



Nutrition Status and Health Behaviour among School-Aged Children and Young Adolescents in Republic of Macedonia

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Submission: October 24, 2016; **Published:** November 07, 2016

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Abstract

Nutrition and physical activity education in school-aged children and young adolescents are in the focus of the modern healthcare and education system. The aims of our cross-section study were to estimate the prevalence of obesity in youth, and the significant correlation between nutrition status and health behaviour including dietary habits, physical activity levels and sedentary behavior. The sample size was 400 randomly selected school-aged children and adolescent from 14 to 18 years old. They were divided into two population groups of school-aged children (14-15 years old) and young adolescent (17-18 years). Standardized, non-quantitative Food Frequency Questionnaire (FFQ) and the International Questionnaire for assessment of Physical Activity (IPAQ)- short version, the anthropometric measurements: body weight and height, and body mass index (BMI kg/m²) presented in percentile using the WHO Child Growth Standards were used. Statistical analysis was included descriptive statistics, Pearson Chi-square test and Logistic regression analysis using SPSS Statistics 17.0. In accordance with the distribution of Pearson Chi-square = 16.94 (p<0.001), there was statistical significance between nutrition status of study participants in both, first and second study groups. Also, there was significant difference in high intensity physical/sports activity between two groups (Pearson Chi-square = 26.59; p <0.001). Sedentary behaviour had the highest influence on development of childhood obesity (Wald=2.81; p=0.09). Significant correlation was estimated between obesity and sweetness food (pasta, rice and potatoes), soft drinks, but drinking water had a protective effect. Prevention and treatment of pediatric overweight and obesity require systems-level approaches that include the skills of registered dietitians/nutritionists, sports coaches as well as consistent and integrated messages and environmental support across all sectors of society, especially educational sector. The next step is to develop an innovative "Skills for health" model including nutrition and physical activity education program in Republic of Macedonia.

Keywords: Nutrition status; Diet; Physical activity; Sedentary behavior; School-aged children; Young adolescent; Education

Abbreviations: FFQ: Food Frequency Questionnaire; IPAQ: International Questionnaire for Assessment of Physical Activity; WHO: World Health Organization; BMI: Body Mass Index; LIPA: Light Intensity Physical Activity; MVPA: Moderate-to-Vigorous Physical Activity; METs: Metabolic Equivalents of Task; PALs: Physical Activity Levels; NCDs: Non Communicable Diseases

Introduction

A wide range of studies have confirmed the role of diet and physical activity levels (PALs) in preventing main chronic, non communicable diseases (NCDs) and overweight and obesity as major risk factor for NCDs. Once considered a high-income country problem, overweight and obesity are now on the rise in low- and middle-income countries, particularly in urban settings. One of main reasons is global computerization worldwide as a social phenomenon associated with the nutrition status and health behaviour including dietary habits; physical activity levels (PALs) and sedentary behaviour of school-aged children

and young adolescents. The World Health Organization (WHO) monitoring framework for NCD's points out that research of behavioural, social, economic and political determinants are important to provide guidance for policy legislative and financial measures [1,2].

Combining behavioural, social and medical theories is the most practical approach to develop strategies and programmes for NCD's prevention and health promotion [3]. A large number of NCD's such as cardiovascular disease (CVD), type 2 diabetes mellitus (T2DM) and certain types of cancer are preventable

through modification of several strong causal behavioural risk factors. Extensive research during the last few decades has identified that behavioural factors such as unhealthy diet, inadequate physical activity and tobacco use are the main global targets in prevention of NCD's. A cornerstone is the WHO Expert Report on Nutrition and Prevention of Chronic Diseases from 2002. Based on this background, the World Health Assembly in 2004 adopted the WHO's Global Strategy on Diet, Physical Activity and Health [4]. People's behaviours are significantly influenced by their social and physical environment.

The greatest potential for NCD's prevention and control lies in population-based integrated preventive interventions and health promotion targeting behavioural factors. The WHO HEPA (Health-Enhancing Physical Activity) European network is focused on developing a national strategy and program by publishing European physical activity recommendations, which are adapted locally. It is recognized that balanced nutrition and physical activity are the basic intervention measures in the concept of an integrated approach for NCD's prevention. Republic of Macedonia needs to address growing NCD's epidemic through health promoting partnerships, strategy and program. The first research study on health-risk behaviours among the Macedonian population was carried out in 2002 year [5] using the locally adapted WHO CINDI Health Monitor questionnaire. Evidence has led to initiatives to develop and implement a national intervention program for NCD's prevention and control and health promotion using the WHO CINDI Protocol in Republic of Macedonia with aim to change population behaviour. Nutrition and physical activity education of youth are in the focus of the modern healthcare and educational system [6,7].

From a public health perspective, investments in organized work in the field of food and nutrition education, primarily at the schools and universities are multiple and are returned to the existing policy and community. It is known that education might provide potential cognitive resources which influence the individual's healthy choices. In addition, educational success may forecast future success: better jobs, higher income, good living area, better housing etc. Also, it is known that for families with low levels of income. In 2016 the World Health Assembly welcomed the report of the Commission on Ending Childhood Obesity and its 6 recommendations to address the obesogenic environment and critical periods in the life course to tackle childhood obesity. The Assembly requested the Director-General to develop an implementation plan to guide further action. The aims of our research were to estimate the prevalence of overweight and obesity in school-aged children and young adolescents, and the significant correlation between nutrition status, dietary habits, physical activity and sedentary behaviour. The first goal was to estimate correlation between nutrition status, dietary habits and physical activity, and the second goal was to confirm statistical significance between two experiment groups, physically active and inactive. The specific objective

was to develop an innovative "Skills for health" model including nutrition and physical activity education program in Republic of Macedonia.

Research Methods

The cross-sectional study examined the correlation between overweight and obesity, dietary habits and physical activity levels including sitting time. Standardized, non-quantitative Food Frequency Questionnaire (FFQ) was originally designed to provide descriptive qualitative information about food-consumption patterns [8]. International Questionnaire for assessment of Physical Activity (IPAQ) - short version [9] was used like suitable questionnaire in our national and regional surveillance systems. The anthropometric measurements included body weight and height, and body mass index (BMI kg/m²) presented in percentile using the World Health Organization Child Growth Standards [10]. The total sample was 400 randomly selected school-aged children and adolescent from 14 to 18 years old. They were divided into two experiment groups of school-aged children (14-15 years old) and young adolescent (17-18 years), with equal numbers of both genders: boys and girls, selected by blind choice. They have filled in questionnaires where the questions were divided in three main research fields:

- A. Anthropometric data: body height, weight, body mass index (BMIkg/m²) presented in percentile using the WHO Child Growth Standards;
- B. Food frequency questionnaires (FFQ) of a list of 72 different types of foods and beverages. Data on diet from FFQs are compared with specific disease outcomes like overweight and obesity;
- C. International Questionnaire for assessment of Physical Activity (IPAQ) - short version is able to give estimates of time spent in activities of various levels of intensity, and are able to rank participants in levels of reported activity as well as time spend in sedentary behaviour (≤ 1.5 METs) [11]. IPAQ- short version included light intensity physical activity (LIPA ≥ 1.5 -3 METs) or non-exercise physical activity and moderate-to-vigorous physical activity (MVPA ≥ 3 METs) and vigorous physical activity (VIPA > 6 METs). Physical inactivity also is defined as MVPA ≤ 30 min/day. Statistical analysis was included descriptive statistics, Pearson Chi-square test and Logistic regression analysis using SPSS Statistics 17.0.

Results

Body Mass Index in normal range (BMI =18.5-24.9 kg/m²) was estimated in 79% of all study participants. The prevalence of under nutrition was 4.25%, and the prevalence of overweight and obese was 16.75%. In the first group of 200 school-aged children (14-15 years old), the prevalence of under nutrition was 1%, and 77% had a normal BMIkg/m². 13% were overweight and 9% were obese of all study participants. In the same group, 82.5% vigorous and moderate-to-vigorous physical

activity (MVPA \geq 3METs), and 17.5% were physically inactive (\leq 3METs) with MVPA \leq 30 min/day. In the second group of 200 young adolescents (17-18 years old), the prevalence of under nutrition was 7.5%, and 81% of all participants had a healthy body weight. Also, 7.5% was overweight and 4% was obese of all participants in this group. Nearly 60% of all participants had moderate-to-vigorous physical activity (MVPA \geq 3METs) and 40% time spent in sedentary behavior (\leq 1.5METs) or physical inactivity (1.5-3METs) with MVPA \leq 30 min/day. In accordance with the distribution of Pearson Chi-square = 16.94 ($p < 0.001$), there was statistical significance between nutrition status of study participants in both, first and second study groups.

Significant impact on development of child obesity had sitting time and light intensity physical activity (LIPA \geq 1.5-3METs). Significant correlation was estimated between obesity and sweetness food (pasta, rice and potatoes), soft drinks, but drinking water had a protective effect. Statistical significance was estimated between children obesity and analyzed independent indicators for example level of physical activity including moderate-to-vigorous (MVPA), light intensity physical activity (LIPA), sedentary behaviour and physical inactivity. In accordance with the distribution of Pearson Chi-square = 26.59 ($p < 0.001$) there was significant difference in sports activity with MVPA intensity between two groups. Sedentary behaviour had the highest influence on development of childhood obesity (Wald=2.81; $p=0.09$). The second factor was light intensity physical activity (LIPA) (Wald score = 0.39; $p=0.53$) and the moderate-to-vigorous physical activity (MVPA) has the lowest influence on development of obesity (Wald score=0.000; $p=0.99$). Regarding to nutrition, diet with crisps, sweets and fizzy drinks were positive predicative indicators for children obesity. Drinking more water than fizzy drinks was negative predictive indicator for children obesity.

Discussion

It is known that morbidity and mortality from main NCD's such as CVD, T2DM and certain cancer related to obesity can be prevented by changes in behaviour risk factors associated with the lifestyle of the population, primarily the reduction of unhealthy diet and decreased PALs. Insufficient physical activity is the 4th leading risk factor for mortality. Related to the physical inactivity, the WHO proposed target is 10% relative reduction in prevalence of insufficiently physically active youth and adults aged \geq 18 year by 2025 [1]. Concerning to clinical and epidemiology studies conducted over the past ten years in Republic of Macedonia, results have shown that reduced levels of physical activity were found in 50% of girls aged from 7 to 12 years independent of educational level [12]. The study results conducted in 2012 among 580 Macedonian school-aged children and adolescent with core range, those aged 10-18 years showed that higher income has an impact on the engagement in organized sports activities and a low effect on participating in moderate intensity physical activities such as brisk walking and

running as well as in moderate-to-vigorous activity (MVPA) such as cycling [13].

Also, the results showed that 59% of children and adolescent had moderate or high levels of physical activity such as organized sports activities. Only 28% of them had low level of physical activity, especially girls. From that reason, prevention and treatment of pediatric overweight and obesity require systems-level approaches that include the skills of registered dietitians, sports coaches as well as consistent and integrated messages and environmental support across all sectors of society, especially educational sector to achieve sustained dietary and physical activity behaviour change [7,13]. Secondary prevention should emphasize family-based, developmental appropriate approaches that include nutrition education and dietary counseling including physicians, parenting skills, behaviour strategies including social media [14] and physical activity promotion programs for healthy lifestyle [15,16]. In accordance to the Position statement by the Academy of Nutrition and Dietetics which is in effect until December 31, 2017 [8], the proposed measures are:

- A. To integrate education with supportive environmental change;
- B. To include both, nutrition and physical education;
- C. To build interventions that aimed to involve parents;
- D. To promote community engagement in schools and child care;
- E. To develop and implement policies that limit food availability, especially in schools, because associated with lower body mass index. Also, dose and continuity of nutrition education is important. More intensive interventions show better results. Although including health education in curricula is important, more innovative and "out of the box" messaging and other strategies should be explored, such as novels, social media, and incorporation of health outcomes and consequences into all sectors of society.

Conclusion

The next step is to develop an innovative "Skills for health" model including nutrition and physical activity education program in Republic of Macedonia [17,18]. Youth sports are a significant source of physical activity, contributing 23 to 60% of daily moderate-to-vigorous physical activity (MVPA). Concerning to screen time recommendations for television and computers/computer games, school-aged children and youth should spend no more than 2 hours per day. Interventions targeted at the individual level are not likely to be sufficient in addressing the adolescent obesity epidemic without changes in social norms and the environment [19]. The strength of community-wide programs is to influence the community as a whole so that the desired behaviours are as easy as possible combining leadership with partnership [3].

Conflict of Interest

We declare that any economic interest or any conflict of interest not exists.

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