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STUDY ON THE INCIDENCE OF EXCESS WEIGHT IN URBAN AREA SCHOOLCHILDREN AT PUBERTY

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Abstract: *The research departs from the premise that excess weight in urban area schoolchildren at puberty can influence the growth and development of the organism which results is a large number of obese children evolving into obese adults.*
The aim of the research is to verify whether the number excess weight cases in urban area schoolchildren, justifies the adoption of measures to diminish their frequency. A study was carried out, in relation with the Body Mass Index (BMI), on puberty age school children from urban areas. The obtained results proved that the number of excess weight and obese schoolchildren increasing compared to previous researches. The research showed that from a total of 757 measured schoolchildren only 55.75% indicate normal BMI values, 33.03% are overweight and 1.31% (7 boys and 3 girls) have different degrees of obesity.

Keywords: *excess weight, schoolchildren, urban area, puberty.*

1. Introduction

Excess weight is defined as a 10% value above the ideal weight of an investigated individual while obesity occurs whenever the ideal weight is exceeded by 15-20% [3, 6].

The ideal weight is the value that corresponds with the largest life expectancy and depends on a multitude of factors such as: stress, marital status, gender, age of subject. It also correlates with a minimum rate of mortality [3, 6].

Body overweight is defined as the excess of adipose tissue accumulated by the organism which results in an weight increase [3, 6].

Obesity is the excess of adipose tissue accumulated by the organism that is associated with increased morbidity and mortality [3, 6].

The frequency of overweight cases is increasing and this phenomenon represents an important health issue involving increased risks of metabolic and

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cardiovascular complications. Obesity is perceived as a social stigma considering the fashionable figure modelling diets which are mainly aimed at short term body weight loss. However, long-term objectives cannot be attained since this involves major health problems for those who pursue such diets [2, 6, 7].

2. Material and method

In order to show the frequency of excess weight in puberty age schoolchildren from urban areas, between 20 Nov. and 20 Dec. 2010 we conducted a study within General Schools 11, 13, 15 and 30, from Braşov Municipality.

The measurements on schoolchildren's weight and height indicators provided the primary data for determining: Body Mass Index, Ideal Weight and Excess Weight in V – VII grade schoolchildren. The measurements were conducted in sports halls, with the support of specialty teachers from the mentioned schools (Table 1 and 2).

Measured indicators – schoolgirls aged 11 – 14 Table 1

Age (years)	Measured indicator	X^-	σ	C.v. (%)	W	±m	Extreme values		Frequency (%)	
							Upper lim.	Lower lim.	$<X^-$	$>X^-$
11	**Height (cm)**	148.95	8.17	5.48	41	0.81	129	170	42.72	57.28
12		156.27	7.06	4.52	35	0.74	140	175	41.94	58.06
13		158.49	7.04	4.44	35	0.73	141	176	48.94	52.06
14		161.44	5.61	3.48	27	3.48	146	173	48.00	52.00
11	**Weight (kg)**	44.04	11.95	27.14	60	1.18	29	87	56.31	43.69
12		51.96	14.52	27.94	72	1.51	31	103	49.46	50.54
13		51.07	9.66	18.91	48	1	32	80	53.19	46.81
14		55.71	9.15	16.42	44	1.06	34	78	53.33	46.67
11	**BMI (Kg/m^2)**	19.7	4.5	22.82	22.57	0.45	13.23	35.8	62.14	37.86
12		21.24	5.1	23.99	25.28	0.53	14.03	39.31	43.01	56.99
13		20.26	3.05	15.06	15.16	0.32	14.61	29.77	52.13	47.87
14		21.33	3.39	15.89	16.3	0.39	14.16	30.46	52.00	48.00
11	**Percentile (%)**	50	19.73	39.45	99.02	1.95	99.51	0.49	48.545	48.545
12		50	19.94	39.89	98.92	2.08	99.46	0.54	48.385	48.385
13		50	19.91	39.81	98.94	2.07	99.47	0.53	50.00	50.00
14		50	20.51	41.02	98.66	2.39	99.33	0.67	49.33	50.67
11	**Ideal Weight (kg)**	45.04	7.37	16.36	36.99	0.73	63.99	27	49.51	50.49
12		51.72	6.35	12.28	31.5	0.66	68.58	37.08	52.69	47.31
13		53.81	6.34	11.78	31.5	0.66	69.57	38.07	53.19	46.81
14		56.57	5.05	8.93	24.3	0.59	66.96	42.66	53.33	46.67
11	**Weight excess (%)**	9.77	2.02	20.65	10.13	0.2	16.93	6.8	59.22	40.78
12		10.05	2.28	22.67	11.3	0.24	18.11	6.81	69.15	30.85
13		9.48	1.34	14.09	6.64	0.14	13.69	7.05	51.07	47.87
14		9.84	1.54	15.66	7.42	0.86	14.12	6.7	52.00	48.00

Measured indicators – schoolboys aged 11 – 14 Table 2

Age (years)	Measured indicator	X^-	σ	C.v. (%)	W	±m	Extreme values		Frequency (%)	
							Upper lim.	Lower lim	$<X^-$	$>X^-$
11	**Height (cm)**	147.19	7.77	5.27	39	0.75	130	169	45.37	54.63
12		154.55	8.08	5.23	40	0.85	139	179	49.45	50.54
13		160.53	7.24	4.51	36	0.75	142	178	40.43	59.57
14		167.18	8.18	4.9	41	0.83	144	185	42.42	57.58
11	**Weight (kg)**	42.49	10.16	23.91	51	0.98	25	76	56.48	43.52
12		50.11	12.73	25.4	63	1.34	31	94	53.85	46.15
13		52.67	12.07	22.92	60	22.92	35	95	56.38	43.62
14		60.31	17.17	28.46	86	1.74	34	120	51.51	48.49
11	**BMI (Kg/m^2)**	19.33	3.09	15.99	15.52	0.3	13.36	28.88	57.41	42.59
12		20.89	4.16	19.91	20.59	0.44	13.96	34.55	57.14	42.86
13		20.28	4.005	19.95	20.11	0.42	14.81	34.92	59.57	40.42
14		21.49	5.03	23.43	25.22	0.51	14.91	40.13	59.59	40.41
11	**Percentile (%)**	50	19.74	39.47	99.08	1.91	99.54	0.46	50	50
12		50	19.98	39.96	98.9	2.11	99.45	0.55	50.55	49.45
13		50	19.91	39.81	98.94	2.07	99.47	0.53	50	50
14		50	19.76	2	39.51	98.98	99.49	0.51	49.5	49.49
11	**Ideal Weight (kg)**	43.72	7.01	16.03	35.19	0.68	63.09	27.90	50.93	49.07
12		50.17	7.27	14.49	36	0.77	72.18	36.18	54.95	45.05
13		55.65	6.51	11.7	32.37	0.68	71.37	38.97	48.94	51.06
14		61.73	7.37	11.93	36.9	0.74	77.76	40.86	46.46	53.54
11	**Weight excess (%)**	9.67	1.4	14.18	7.03	0.28	14.32	7.29	58.33	41.67
12		9.95	1.97	19.76	9.73	0.21	16.59	6.86	50.55	49.45
13		9.43	1.8	19.07	8.94	0.19	15.92	6.98	63.83	36.17
14		9.75	2.14	21.94	10.71	0.22	17.92	7.21	61.62	38.38

The indirect determination of excess weight was obtained based on Body Mass Index (BMI) and calculated through the formula: $IMC=G/I^2$ the result being expressed in kg/m^2. The World Health Organization provides following BMI values [2, 4, 6, 7]:

- Underweight $<18,5$ kg/m^2
- Normal $18,5 – 24,9$ kg/m^2 → reduced mortality rate
- Overweight $25,0 – 29,9$ kg/m^2 → risk of metabolic and cardiovascular complications
- Obese $< 30,0 – 34,9$ kg/m^2 → moderate obesity

$35,0 – 39,9$ kg/m^2 → severe obesity

> 40 kg/m^2 → morbid obesity.

The advantage of determining the BMI is that it can be calculated with respect to the subject's height. Its disadvantage consists in the fact that it cannot provide a differential diagnosis between the increase of weight also as a consequence of fluid retention or the excess of adipose tissue [3, 4, 7].

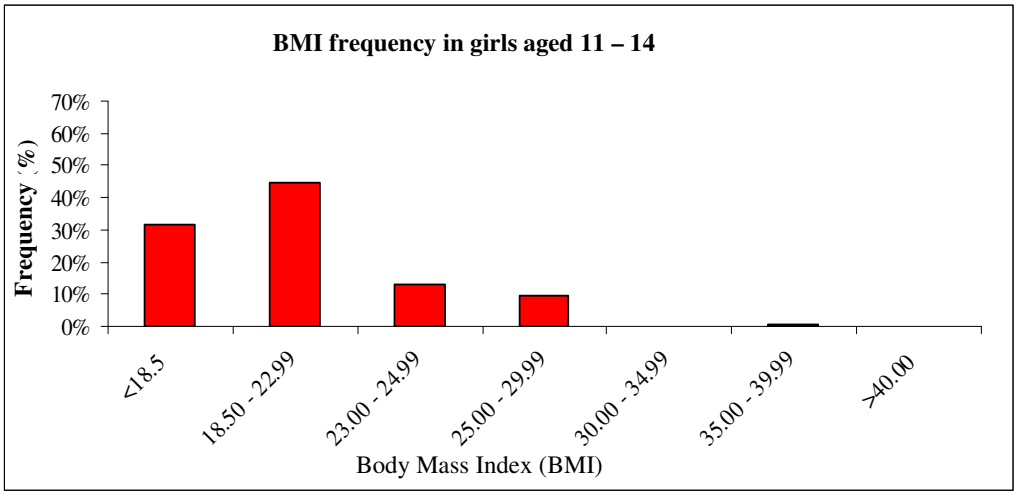
The obtained BMI values as well as its frequency in girls aged 11 – 14 show

normal BMI in 57.81% of the cases, 31.51% underweight, 10% overweight of which 9% are pre-obese and less than 1% present 1st degree obesity (0.27%) and 2nd degree obesity (0.55%) (Table 3 and Graph 1).

Table 3

Classification		BMI (kg/m^2)	Frequency (%)
Underweight <18.50	severe	<16.00	8.22
	moderate	16.00 – 16.99	7.12
	low	17.00 – 18.49	16.16
Normal 18.50 – 24.99		18.50 – 22.99	44.66
		23.00 – 24.99	13.15
Overweight ≥25.00	Pre-obese 25.00 – 29.99	25.00 – 27.49	7.40
		27.50 – 29.99	2.47
Obese ≥30.00	1st degree 30.00 – 34.99	30.00 – 32.49	0.27
		32.50 – 34.99	0.00
	2nd degree 35.00 - 39.99	35.00 - 37.49	0.27
		37.50 - 39.99	0.27
	3rd degree ≥40.00	≥40.00	0.00

Graph 1

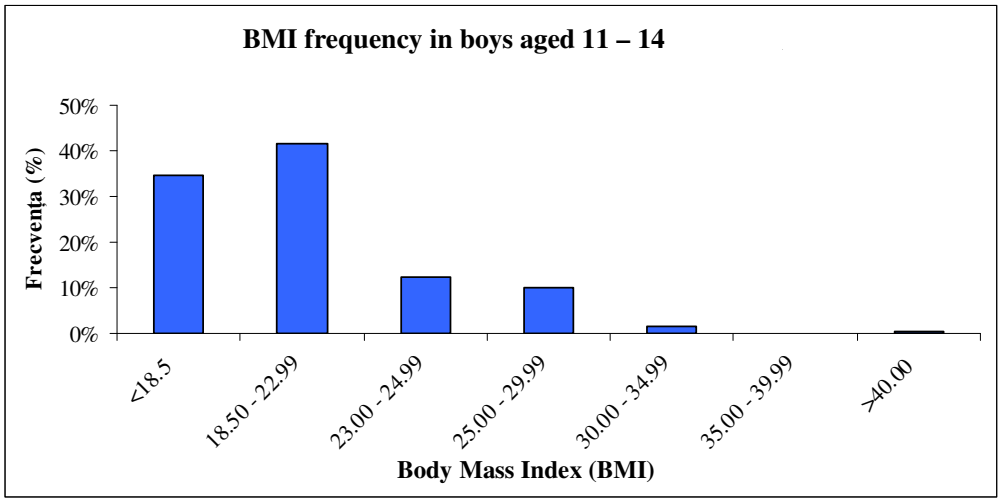


By analysing the BMI values as well as its frequency, we note that only 53.83% of the boys show normal BMI, that is, barely above mid-level value, 34.44% are underweight, about 10% are overweight of which 9% are pre-obese, 1.53% have 1st degree obesity and less than 1% (0.26%) have 3rd degree obesity (Table 4 and Graph 2).

Table 4

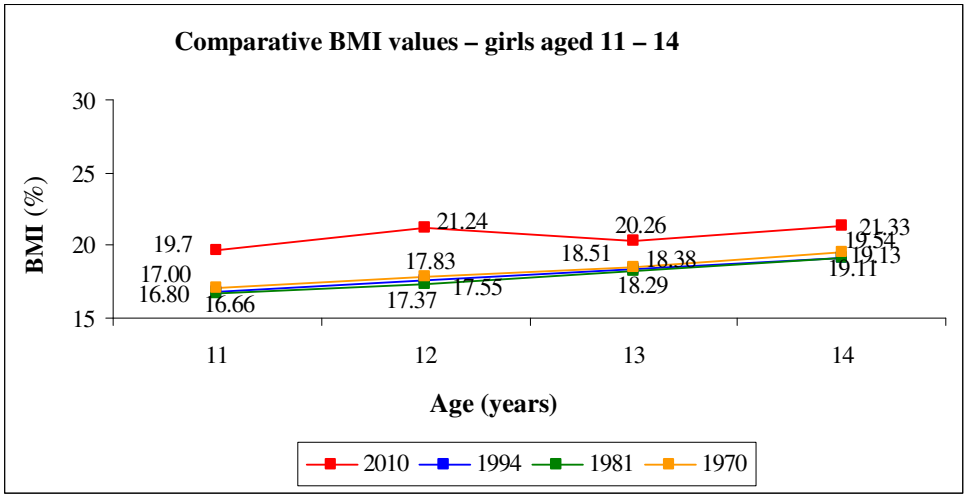
Classification		BMI (kg/m^2)	Frequency (%)
Underweight <18.50	severe	<16.00	7.14
	moderate	16.00 – 16.99	10.97
	low	17.00 – 18.49	16.33
Normal 18.50 – 24.99		18.50 – 22.99	41.58
		23.00 – 24.99	12.24
Overweight ≥25.00	Pre-obese 25.00 – 29.99	25.00 – 27.49	5.61
		27.50 – 29.99	4.34
Obese ≥30.00	1st degree 30.00 – 34.99	30.00 – 32.49	0.77
		32.50 – 34.99	0.77
	2nd degree 35.00 - 39.99	35.00 - 37.49	0.00
		37.50 - 39.99	0.00
	3rd degree ≥40.00	≥40.00	0.26

Graph 2



By analysing the 2010 values compared to the ones obtained in 1994, 1981 and 1970 [1] we obtain after 11 years values of BMI increased by a factor of 2.90 compared to the testing of 1994, 3.04 compared to 1981 and 2.70 compared to the 1970 measurements. For the 12 years group the BMI value is greater by a factor of 3.69 compared to 1994, by 3.87 compared to 1981 and by 3.41 compared to 1970. For the 13 years group the BMI value is greater by a factor of 1.90 compared to 1994, by 1.97 compared to 1981 and by 1.75 compared to 1970. For the 14 years group the differences are 2.22 compared to 1994, 2.20 compared to 1981 and 1.79 compared to 1970 (Graph 3, Table 5).

Graph 3



The percentage of girls having an BMI over the average is 37.86% for the 11 years group, 56.99% for the 12 years group, 47.87% for the 13 years group and 48% for the 14 years group while the percentages with under average are 62.14% for the 11 years group, 43.01% for the 12 years group, 52.13% for the 13 years group and 52% for the 14 years (Table 1).

Table 5

Age (years)	Annual rates– BMI			
	2010	**1994**	**1981**	**1970**
11 – 12	1.54	0.75	0.71	0.83
12 – 13	1.02	0.83	0.92	0.68
13 – 14	1.07	0.73	0.84	1.03

The frequency values above average boys are 42.59% for the 11 years group, 42.86% for the 12 years group, 40.42% for the 13 years group and 40.41% for the 14 years group while the under average frequency is 57.41% for the 11 years group, 57.14% for the 12 years group, 59.57% for the 13 years group and 59.59% for the 14 years group (Table 2)

Table 6

Age (years)	Annual rates– BMI			
	2010	**1994**	**1981**	**1970**
11 – 12	1.56	0.53	0.37	0.49
12 – 13	-0.61	0.59	0.64	0.75
13 – 14	1.21	0.57	0.68	0.51

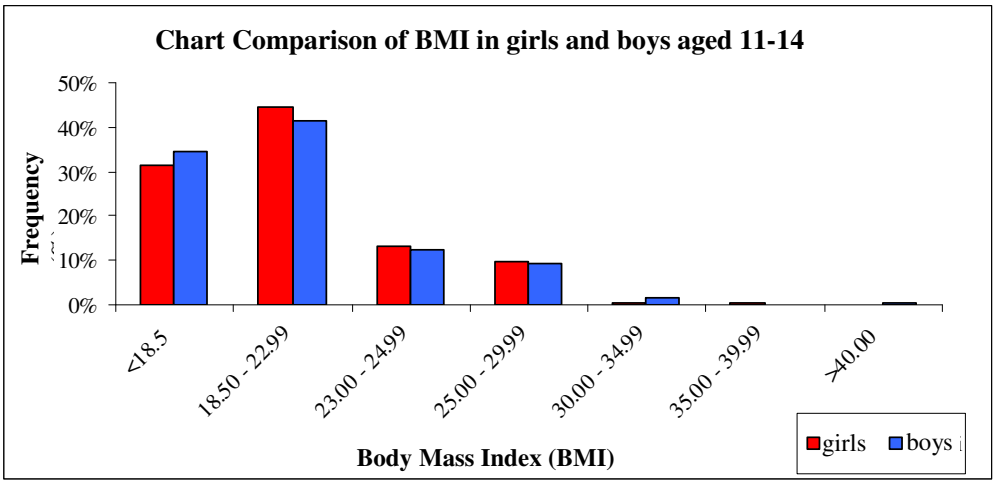
In the case of boys, the values obtained in 2010, for the 11 years group were higher by a factor of 2.33 compared to the 1994 and 1970 results and by a 2.48 compared 1981. For the 12 years group the BMI is higher by a factor of 3.36 compared to 1994, 3.67 compared to 1981 and 3.4 compared to 1970. For the 13 years group the BMI is higher by 2.16 than the 1994 values, 2.42 than the 1981 values and 2.04 than the 1970 values. At 14 years increases are 2.8 compared to 1994, 2.95 compared to 1981 and 2.74 compared to 1970 (Table 5, Graph 4).

By analyzing the BMI values of the 2010 research is both girls and boys we note that from a total of 365 measured schoolgirls, 57.81% have normal BMI, 31.51% are underweight, about 10% are overweight, of which 9% are pre-obese and <1% have 1st and 2nd degree obesity while in the case of boys, from a total of 392 measured boys, 53.83% have a normal BMI, 34.44% are underweight, about 10% are overweight, of which 9% are pre-obese and about 2% have 1st and 2nd degree obesity (Table 7 and Graph 5).

Table 7

Classification		**BMI (kg/m^2)**	**Frequency (%)**	
			Girls	**Boys**
Underweight <18.50	severe	<16.00	31.51	34.44
	moderate	16.00 – 16.99		
	low	17.00 – 18.49		
Normal 18.50 – 24.99		18.50 – 22.99	44.66	13.15
		23.00 – 24.99	41.58	12.24
Overweight ≥25.00	Pre-obese 25.00 – 29.99	25.00 – 27.49	9.86	9.95
		27.50 – 29.99		
Obese ≥30.00	1st degree 30.00 – 34.99	30.00 – 32.49	0.27	1.53
		32.50 – 34.99		
	2nd degree 35.00 - 39.99	35.00 - 37.49	0.55	0.00
		37.50 - 39.99		
	3rd degree ≥40.00	≥40.00	0.00	0.26

Graph 5

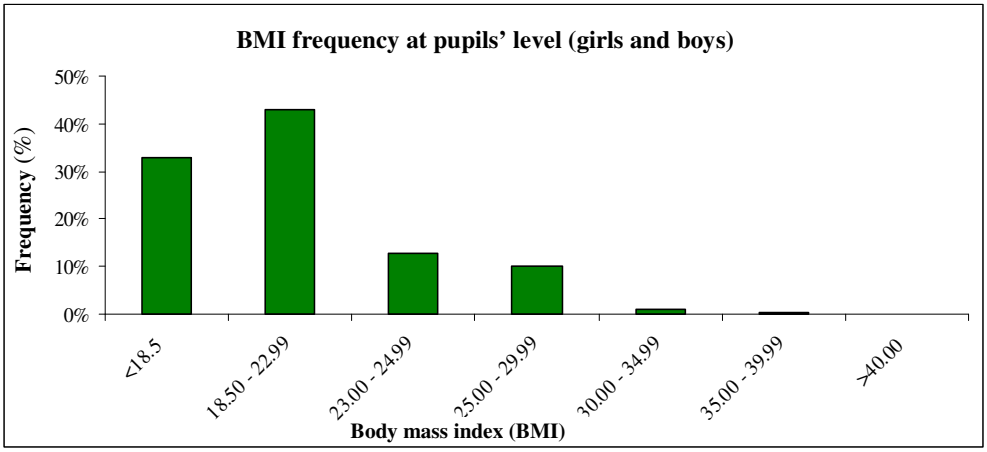


From a total of 757 measured schoolchildren, only 55.75% have normal BMI, 33.03% are underweight, 9.91% overweight and pre-obese while 1.31% (10 schoolchildren – 7 boys and 3 girls) suffer from 1st, 2nd and 3rd degree obesity (Table 8 and graph 6).

Table 8

Classification		BMI (kg/m^2)	Frequency (%)
Underweight <18.50	severe	<16.00	33.03
	moderate	16.00 – 16.99	
	low	17.00 – 18.49	
Normal 18.50 – 24.99		18.50 – 22.99	43.06
		23.00 – 24.99	12.68
Overweight ≥25.00	Pre-obese 25.00 – 29.99	25.00 – 27.49	9.91
		27.50 – 29.99	
Obese ≥30.00	1st degree 30.00 – 34.99	30.00 – 32.49	0.92
		32.50 – 34.99	
	2nd degree 35.00 - 39.99	35.00 - 37.49	0.26
		37.50 - 39.99	
	3rd degree ≥40.00	≥40.00	0.13

Graph 6



Obesity in children and adolescents is characterised by a BMI < 95 percentile, overweight is defined by a BMI between the 85 and <95 percentile, the <5 percentile is characteristic for underweight while normal BMI lays between percentile 5 and <85[8].

During our research carried out in 2010, we noticed that the higher values of the ale percentile exceeded 99%, both in girls and in boys, as well (Table 1 and 2).

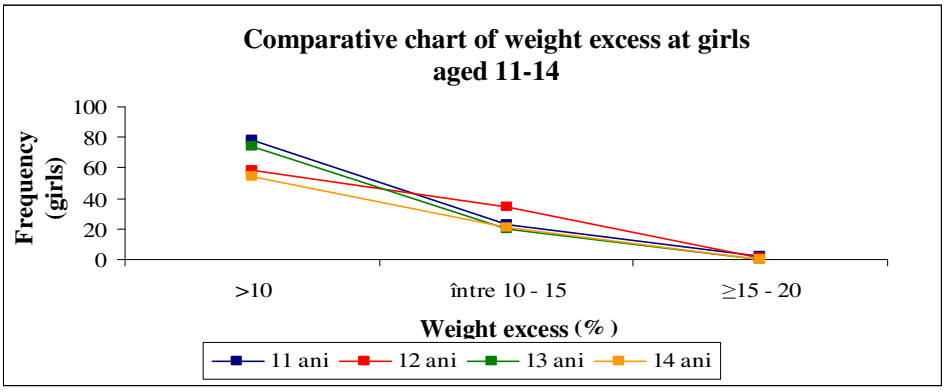
The weight excess defines any weight exceeding by 10% the ideal weight of the investigated individual. An excess weight of over 15 – 20% defines obesity.

In the case of girls, 26.84% have excessive weight, 0,8% are obese and 72.32% no weight excess could be found (Table 9, Graph 7).

Table 9

Age (Years)		Frequency (no. of cases)					
		Percentile (%)					
		<10		10-15		<15-20	
	Total no.	No.	%	No.	%	No.	%
11 years	103	78	75,72	23	22,23	2	1,94
12 years	93	58	62,36	34	36,55	1	1,0
13 years	94	74	78,72	20	27,02	0	0
14 years	75	54	72,00	21	28,00	0	0
Total	365	264	72,32	98	26,84	3	0,8

Graph 7

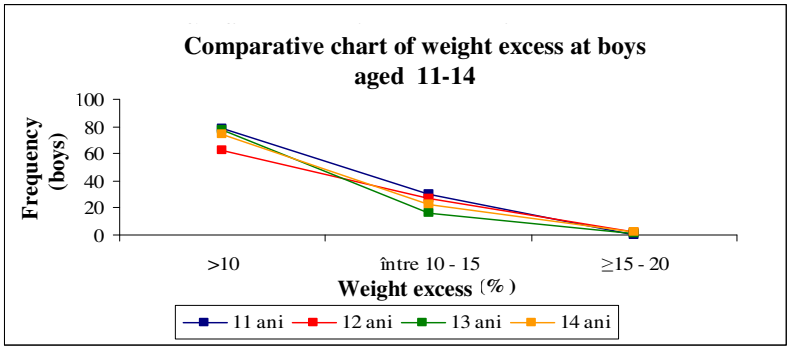


In the case of boys, 24.48% are characterised by weight excess of which, 1.20% are obese while 72.23% of them have no weight excess (Table 10, Graph 8).

Table 10

Age (Years)		Frequency (no. of cases)					
		Percentile (%)					
		<10		10-15		<15-20	
	Total no.	No.	%	No.	%	No.	%
11 years	108	78	72,22	30	27,77	0	0
12 years	91	62	69,13	27	29,67	2	2,19
13 years	94	77	81,91	16	20,77	1	1,06
14 years	99	74	74,74	23	31,08	2	2,02
Total	392	291	74,23	96	24,48	5	1,20

Graph 8



3. Conclusions

The increase of schoolchildren percentages showing values of excess weight indicators up to 26,85% in girls, and 24,49% in boys (Table 8 and 9).

From a total of 757 measured schoolchildren, only 55,75% show normal BMI values, 33,03% have values that are specific to overweight condition, 1,31% (7 boys and 3 girls) have different degrees of obesity (Table 7, Graph7).

The absence of programmes intended to sensitize schoolchildren to the negative effects and consequences of an inadequate lifestyle and the ways to eliminate them that are specific to this age and the benefits resulting from weight excess prevention.

4. Recommendations

Assessment of inadequate feeding habits, in order to identify excess calorie foods.

Assessment of physical activities, both organized by school programme and during daily activities as well: playing games, bicycle riding, walking to school.

Determining the risk factors of weight excess that are specific to inadequate lifestyle, frequently encountered at this age.

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