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Prevalence of back pain and the knowledge of preventive measures in a cohort of 11619 Polish school-age children and youth—an epidemiological study

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Abstract

The study sought to characterize back pain (BP) (in the period of 12 months) in children and youth aged 10 to 19 from eastern Poland.

The study included 11619 children and youth (6254 girls and 5365 boys) aged 10 to 19 from eastern Poland. An original questionnaire was applied as a research tool. Before the study, the reliability of the questionnaire had been assessed. The Kappa coefficient value for all the analyzed variables was equal to or higher than 0.91.

Over 74.4% of the respondents admitted that within the last 12 months, they had experienced BP which was usually located in the lumbar spine (55.8%). The percentage of individuals reporting BP increased with age of participants. Girls reported BP more often than boys (82.8% vs 64.3%). The main circumstances in which BP occurred included lifting heavy objects, carrying school backpack and maintaining a sedentary position (70.7% vs 67.4% vs 67.8%). Over 67% of the respondents declared they did not know ergonomic principles.

High prevalence of BP was noted. The declared BP was mainly located in the lumbar spine. Girls reported BP more often than boys. The students presented a very low level of knowledge about ergonomics. Therefore, the appropriate education should be included at school.

Abbreviations: BP = back pain, LBP = low back pain, PE = physical education.

Keywords: back pain, children and youth, prevention, risk factors, treatment

1. Introduction

Back pain (BP) is one of the most prevalent musculoskeletal disorders and, as a consequence, it has become a significant problem of the contemporary society.[1,2,3] Epidemiological data indicate that BP exists not only among adults but also among children and youth.[3–9] What is more, BP experienced in young age leads to its more common occurrence in adulthood.[10,11] Unsurprisingly, the high prevalence and care-seeking translate into a substantial financial burden for the society. A study in the US estimated that the annual costs of chronic pain in adolescents aged 10 to 17, where musculoskeletal pain comprised the largest proportion, were $19.5 billion.[12] A large survey in Germany estimated minimum direct costs of the treatment of individuals under 25 with back disorders at the level of 100 million per year.[13] Although data documenting the costs associated with children's BP are sparse, they appear to be substantial, which means that investigation into prevention and treatment is worthwhile from an economic perspective.

What is important, BP is not only a musculoskeletal system disease, but it may also lead to many different disturbances determining the quality of life. Lopez-Lopez et al and Calvo-Lobo at al, indicated the relation between BP and depression.[14–15] Other authors emphasized the connection between chronic BP and a compromised quality of life,[16] sleep disturbance,[17] and increased utilization of health care resources.[18]

To date, a few interesting studies have been published concerning BP in Polish children and youth.[19–20] However, they included relatively small study groups, which could limit their conclusions. What is more, most of the papers in this field have focused only on 1 part of the spine (e.g., lumbar or cervical pain).

The aim of the study is to characterize BP (in the period of 12 months) in more than 11,000 children and youth aged 10 to 19 from eastern Poland. A big sample size, wide age range, and the fact that all parts of the spine (cervical, thoracic, and lumbar) were taken into account will make it possible to comprehensively assess the characteristics of BP in the population of Polish children and youth.

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2. Methods

2.1. Materials

The study included 11619 children and youth (6254 girls and 5365 boys) from eastern Poland. The sample was selected in 2-phase group sampling. In the first phase, schools from 3 levels of education (primary, lower-secondary, and upper-secondary schools) were randomly selected in particular towns. In the second phase, particular classes were selected (stratified phase sampling).[21] Ultimately, the study included students from the 4th to 6th grade of primary school (children aged 10–13), the 1st to 3rd grade of lower-secondary school (14–16 years) and the 1st to 3rd grade of upper-secondary school (17–19 years). Students who gave their consent to participate in the study were qualified to it. A final analysis included 11424 questionnaires, which constitutes 98.3% of the total number of the participants.

2.2. Methods

An original questionnaire was applied as a research tool. All the students completed the questionnaire during school classes with the one of the study authors present. The questionnaire included single-choice (9) and multiple-choice (7) questions.

The main part of the questionnaire concerned the following aspects:

a. experiencing or not BP within the last year (12 months). Individuals who gave a negative response to this question did not complete the remaining part of the questionnaire,
b. the frequency and location of BP,
c. types of situations in which BP occurred or increased,
d. ways of dealing with pain and the knowledge of ergonomics.

Before the study, the reliability of the questionnaire was assessed by conducting the survey twice in a group of 60 individuals (20 students from 3 levels of education) with a month-long interval.

The survey was anonymous and voluntary.

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Senate Research Ethics Committee of Jozef Pilsudski University of Physical Education in Warsaw, Poland (research number—Statutory Research DS. 183).

2.3. Statistical analysis

Calculations were made with the use of Microsoft Excel 2007 and SPSS 9.0 (SPSS, IL) software. In the statistical analysis, descriptive statistics were used. To analyze the collected research results, a non-parametric test based on Chi-square function was employed. The reliability of the questionnaire was evaluated with Kappa coefficient. The value of alpha $<.05$ was established as the significance level.

3. Results

3.1. Pilot reliability study

The Kappa coefficient value for all the analyzed variables was equal to or higher than 0.91. No significant differences between the results obtained in the 2 tests were revealed ($P<.05$).

3.2. Prevalence of BP

From among 11424 of the participants, 8498 (74.4%) respondents declared that they had experienced BP within the last 12 months. Girls reported BP more often than boys (82.8% vs 64.3%). Such a situation occurred in all the age groups. The percentage of individuals reporting BP increased with age of participants, both among girls and boys ($P<.05$) (Table 1).

Afterward, the frequency of BP with regard to the number of hours a day spent in a sedentary position was analyzed. The percentage of individuals who spent more than 5 hours a day in a sedentary position increased with age (72.4% vs 86.9% vs 92.6%) ($P<.05$). Simultaneously, the percentage of the respondents who spent less than 5 hours in this position decreased (27.6% vs 13.1% vs 7.4%) ($P<.05$). Such a situation occurred both in the group of individuals who declared BP and among those who did not (Table 2).

Students with BP spent more than 5 hours per day in a sedentary position more often than students without BP (88.5% vs 69.4) ($P<.05$) (Table 2).

Table 1

The prevalence of BP with regard to sex and age of the respondents (n = 11424).

	10–13 years (n = 2944)		14–16 years (n = 4040)		17–19 years (n = 4440)		Total (11424)		*P*
	n	%	n	%	n	%	n	%	
Total									
Without pain	1126	38.2	1050	26.0	750	16.9	2926	25.6	<.05
With pain	1818	61.8	2990	74.0	3690	83.1	8498	74.4	
10–13 yr <14–16 yr, 17–19 yr ($P<.05$); 10–13 yr,14–16 yr <17–19 yr ($P<.05$);									
Boys									
Total	1494	100	2018	100	1660	100	5172	100	
Without pain	674	45.1	712	35.3	462	27.8	1848	35.7	<.05
With pain	820	54.9	1306	64.7	1198	72.2	3324	64.3	
10–13 yr <14–16 yr, 17–19 yr ($P<.05$); 10–13 yr,14–16 yr <17–19 yr ($P<.05$);									
Girls									
Total	1450	100	2022	100	2780	100	6252	100	
Without pain	452	31.2	338	16.7	288	10.4	1078	17.2	<.05
With pain	998	68.8	1684	83.3	2492	89.6	5174	82.8	
10–13 yr <14–16 yr, 17–19 yr ($P<.05$); 10–13 yr,14–16 yr <17–19 yr ($P<.05$);									

BP = back pain.

Table 2

The prevalence of BP with regard to the number of hours spent in a sedentary position and students' age (n = 11424).

	With pain		Without pain		Total		*P*
	n	%	n	%	n	%	
Total	8498	100	2926	100	11424	100	
<5 h	978	11.5	696	21.6	1674	14.6	<.05
>5 h and more	7520	88.5	2230	69.4	9750	85.4	
10–13 yr	1818	100	1126	100	2944	100	
<5 h	403	22.2	410	36.4	813	27.6	<.05
>5 h and more	1415	77.8	716	63.6	2131	72.4	
14–16 l yr	2990	100	1050	100	4040	100	
<5 h	346	11.6	185	17.6	531	13.1	<.05
>5 h and more	2644	88.4	865	82.4	3509	86.9	
17–19 yr	3690	100	750	100	4440	100	
<5 h	229	6.2	101	13.5	330	7.4	<.05
>5 h and more	3461	93.8	649	86.5	4110	92.6	

BP = back pain.

The frequency of occurrence of BP depending on school backpack weight was the next aspect included in the analysis. The results indicate that students reporting BP declared that their backpack was heavy more often than their counterparts who did not report BP (59.6% vs 43.3%). This situation occurred in all the age groups ($P < .05$) (Table 3).

3.3. Frequency, location, and circumstances of BP

While analyzing the frequency of occurrence of BP, it was noted that the respondents who experienced pain rarely, that is, 1 to 2 times a year constituted the largest group. This state was declared by 55.1% of the respondents. The analysis of the frequency of BP with regard to sex revealed that boys declared BP occurring 1 to 2 times a year more often than girls (61.2% vs 51.2%); however, the percentage of boys declaring frequent or constant pain was lower than the percentage of girls (7.9% vs 10.8%) (Table 4).

When analyzing the frequency of BP with regard to age, it was observed that the percentage of the respondents reporting very rare cases of BP (1–2 times a year) decreased with age (63.9% vs 57.2% vs 49.1%). In turn, the percentage of individuals declaring frequent or constant pain (more than 1–2 months) increased (7.2% vs 8.9% vs 11.4%) (Table 4).

BP was mainly located in the lumbar spine, which was declared by 55.8% of the respondents. The analysis of pain location depending on the respondents' age showed that in the group of 10 to 13-year-olds, pain was located mainly in the cervical spine (50.3%), while in the groups of 14 to 16-year-olds and 17 to 19-year-olds in the lumbar spine (51.9%, 71.2%) (Table 4).

Students aged 10 to 13 and 14 to 16 mainly experienced BP when carrying a school backpack, while in the group of 17 to 19-year-olds, BP occurred most often when lifting heavy objects. A considerable group of students declared that they felt BP during physical activities (21.8%) and during physical education (PE) classes (19.1%) (Table 4).

3.4. Ways of dealing with BP and the students' knowledge of ergonomics

Only 20.0% students sought medical help due to BP. The percentage of the respondents who went to a physician because of their BP decreased with age (28.8% vs 19.5% vs 16.2%).

The analysis revealed that rest was the most common method of dealing with pain (71.3%), while physiotherapy procedures other than electrotherapy were the second most common way (44.4%). It occurred in all the age groups. A considerable group of students aged 10 to 13 (14.9%), 14 to 16 (12.7%) and 17 to 19 (17.5%) used painkillers to relieve BP (Table 5).

Table 3

The prevalence of BP in students with regard to the declared backpack weight and students' age (n = 11424).

	With pain		Without pain		Total		*P*
	n	%	n	%	n	%	
Total	8498	100	2926	100	11424	100.00	
heavy	5063	59.6	1267	43.3	6330	55.4	<.05
light	3435	40.4	1659	56.7	5094	44.6	
10–13 yr	1818	100	1126	100	2944	100	
heavy	968	53.3	434	38.5	1402	47.6	<.05
light	850	46.7	692	61.5	1542	52.4	
14–16 yr	2990	100	1050	100	4040	100	
heavy	1845	61.7	505	48.1	2350	58.2	<.05
light	1145	38.3	545	51.9	1690	41.8	
17–19 yr	3690	100	750	100	4440	100	
heavy	2250	60.9	328	43.7	2578	58.1	<.05
light	1440	39.1	422	56.3	1862	41.9	

BP = back pain.

Table 4

The frequency, location and circumstances in which BP occurred in the group of students with regard to their age (n = 8498).

	Girls with pain (n = 5174)		Boys with pain (n = 3324)		BP (n = 8498)		10–13 yr (n = 1818)		14–16 yr (n = 2990)		17–19 yr (n = 3690)	
	n	%	n	%	n	%	n	%	n	%	n	%
BP frequency												
Very rare BP (1–2/yr)	2650	51.2	2034	61.2	4684	55.1	1162	63.9	1711	57.2	1811	49.1
BP a few times a year (3–6 yr)	1968	38.0	1026	30.9	2994	35.2	525	28.9	1012	33.9	1457	39.5
Frequent or constant BP (more than 1–2 mo)	556	10.8	264	7.9	820	9.7	131	7.2	267	8.9	422	11.4
BP location*												
Cervical spine	1916	37.0	1156	34.8	3072	36.2	914	50.3	1116	37.3	1042	28.2
Thoracic spine	1494	28.9	1018	30.6	2512	29.6	606	33.3	994	33.2	912	24.7
Lumbar spine	3097	59.9	1646	49.5	4743	55.8	564	31.0	1552	51.9	2627	71.2
Circumstances in which BP occurred*												
Lifting heavy objects	3949	76.3	2058	61.9	6007	70.7	1121	61.7	2054	68.7	2832	76.8
Carrying a school backpack	3915	75.7	1816	54.7	5731	67.4	1301	71.6	2111	70.6	2319	62.8
Sitting	2732	52.8	1334	40.1	4066	47.8	810	44.6	1382	46.2	1874	50.8
PE lesson	1261	24.4	681	20.5	1942	22.9	531	29.2	705	23.6	706	19.1
Physical exercises	1196	23.1	714	21.5	1910	22.5	470	25.9	635	21.2	805	21.8
Changeable weather	503	9.7	250	7.5	753	8.9	99	5.5	231	7.7	423	11.5
Mental stress	489	9.5	207	6.2	696	8.2	99	5.5	263	8.8	334	9.1
Other	1474	28.5	318	9.6	1792	21.1	228	12.5	580	19.4	984	26.7

* The numbers do not add to 100% since the respondents were allowed to choose more than 1 answer; BP- back pain.

Next, the respondents experiencing BP were asked about their knowledge of ergonomics (i.e., how to sit properly or how to prepare a place of work and study). Students who declared the lack of such knowledge constituted the largest group (67.4%). This situation was noted in all the age groups. The 11.9% of the study participants declaring the knowledge of the rules of ergonomics and the ability to apply them constituted 11.9%, however, the number of students declaring this knowledge increased with age (Table 5).

Table 5

Ways of coping with BP and the knowledge of ergonomics among the students with regard to their age (n = 8498).

	BP (n = 8498)		10–13 years (n = 1818)		14–16 years (n = 2990)		17–19 years (n = 3690)	
	n	%	n	%	n	%	n	%
Seeking doctor's help								
Yes	1701	20.0	523	28.8	582	19.5	596	16.2
No	6797	80.0	1295	71.2	2408	80.5	3094	83.8
Ways of coping with BP*								
Medicines prescribed by a doctor	375	4.4	103	5.7	112	3.8	160	4.3
Generally available painkillers	1298	15.3	271	14.9	380	12.7	647	17.5
Electrotherapy procedures	237	2.8	30	1.7	96	3.2	111	3.0
Physiotherapeutic treatment other than electrotherapy (gymnastics, exercises)	3771	44.4	738	40.6	1316	44.0	1717	46.5
Rest	6057	71.3	1059	58.3	2121	70.9	2877	78.0
Other	409	4.8	91	5.0	178	5.9	140	3.8
The knowledge of ergonomics (how to sit properly, how to adapt one's place of work or study)								
I don't know the rules	5724	67.4	1325	72.9	2015	67.4	2384	64.6
Yes, I know the rules but I cannot apply them in practice	1759	20.7	394	21.6	605	20.2	760	20.6
Yes, I know the rules and I can apply them in practice	1015	11.9	99	5.5	370	12.4	546	14.8
What can reduce BP, according to the students*								
I don't know	719	8.5	279	15.4	249	8.3	191	5.2
Increased physical activity	5713	67.2	1019	56.1	1857	62.1	2837	76.9
Limiting the weight of a school backpack	5316	62.6	972	53.5	1936	64.8	2408	65.3
Reducing the number of hours spent in a sedentary position	3309	38.9	582	32.0	963	32.2	1764	47.8
Adapting school equipment (desk, chair) to body height	2436	28.7	447	24.6	811	27.1	1178	31.9
Increasing the availability of painkillers	282	3.3	64	3.5	99	3.3	119	3.2
Other	240	2.8	64	3.5	109	3.7	67	1.8

* The numbers do not add to 100% since the respondents were allowed to choose more than 1 answer; BP = back pain.

The largest group was constituted by the respondents who claimed that increasing the level of physical activity (67.2%) and decreasing the weight of a school backpack may reduce BP. According to a considerable group of students (38.9%), limiting the weight of a school backpack could reduce BP as well (Table 5).

4. Discussion

The study sought to characterize BP (in the period of 12 months) in children and youth aged 10 to 19 from eastern Poland.

The study revealed that BP affected a considerable group of children and youth aged 10 to 19 (74.4%). It could be noted that girls reported BP more often than boys (82.8% vs 64.3%) and the percentage of individuals reporting BP increased with age. Students with BP more often spent more than 5 hours in a sedentary position than students without pain (96.4% vs 63.6%) ($P < .05$). It was also revealed that students who reported BP more often declared that their backpack was heavy than students without pain (59.6% vs 43.3%).

Similar research on BP in children and youth was carried out in other countries. The study by Wedderkopp et al conducted in Denmark revealed that BP (occurring within the last month before the investigation) occurs in 39% of the children and youth aged 8 to 10 and 14 to 16.[22] In the American study on children aged 12 to 18, Sheir-Neiss et al revealed that BP occurred in 74.4% youths.[7] Ayanniyi et al observed that BP was reported by nearly 60% of the children from Nigeria.[23] Differences in the percentage values obtained in the cited studies may result from the fact that they analyzed different periods in which BP occurred. Some studies analyzed BP occurring within 1 or 2 months preceding the investigation, while other researchers focused on a longer period of 1 year (12 months). The results presented in our study regarded 1 year preceding the investigation, which may have led to the fact that the percentage of the respondents reporting BP was bigger.

The study revealed that BP was mainly located in the lumbar spine, which was reported by over 55.8% of the respondents. The next most common locations were cervical (36.1%) and thoracic (29.6%) spine. Similar findings were presented by Wagenhauser, who concluded that BP was mainly located in the lumbar (53.5%) and cervical spine (23.4%).[24] In turn, the research carried out by Diepenmaat et al indicated that BP was most often located in the cervical spine and then in the lumbar spine.[25] In the study by Wedderkopp et al, it was concluded that in children (8–10 years old) BP was noted mainly in the thoracic spine, while in adolescents (14–16 years old), the prevalence of BP in the thoracic spine was similar to that in the lumbar spine.[9] The obtained results are also contrary to the findings of Vikat et al, who revealed that BP was located in the cervical spine more often than in the lumbar spine.[2] It is difficult to conclude unanimously what causes such big differences regarding the location of BP. However, according to Wedderkopp et al, in the research on children and youth, BP should be analyzed separately for the cervical, thoracic and lumbar spine for clinical and scientific reasons.[9]

Our research revealed that the BP occurs mainly during lifting heavy objects (70.7%), carrying a school backpack (67.4%) and maintaining a sedentary position (47.8%). The fact that a considerable group of students felt BP during physical exercises (22.5%) or even during PE classes (22.8%) is an alarming situation.

The data concerning the influence of physical activity on BP which are available in the literature are not unanimous. The study by Harreby et al revealed that high-intensity physical activity correlated with the occurrence of BP.[26] In turn, the lack of correlation between pain and physical activity was confirmed by Diepenmatt and Morgensen et al.[25,27] Contrary results were revealed by Wedderkopp et al, who concluded that high-intensity physical activity in childhood may be treated as a way of preventing BP in older age.[22] The studies by other authors revealed that taking up physical activity by persons experiencing BP protects them against recurring or chronic pain.[28] Very interesting observations were made by Heneweer et al in their study on a group of 3664 participants. They concluded that the correlation between BP and physical activity may be U-shaped. Both a sedentary lifestyle and high-intensity physical activity increased the risk of BP.[29] It shows that both passive lifestyle and excessive activity may increase the risk of BP. The authors concluded that it was the quality, not the quantity of physical activity that was significant. The boundary between moderate and excessive physical activity is also determined by physical fitness. The authors also pointed to the fact that it was significant whether physical activity was taken up as an obligation or voluntarily.[29]

The ways of relieving or eliminating BP observed in the study are alarming. Only 20% of the respondents sought physician's help. In future studies, it would be worth analyzing reasons for BP in a young population, which can improve the quality of the prevention programs. Considerable groups of students used generally available painkillers to relieve BP. The knowledge of ergonomics and an ability to adapt a place of work and study was also very low (11.9%) and indicates very important role of education in this area.

4.1. Study limitations

The presented results are a subjective assessment of the reported BP; however, it should be noted that these are recognized methods of assessing BP.[2,22,26,29] Moreover, the questionnaire was validated, so these limitations did not affect the value of the obtained results significantly.

4.2. Study strengths

In the available literature, there are studies which analyze the prevalence of BP in children and youth; however, they are mainly analyses of low BP (LBP) only. We did not limit our study to LBP, as all the segments of the spine (cervical, thoracic, lumbar) were taken into account. A large population sample (11619 study participants) and a broad age range (10–19 years) constitute study strength as it makes it possible to verify the spinal pain occurrence in particular age groups. To our knowledge, this is the first study concerning BP on such a large group of children and youth from Poland.

The reliability of the questionnaire applied in this study was assessed. The Kappa coefficient value for all the analyzed variables was equal to or higher than 0.91, which proves high validity of the questionnaire and the reliability of information gathered with it (a large percentage of responses was obtained (98.3%). This was a basis for an appropriate analysis of the collected material.

5. Conclusions

1. BP occurred in a large group of students (74.4%) and its prevalence increased with age. The pain was usually rare (1–2 times a year).
2. The declared BP was mainly located in the lumbar spine. The results of the research showed that a small group of students (20.0%) sought medical help because of BP. Rest was the most common method of dealing with pain (71.3%), while physiotherapy procedures were the second most common way of relieving the pain (44.4%).
3. Increasing the level of physical activity (67.2%) and decreasing the weight of a school backpack were indicated as factors which may reduce BP.
4. The students present very low level of knowledge about ergonomics. Therefore, the appropriate education should be included at school.

Author contributions

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