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Low back pain in a population of school children

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Abstract A study was undertaken to analyse the prevalence of low back pain (LBP) and confounding factors in primary school children in the city of Antwerp. A total of 392 children aged 9 were included in the study. All children completed a validated three-page questionnaire and they all underwent a specific lumbar spine oriented medical examination during their annual routine medical school control. This examination was performed by the city school doctors. The questionnaire was composed of easy "yes/no" questions and visual analogue scales. Statistical analysis was performed using Student's *t*-test and chi-squared test at the significance level $P < 0.05$. The prevalence of LBP was high. No gender difference was found. A total of 142 children (36%) reported having suffered at least one episode of LBP in their lives. Of these, 33 (23%) had sought medical help for LBP from a doctor or physiotherapist. Sixty-four percent of children reporting LBP said that at least one of their parents suffered from or complained of LBP. This was significantly higher than for the children who did not report having suffered LBP. The way in which the school satchel was carried (in the hand, on the back) had no bearing on the incidence of LBP. There was significantly more LBP in children who reported playing video games for more than 2 h per day, but this was not so for television watchers. The visual analogue scales concerning general well-being were all very significantly correlated with self-reported LBP, with children who reported LBP being more tired, less happy, and worse sleepers. Of the 19 clinical parameters taken down during the medical examination, only one was significantly more prevalent in the group of children reporting LBP: pain on palpation at the insertion site on the iliac crest of the iliolumbar ligament. From this study we can establish that there are few clinical signs that can help to single out school children with LBP.

Key words Low back pain · Children · Clinical examination · Questionnaire · Prevalence

Introduction

Lumbar pain has generally been believed to be uncommon among children and adolescents before the age of 20 [12]. Moreover, "… in traditional paediatric orthopaedic teaching, a child with back pain has a tumour or infection until proven otherwise." [6]. In one study, subjects aged less than 20 years represented 1% of the whole population of patients operated on for disc herniation [2].However, the NHANES II (National Health and Nutrition Examination Survey Series) survey reported onset of low back pain (LBP) before the age of 20 in 11% of the general population [8]. During the last 15 years, a large number of studies in different countries have shown that the prevalence of non-specific LBP among adolescents is close to the figures well known for adults [1, 5, 13, 14, 16, 17, 19, 21, 23]. The epidemiology of LBP and the associated factors among these age groups have been reviewed by different authors [2, 3, 7, 9, 22].

Most of these studies were cross-sectional, with all the bias and limits inherent to this type of studies. More recently, some longitudinal studies have been published, which have increased our knowledge of this topic. Burton et al. followed a cohort of 216 adolescents between the ages of 11 and 15 over a period of 5 years, and reported figures of annual incidence of LBP increasing from 11.8% to 21.5% over the follow-up period. Lifetime prevalence of LBP increased similarly from 11.6% at age 11 to 50.4% at age 15 years [4]. These results are in agreement with the results of Ehrmann-Feldman, who found a 1-year cumulative incidence of LBP of 17.2% [10]. A significant proportion of adolescents report recurrent or chronic pain [4, 21]. In Finland, Zitting et al. studied a large cohort of subjects (about 12,000) born in 1966, focusing on hospital admissions due to lumbar disc diseases. They reported that the first hospitalisations appeared at around the age of 15 years, but the incidence sharply increased from the age of 19 [24]. In a retrospective study of 648 paediatric patients, Combs and Caskey reported that “back pain with no organic cause” was the most frequent primary diagnosis (57.4%) [6]. Micheli and Wood highlighted the higher frequency of some diagnoses, mainly spondylolysis/spondylolisthesis among young athletes [15]. Salminen et al. performed a prospective study with 3-year follow-up, comparing adolescents with and without LBP [20]. These authors concluded that their results “favour the hypothesis of a causal relationship between the early evolution of degenerative process of lower lumbar discs and frequent LBP in some young persons” [20].

Concerning the value of routine school examinations, Hertzberg studied the predictive value of such examination by means of a comparison between the school health records of 302 subjects examined at the age of 16, and the results of a survey carried out 9–12 years later. No consistent risk factor for lumbar pain was found in this study [11].

From this overview of the literature it appears that most studies concerning non-adults have been focused towards adolescents. The present longitudinal prospective study aims at finding factors associated with the prediction of LBP in school children 9–12 years old. This is a younger age group than has been reported on in previous studies, with the exception of the cross-sectional study by Mierau et al. [16].

The first part is cross-sectional, and describes a group of children age 9. The same children will be re-examined at age 12.

Materials and methods

This study was performed on school children in the city of Antwerp, Belgium.

Recruitment of schools

Antwerp has a public and religious (Catholic) school system. All schools are mixed, boys and girls. Schooling is compulsory, free of charge and there is freedom of choice. This study was performed within the context of the state school medical health care system, with the collaboration of the school medical doctors. These doctors acted as independent examiners of the children at routine examination. Medical screening is compulsory at 9 and 12 years of age. All children available for medical examination in 1997 were included in the study.

Subjects

A total of 392 children in the third grade at state primary school, representing 24 classes, were recruited into this study. There were 202 boys and 190 girls. Of these, 365 children turned 9 during the school year in which the study was performed, 22 were 1 or 2years older, and five were younger.

Questionnaire

All children filled in a three-page questionnaire (Appendix 1) about their general health and health perception, in particular regarding LBP. The questionnaire was composed of easy “yes/no” questions and visual analogue scales. Their own regular teacher, by means of an example, explained the principle of VAS (visual analog scales) to them on the blackboard. The children filled in the questionnaires themselves at the annual school medical visit.

Medical low back clinical examination

Besides the routine medical visit, a special standardised clinical examination of the lumbar spine (Appendix 2) was carried out. All school doctors attended a 2-h session to learn about the purpose of the study and to ensure standardisation of the routine low back examination. A one-time follow-up visit by the first author was made to each participating school to verify the comprehension and adherence to protocol by the trained physicians. The researcher had no other involvement.

Statistical analysis

Once the school children had completed their questionnaires and the doctors the evaluation sheets, the data were processed for analysis. Statistical analysis was performed using Student’s *t*-tests and chi-squared tests at a $P < 0.05$ level. The reproducibility of the response to the questionnaire had previously been evaluated by test-retest, with a group of 60 children who filled in the questionnaire on two occasions with a 6-week interval. There were no statistical differences between the first and the second round, with question-by-question Kappa values ranging from 0.81 to 0.95 (unpublished data, Gunzburg et al., 1997). There were very few missing data and the results are reported with missing data excluded.

Approval of the study

Ethical approval was obtained from the inspector general of the state schools of Antwerp. All data were treated confidentially by the research group. There were no links between the school inspectors and the research group.

Results (Table 1)

The prevalence of LBP was high and there was no difference between the sexes. Lifetime prevalence was 36%, 142 children reported having already experienced LBP at least once in their life. Of these, 20 (14%) complained of LBP the day before the test, 36 (25%) had already had to miss school because of low back trouble and 14 (10%) had had to miss calisthenics classes at school. In this group of 142 children, 23 (16%) had had to interrupt sports activities at some stage because of LBP and 33 (23%) had already visited a doctor or a physiotherapist in connection with the LBP. In this same group of 142 children, 64% mention that at least one of their parents suffers from or complains of LBP. This percentage is significantly higher (P = 0.002) than in the group of children who reported never having experienced LBP. Children who walked to school (n = 218) reported suffering LBP significantly less(66/218 or 30%) than children who took public transport or children who were brought to school (n = 174, 76/174 or 44%: P = 0.006). The way in which the school satchel was carried [in the hand (n = 45) or on the back (n = 342)] did not influence the prevalence of LBP (P = 0.9), yet children reporting LBP more often found their school satchels too heavy (64/142 or 45%) in comparison with the other children (83/247 or 36%; P = 0.02).

There was no difference in reported LBP between children actively involved in sports activities (n = 238) and those who were not (n = 153; P = 0.44).

There was significantly more reported LBP in children who played video games for more than 2 h per day (12/18; P = 0.03), whereas this was not the case for children who watched television for more than t2 h per day (29/80). Children who played video games for more than t2 h per day were also worse sleepers (P < 0.05).

The visual analogue scale measurements for the questions “Are you happy?”, “Do you sleep well?”, “How easily do you fall asleep?”, “Are you tired without reason?”, “How do you find your health?” were significantly higher (non-paired t-test, P < 0.05) in the children who mentioned having suffered LBP at least once in their lifetime; these children being less happy, worse sleepers, more tired without reason and generally feeling less happy.

Of the 19 clinical parameters recorded during the medical examination, only one was statistically more prevalent (P = 0.0016) in children mentioning LBP: pain at palpation of the insertion point on the iliac crest of the iliolumbar ligament.

Table 1 Incidence of some self-reported references

	n	Low back pain at least once		Low back pain never	
		n	%	*n*	%
Boys	202	69	34	133	66
Girls	190	73	38	117	62
Sport outside school	238	90	38	148	62
No sport outside school	153	52	34	101	66
Parents with LBP	210	91	43	119	56
Parents without LBP	182	51	28	131	72
Walking to school	218	66	30	152	70
Not walking to school	174	76	44	98	56
Satchel on the back	342	123	36	219	64
Satchel in hand	45	16	36	29	64

Discussion

Over the years it has become clear that a high prevalence of LBP occurs not only in adults, but also in adolescents [2,22]. One of the important facets of this study is that it focused on children younger than those dealt with in the current literature. More recently, cross-sectional and longitudinal studies have focused on non-specific back pain in children. Whereas Burton et al. [4] found an incidence of 12% at the age of 11, we found that 36% of a cohort of 392 9-year-olds had experienced at least one episode of LBP. This is more than has been reported up to now in the literature. One of the reasons may be that the numbers in this study do not originate from a clinic or a medical practice, but were obtained from a self-reporting questionnaire. This by no means indicates chronicity for these children, even though a large number (14%) reported having experienced LBP the previous day. That the low back trouble may be debilitating even in so young an age group is clearly demonstrated by the need for some to miss gym classes (10%) or to seek medical help (23%).

The relationship between LBP in adults and personality factors is well established. Some studies have suggested a similar relationship among school children [2, 3, 10, 22]. One of the most interesting findings in this study is that a similar trend appears to exist even in this group of 9-year-old city children. Incidence of self-reported LBP was significantly correlated with self-reported feeling of unhappiness, sleeplessness and perceptions of ill health.

Interestingly, there was a strong correlation between self-reported LBP and the perception by the children that one or both parents were back pain sufferers. Perhaps these children, being aware of the condition, were more inclined to report it themselves. Or perhaps there are hereditary and/or environmental factors that could explain this relationship. The same association has been reported previously [2, 3, 19, 22]. However, a recent longitudinal study has not found this correlation [10].

The children in this study were recruited through the state school health care system. It is not possible to find out how many children of the same age were in the religious school system. In our study group, 60% of the children practised some form of sports apart from the schools' compulsory 2 h per week. We found no relationship between the prevalence of self-reported LBP and sports activity. There appears, therefore, to be no substantiated reason to tell a child with LBP to restrict this kind of activity. In Ehrmann-Feldman's longitudinal study [10] and in Burton and co-workers' study [4], sports activities were not significantly associated with LBP. However, in a longitudinal study, Burton et al. [4] found an increased risk associated with sports activities among boys aged 15 years.

Children who played video games for more than 2 h per day reported significantly more LBP, whiletelevision watchers did not. One possible explanation could be the position in which such activities are performed. Watching television, being entirely passive, is mostly done sitting or even lying on a couch. Video games, on the other hand, require active participation, and often a cord link to the screen, with children adopting squatting or prone positions on the floor in front of, and thus often at the foot of the television set. How these children determined the time spent on these activities is hard to tell. Judging a time lapse may be difficult for a child, yet we found a good correlation during the validation test for the questionnaire. Some previous cross-sectional studies have reported significant associations between LBP and time spent watching television [1, 23], while in other papers no association was found [3]. This is the first attempt to distinguish between watching television and playing video games.

That routine medical examination of children at school is of paramount importance in the early detection of scoliosis is in no doubt. The earlier a scoliosis is treated, the better is the outcome. This is certainly not the case for LBP. Even if it were possible to clinically diagnose LBP at an early stage, it would not be of much use, for there is no specific treatment based on scientific evidence. In any case, the results of our study so far cannot help determine clinical predictive parameters. Sagittal dorsal and lumbar profile as well as pelvic inclination were judged on inspection by the medical examiners. The presence or absence of scoliosis was also checked clinically, and included a forward bending test to look for an asymmetrical hump. As we are about to re-examine all the same children at age 12, this next step of the study will allow us to look at the association of some factors with "new cases" of LBP. Interestingly, pain was more often elicited at the iliac crest in children reporting LBP. There was, however, no correlation with hyper-lordosis, pelvis asymmetry or tight hamstrings. The lack of value of the clinical examination has already been reported by others [11], while Nissinen et al [18] reported that sitting height and trunk asymmetry were positively associated with the risk of LBP. However, the authors concluded that the role of anthropometrics seemed "modest" (OR 1.24 and 1.19 per SD respectively for sitting height and hump size)[18].

In adults, smoking is one of the major confounding factors in LBP. A significant association with incident LBP among 13-year-old adolescents has been found [10]. This cannot be imputed in 9-year-olds. However, 36% of all children reported LBP. To what extent there was a correlation with smoking parents has, unfortunately not yet been established in this study. The possible role of passive smoking has been mentioned by Ehrmann-Feldman [10], but her study could not answer this question.

One limitation of this study is that there are no rural children participating. It is only generalisable to city children. The strength is that the study is representative for city children and that the school medical health care system was willing to participate, ensuring independent evaluation.

In spite of the high prevalence of non-specific LBP in this study, clinicians need to remain extremely attentive by establishing a differential diagnosis: tumours, infection, spondylolisthesis and other major conditions must always first be excluded.

Conclusion

In this group of 392 mostly 9-year-old city children, 36% reported having suffered at least one episode of back pain. Clinical examination was not helpful in indicating self-reported LBP. There was a significant correlation between self-reported LBP and indicators of general well being, as well as between self-reported LBP and LBP in these children's parents. The risk of future LBP associated with these factors will be analysed in the next phase of our study.

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Appendix 1: Questionnaire

1. Do you need spectacles in class?
2. Do you find that you see well?
3. Can you see colours well?
4. Do you hear well?
5. Are you wearing braces?
6. Do you write with the right hand, the left hand or can you write with both hands?
7. How long did you watch TV yesterday?
8. How long did you play with computer or video games yesterday?
9. Do you do sport?
10. Do you do it competitively?
11. How well do you usually sleep? (VAS)
12. How well do you fall asleep? (VAS)
13. Do you sleep with a pillow?
14. Do you wake up at night? (VAS)
15. Are you sometimes tired without reason? (VAS)
16. How do you rate your health? (VAS)
17. Are you happy? (VAS)
18. Have you at least once in your life experienced pain in the back in the place shown on the drawing?
19. Was this pain bearable? (VAS)
20. How many days did it last?
21. Did you have low back pain yesterday?
22. Was this pain bearable? (VAS)
23. Did you ever stay at home because of back pain?
24. Did you ever stop gym because of back pain?
25. Did you ever stop sport because of back pain?
26. Did you ever see a doctor or physiotherapist because of back pain?
27. Does your mother or father complain of back pain?
28. Do you walk to school?
29. How many minutes does this take?
30. How do you carry your satchel?
31. Do you find your satchel too heavy?

Appendix 2: Clinical examination

32. Height
33. Weight
34. Sagittal dorsal profile standing (normal/hyperkyphotic/flat back)
35. Sagittal lumbar profile standing (normal/hyperlordotic/flat back)
36. Scoliosis
37. Pelvic inclination
38. Skin inspection (normal/hypertrichosis/sinus etc)
39. X-legs
40. O-legs
41. Footsoles (normal/flat/hollow)
42. Valgus feet
43. Left sacro-iliac pain (on testing)
44. Right sacro-iliac pain (on testing)
45. Left lateral inclination
46. Right lateral inclination
47. Finger-floor distance in forward bending (hamstrings)
48. Gibbus?
49. Painful palpation ilio-lumbar ligament insertion point on iliac crest
50. Painful palpation spinous processes
51. Paraspinal pain on palpation