

# Monitoring of Excess Body Weight in Children in the Emergency Department of a Tertiary Pediatric Hospital in Bucharest, Romania

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## ABSTRACT

**Introduction:** Excess body weight in children has become a public health issue in most countries. The aim of our study was to determine the prevalence of overweight and obesity in children over two years of age who presented at the Emergency Department of a tertiary pediatric hospital in Bucharest, Romania.

**Methods:** Between July and August 2018, we conducted a prospective study among children who presented at the Emergency Department of "Alessandrescu-Rusescu" National Institute for Mother and Child Health, Bucharest, Romania. We collected data on weight, height and blood pressure classified by age and gender.

**Results:** A total of 335 children aged 2 to 18 years were included in our study. A quarter of them had above normal body mass index values, 7.5% were overweight and 18.5% obese. Also, when measuring blood pressure, we observed increased values in 29.3% (n=98) of them. Among children with excess body weight, nearly a half (49.4%, n=47) had higher than normal blood pressure values.

**Conclusions:** We identified an increased prevalence of obesity in children and adolescents in the last decade. Given that the effects of this condition are not limited to childhood, urgent measures are needed to curb this trend. Both healthcare providers and non-medical members of the society should be involved in promotion of a healthy lifestyle.

**Keywords:** obesity, hypertension, children, emergency department.

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## INTRODUCTION

**O**besity in children and adolescents has become a public health problem in most countries around the world in the last decades (1). Recent estimates suggest that approximately 17% of children between ages of 2 and 19 years are obese (2), and the prevalence of high blood pressure (HBP) for the same age range is now approaching 4% (3). Body weight and blood pressure (BP) are closely correlated, and studies have shown a directly proportional link between increased HBP prevalence and elevated body mass index (BMI) in children (4).

Childhood overweight is a very common problem in high-income countries, but it has also spread to low and middle-income areas (5, 6). A number of factors, including genetic predisposition, socio-economic, psychological, and environmental factors (pollution, lack of green spaces), inadequate nutrition and reduced physical activity contribute to overweight (7, 8). Childhood obesity frequently persists into adulthood, with a rate of up to 80% (9). The same trend was observed for hypertension in children (10).

The aim of our study is to determine the prevalence of obesity in children over two years of age who presented at the Emergency Department of a tertiary pediatric hospital in Bucharest, Romania. □

## METHODS

**W**e conducted a prospective study to monitor the BMI of children aged 2 to 18 years who presented at the Emergency Department of "Alessandrescu-Rusescu" National Institute for Mother and Child Health (NIMCH), Bucharest, Romania, between July and August 2018. NIMCH is the tertiary children's hospital of the second district of Bucharest and Pipera-Voluntari suburban area, with more than 45.000 pediatric outpatients per year. The second district of Bucharest is a metropolitan area of about 70 square km with a population of nearly half a million inhabitants.

In our study we included cooperant children aged between 2 and 18 years. They belong to a group of low severity pediatric emergencies (white, blue or green in Romanian national triage

codes) (11). Major emergencies, with a yellow or red triage code, were excluded, because BP values could have been affected. Uncompliant and agitated children and those with multiple injuries or burns were excluded too. For each participant of this study, a written parental consent was obtained.

Data collected by us included age, sex, weight, height and BP value.

The Centers Disease Control (CDC) recommended calculator (<https://www.cdc.gov/healthy-weight/bmi/calculator.html>) for children and adolescents was used to correctly determine the BMI. Children with a BMI value lower than the 5<sup>th</sup> percentile were considered underweight, those between the 5<sup>th</sup> and 85<sup>th</sup> percentiles were considered normal weight, overweight children had BMI values above the 85<sup>th</sup> but below the 95<sup>th</sup> percentile, and obesity was defined as BMI values greater than or at least equal to the 95<sup>th</sup> percentile (12).

Blood pressure measurement was performed using Edan iM60 electronic devices (Edan, USA). During the BP measurement procedure, the child was at rest, in a comfortable sitting position. Cuffs corresponding to the size of the children's arm were used. *Per protocol*, an optimal width covered at least 40% of the circumference and optimal length was at least 80%, up to 100% of the circumference of the arm (13).

The analysis of blood pressure values was made using the European Guide of the Hypertension Society, based on the percentiles for BP values by sex, age and height (14).

Statistical analysis was performed using IBM SPSS Statistics for Windows, version 25 (IBM Corp., Armonk, NY, USA). The level of statistical significance was set at  $p < 0.05$ . □

## RESULTS

**A** total of 335 children were included in the study, with a median age of the study group of 6.9 years (IQR: 4.2-9.8): 111 preschoolers (2-5 years), 171 schoolchildren (5-12 years) and 53 adolescents (12-18 years) (Table 1). The distribution by sex was balanced, with a slight predominance of males (56.4%). Regarding the type of emergency, most of the children (252, 75.2%) presented with non-emergency pathologies [white (25 children), and blue (227 children), triage code], whereas 24.8% (83) presented for minor emergencies (green triage

code). Most patients were normal-weight (n=204, 60.9%), and 87 (26.0%) children had elevated BMI values, being overweight (n=25) or obese (n=62) (Table 1). A percentage of 29.3% (n=98) of children had BP values above the 95<sup>th</sup> percentile. The presence of high blood pressure values or obesity were not statistically correlated with the patient's gender (Table 2).

High blood pressure values measurements were not statistically correlated with the patient's age (p=0.248, U=1 0682.0), while obese or overweight children had a median age of older than normal or underweight: 7.8 years (IQR: 5.3-10.2) vs. 6.5 years (IQR: 3.8-9.7), p=0.048, U=9 252.5, r=0.1.

Among overweight or obese children, 49.4% (n=47) had higher than normal values of blood pressure. This was statistically associated with a 3.4-fold higher risk of children with increased BMI of having high blood pressure values, p<0.001,  $\chi^2=23.10$ , OR=3.4, 95% CI 2.04-5.74. □

### DISCUSSIONS

This study presents a brief analysis of the prevalence of obesity in children over two years of age who presented for various acute

conditions in the Emergency Department of "Alessandrescu-Rusescu" NIMCH, Bucharest, Romania.

We identified an increased prevalence of children with high BMI, a quarter of whom were overweight (7.5%) or obese (18.5%). These data are worrying, considering that a study started in 2010 and published in 2015, on 1 108 children between 6-18 years old from Romania, identified an obesity rate of 10% (15). At the same time, this trend has been observed in almost every single European country, where the prevalence of overweight and obesity has considerably increased lately, with one in three children having a BMI above the normal limit (16, 17). The prevalence of obesity identified by us is equal to that reported for the United States (18.5%), which corresponds to over 13.7 million obese children and adolescents in this country (18). However, in our study the prevalence of obesity in the age group 5-12 years was much higher than in adolescents (22.8% vs. 15.1%) compared to the US, where the prevalence of obesity was higher in adolescents (18.4% vs. 20.6%) (18).

Particular attention should be paid to the high rate of overweight and obese children under five years of age. While a percentage of 8% of children

**TABLE 1.** Characteristics of patients by age categories

	<b>Preschoolers (2-5 years old), n=111</b>	<b>School children (5-12 years old), n=171</b>	<b>Adolescents (12-18 years old), n=53</b>	<b>Total</b>
Gender				
Male	68 (61.3%)	93 (54.4%)	28 (52.8%)	189 (56.4%)
Female	43 (38.7%)	78 (45.6%)	25 (47.2%)	146 (43.6%)
Underweight	19 (17.1%)	19 (11.1%)	6 (11.3%)	44 (13.1%)
Normal weight	69 (62.2%)	101 (59.1%)	34 (64.2%)	204 (60.9%)
Overweight	8 (7.2%)	12 (7.0%)	5 (9.4%)	25 (7.5%)
Obesity	15 (13.5)	39 (22.8%)	8 (15.1%)	62 (18.5%)
HBP*	37 (33.3%)	50 (29.2%)	11 (20.8%)	98 (29.3%)

**TABLE 2.** Characteristics of patients by gender

	<b>Female, n=88</b>	<b>Male, n=97</b>	<b>Statistical analysis</b>
Overweight/ Obesity, n=87	40 (46.0%)	47 (54.0%)	p=0.601, $\chi^2=0.27$ , OR=0.88, 95% CI 0.54-1.43
HBP*, n=98	48 (49.0%)	50 (51.0%)	p=0.200, $\chi^2=1.64$ , OR=0.73, 95% CI 0.46-1.18

under five years obese or overweight (19) was reported in Romania in 2002, we identified an increase of 20.7%. Our results were comparable to those from European studies, which identified rates of up to 28.6% in this age group (under five) (20).

Depending on gender, the share of overweight or obese boys was higher, but without a significant difference compared to girls. This trend has been observed in most studies of childhood and adolescent obesity (15, 16).

Childhood obesity has become a real public health issue, because the effects of excess weight have an important impact on the individual from the beginning of life. Thus, in many studies, childhood obesity has been associated with cardiovascular disease, increased insulin resistance and type 2 diabetes, dyslipidemia, hepatic steatosis, sleep apnea syndrome, orthopedic problems, but especially social and psychological problems, school isolation, low self-esteem and even suicide, especially among older schoolchildren and adolescents (16, 21).

Most children maintain excess weight in adulthood, increasing the rate of morbidity and complications due to obesity (9). Although there are a number of factors that predispose to obesity since childhood, diet and lack of physical activity seem to play a key role (22). Early interventions to control childhood obesity are often difficult to do, because most parents do not recognize the problem until it worsens significantly. A whole series of parental perceptions that reflect a very high tolerance for overweight is summed up in the Romanian popular expression "fat and beautiful". Romanian doctors are not prepared to have a high rate of suspicion for the early diagnosis of overweight, nor do they have the support of health systems to provide the necessary care for an obese child. Under these conditions, social media can play an important role in raising awareness of the impact that overweight has on children's health. For example, in our country, in a large group dedicated to parents, Spitalul Virtual pentru Copii (SVC)<sup>®</sup>, through the information published in a simple and explicit way, an attempt is made to raise awareness about children's health problems. The impact of the information presented in the SVC has been quantified several times as positive among parents (23, 24). A recent overweight post in SVC had over 70,000 views and over 600 comments and reactions (25). There-

fore, social media can be considered as an effective tool of approaching the increase of overweight. Such a strategy is simple, inexpensive and sustainable. It requires only the active involvement of doctors, health system representatives and communication experts.

Obesity is a determining factor in the occurrence of hypertension in children. We measured the BP of the children included in the study, and 29.3% of them presented elevated values. This rate is higher than the average value from studies in other countries (3, 26). This aspect could have a bias coefficient due to BP measurement in patients who presented to hospital with acute illness. In a recent meta-analysis, Hanevold showed that about half of children presented white coat hypertension when the measurement took place in a medical environment (27). However, taking into account the previous statement, the HBP rate in our study group remains alarming. At the same time, the low prevalence of hypertension in children in other studies may also be due to the fact that measuring BP in children is not a routine in Emergency Departments (3).

In our study, we showed that overweight or obese children had a 3.4 higher risk of associating an elevated BP value. This observation has been highlighted since the early 2000s, when Must and colleagues showed that 25% of obese children aged 5 to 11 years had HBP (28). The Bogalusa study revealed that overweight adolescents were eight times more likely than thin adolescents to associate with HBP that persists into adulthood (29). This observation has led to further studies showing that obese adults who were overweight or obese in childhood had an even higher risk of HBP than obese adults who had a normal weight as children. This may suggest that childhood adiposity has a lasting effect on the risk of HBP, even after normalizing BMI (30).

The small group of patients included in current study, the conditions of potential discomfort induced by the hospital environment in the Emergency Department, but also by mild acute illness, as well as the lack of dynamic measurements of BP values, represent some of the limitations of our study. □

## CONCLUSIONS

In our study we identified an increased prevalence of obesity in children and adolescents,

comparable to the situation in other European countries. Moreover, we noticed a trend of these children to present higher blood pressure values. The proportion of obesity registered a tendency to double in the last decade in Romania. As the effects of these pathologies are not limited to childhood and continue to increase the risk of complications in adulthood, urgent action is needed on the part of healthcare professionals, parents and other members of society

(communication experts, local authorities, teachers, etc.) to promote a healthy lifestyle. Parental and physician's awareness could be increased via social media tools. □

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