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Original article

Obesity and chronic diseases prevention among school children: nursing intervention in healthy eating education

Obesity and chronic diseases prevention

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Conflict of interest

Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Abstract. *Objective:* The aim of this research was to explore the food frequency assumption among a sample of school children by assessing nursing interventions in eating education.

Design: A correlation study was performed to assess the effectiveness of nursing education in healthy eating among schoolchildren. *Setting:* Anthropometric parameters were recorded and a Food Frequency Questionnaire was performed by participants and their parents at the enrollment moment (T0) and after six months (T1) from the nursing educational reunion. *Participants:* 33 schoolchildren who attended the elementary school were enrolled after their parents gave their consents to participation. *Results:* Differences between BMI were not significant as well as we consider the sex subgroups. *Conclusion:* Child care contexts provide a salient chance to control children's eating habits in preschool and school age thanks to knowledge of healthy eating lifestyles.

Key Words: Education; Educational Nursing Intervention; Food Frequency Questionnaire; Healthy Eating; Prevention; School children.

Introduction

It is well know that healthy eating plays a significant role in preserving health and avoiding chronic conditions (1,3). Healthy lifestyle could be adequate in the reduction of morbidity and mortality supported in early life and continued in the long term. Children and teens take responsibility on their healthy eating lifestyle.

While youth progress independence is often correlated with unhealthy eating models. Moreover researchers have showed that food assumptions could be reports as a defined number of in terms of limited number of eating arrangements . Most of them have published healthful eating models, which were identified by the assumption of fruit, vegetables and fish (3,4).

Nowadays, the "globesity", especially among the youngest people increasing, so any actions that might promote healthy food facilities merit to be put into consideration (5). Moreover, it has been fully thought that parents had a decisive control on children' s eating actions. Parents were gate caretakers and could help their sons by addressing to well eating ways (6). Accordingly, there was a common recognition of a strong parent-child linking in dietary intakes. Moreover, many environmental and social patterns also induced eating ways and eating actions. So, eating patterns in the youngest people were influenced by several heterogeneous factors and, in addition family' s context played a partial role (3,7). Nowadays, obesity is considered as a persistent condition that is a enduring condition for most people. It is generally distinguished by protracted advancement during the whole of adult life, although in others it is identified by times of weight constancy or brief moment of weight decrease accompanied by recidivism. The cause of obesity is multifactorial. Genetic, surround, metabolic, and attitudinal topics may provide to the growth and increasing of obesity. Moreover, obesity is correlated with usual reasons of morbidity and mortality, such as coronary heart disease (CHO), type 2 diabetes, hypertension, and dyslipidemia. Each of these correlations develops a dose-response association: wherein danger intensifies as the rate of obesity rises (8-10) . As regards obesity to be a latent condition brings significant consequences for the care model adopted. No more than other persistent diseases, obesity is most successfully treated with associated life way behaviors, with pharmaceutical therapy and surgery, in particular subjects. Moreover, obesity, which is defined as a high increase in adipose tissue mass, is correlated with a latent inflammatory condition, characterized by the circulating increase levels of inflammatory markers such as C- reactive protein, interleukin -6 (IL-6), IL-18, haploglobin, MlF, TNFα and PAl-l (3,11,12). The increased production of adipokines reases during the spread of adipose tissue mass in the obese. A particularlity is adiponectin, which has an anti-inflammatory effect. Inflammatory condition in the White Adipose Tissue (WAT) is supposed to be original in the growth of type 2 diabetes and the metabolic syndrome associated to obesity. Nevertheless, there has been little focus on why the increase in adipose tissue mass in the obese should stimulate the inflammatory adipokines proliferation. One probable cause is that is a response to relative hypoxia in clusters of adipocytes distant from the vasculature, inflammation serving to increase blood flow and simulate angiogenesis (13). There is a growing interest in healthy eating in children as a method of preventing chronic diseases. Immoderate weight gained in early childhood is very tricky when it is correlated with the growth of advancing physical, social and psychological diseases addressed to a non-communicable diseases (NCD). Literature shows public health policies worked for a decrease in diet patterns by socio-economic disparities and performed well being food assumption which have a low cost, which could be accessible for everyone. Finally, obese subjects were affected of numerous health problems, such as heart disease, diabetes, and some cancers, which decrease their life expectancy age. Encouraging life expectancy and ameliorating the quality of life of persons might be the topics of public health (14).

Nurses are considered as vital to encouraging well health, thanks their presence in schools. In fact, they are well positioned both to promote healthy eating lifestyle and to influence organizational policies that serve to exacerbate or ameliorate the problem directly with families and authorities. The National Association of School Nurses (NASN) defined school nursing as: "a specialized practice of professional nursing that advances the well-being, academic success, and lifelong achievement of students. To that end, school nurses facilitate positive students responses to normal development; promote health and safety; intervene with actual and potential health problems; provide case management services; and actively collaborate with others to build student and family capacity for adaptation, self-management, self-advocacy, and learning". School nurses promote health behavior and health facilities within schools. School nurses promote healthy food assumption and develop the availability of fruits and vegetables in the school.

Unluckily, obstacles to the improvement of healthy public strategy exist. Environmental and cultural concerns create important obstacles, as causes skepticism about the potential for strategies to promote challenge. Obesity continue to grow despite

continuous suggestions on healthy eating and physical activity. Other obstacles involve the public awareness that obesity is primarily a result or personal frailty and our context, where redundant publicity on fatty and unhealthy food are increasingly tempting to children and families (3,15). Therefore, the aim of this research was to explore the food frequency assumption among a sample of school children and to evaluate nursing interventions in eating education, having more literature resources supporting that healthy eating are needed to help children potentially achieve a healthy weight and prevent chronic diseases.

Subjects and Methods

In all children, Body Mass Index (BMI) were evaluated, by achieving their height expressed in meters (m) and weight expressed in kilograms (Kg) and dividing by the square of the height in meters (Kg/ m^2). Height was assessed by a stadiometer and weight was evaluated by a scale with clothing worn. BMI from all children was plotted on the Centers for Disease Control-United States BMI (CDC-US BMI) growth chart and International Obesity Task Force BMI cut- offs points (IOTF BMI) (CDC Table for Calculated Body Mass Index). Children with BMI values below 5th percentile were considered as underweight, while children with values between 5th and 85th percentile were considered as normal weight and, finally, children with values above 85th percentile were further classified as overweight and obese (16,17).

Anthropometric measures were assessed at the enrollment moment (T0) and after six months (T1).

A Food Frequency Questionnaire (FFQ) was also administered at T0 and at T1. The eating frequency questions were obtained from the evaluation of the existing literature (18-21). To determine the FFQ, a database of the most frequently consumed foods was constructed and the frequencies of the recorded foods were analyzed. Foods were grouped in six high frequency groups which included dairy, meat, cereal, oil and margarine, vegetable and fruits.

Prevalence of food assumption was recorded in nine categories: from more than 6 assumption par day to one consumption par month. The size of the portion of the assumed food was determined by using a food atlas. After the enrollment moment (T0), all participants in the presence of at least one their parents were met to performed their knowledge on healthy lifestyle eating habits. Interventions can perform in children's eating habits correlated with social-environmental factors. Emphasis was given to important rise in fruit and vegetable assumption and in nutrition consciousness in several researches. After six months (T1) a new evaluation of anthropometric measures and the FFQ was performed to assess the importance of the nursing educational intervention.

All data were collected in May 2018 (T0) and in November 2018 (T1).

BMI values were assessed as mean ± standard deviations and t-Student test was performed to assess statistically significance in BMI values and FFQ answers at T0 and at T1, respectively.

Results

A total of 43 schoolchildren were considered to be involved in this study. Therefore, the effective sample is made up of 33 schoolchildren (14 males and 19 females), because the other 10 and their parents did not gave their consent for participation.

The mean age was 9 years ± 5 months. In May 2018 and in November 2018, at the moment of the enrollment and after six months, anthropometric parameters were recorded and a food frequency questionnaire was performed by participants and their parents in order to compare the effectiveness of the nursing educational intervention at T0 and how eating habits change in children during this period. Finally 25 participants were effectively enrolled since they participated in all moments of this research. In fact 8 schoolchildren were not present at T0 moment or at T1 moment then a right comparison was not possible to perform.

Table 1 shows BMI values and FFQ rating answers at T0 and at T1 and statistically significance between values, respectively. Moreover, Table 2 explains differences between the male group (n=9) and the female group (n=16) at T0 and at T1, as concerns BMI values and FFQ rating answers, respectively.

By considering BMI values a minimal reduction was recorded at T1, but it was not statistically significant. Moreover, if we consider BMI differences between male and female differences were not also statistically significant and in the male group BMI values raised at T1, while in the female group BMI values decreased at T1.

As regards meat portions assumption in all participants values increased at T1, but not statistically significant. In the female group meat assumption increased more than the male group, but not statistical significantly.

Also sweet assumption decreased in all participants at T1, more in the male group than in the female group. In this case also differences at T0 and at T1 and between the male and the female group were not statistical significantly.

The same condition was displayed as regards oil and margarine assumption quantities.

A different trend was showed for the dairy group that increased at T1 in all participants, but if we consider the sex differences dairy assumption increased at T1 in the female group, while decreased in the male group. Although differences were not statistical significantly.

The decreased trend was showed also for vegetables and fruits group, both in the all participants and in the male and female groups. Also in this case differences were not statistical significantly.

Finally, as regards cereal assumption it increased at T1, both in the male and in the female group, but it was not statistically significant.

Discussion

Our data showed a very low reduction in BMI values at T1 and an improvement in food assumption, but all differences recorded were not statistically significant.

Maybe an unique meeting between school nurse and parents was insufficient to perform healthy eating lifestyle among parents and their children. Since,current literature (3,22) shows that parents play an important role in the eating habits correction and prevention on childhood obesity. With exaggerated consumption of added sugars and saturated fat, and low intake of high-fiber vegetables and whole grains, the diets of most children today are unsuccessful as regards widespread

Table 1. BMI values and FFQ rating answers expressed in means ± standard deviations and t-test at T0 and at T1 in all participants (n=25).

BMI values and FFQ rating scores	**Means ± stand. dev.**	**p values (*p≤0.05: statistically significance)**
BMI T0 BMI T1	18.57±3.61 18.26±5.07	p=0.790
Meat group T0 Meat group T1	198.15±29.49 201.48±27.27	p=0.581
Sweet group T0 Sweet group T1	41.33±7.45 38.93±9.24	p=0.229
Oil and margarine group T0 Oil and margarine group T1	33.44±8.54 31.67±9.76	p=0.260
Dairy group T0 Dairy group T1	177.41±37.79 178.51±33.25	p=0.833
Vegetable and fruit group T0 Vegetable and fruit group T1	442.96±68.91 438.89±31.06	p=0.742
Cereal group T0 Cereal group T1	208.51±31.06 210.56±28.77	p=0.735

Table 2. BMI values and FFQ rating answers expressed in means ± standard deviations and t-test at T0 and at T1 in male and female participants.

BMI values and FFQ rating scores	Male (n=9) Means ± stand. dev.	p values (*p≤0.05: statistically significance)	Female (n=16) Means ± stand. dev.	p values (*p≤0.05: statistically significance)
BMI T0 BMI T1	18.13±2.69 18.50±3.03	p=-0.388	18.81±4.09 18.12±5.07	p=0.394
Meat group T0 Meat group T1	205±25.60 200.45±23.92	p=0.787	193.44±31.82 202.19±30.11	p=-0.954
Sweet group T0 Sweet group T1	41.27±7.16 37.63±10.34	p=1.896	41.37±7.87 38.81±8.63	p=0.510
Oil and margarine group T0 Oil and margarine group T1	34.00±8.81 31.63±10.75	p=1.376	33.06±8.62 31.69±9.38	p=0.581
Dairy group T0 Dairy group T1	178.18±33.41 173.63±35	p=1.000	176.87±41.59 181.87±32.70	p=-0.609
Vegetable and fruit group T0 Vegetable and fruit group T1	445.45±45.90 437.27±64.05	p=0.626	441.25±61.63 440.00±74.11	p=0.066
Cereal group T0 Cereal group T1	205±31.86 209.54±31.50	p=-0.833	210.94±31.31 211.25±27.78	p=-0.033*

recommendations of the good healthy dietary guidelines promoted by several eating associations. In this way, children are always at risk for developing obesity and diet-related chronic diseases. Early childhood is an ideal time to support the adoption of healthful dietary patterns, as lifelong eating habits are established early. Child care contexts provide a salient chance to control children's eating habits in preschool and school age. The child care context may direct children's dietary intake by supply healthful food and beverages, performing eating habits that inspire healthy selections, and the provision of nutrition education facilities (3,23).

The influence of children parents in prevention and treatment is comprehensible; though, traditional familial positions have started to rearrange. Correlated to 20 years ago, more families have both parents working. As a result, parents may have grown stress and reduced time achievable for cooking and playing with their sons. The time spent in free physical activity is variable among children, but is suggested to be less than if at home with a parent. After time school, most adolescents preferred to spent their time in watching television than in physical activities (2,3,24). Nowadays, a further challenge is that has become more usually for parents to be the primary care supplier in the families that have one parent staying at home with their sons. Given this modification, it is anticipated that the contribution of parents in child weight handling mediations would have also grown. While, parents involvement in family based obesity care programs appears to have significantly reduced from the latest decades (25). Literature promotes the participating in the eating training method, with a focus on eating habits, by causing a synergistic result connecting to embracing of other healthy lifestyle innovations.

Moreover T0 recording data moment was attended in May 2018, at the end of the school year, before the summer pause and T1 moment was indent in November 2018. Maybe the summer pause could influ-

ence eating habits and then our results. For example in the Prosper study(26) the dietary lifestyles of children and the positive effect of eating education were assessed during the school year and results were more significant. Moreover, student enrolled were 1469, and school considered were 51 elementary, middle and high schools. Specifically, the authors included students and their families with a low income. The treatment, titled "Healthy for Life/PE4ME" included nutrition, environment and physical activity dimensions. To improve and assess healthy eating habits the School Health Index (SHI) was used. Nutrition education was implemented into the school by the PE teacher in one year. A registered nurse was engaged, during the same time period, to perform all the results obtained. Course content focused on the relevance of eating a healthy breakfast, increasing the intake of fruits and vegetables and several policies to cook healthy meals, reducing fat and sugar quantities, how to eat out well and how to read a nutrition label. At the beginning of the school year, PE teachers performed six hours of instruction to help student in their program. Data were reported three times throughout the project, specifically: at the beginning, at mid and at the end of the year. Questionnaires were employed to collect data. The first questionnaire explored eating lifestyles in frequency of vegetable, fruit, breakfast, milk and fast food assumptions. The second questionnaire specifically addressed to preschool and elementary school students assessed knowledge of healthy food habits in children: twelve photo on healthy and unhealthy food were showed and asking children to indicate the healthy food. Correct answers were totaled and a score, ranging from 0-12 was given to each participant. Results showed statistically significant improvements in eating healthy choices. Our study was very little since we considered only 25 students, but it was not easily to involve teachers and parents to the idea of the survey.

Moreover, Katz et al. (27) performed an eating educational program with the aim of encouraging children to distinguish between healthy and unhealthy food choices in a variety of categories. A total of 1180 child students from three separate schools were enrolled and randomly assigned to groups. A control group of 552 students and an intervention group of 628 students were identified. The program was carried out by the school's physical education teachers over several sessions. Education regarded food labels and identification the more healthy food choice. Parents were also enrolled in the eating education by sending information home. The treatment focused on findings of nutrition, eating patterns and BMI assessments. The questionnaire adopted to evaluate the nutrition education given was composed from 10 questions on students making an healthful food choice. Data reported a statistically significant increase in eating knowledge. Parents also showed a statistically significant advancement too. Students' eating models were not statistically significant if specific categories of food choices were considered.

Moreover, establishing eating patterns and behaviors in childhood can result in dietary habits that continue through adulthood; therefore, it is becoming increasingly important to educate adolescents on nutrition and healthy eating patterns, such as the importance of not skipping meals. Previously, analysis of nutrition knowledge has largely been focused on child level. It has been demonstrated that there is a deficiency in general nutrition knowledge among when translating nutrition knowledge into food choices and meal frequency. However, now that there are known deficiencies in nutrition knowledge in children, and there is a validated tool to assess knowledge, there is a growing need to determine which education methods are more effective when educating children and their parents on general nutrition (2,3).

In this direction, future studies may address nurses to improve educational nutritional coaching strategies in order to better promote healthy eating habits in children and their families.

Moreover, literature associates childhood obesity conditions with the triggering of stress system, by including the hypothalamic-pituitary-adrenal axis and the arousal/sympathetic nervous systems. In normal conditions, the stress system works in a circadian process and performs with other systems to control different behavioral, endocrine, metabolic, immune, and cardiovascular functions (28). While, an important physical or psychological stress condition or a latent tension, may exacerbate the increasing of several psychological and somatic conditions, as well as anxiety

disorders, depression, obesity, and the metabolic syndrome. In persistent stressed subjects, both behavioral and neuroendocrine mechanisms encourage obesity and metabolic abnormalities: unhealthy habits with dysregulation of the stress system and prolonged release of cortisol, catecholamines, and interleukin-6, with simultaneous increased insulin levels, induced the development of central obesity, insulin resistance, and the metabolic syndrome (29). Early life, childhood, and adolescence are especially susceptible phases of life to the consequences of severe or persistent stress. In the same way, these life ages are important for the afterwards progress of behavioral, metabolic, and immune strangeness.

Moreover, persistent changes in cortisol emission in children may influence the puberty age, final stature, body composition, and cause early-onset obesity, metabolic syndrome, and type 2 diabetes mellitus (30). The knowing childhood obesity preventing metabolic disorders since early age and performing intervention polices of obesity-concerned health question.

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