuscript. AO and EM offered advice on the methods and organization of the study. Each author commented on drafts and approved the submission of this version of the manuscript.

References

1. Wang Y, Beydoun MA (2007) The obesity epidemic in the United States--gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. Epidemiol Rev 29: 6-28.
2. Krebs NF, Jacobson MS (2003) American Academy of Pediatrics Committee on Nutrition: Prevention of pediatric overweight and obesity. Pediatrics 112: 424-430.
3. Stice E, Shaw H, Marti CN (2006) A meta-analytic review of obesity prevention programs for children and adolescents: the skinny on interventions that work. Psychol Bull 132: 667-691.
4. Puska P, Vartainen E (1987) The North Karelia Youth Project 1978-80: Effect of two years of educational intervention on cardiovascular risk factors and health behaviour in dolescence. In: Cardiovascular Risk Factors in Childhood: Epidemiology and Prevention. Edited by Hetzel BS & Berenson GS. Amsterdam, New York, Oxford: Elsevier pp:183-202.
5. Tell GS, Vellar OD (1988) Physical fitness, physical activity, and cardiovascular disease risk factors in adolescents: the Oslo Youth Study. Prev Med 17: 12-24.
6. World Health Organization (1990) Prevention in childhood and youth of adult cardiovascular diseases: time for action. World Health Organ Tech Rep Ser 792: 1-105.
7. Jelalian E, Wember YM, Bungeroth H, Birmaher V (2007) Practitioner review: bridging the gap between research and clinical practice in pediatric obesity. J Child Psychol Psychiatry 48: 115-127.
8. Mannino ML, Lee Y, Mitchell DC, Smiciklas-Wright H, Birch LL (2004) The quality of girls' diets declines and tracks across middle childhood. Int J Behav Nutr Phys Act 1: 1-11.
9. Mrdjenovic G, Levitsky DA (2003) Nutritional and energetic consequences of sweetened drink consumption in 6- to 13-year-old children. J Pediatr 142: 604-610.
10. James J, Thomas P, Cavan D, Kerr D (2004) Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trial. BMJ 328: 1237-1248.
11. Paeratakul S, Ferdinand DP, Champagne CM (2003) Fast-food consumption among US adults and children: Dietary and nutrient intake profile. J Am Diet Assoc 103: 1332-1338.
12. Matthiessen J, Fagt S, Biltoft-Jensen A, Beck AM, Ovesen L (2003) Size makes a difference. Public Health Nutr 6: 65-72.
13. Müller MJ, Koertzinger I, Mast M, Langnäse K, Grund A (1999) Physical activity and diet in 5 to 7 years old children. Public Health Nutr 2: 443-444.

14. Summerbell CD, Waters E, Edmunds LD (2005) Interventions for preventing obesity in children. Cochrane Database Syst Rev 3: CD001871.
15. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, et al. (2002) Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 346: 393-403.
16. Kalarchian MA, Levine MD, Arslanian SA, Ewing LJ, Houck PR, et al. (2009) Family-based treatment of severe pediatric obesity: randomized, controlled trial. Pediatrics 124: 1060-1068.
17. Doak CM, Visscher TL, Renders CM, Seidell JC (2006) The prevention of overweight and obesity in children and adolescents: a review of interventions and programmes. Obes Rev 7: 111-136.
18. Robinson T, Killen J, Kraemer H (2003) Dance and reducing television viewing to prevent weight gain in African-American girls: the Stanford GEMS pilot study. Ethnicity & Disease 3:S1-65.
19. Trevino RP, Hernandez AE, Yin Z (2005) Effect of the bienestar health program on physical fitness in low-income Mexican American children. Hisp J Behav Sci 27: 120-132.
20. Johnston CA, Tyler C, McFarlin BK, Poston WS, Haddock CK, et al. (2007) Weight loss in overweight Mexican American children: a randomized, controlled trial. Pediatrics 120: e1450-1457.
21. Institute of Medicine. Preventing childhood obesity: health in the balance. Washington, DC: National Academies Press; 2005.
22. McGill HC Jr, McMahan CA, Herderick EE, Zieske AW, Malcom GT, et al. (2002) Obesity accelerates the progression of coronary atherosclerosis in young men. Circulation 105: 2712-2718.
23. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, et al. (1993) Do obese children become obese adults? A review of the literature. Prev Med 22: 167-177.