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Adolescent obesity prevention and complex lifestyle interventions

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ABSTRACT: Adolescent overweight and obesity are a growing problem worldwide. Weight gain is triggered by poor dietary behavior, lack of regular physical activity, sedentary family lifestyle and psychological state. Studies have shown that interventions targeting all family members, or a parent and a child, are more effective than interventions targeting only the child. We conducted a 30-day adolescent overweight and obesity prevention program to modify the lifestyle of the teenager and at least one adult family member. A 5 full days training camp took place followed by remote support. Weight, height, waist, and hip circumference were measured, a body composition analysis was performed. 55 teenagers participated in the program. The changes in weight, waist and hip circumference were statistically significant during days 8^{th}-28^{th} of intervention ($p<0.001$). There was a statistically significant body fat and internal fat loss and an increase in muscle mass between days 8^{th}-13^{th} ($p<0.001$). We are convinced that interventions aimed at changing family's lifestyle, not just the child's, are effective. We believe that a weight management intervention for the whole family can help to develop skills for a balanced diet, regular physical activity, and a healthier lifestyle.

KEYWORDS - Adolescent, intervention, obesity, overweight.

I. INTRODUCTION

Obesity and overweight are defined as abnormal or excessive increase in fat mass that affects health [1]. According to the World Health Organization, more than 340 million children and young people aged 5-19 years worldwide were overweight in year 2016 [2]. According to the Lithuanian Institute of Hygiene's estimates for children and young people aged 2 to 18+ attending educational institutions in the academic year 2020-2021, 21.7% of all had a body mass index above the reference value. Of these, 14.8% individuals lived with overweight and 6.9% with obesity. Also, when analyzing the rates of increase in body mass index, the highest number of children with overweight was found among students aged 7-17 years [3]. Overweight and obesity is also assessed in terms of waist and hip circumference [4]. Waist and hip circumference above the 90th percentile is believed to increase the risk of dyslipidemia, insulin resistance and cardiovascular disease [5,6].
Measurements of weight, height, waist, and hip circumference are important indicators for assessing the risk of overweight and obesity [7]. In this study, we wanted to highlight that family-based interventions are effective in weight correction and lifestyle modification. We evaluated changes in measurements taken in adolescent obesity prevention program. As the program lasted 28 days, changes in weight, waist and hip circumference were monitored, as well as changes in the results of an additional body composition analysis. Children's BMI and height-weight percentiles were not assessed, as these changes would need to be captured over a longer time.

II. IMPLEMENTATION OF THE INTERVENTION PROGRAM

Obesity prevention program for teenagers lasted 30 days. The aim of this intervention was the adjustment of the lifestyle including the teenager (11-17 years old) and at least one grown up of the family. Intervention was applied to the teenagers with overweight or obesity. The aim was the development of balanced and wholesome eating habits, regular and health promoting physical activity habits, social and emotional skills, study/learning and leisure balancing skills, parental skills of the adults and the increase of mutual understanding between children and parents.

The first step of the program: a motivational interview with a parent responsible for the teenager's feeding. The interview was conducted through a phone call. The duration of the interview was 40-60 minutes long. During the interview, the analysis of the problem was performed, ways to help were discussed, transfer of the responsibility for the results to parents was assured. The interview was characterized as strict and unyielding,

the evaluation of the respondent‘s performance was carried out, the reaction to a straightforward question, the encouragement to share responsibility for the child’s weight gain, the honesty and the control of negative emotions were monitored. 9 out of 10 respondents increased their awareness and laid the foundation for further changes. 1 out of 10 respondents experienced either too much pressure from taking responsibility or understood that the family is not ready to apply changes (wrong time, the importance of other priorities) and decided to skip the program. Motivational talk was not performed with teenagers. Interviewed adults were asked to initiate the discussion with the child and evaluate his motivation to participate.

Second step of the program: face-to-face training camp lasting 5 full days. Only teenagers participated in the training. Parents monitored their children training activities online (usually through private Facebook groups) and carried out tasks. Teenagers were able to attempt living according to healthy lifestyle conditions: helped to prepare meals, performed regular physical activities, tended to their emotional hygiene, and practised mindfulness, participated in theoretical-practical learning activities, and learned about study/leisure time management.

Third step of the program: online support. Following 14 days camp training all teenagers and at least one parent continued participation online. Participants analyzed their lifestyle habits, updated information about meals, leisure, and physical activity performance every day in the online group. The information was collected individually from one of the parents and a teenager. Updates were viewed by the executives of the program, recommendations and consultations were carried out. Starting a second week participants were encouraged to give feedback to each other (each participant having a person needing feedback) resulting in experiential learning. Positive changes in circumference of the body or weight as well as detailed feedback provided to other participants were rewarded special points. This resulted in positive competition between families.

III. METHODOLOGY

The aim of the study is to evaluate the effectiveness of a family-targeted intervention on adolescents' weight management. A retrospective research approach was used. 55 adolescents were included in the study. This study was approved by the Bioethics Centre of Lithuanian University of Health Sciences (No. BEC-MF-161). Data was collected as part of the adolescent weight correction program of the Lithuanian Association for the Prevention of Overweight and Obesity "Lobesity". Data was gathered when the adolescent and the adult family member responsible for the teenager voluntarily participated in a lifestyle intervention program. The confidentiality of the subjects was ensured as the data analyzed was reported anonymously and results of the study are only presented in a summarized form. Adolescents' age, height, weight, result of the body mass analysis (percentages), waist and hip circumference was assessed. Changes in weight, waist and hip circumferences and body composition were calculated for days 8^{th}-13^{th} (1^{st} - 5^{th} day of the camp) and days 8^{th}-28^{th} (1^{st} day of the camp - last day of the program) time. Data was analyzed using Microsoft Excel and Statistical Package for Social Sciences (SPSS) programs, statistical significance in changes was assessed.

IV. RESULTS

55 teenagers participated in the intervention program resulting in total of 27 girls (49.1%) and 28 boys (50.9%). Weight, height, and circumference of the waist were measured for every participant. Circumference of the 27 participants‘ (49,1%) hips were measured as well. The measurements of the weight, height, waist, and hips were performed on the 8th day of program (the first day of the face-to-face training camp) and 13th day of the program (5th day of the face-to-face training camp) using body composition scales by the camp leader. On the 28^{th} day of the program, participants measured their own weight, waist and hips circumference and passed the information to the executives of the program to keep updates of the measurements. The intensive learning and development of good lifestyle habits took place during the face-to-face exercises on days 8^{th}-13^{th} of the program, in the camp. Registered weight loss during 8^{th}-13^{th} days period varied between 0 – 3.60 kg, the average weight loss being 1.65 kg (Standard deviation (SD) 0,87). The biggest waist circumference decrease was by 8.00 cm, while a mean decrease was of 2.80 cm (SD 1,55). Hip circumference decreased from 1.00 to 5.00 cm with a mean decrease of 2.24 cm (SD 1,06). The recorded weight changes on days 8^{th}-28^{th} ranged between +0,70 kg and -9,20 kg, the average weight loss being 2,59 kg (SD 2,03). Waist circumference changes on days 8^{th}-28^{th} ranged from +7.00 cm to -13.00 cm, with an average decrease of 6.65 cm (SD 3,37). The highest decrease in hip circumference was 12.00 cm in the 8^{th}-28^{th} days period, while the average decrease in hip circumference per adolescent was 5.20 cm (SD 2,98). Statistically significant changes in weight, waist and hip circumference were calculated for the 8^{th}-28^{th} days’ time of intervention ($p<0.001$).

On days 8th and 13th of the intervention an additional body composition analysis was performed measuring the distribution of fat, muscle and visceral fat compared to total body weight. During the 5 days period of face-to-face training camp fat loss ranging from 0.00% to 19.00% was recorded. The mean loss of body fat was 1.85% (SD 3,92). The change in muscle mass ranged from 0.00% decrease to 1.80% increase. On average body muscle increased by 0.36% (SD 0,45). The recorded change in internal fat was from 0.00% to 1.00% loss. On average internal fat decreased by 0.29% (SD 0,46) of total body weight. There was a statistically significant body fat and internal fat loss and an increase in muscle mass when comparing the results of the body composition analysis for the time of days 8^{th}-13^{th} of the intervention ($p<0.001$).

V. DISCUSSION

Dietary behavior: one of the most important risk factors for weight gain is poor dietary behavior [2]. Excessive consumption of sugary, semi-prepared and junk food among children and young people contributes to the deviations in body mass index. A 1.6 times higher risk of obesity or overweight has been shown to be associated with each daily serving of soft drinks consumed above the recommended limit [8]. Eating habits are also a potential risk factor for obesity. The number of eating times per day, the regularity and the length of time spent eating are particularly important variables on the obesity risk scale [9]. The influence of parental behavior on the amount and frequency of eating and the choice of products is also discussed. A significant association has been found between positive changes in children's eating habits and the frequency of meals when all family members are at the table [10,11]. A paper published in 2014 reported on a study involving over 2000 young people attending school [12]. The aim of this study was to investigate the association between the risk of developing obesity and the frequency with which young people eat at the dinner table with family members. The results showed that the more often all family members eat together at the dinner table, the lower the risk of developing obesity after 10 years. Young people who ate with their families 1-2 times a week had a 45% lower risk of obesity at 10 years compared with young people who never ate with their families [12]. These findings are associated with the fact that children of families that eat together consume a fuller diet, more fruit, and vegetables than children in families that eat separately [13,14]. In addition, a lower incidence of eating disorders has been reported in young people who eat more often with the whole family than alone [15]. Another significant finding was found in a study looking at the links between parents with obesity and parents with normal weight behavior and children's level of overeating control. It was reported that parents with normal weight tend to have more control over their food intake than parents with obesity, which is thought to be due to less parental involvement in promoting healthy eating habits [16]. For these reasons, interventions targeting the whole family, rather than just children, are thought to be more effective, especially when aiming to prevent rather than treat childhood obesity [17,18].

Recognizing the importance of healthy eating behavior and parental influence in the prevention of overweight and obesity, the intervention program we presented aimed to develop balanced and wholesome eating habits, to involve children and adolescents in the preparation of food, to promote awareness of the importance of a healthy lifestyle, to strengthen socioemotional skills, and to increase understanding between children and parents.

Family leisure: it is necessary to mention not only the influence of dietary habits, which depend on the child's or young person's family, but also the importance of family leisure activities in the development of overweight and obesity. Weight gain correlates with the ratio of nutrient intake to nutrient consumption [19]. If nutrient intake remains the same or increases while consumption decreases, the risk of developing obesity rises [20]. Good eating habits and sufficient physical activity are important to maintain a good balance between calorie intake and calorie consumption. According to WHO recommendations, moderate to vigorous physical activity of at least 60 minutes per day should be promoted for all individuals aged 3-17 years to maintain a healthy lifestyle [21]. Inadequate time for physical activity and sedentary family lifestyle is associated with an increased risk of obesity in children or young people. This is supported by the results of the American Heart Association's study published in 2018, which illustrated a 1.8 times increased risk of obesity in children and adolescents who engage in passive activity for more than two hours per day [22]. Adolescents, more often than children, are prone to sedentary leisure time and low physical activity [23]. Meta-analyses of prospective studies have shown a linear dose-response relationship between TV viewing and childhood obesity, with a 13% increase in risk for every hour of TV viewing per day [24]. In addition, recent studies have found that eating while watching TV is strongly associated with overweight in childhood and adolescence [25]. Given the research findings, we also included education on the importance and impact of regular physical activity on well-being and prevention of weight gain in the applied intervention program.

Emotional and psychological state: furthermore, the psychological state of the child or adolescent has been linked to a higher risk of developing obesity [26]. Children are particularly susceptible to psychological and emotional stress that affects eating behavior. Children who are stressed tend to eat irregularly, to consume larger amounts of food, and to vary in the length of time dedicated to eating [27,28]. In 2018, Eun Young Lee et al. conducted a study to investigate the causes of students' uncontrollable snacking. It has been found that stress levels correlate with uncontrollable urges to eat, and that children living with obesity who are stressed at school or at home are more likely to have impulsive urges to eat [29,30]. Psychological and emotional stress is a hot topic not only for adults but also for children. The negative emotions that children experience have a significant impact on the way they behave. The tendency of young people to eat irregularly and to spend less time on physical activity is highlighted by stress at school or at home. In our overweight and obesity prevention program, we have emphasized the importance of proper work and rest patterns, emotional hygiene, and mindfulness. The ability to express emotions appropriately and to recognize the effects of stress and tension is a key factor in achieving and maintaining a healthy lifestyle.Many of the risk factors for children living with overweight and obesity can be addressed through interventions at family level. Adjustments in diet, physical activity and psychological state can help to achieve weight loss outcomes effectively. Studies have shown that interventions targeting all family members, or a parent and a child, are more effective than interventions targeting only the child [31–34].

VI. CONCLUSIONS

We assessed the effectiveness of the intervention program by comparing the measurements of weight, waist and hip circumference and results of body composition analysis. After analyzing the results, we are convinced that interventions aimed at changing the family's lifestyle, not just the child's, are effective. The changes in weight, waist and hip circumferences measurements made on intervention day 8^{th} and 28^{th} and comparison of the body composition analysis results between day 8^{th} and 13^{th} were statistically significant ($p<0.001$). Our program is unique because it helps to strengthen the bond between children and parents. We aim to introduce the principles of healthy living into the daily activities of the whole family. We encourage the expression of emotions, the development of self-awareness and the strengthening of bonds between family members. We believe that a comprehensive weight management intervention for the whole family can help to develop skills for a balanced and nutritious diet, a regular physical and strengthen family relations.

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