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The Role of Body Weight and Growing in Body Height to Nonspecific Musculoskeletal Pain in a Cohort of Bosnia and Herzegovina Schoolchildren

A concise and informative title: **Musculoskeletal pain during grow in height**

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Abstract

Background Children often suffer the nonspecific musculosceletal pain as reported in literature. **Aim** To determine relationship between body weights with development of musculoskeletal pain and to determine whether growing in body height is associated with musculoskeletal pain in schoolchildren.

Subjects/ Methods A prospective longitudinal study included 1315 school children aged 7-14 years (652 boys and 663 girls) and was performed in 13 elementary schools in B&H. Child body height and body weight were measured. The survey of perception of musculoskeletal pain in different body regions of subjects was conducted by adjusted Nordic Musculosceletal Questionnaire (NMQ).

Results The highest prevalence of an overweight and obesity in the 10th year 35.7% and the lowest frequency 17.8% in the 14th year was. In the age 14th obesity was'nt found. Boys have more prevalence of overweight. Using logistic regression model, we found that school children with normal BMI were protected with increased body height of acute lower back pain (β= -0.089, 95%CI, -9.730- -0.023, P< 0.049), and increased body height was protector of obese school children of acute upper back pain (β= -0.356, 95%CI, -14.077- -3.878, P< 0.001) and chronic lower back pain (β= -0.356, 95%CI, -14.077- -3.878, P< 0.001).

Conclusion Schoolchildren with normal weight more often have had musculosceletal pain than those with overweight or obesity. This can be associated with intense physical growth period in height, especially. The assumption is that the increase in height changes the relationship between excessive BMI and musculoskeletal pain in children of school age.

Key words: nonspecific musculoskeletal pain, body height, body weight, schoolchildren

Introduction

A musculoskeletal pain (MSP) in children is important public health problem, which is manifested in only occasional limiting movements with pain and usually with little clinical implications [1]. A nonspecific musculoskeletal pain (NSMSP) in childhood includes often a specific, identifiable pathoanatomical basis for symptoms cannot be found, resulting in non-specific diagnoses based on the location of symptoms [2]. Amongst various risk factors, it has been suggested that elevated body mass index (BMI), overweight and obesity might be an independent risk factor for NSMSP [3]. The relationship between BMI and MSP has mainly been investigated in studies on low back pain (LBP) [4-6]. Body height was associated with increased risk of low back pain in both genders [7]. MSP in the lower extremities occurs both in children and in adolescents with ankle and foot problems being more common in children [8]. There is emerging evidence that children, especially adolescents who report persistent musculoskeletal pain, are at increased risk of chronic pain as adults [1,2,5]. The time of adolescence is the transition period from childhood to adulthood and over only a few years, both body and soul will undergo many changes. The most apparent morphological differences are increased height and a change in body composition. It has been proposed that these may impact LBP [8-10].

The lack of research into relation of MSP with overweight and obesity in children means that understanding of these conditions is limited and health care professionals have little empirical evidence to underpin their clinical practice [10-11]. We examined the association between body mass index and MSP in different body regions and association between growing in body height and MSP in different body regions in school children aged from 9 to 14 years.

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Subjects and Methods

A prospective longitudinal study was performed from September 2016 to January 2017 in elementary schools in Tuzla Canton, in each of 13 municipality's institutions. Tuzla Canton as most populated Bosnia and Herzegovina canton has about 500 000 citizens, out of which 24 027 are children age 9 to 14 years. This research data containing elements that could lead to identification of respondents: the number of sex participants, some anthropometric measures data (body weight and body height, body mass index) including year of birth (age) as indirect identifiers of human research participants as indirect sensitive data. Data collection was performed by means of an anonymous and voluntary participation of all respondents in a part of questionnaire surveys and in a part of data collection of anthropometric measurements of body height and body weight which were taken by trained clinical staff. Written informed consent was obtained from parents for each child, respondents in a study. This study was approved by written authorization from the Ministry of Education, Science, Culture and Sport of Tuzla Canton and head of each participating school. The ethical approval for this research was obtained from the appropriate research committee at the Tuzla University School of Medicine (No: 03-8373-8.3.5/16.).

We analyse non-specific musculoskeletal pain in different body regions. We do not discuss pain associated with congenital or systemic diseases, such as hip dysplasia, juvenile arthritis or scoliosis. We also exclude pain resulting from frank injuries e.g. anterior ligament rupture, ankle sprain, fractures and pain following surgical interventions.

Study population

The study population included 2500 children who attended 3th to 7th grade (10.4% children of total their population). Respondents who did not answer all of the questionnaire items or who refused to take part in the survey were excluded. The total sample of study included 1315 out of 2500 children, response rate was 54%. There were no statistical differences of the respondents by gender, 652 (49.58%) boys and 663 (50.41%) girls. We visited, randomly selected, one primary school institution in every municipalities where we randomly selected 2500 children for our study.

We used cluster sample method in forming a representative sample of respondents: random selection of 2-5 respondents of one class repeated over 1 lecture (average of daily number of lectures 4-5), and 20 school children was selected from each school class (≥100 respondents per one elementary school institution). Excluding factor for study participation was the existence of congenital or acquired deformities and physical disorders (children, who use wheelchairs, with child musculoskeletal disease, determined disparity between the lower extremities, problems with the foot etc.).

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Interview

The survey was conducted by specially designed questionnaire. The questionnaire consisted of two parts: the first part consisted of data on demographic and individual characteristics of participants and the second part was The Nordic Musculosceletal Questionnaire (NMQ) [12], which was translated to Bosnian language by team of two experts. NMQ quantifies musculoskeletal pain in 9 body regions: neck, shoulders, upper back, elbows, low back, wrist/hands, hips/thighs, knees and ankles/feet [12-13]. The internal consistency of each 16 items used about acute and chronic various body region NMQ questionnaire items in our study sample was excellent (Cronbach' alpha=0.859).

Anthropometric measurement

Child anthropometric measurements were taken by trained clinical staff. Weight was measured using GIMA scale (model 27310 Astra) to the nearest of 0.001kg and height was measured using SECA 213 portable stadiometer. For reliability, all measurements were taken in the duplicates and average. The scale is calibrated before each measurement. The obtained values of body weight and body height were used to calculate body mass index (BMI) as a ratio of body weight by the square of height. BMI were calculated and were expressed in percentiles also, to determine the nutritional status of school children due to changes in BMI by age and gender [14].

Body mass index

BMI groups were classified according to US Centre for Disease Control (CDC) and Prevention's age- and sex-matched percentile grading: underweight (<5%), normal, healthy weight (5% <85%), overweight (85% <95%) and obese (≥95%) [18]; and z-score. The risk of developing obesity has children, whose BMI are above the 85 and 95 percentiles for age [14].

Statistical Analysis

We performed data analysis using IBM SPSS Statistics for Windows, Version 19.0, IBM Corp., and Armonk, NY. The descriptive statistics are presented by means and standard deviations, or relative numbers and percentages for categorical data. To examine differences between- and within groups of acute and chronic pain according NMQ different body regions (neck pain, right shoulder, right wrist, upper back, lower back, hips, knees, ankles); and BMI categories groups we used ANOVA, sum of squares test. Non-parametric Spearman correlation test was used to analyse correlation relationships between NMQ scales and body height as NMQ scales and body weight; NMQ and Spearman's correlations were computed to evaluate relationships between mean item scale scores on each of the eight factors of the NMQ and body weight. Logistic regression analysis ANOVA were used to provide multivariate association (predictive or protective potential) between NMQ scales (independent variables) and body height among schoolchildren who are divided in four BMI category as selected variables (body weight as dependent variables). All p-values < 0.05 were regarded as statistically significant.

Results

Between individual characteristics of respondents the mean by standard deviation (SD) were for: age 11.31±1.48 years; sex 1.50±0.50; school class 5.05±1.42; body height 146±10.61; body weight 41.57±11.71; BMI mass index 60.89±30.83 percentiles, and MSP 1.47± 0.49. The higher average values of musculoskeletal pain regarding of localisation (from 1-2) were: acute neck pain (1.17±0.37), chronic neck pain (1.17±0.38), chronic right shoulder pain (1.17±0.38), and chronic low back pain (1.16±0.37) (shown in Table 1).

Table 1 Individual characteristics of respondents with perception of musculosceletal pain (n=1315)

Characteristics of subjects	**Mean ± SD***	**Minimum**	**Maximum**
Age (years)	11.31±1.48	7.00	14.00
Sex	1.50±0.50	1.00	2.00
School class	5.05±1.42	3.00	7.00
Body Weight (kg)	41.57±11.71	20.00	93.00
Body Height (cm)	146.18±10.61	113.50	180.00
Body mass index- BMI ($m^{2)}$	19.17±3.7	9.84	40.25
Body mass index- BMI (percentile)	60.89±30.83	4.00	96.00
BMI categories	2.39±0.77	1.00	4.00
Musculosceletal Pain	1.47±0.49	1.00	2.00
Acute neck pain	1.17±0.37	1.00	2.00
Chronic neck pain	1.17±0.38	1.00	2.00
Acute right shoulder pain	1.03±0.18	1.00	2.00
Chronic right shoulder pain	1.17±0.38	1.00	2.00
Acute right wrist pain	1.01±0.09	1.00	2.00
Chronic right wrist pain	1.01±0.07	1.00	2.00
Acute upper back pain	1.10±0.31	1.00	2.00
Chronic upper back pain	1.12±0.33	1.00	2.00
Acute low back pain	1.10±0.30	1.00	2.00
Chronic low back pain	1.16±0.37	1.00	2.00
Acute hip pain	1.03±0.18	1.00	2.00
Chronic hip pain	1.04±0.19	1.00	2.00
Acute knees pain	1.05±0.22	1.00	2.00
Chronic knees pain	1.06±0.25	1.00	2.00
Acute ankles pain	1.06±0.24	1.00	2.00
Chronic ankles pain	1.06±0.23	1.00	2.00

*SD, Standard Deviation

Table 2 shows the differences between each individual characteristics and perception of MSP of all respondents per BMI categories. We found the highest prevalence of an overweight BMI and obesity in the 10th year being 35.7% (in the 11th was 31.3%; in the 12th, 32.5%; and in the 13th, 30.8%). The lowest frequency of excessive body weight was 17.8% in the age group of 14, when obesity was not observed. On the other hand, an underweight BMI category was

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most frequent in the 14th year, 8.3%, and is not negligible in the 10th year, 6.8% also. An underweight was highest in the 14th year, 8.3%, and is not negligible in the 10th year, 6.8%. This can be associated with intense physical growth period in height, especially. In the ninth year, excessive BMI weight also had a high prevalence of 27.4%. It was interesting to analyze the frequency of obesity by age. The highest frequency of obesity is in the 9th year (18.5%), followed by a decreasing trend (in the tenth of 15.3%, in the eleventh 14.4%, in the twelfth 11.8% in the thirteenth 8.7%, and in the fourteenth 0%). There are statistically significant differences in BMI categories by age of life (P <0.003, data not presented). The frequency of underweight MBI among girls is almost two times higher than the frequency of underweight MBI among boys (41:23 vs. 6.2%: 3.5%). Boys have more prevalence of overweight (127: 116 vs. 19.5%: 17.5%). Obesity is more than twice as frequent in boys as it is in girls 114: 52 vs. 17.5%: 7.2%. BMI by gender is significantly different (P <0.001, data not presented). When comparing the BMI category of respondents regarding the school classes, excess body weight is most common in the sixth grade 20.8% and in fourth grade 20.6%. Obesity had the highest prevalence in the third class 19.5%, and has obvious declining trend in the next classes. As far as the appearance of musculoskeletal pain and the activity of our subjects are concerned, there are no significant statistical differences in the appearance of musculoskeletal pain between those who exercise sport and those who do not. When we compare MSP and BMI categories we discover the inversion. Pain is increasing in the category of underweight (33: 31 vs. 5.3%: 4.5%), although declining in subjects with overweight (110: 133 vs. 17.6%: 19.2) and in the category of obese (65: 101 versus 10.4%: 14.6 %).

School children have perceived chronic pain in neck 221 (16.8%), upper back 158 (12%), and low back 214 (16.3%). The most common chronic musculosceletal pain was suffered by respondents with normal (healthy) body weight, overweight and obesity BMI categories. The prevalence rate of acute musculoskeletal pain was: right shoulder 10.2%, neck 17%, upper back 10.5% and low back 10.2% of the examinee. The most frequently acute musculosceletal pain is located in the right shoulder, chest and back. Underweight respondents did not perceived acute neck pain (0%) (Table 2).

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Table 2 The differences between individual characteristics and perception of MSP of all respondents per BMI categories (n=1315)

Characteristics	**Underweight** 64 (4.9%)	**Normal** 842 (64.0%)	**Overweight** 243 (18.5%)	**Obesity** 166 (12.6%)	**χ^2 * P-value**
Age (years)					
9	8 (4.8)	114 (67.8)	15 (8.9)	31(18.5)	26.959 0.029
10	19 (6.8)	161(57.5)	57 (20.4)	43 (15.3)	
11	5 (1.8)	182 (66.9)	46 (16.9)	39 (14.4)	
12	11 (4.5)	155 (63.0)	51 (20.7)	29 (11.8)	
13	15 (5.5)	176 (63.7)	61 (22.1)	24 (8.7)	
14	6 (8.3)	54 (73.9)	13 (17.8)	0 (0.0)	
Gender					
Male	23 (3.5)	388 (59.5)	127 (19.5)	114(17.5)	14.528 0.002
Female	41 (6.2)	454 (68.5)	116 (17.5)	52 (7.8)	
School class					
3rd	13 (5.3)	164 (65.3)	25 (9.9)	49 (19.5)	11.658 0.473
4th	12 (4.7)	152 (59.8)	52 (20.6)	38 (14.9)	
5th	11 (4.1)	177 (65.3)	53 (19.5)	30 (11.1)	
6th	12 (4.7)	161 (63.1)	53 (20.8)	29 (11.4)	
Play sport					
no	34 (5.7)	393 (64.6)	112 (18.4)	69 (11.3)	0.985 0.151
yes	30 (4.3)	449 (63.5)	131 (18.5)	97 (13.7)	
MS- pain					
no	31 (4.5)	426 (61.7)	133 (19.2)	101 (14.6)	8.678 0.034
yes	33 (5.3)	416 (66.7)	110 (17.6)	65 (10.4)	
Musculoskeletal pain, acute or chronic in different part of the body	**Underweight**	**Normal**	**Overweight**	**Obesity**	**χ^2, P-value**
Acute neck pain	0 (0.0)	148 (11.3)	41(3.1)	21(1.6)	2.727, 0.436
Chronic neck pain	12 (0.9)	133 (10.1)	49 (3.7)	27 (2.1)	2.001, 0.572
Acute right shoulder pain	17 (1.3)	176 (13.4)	38 (2.9)	16 (1.2)	10.736, 0.013
Chronic right shoulder pain	0 (0.0)	28 (2.1)	9 (0.7)	5 (0.4)	2.213, 0.529
Acute right wrist pain	2 (1.2)	17 (1.3)	6 (0.5)	2 (1.2)	2.363, 0.501
Chronic right wrist pain	3 (0.2)	20 (1.5)	2 (0.2)	2 (0.2)	5.415,0.144
Acute upper back pain	8 (0.6)	96 (7.3)	19 (1.4)	15 (1.0)	2.859, 0.414
Chronic upper back pain	8 (0.6)	109 (8.3)	20 (1.5)	21(1.6)	6.222, 0.101
Acute low back pain	9 (0.7)	91 (6.9)	21 (1.6)	13(1.0)	1.468, 0.690
Chronic low back pain	12 (0.9)	138 (10.5)	34 (2.6)	30 (2.3)	4.076, 0.253
Acute hips pain	2 (0.2)	30 (2.3)	7 (0.5)	6 (0.5)	0.704, 0.872
Chronic hips pain	4 (0.3)	33 (2.5)	6 (0.5)	7 (0.5)	1.257,0.739
Acute knees pain	3 (0.2)	42 (3.2)	15 (1.2)	8 (0.6)	2.542, 0.468
Chronic knees pain	3 (0.2)	53 (4.0)	18 (1.4)	10 (0.8)	2.007, 0.557
Acute ankles pain	4 (0.3)	52 (4.0)	17 (1.3)	7 (0.5)	2.038, 0.564
Chronic ankles pain	3 (0.2)	51 (3.9)	15 (1.1)	9 (0.7)	2.165, 0.564

***χ^2 – Chi square test**

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There are highly significantly positive correlations (at the level of P< 0.001) between *body height* and acute MSP of neck, right shoulder, upper back, low back, hips, knees, ankles and significantly positive correlation between body height and right wrist pain. Increased body height correlated with all acute MSPs in different body parts. Unexpected, increased body height was correlated with chronic MSPs in right wrist, upper back, hips, knees, ankles, neck pain and right shoulder. We did not found correlation between body height and chronic low back pains. Body weight correlated highly positive only with acute knees pains. There are body weight correlations (at the level of P< 0.05) with acute pains in neck, upper back, lower back, hips and ankles. Overweight and obese highly correlated with chronic knees pains in school children. On other site, body weight was correlated with chronic MSPs in right shoulder, upper back and ankles pains (shown in Table 3).

Table 3 Correlation between body height and MSP and body weight and MSP in different part of the body in all respondents (n=1315)

Spearman correlation between *body height* (113- 173cm) and MSP	**Correlation factor**	**Spearman correlation between *body weight* (20.0-36.8kg) and MSP**	**Correlation factor**
Chronic neck pain	0.068**	Chronic neck pain	0.053
Chronic right shoulder pain	0.080**	Chronic right shoulder pain	0.084**
Chronic right wrist pain	0.095*	Chronic right wrist pain	0.033
Chronic upper back pain	0.098*	Chronic upper back pain	0.061**
Chronic lower back pain	0.041	Chronic lower back pain	0.024
Chronic hips pain	0.012*	Chronic hips pain	0.020
Chronic knees pain	0.127*	Chronic knees pain	0.097*
Chronic ankles pain	0.113*	Chronic ankles pain	0.087**
Acute neck pain	0.117*	Acute neck pain	0.069**
Acute right shoulder pain	0.138*	Acute right shoulder pain	0.053
Acute right wrist pain	0.087**	Acute right wrist pain	0.023
Acute upper back pain	0.125*	Acute upper back pain	0.063**
Acute lower back pain	0.147*	Acute lower back pain	0.072**
Acute hips pain	0.112*	Acute hips pain	0.073**
Acute knees pain	0.127*	Acute knees pain	0.094*
Acute ankles pain	0.120*	Acute ankles pain	0.087**

* Correlation is significant at the 0.05 level (2 tailed)

** Correlation is significant at the 0.001 level (2 tailed)

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Using logistic regression model we found that *increased body height* protect acute lower pain among schoolchildren with normal BMI (β= -0.089, 95%CI, -9.730- -0.023, P< 0.049); and protect acute upper back pain (β= -0.356, 95%CI, -14.077- -3.878, P< 0.001) and chronic lower back pain (β= -0.356, 95%CI, -14.077- -3.878, P< 0.001) among obese schoolchildren (as shown in Table 4).

Table 4 Logistic regression model assessing association between *body height* (dependent variable) and acute and chronic musculosceletal pain in different part of the body (independent variables) among all respondents (n=1315) selecting step by step only in one of four groups of BMI classification groups

Body height and MSP association among underweight group of respondents (selecting cases, n= 64)	**β***	**95% CI****	**P-value**
Chronic neck pain	0.037	-7.363-9.380	0.810
Acute neck pain	-0.021	-9.003-7.908	0.897
Chronic right shoulder pain	0.234	-3.316-14.524	0.213
Acute right shoulder pain	0.198	-14.690-34.456	0.423
Chronic right wrist pain	-0.063	-34.694-27.094	0.806
Acute right wrist pain	-0.015	-13.858-12.911	0.944
Chronic upper back pain	0.096	-9.615-15.723	0.630
Acute upper back pain	-0.119	-11.331-4.905	0.430
Chronic lower back pain	-0.448	-50.020-10.853	0.202
Acute lower back pain	0.479	-4.992-63.242	0.093
Chronic hips pain	0.412	-9.682-50.927	0.178
Acute hips pain	0.212	-29.678-8.468	0.269
Chronic knees pain	0.208	-4.744-22.909	0.193
Acute knees pain	0.046	-2.143-6.627	0.316
Body height and MSP association among normal weight group of respondents (selecting cases, n= 842)	**β***	**95% CI**	**P-value**
Chronic neck pain	0.010	-1.896-2.478	0.794
Acute neck pain	0.023	-1.665-2.963	0.582
Chronic right shoulder pain	0.033	-2.095-6.026	0.342
Acute right shoulder pain	0.066	-0.345-3.828	0.102
Chronic right wrist pain	0.066	-1.386-10.639	0.131

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Acute right wrist pain	-0.061	-11.072-1.843	0.161
Chronic upper back pain	0.044	-1.413-4.200	0.330
Acute upper back pain	0.018	-2.509-3.712	0.704
Chronic lower back pain	0.014	-1.759-2.537	0.722
Acute lower back pain	-0.089	-9.730--0.023	**0.049**
Chronic hips pain	0.086	-0.247-10.168	0.062
Acute hips pain	0.042	-2.342-6.052	0.386
Chronic knees pain	0.046	-2.143-6.627	0.316
Acute knees pain	0.027	-2.514-4.890	0.529
Body height and MSP among over weight group of respondents (selecting cases, n= 243)	**β***	**95% Confidence interval**	**P-value**
Chronic neck pain	-0.027	-4.771-3.345	0.729
Acute neck pain	0.130	1.152-8.416	0.136
Chronic right shoulder pain	0.080	-3.391-12.076	0.253
Acute right shoulder pain	0.060	-3.109-6.586	0.480
Chronic right wrist pain	-0.004	-16.242-15.263	0.951
Acute right wrist pain	0.057	-6.232-13.928	0.453
Chronic upper back pain	-0.077	-9.365-3.479	0.368
Acute upper back pain	-0.057	-9.402-4.937	0.540
Chronic lower back pain	-0.045	-6.606-3.357	0.572
Acute lower back pain	0.154	0.511-21.364	0.062
Chronic hips pain	-0.032	-13.763-9.798	0.741
Acute hips pain	0.089	-3.493-10.644	0.320
Chronic knees pain	0.075	-11.349-4.856	0.431
Acute knees pain	0.083	-3.980-10.644	0.365
Body height and MSP association among obese weight group of respondents (selecting cases, n= 166)	**β***	**95%CI**	**P-value**
Chronic neck pain	-0.086	-7.271-2.773	0.378
Acute neck pain	0.119	-2.440-9.403	0.247
Chronic right shoulder pain	0.117	-2.170-15.438	0.139
Acute right shoulder pain	-0.108	-10.916-3.814	0.342
Chronic right wrist pain	0.051	-13.011-0.044	0.621

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Acute right wrist pain	0.132	-2.917-10.624	0.263
Chronic upper back pain	0.200	-1.548-15.063	0.110
Acute upper back pain	-0.356	-14.077--3.878	**0.001**
Chronic lower back pain	-0.356	-14.077--3.878	**0.001**
Acute lower back pain	-0. 252	-34.641-10.342	0.288
Chronic hips pain	0.029	-22.494-25.474	0.902
Acute hips pain	0.267	-2.175-23.934	0.102
Chronic knees pain	-0.076	-18.465-11.542	0.649
Acute knees pain	0.095	-6.668-15.867	0.421

* **β,** Beta coefficient in regression ANOVA analysis of potential predictors of musculosceletal pain

****95% *CI*,** 95% Confidence interval

Discussion

This school-based survey adds important knowledge about 1315 Bosnia and Herzegovina schoolchildren 11.31±1.48 years old, 146.18±113.50 cm tall, 60.89±30.83 hard, who most often self-reported neck pain, right shoulder pain and lower back pain as musculosceletal trouble in the last 12 months (chronic pain). Forty eight percent of this entire population-based cohort reported daily current MSP, the most frequent acute neck pain.

Overweight and obese children report more musculoskeletal problems in daily life than their normal-weight peers [4-6, 15-16]. Furthermore, they reported more ankle and foot problems than did the children who were of normal weight (OR = 1.92; 95% CI, 1.15–3.20). Overweight and obese children aged 12 to 17 years consulted their family physicians more often with lower extremity problems than did the normal-weight children (OR = 1.92; 95% CI, 1.05–3.51) [6]. Our school children with normal weight have suffered more often acute neck pain, acute right shoulder pain, acute upper back pain, chronic upper back pain, acute low back pain and chronic low back pain than those with overweight or obesity (regarding BMI categories). Finally, overweight and obesity has not been associated with MSP in school children. It is hypothetically assumed that MSP in children with normal weight is actually associated with progressive growth of children at this age. Adolescence plays an important role on the natural evolution of MSP since during the pre-adolescence period MSP tends to resolve. Conversely, adolescents continue suffering from MSP to a greater extent than the pre-pubertal ones [17-20].

Possible limitation of the present study was the fact that it was based on a survey through a self- rated questionnaire. As the study was cross- sectional in design, it is difficult to determine the temporal associations between the factors.

Our results clearly show protective role of body height (cm) in normal weight children regarding acute lower back pain (β=-0.089, 95% CI, -9.730- - 0.023, P<0.049), and in obese school children regarding acute upper back pain (β=-0.356, 95% CI, -14.077- - 3.878, P<0.001) and chronic low back pain (β=-0.356, 95% CI, -14.077- - 3.878, P<0.001). Meanwhile, body weight (kg) was not associated with MSP in step by step selected different BMI categories during regression analysis.

The main findings of this study were that those elevated body mass indexes have been not independent predictor of MSP in different part of body among schoolchildren. On other site, growth in height during adolescence has rarely been examined in relation to growing MSP.

Conclusion School children with normal weight have suffered more often pain than those with overweight or obesity. Body height (cm) showed a protective role in normal weight children regarding acute lower back pain and in obese schoolchildren regarding acute upper back pain and chronic lower back pain. Factors for MSP development should be explored especially in the population of children and adolescents. Due to height growth, body height plays a significant role in the protection of musculoskeletal trouble [20]. Risk factors for MSP are not always comparable with risk factors for MSP of adults.

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