

An Assessment of Body Composition and Lifestyle in Children Aged from 8 to 10 years

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Abstract

Introduction: The high prevalence of childhood obesity is a public health problem across the world, because it is a risk factor for cardiovascular disease, hypertension, hyperlipidemia and insulin resistance. The aim of this study was to investigate the lifestyle, body composition, and to detect any possible behavioral effects and potential repercussions on the body in children.

Methods: 272 children of two primary schools underwent bioimpedance analysis (BIA) to assess their body composition. Information was also collected about their eating habits, exercise and lifestyle, by means of a questionnaire administered.

Results: The 19% of children were obese and 32% overweight. In the first group, the fat mass constituted 48% of body weight, while in the second 40%. The 52% of females and 64% of males took part in sports 2-3 times a week. At lunch, pasta was the predominant food, mainly with sauce or vegetables, and 63% had a second dish as well. For evening dinner, a main course was the predominant food 95% and was eaten with bread in 61% of cases. The 18% of children did not eat green vegetables, and 61% did not eat fruit. The average daily intake of bread amounted to 80g and that of water to 1 liter.

Discussion: The BMI calculated were in line with those reported in 2014 by the Italian Ministry of Health. The BIA revealed high fat mass, probably correlated to a greater differentiation of the cells into adipocytes, which occurs when excessive food intake happens during the growth phase.

Keywords: Obesity; Body composition; Children; Lifestyle

Introduction and Objectives

Obesity is a complex disorder characterized by an excess of body fat, usually caused by a lack of balance between energy intake and expenditure [1,2]. The World Health Organization has estimated that in 2014, more than 1.9 billion adults were overweight, 600 million of which were obese, and that in 2013, 42 million children under 5 years of age were overweight or obese [3].

The high prevalence of childhood obesity is a public health problem across the world, because it is a risk factor for cardiovascular disease, hypertension, hyperlipidemia and insulin resistance [4-6]. A higher incidence of atopy has also been observed, due to an increase in total IgE, as well as psychological disorders such as anxiety and loss of self-esteem, associated with a low body image, parent distress and being teased at school [6-9]. In order to understand the etiology of overweight and obese children and related disorders, and to develop a tailored primary prevention program, in 2007-2008 the IDEFICS began in Europe (Identification and prevention of dietary- and lifestyle

induced health effects in children and infants). This was a prospective cohort study with an integrated intervention study that involved 16,224 children aged from 2 to 9 years in eight countries (Cyprus, Belgium, Estonia, Germany, Italy, Spain, Sweden and Hungary) [10]. The prevalence of obesity and fatness is higher in populations from southern Europe (Italy, Cyprus and Spain) and groups with lower levels of education and incomes, in which there is a higher intake of unhealthy foods [11,12]. Children's preference for fatty foods and sweets, sugary drinks, low consumption of fruit and vegetables and physical inactivity were found to be the principle obesogenic factors [13,14]. Most children, especially in countries with a higher incidence of childhood obesity (Italy and Cyprus), did not undertake enough physical activity, which should be at least 1 hour per day [15]. Even the building environment of the neighborhood in which they were living had an effect on their movements. Physical activity is favored by the availability of public open spaces, maintenance of roads and buildings and by efficient public transport [16].

In Italy, eating habits have changed over the last fifty years: the consumption of fruit, vegetables, legumes, whole grains and extra virgin olive oil has decreased, whilst that of energy-dense, sugary foods, salt and added fats has increased [17]. In 2007, the Italian

Ministry of Health promoted the initiative "Okkio alla SALUTE" in primary schools, which was the first national survey to estimate the prevalence of overweight and obese children, and gathered information about diet, physical activity and the role of families and schools. Data presented in 2008 and later in 2010, 2012 and 2014, denounced the high rates of obesity and overweight, particularly in southern regions, where values exceeded 40%. It is favored by physical inactivity, an unhealthy diet and parents with a low educational attainment level, who were often found to have no real idea about their children's appearance [18–20]. The 2014 data showed an increased involvement of schools in education on correct lifestyles, but the persistence of bad eating habits, which produced only a slight improvement on 2008 values [21]. This study examined the lifestyle and body composition of children aged between 8 and 10 years in Marcanise, a small town in Campania, the region with the highest percentage of childhood corpulence and obesity, to detect possible behavioral mistakes and potential repercussions on the body.

Materials and Methods

In this study were enrolled 272 children (131 M and 141 F) attending classes IV and V of two primary schools in Marcanise, a small Italian town in the Campania region.

Each subject had a normal physical examination and met the following inclusion criteria: no medication or nutritional supplements with the exception of vitamins, and minerals.

The parents of participants were provided with both written and oral information regarding the study protocol and were ensured that they were free to withdraw from the study at any time. All subjects gave their written informed consent before participation. All procedures conformed to the directives of the Declaration of Helsinki. The study was approved by the Human Ethical Review Committee of Second University of Naples.

Body weight and height were measured using standard techniques. The BMI was calculated as body weight/square of height (kg/m^2). Body composition was determined by conventional Body Impedance Analysis (BIA) with a single-frequency (50 kHz) bioelectrical impedance analyzer (BIA 101 RJL, Akern Bioresearch, Firenze, Italy), according to the standard tetrapolar technique, with the subject in supine position and the electrodes placed on the dorsal surface of right foot and ankle, and right wrist and hand. Subjects were asked to refrain from strenuous exercise during the 3 days preceding the measurements. After overnight fasting, they were invited to empty the bladder before being evaluated; furthermore they did not have to drink four hours before undergoing the examination. Body composition was then calculated by bioelectrical measurements and anthropometric data using the software provided by the manufacturer, which incorporated validated predictive equations for total body water, fat mass and fat free mass [22–24].

All parents completed a self-assessment questionnaire that investigated routine for eating (frequency of intake of different foods and the type and number of meals made during the day), physical exercise (type and frequency of sport) and lifestyles (hours before TV and video games, frequency of playing outdoors, means of transport to get to school) of their children. In addition, the questionnaire investigated the possible presence of family members who were

overweight or obese, the parent's physical activities, and their perception of their child's body shape [25].

Statistical analysis

The R Project for Statistical Computing software (version 3.1.0) was used for statistical analyses. Means and SDs were calculated for each of the analyzed variables and statistical significance was set at $p \leq 0.05$. The Shapiro-Wilk test was used to verify the normal distribution of variables. The significance of the data was verified by the Student's T-test.

Results

The body mass index was compared with SIEDP-2006 [26] growth charts. The 32% of children (38% M 27% F) were overweight with a BMI between the 85th and 97th percentile, and 19% (22% M 16% F) were obese with a BMI above the 97th percentile. In the first group, the fat mass measured with BIA constituted 40% of body weight (M 39% and F 41%), whilst in the second it constituted 48% (Figures 1 and 2).

The parental perception was very different from reality, as according to them, only 18% of the children were overweight and 7% obese (Figure 3). Only 30% of parents took part in sports; whilst amongst the children, 52% of females and 64% of males took part in sporting activities 2–3 times a week. The most popular sports were football (30%), boxing (25%) and swimming (17%) for males and dancing (53%), swimming (16%) and volleyball (15%) for females (Figure 4).

There were significant differences in lifestyle and eating habits between males and females. The children spent two hours per day watching TV, and videogames were found to be the dominant form of entertainment. 71% went to school by car, although the average distance was equal to 1.4 km. This decreased to 400 m in 25% of pupils who went on foot. 90% of children had breakfast and in 74% of cases, this was found to be milk. It was taken with biscuits or cereals in 40% and 18% of cases, respectively (Figure 5).

At school, only 5% ate healthy foods like fruit or yoghurt, but they preferred sandwiches (45%) and cakes (33%) (Figure 6). Although in the afternoon, the percentage of children eating fruit or yogurt increased to 33%, 45% preferred cakes, sandwiches or cookies (Figure 7). The 18% of children did not eat vegetables, 43% eating them once a day and 41% twice a day. 61% of children did not eat fruit, 19% eating it once a day and 20% twice a day (Figure 8). At lunch, pasta was the predominant food (97%), mostly with sauce or with vegetables (2 times per week), followed by rice (1 time per week) and pasta with vegetables (every 10 days), whilst the average intake of minestrone or soups dropped dramatically to 2 times a month. At lunch, 63% had a second helping, and 27% ate bread. Only 8% ate pasta for dinner, whilst the main course was the predominant food (95%), taken with bread in 61% of cases. Amongst the main courses, white meat and sausages were eaten most frequently (2 times per week), followed by red meat, cheese and eggs (1 time per week), then pork and fish (every 10 days). On average, the children ate pizza and/or sandwiches as fast food once a week, and carbonate and sweet drinks 3 times a week (Figure 9). The average daily intake of bread amounted to 80g, and that of water was 1 liter.

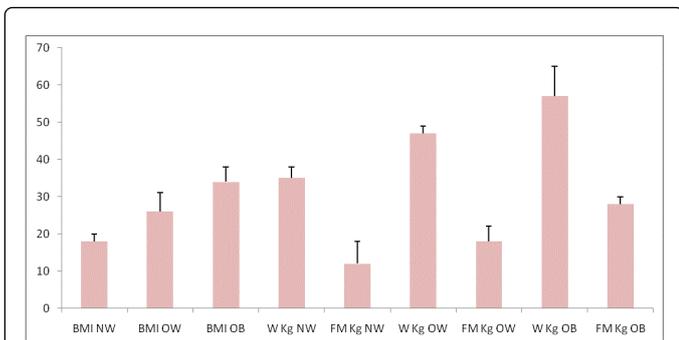


Figure 1: Mean and standard deviation of Body mass index (BMI), weight (W), and fat mass (FM) in normal-weight (NW), over-weight (OW) and obese female children.

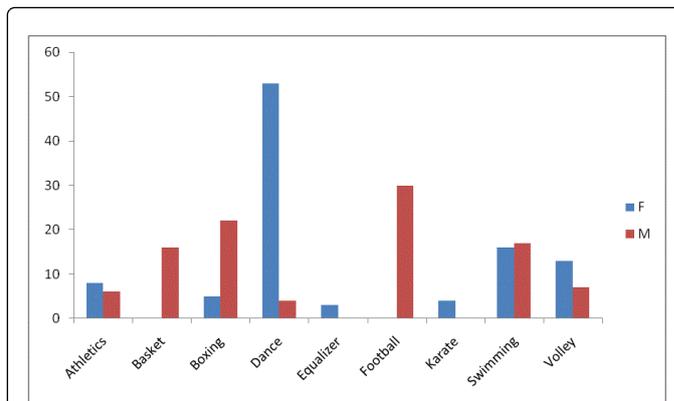


Figure 4: Kind of sport practiced by the 52% of the females and by the 64% of males.

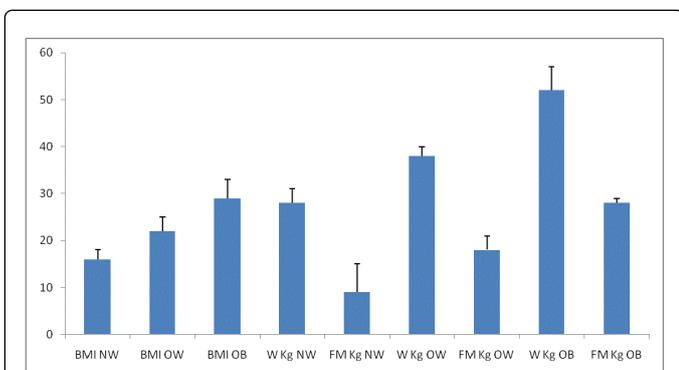


Figure 2: Mean and standard deviation of Body mass index (BMI), weight (W), and fat mass (FM) in normal-weight (NW), over-weight (OW) and obese male children.

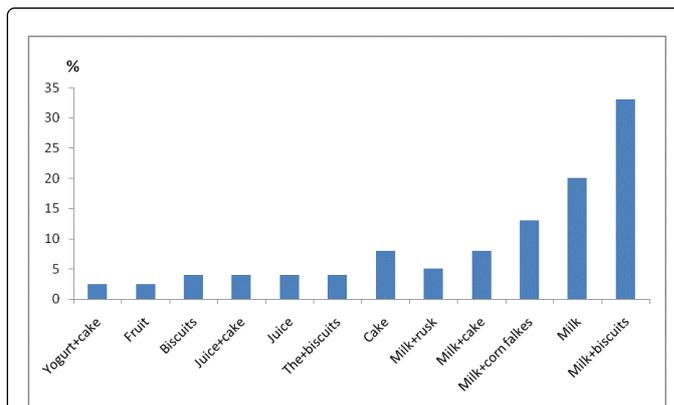


Figure 5: Breakfast intake in percentage.

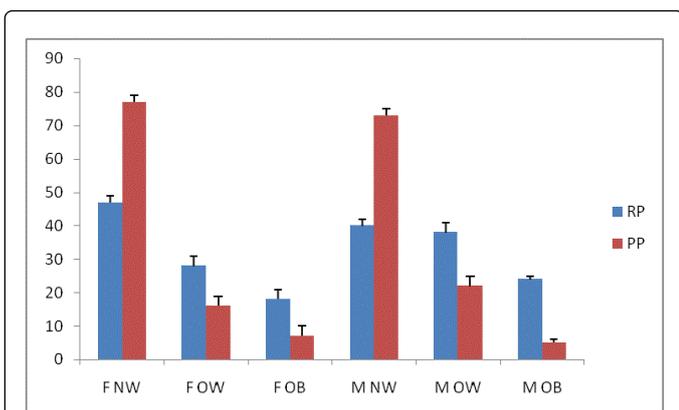


Figure 3: Differences (men and standard deviation) between the real percentage (RP), and the parental perception (PP), of female normal-weight (F NW), female over-weight (F OW), female obese (F OB), male normal-weight (M NW), male over-weight (M OW), male obese (M OB).

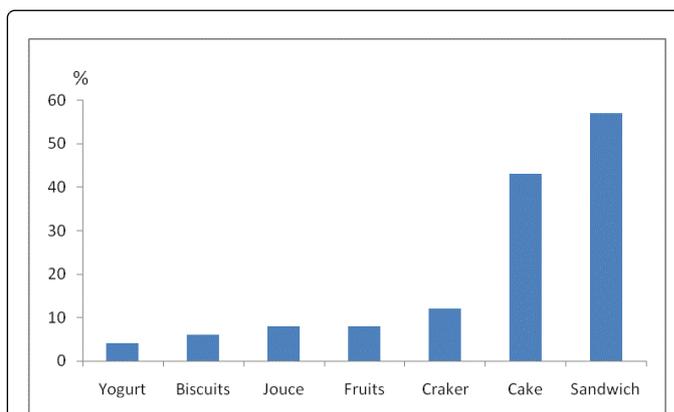


Figure 6: The mid-morning snack intake in percentage.

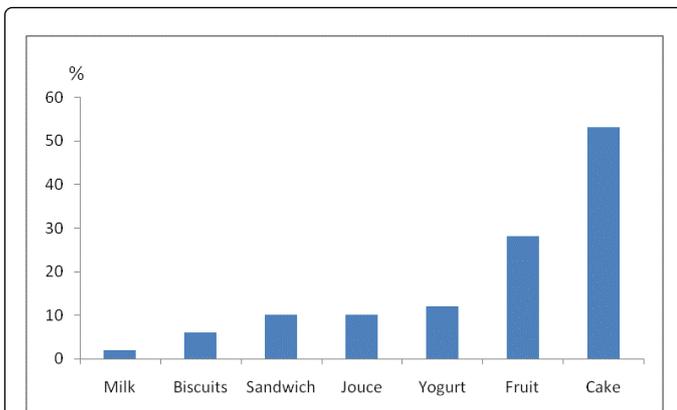


Figure 7: Mid-afternoon snack intake in percentage.

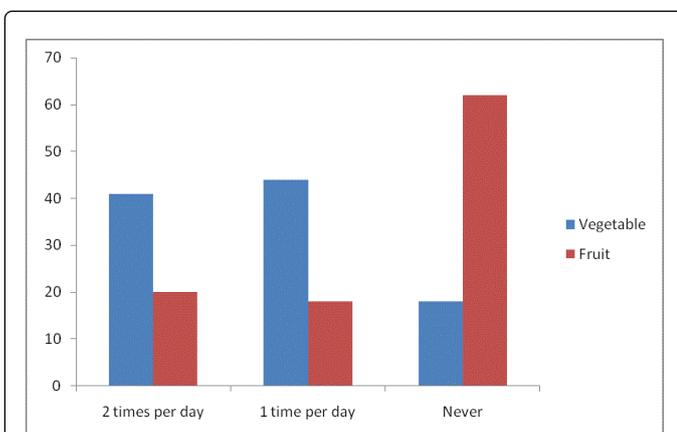


Figure 8: The percentage of intake of vegetable and fruit.

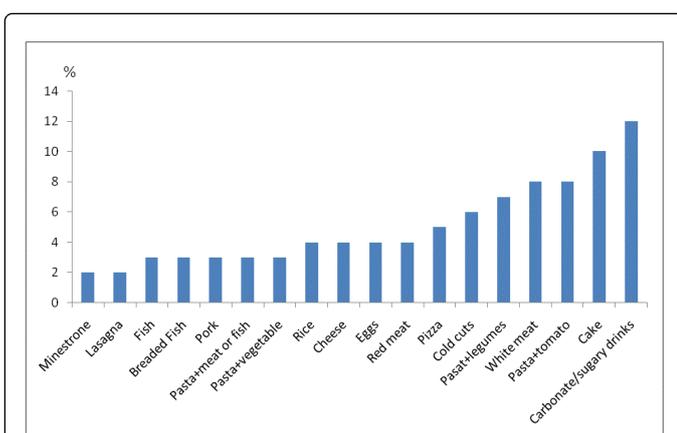


Figure 9: Monthly frequency of intake of the most eaten dishes.

Discussion

If the highest number of overweight males are excluded, BMI calculated were in line with those reported in 2014 by the Italian

Ministry of Health. However, the BIA revealed however, quite alarming fat mass values, probably correlated to a greater differentiation of totipotent cells into adipocytes, which occurs when excessive food intake happens during the growth phase. The questionnaire administered disclosed the fact that sedentary behaviour was associated with the frequent intake of high calorie foods. Children did not eat enough fruits and fish, while the amounts of meats, sweets, soft drinks and bread was excessive. 3 out of 4 children examined brought high energy foods to school, which were high in sugar, salt and added fats, and the same was true of their mid-afternoon snacks. Children were also found to walk too little, spend too much time watching TV and preferred videogames to playing outdoors. Despite the efforts of schools to educate their pupils towards a healthier lifestyle, bad eating habits persist. And this is a problem that concerns the whole of Europe, where the primary prevention program promoted for two years by the IDEFICS was unsuccessful [27-29]. A recent review [30] confirmed this observation, demonstrating low intakes of fruits and vegetables in most American, European and Australian studies, between 2 and 3 portions per day which are well below the recommended five portions. This target value of five portions should consider the age of the child, that is, the appropriate amount of fruits and vegetables depends on the energy needs, where for example, a young child should eat more than 200 g per day [31]. The fact that 44% of children who are overweight, and 63% of those who are obese are perceived as normal by their parents shows that the root of the failure was insufficient awareness of the problem within the family, resulting in insufficient collaboration in the program to re-educate their children toward a healthier lifestyle [26,32-35]. We therefore stress that activating direct intervention plans with families is a basic condition to reduce the high incidence of obesity and related diseases.

Several lifestyle factors are described as behavioural contributors to childhood obesity [36-38], which are often associated with each other. Regarding intervention targets, the literature typically deals separately with these factors. The advantage of combining the most important lifestyle factors in a compliance score may provide a more holistic view: complying with certain aspects of lifestyle message to improve the quality of family life and the newly developed quality of life score has not been directly shown. But as the quality of life score used in this paper contains a module characterising the quality of family relations, we are quite confident that its use is valid for indicating the key message with respect to an improved quality of family life. The compliance of young children to health-behaviour recommendations was very low and should therefore be improved, preferably via those actors who can serve as a role model, mediator for the different lifestyle aspects or nutritional gate-keeper for the children.

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