

Chronic idiopathic pain in adolescence – high prevalence and disability: The young HUNT study 2008

Gry Børmark Hoftun^{a,b,*}, Pål Richard Romundstad^c, John-Anker Zwart^{d,e}, Marite Rygg^{a,b}

^a Department of Laboratory Medicine, Children's and Women's Health, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway

^b Department of Pediatrics, St. Olavs Hospital, Trondheim, Norway

^c Department of Public Health and General Practice, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway

^d Department of Neuroscience, Faculty of Medicine, Norwegian University of Science and Technology, Trondheim, Norway

^e Department of Neurology, Oslo University Hospital, Ullevål and University of Oslo, Norway

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

ARTICLE INFO

Article history:

Received 18 February 2011

Received in revised form 2 May 2011

Accepted 11 May 2011

Keywords:

Pain
Musculoskeletal pain
Headache
Adolescent
Disability
Prevalence

ABSTRACT

The aim of this study was to determine the prevalence of self-reported chronic idiopathic pain among adolescents in relation to age and gender, and to explore how pain interferes with daily activities. The study was performed in Nord-Trøndelag County, Norway in 2006–2008. All adolescents were invited to participate; the response rate was 78%. Participants completed a comprehensive questionnaire, including questions about pain and interference with everyday life. Chronic idiopathic pain was defined as pain at least once a week during the last 3 months, not related to any known disease or injury. The final study population, with complete pain questionnaires, consisted of 7373 adolescents aged 13–18 years. Chronic pain was reported by 44.4% of the participants, and 25.5% reported pain in at least 2 locations. Chronic idiopathic musculoskeletal pain was most prevalent (33.4%), and the neck/shoulder was most commonly affected. Musculoskeletal pain in 3 or more locations was reported by 8.5%. Pain almost daily was reported by 10.2%. More girls than boys reported pain. In girls, the prevalence of pain increased with age. A high number of pain-associated disabilities were reported, and 58.5% described difficulties doing daily activities in leisure time. Subjective disabilities were higher in girls, and increased with the frequency of pain and the number of pain locations, as shown by high disability in adolescents with musculoskeletal pain in 3 or more locations. Chronic idiopathic pain, especially multisite pain, is common among adolescents, and those suffering from it report a major impact on several areas of daily living.

© 2011 International Association for the Study of Pain. Published by Elsevier B.V. All rights reserved.

1. Introduction

Pain is a common complaint among children and adolescents [7,16,35,40,46]. The prevalence of chronic idiopathic pain, at least once a week, varies among studies, ranging from 12% to 35% [40,43,46]. Similarly, the prevalence of weekly musculoskeletal pain ranges from 9% to 32% [6,35]. The wide variations in prevalence are probably due to differences in pain definition, study design, and study population. Studies on pain impact have shown that children with chronic pain report similar or more disabilities in daily life than children with chronic somatic disorders [15,26]. Limitations in social functioning, school participation, sports activ-

ities, and/or sleeping problems are often reported by children with chronic pain [7,26,46]. Chronic pain in adolescents is also a burden to their families and to society [7,19,39]. Pain in adulthood is known to have severe economic consequences [30,31], but even in adolescence, chronic pain may have extensive financial consequences [49]. Follow-up studies have demonstrated that pain complaints in childhood tend to persist [4,11,12,15,20,41,51], and a considerable number of patients will have persistent or recurrent pain into adulthood [4,7,13,56]. Also, among children treated in specialized clinics, persistence rates are high [32]. Studies have shown that children often report pain in more than one location [35,40,43,46], and that the negative impact of pain [35,44,50] and the risk of persistence [11] increase as the number of painful locations increases.

Most studies on pain have focused on specific locations of pain, such as low back pain, neck pain, or headache [3,16,37], and studies on multisite pain in adolescents have been recommended [22]. A recent report showed that number of pain sites is relatively

* Corresponding author. Address: Department of Laboratory Medicine, Children's and Women's Health, Faculty of Medicine, NTNU, P.O. Box 8905, Medisinsk teknisk forskningscenter, Trondheim 7491, Norway. Tel.: +47 915 91 038; fax: +47 725 73 801.

E-mail addresses: gry.b.hoftun@ntnu.no, gryho@hotmail.com (G.B. Hoftun).

stable through adulthood [22], and this finding highlights the need to look at the situation in adolescence. Some studies have focused on the impact of different pain conditions on the adolescents' everyday activities, but few studies have assessed self-reported pain and disabilities in a large, unselected, nonclinical population. The high prevalence, the reduced quality of life, the financial consequences, and the importance of searching for factors associated with pain, justify further research in these areas.

The aim of this study was to estimate the prevalence of self-reported chronic pain, and especially the prevalence of chronic idiopathic musculoskeletal pain, single-site as well as multisite pain, in a large, unselected adolescent population in relation to age and gender. A second aim was to explore how pain interferes with daily activities.

2. Methods

2.1. Study design and population

The study took place in Nord-Trøndelag county in the middle of Norway, with approximately 132,000 inhabitants [53]. The county consists of both rural and urban areas, and does not differ considerably from other counties in Norway with regard to demographic factors, geography, and industry [38].

During the years 2006–2008, all the county's adolescents, aged 13–19 years, were invited to participate in the youth part of the Nord-Trøndelag Health Study ("Helseundersøkelsen i Nord-Trøndelag [HUNT]"). Of 10,485 invited, 8200 (78%) participated. The field work took place from October 2006 to June 2008. During a school lesson, the students completed a comprehensive questionnaire with more than 100 health-related items. Adolescents not attending school (apprentices and dropouts, $n = 412$ [3.9%]) were also invited ($n = 57$ participated). Students not at school on the day of the study could complete the questionnaire at a later clinical examination. The questionnaires were identical, except for one extra page for high school students. Reasons for not participating were mainly being absent from school on the day of the study, not wanting to participate, or lack of written consent from parents. Some 12-year-old children, who had entered junior high school, participated but were excluded due to the low number ($n = 27$). Only 260 of the 19-year-olds were reached, and they were also excluded. Of 7913 participants in the target age groups of 13–18 years, 7373 (93%) completed the pain questions and thus constituted the final study population in the present study.

The study was approved by the Regional Committee for Medical Research Ethics and the Norwegian Data Inspectorate Board. Written consent was obtained from the adolescents or from both child and parents if the child was younger than 16 years old.

2.2. Measures

2.2.1. Pain

The questionnaire included questions about whether they had experienced pain, not related to any known disease or injury, during the last 3 months. Participants were asked to specify if they had experienced headache/migraine, abdominal pain, or pain in the neck/shoulder, upper back, low back/buttocks, chest, upper and/or lower extremities, with locations marked on a figure beside the questions. The frequency of pain in each location was specified as; never/seldom, once a month, once a week, more than once a week, or almost every day. Chronic idiopathic pain was defined as pain not related to any known disease or injury, for at least once a week during the last 3 months. Chronic idiopathic musculoskeletal pain was defined as chronic idiopathic pain in the musculoskeletal locations (neck/shoulder, upper back, low back/buttocks,

chest, upper and/or lower extremities). The criteria for diffuse idiopathic pain [29] were chronic idiopathic pain affecting at least 3 musculoskeletal locations (areas) of the body.

2.2.2. Subjective disability

To assess to what extent pain interfered with the adolescents' everyday life, participants were asked to indicate if they agreed with one or more of the following statements: (1) I have difficulties falling asleep because of pain and/or pain disturbs my sleep; (2) because of pain I have difficulties sitting during a lesson; (3) pain disturbs me if I walk more than 1 km and; (4) pain disturbs me during physical exercise class. The statements were adapted from Mikkelsen et al. in order to calculate a subjective disability index [35]. The fifth phrase to establish the index was converted to a question: "All things considered, has pain made it difficult to do daily activities in leisure time?" This is slightly different from the original statement: (5) "Pain and aches disturb my hobbies [35]." The subjective disability index is calculated from the answers to the 5 statements, with one point for each verified statement, and a maximum of 5 points [35].

2.3. Data analysis

The data were analyzed using PASW 17 (Predictive Analytics Software; SPSS Inc, Chicago, IL, USA). For estimation of exact confidence intervals for binomially distributed variables, we used STATA (STATA Corp, College Station, TX, USA). Descriptive statistics were computed for pain in relation to age and gender, and for subjective disability.

3. Results

A total of 7373 adolescents, 3748 girls and 3625 boys, completed the pain questions. Of these, 4084 were aged 13–15 years (junior high school) and 3289 were 16–18 years (high school). Mean age was 15.8 years (SD 1.6).

3.1. Pain prevalence

Pain in any location, at least once a week during the last 3 months, was reported by 44.4% of the adolescents (Table 1). Chronic idiopathic musculoskeletal pain was the most prevalent condition, experienced by 33.4% of the adolescents, while headache/migraine (21.8%) and abdominal pain (11.3%) were less frequently reported. The neck/shoulder was the most commonly affected musculoskeletal location in both genders and both age groups, followed by lower extremities in the 13- to 15-year-olds and low back/buttocks in the 16- to 18-year-olds.

The prevalence of pain was higher in girls than in boys for all pain locations (Table 1). Girls reported twice as much headache/migraine and 3 times as much abdominal pain as boys. Pain prevalence was also, for the most part, higher in 16- to 18-year-old adolescents compared to 13- to 15-year-olds. However, in lower extremities, pain prevalence was higher in the youngest age group. Increase with age was most evident for pain in the neck/shoulder and low back/buttocks. The increase in pain prevalence with age was due to an increase in pain among girls (Fig. 1). Also, the gender difference in specific age groups increased with age, and was most pronounced at the age of 16 years.

Chronic pain in more than one location was reported by 25.5% (Table 1). In all pain locations, multisite pain was more prevalent than single-site pain. Chronic idiopathic musculoskeletal pain in 3 or more locations was reported by 8.5% of the adolescents, fulfilling the criteria for diffuse idiopathic pain [29]. Headache/migraine was associated with abdominal pain and musculoskeletal pain,

Table 1
Chronic idiopathic pain^a in adolescents aged 13–18 years, n = 7373.

	Only one location		At least one location		Girls		Boys		13–15 years		16–18 years	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Headache/migraine	519	7.0 (6.5–7.6)	1611	21.8 (20.9–22.8)	1122	29.9 (28.5–31.4)	489	13.5 (12.4–14.6)	823	20.2 (18.9–21.4)	788	24.0 (22.5–25.5)
Abdomen	168	2.3 (2.0–2.6)	834	11.3 (10.6–12.1)	641	17.1 (15.9–18.3)	193	5.3 (4.6–6.1)	438	10.7 (9.8–11.7)	396	12.0 (10.9–13.2)
Musculoskeletal	235	3.2 (2.8–3.6)	1271	17.2 (16.4–18.1)	838	22.4 (21.0–23.7)	433	11.9 (10.9–13.0)	583	14.3 (13.2–15.4)	688	20.9 (19.5–22.3)
Neck/shoulder	46	0.6 (0.5–0.8)	292	4.0 (3.5–4.4)	164	4.4 (3.7–5.1)	128	3.5 (3.0–4.2)	163	4.0 (3.4–4.6)	129	3.9 (3.3–4.6)
Upper extremities	47	0.6 (0.5–0.8)	310	4.2 (3.8–4.7)	188	5.0 (4.3–5.8)	122	3.4 (2.8–4.0)	164	4.0 (3.4–4.7)	146	4.4 (3.8–5.2)
Chest	37	0.5 (0.4–0.7)	710	9.6 (9.0–10.3)	473	12.6 (11.6–13.7)	237	6.5 (5.8–7.4)	331	8.1 (7.3–9.0)	379	11.5 (10.5–12.7)
Upper back	191	2.6 (2.2–3.0)	1024	13.9 (13.1–14.7)	625	16.7 (15.5–17.9)	399	11.0 (10.0–12.1)	447	10.9 (10.0–11.9)	577	17.5 (16.3–18.9)
Low back/buttocks	149	2.0 (1.7–2.4)	804	10.9 (10.2–11.6)	474	12.6 (11.6–13.8)	330	9.1 (8.2–10.1)	522	12.8 (11.8–13.8)	282	8.6 (7.6–9.6)
Lower extremities												
Musculoskeletal	705	9.6 (8.9–10.3)	2459	33.4 (32.3–34.4)	1500	40.0 (38.4–41.6)	959	26.5 (25.0–27.9)	1276	31.2 (29.8–32.7)	1183	36.0 (34.3–37.6)
One location	240 ^b	3.3 (2.9–3.7)	630 ^c	8.5 (7.9–9.2)	410	10.9 (10.0–12.0)	220	6.1 (5.3–6.9)	314	7.7 (6.9–8.5)	316	9.6 (8.6–10.7)
Three or more locations												
Pain, any location	1392	18.9 (18.0–19.8)	3270	44.4 (43.2–45.5)	2029	54.1 (52.5–55.7)	1241	34.2 (32.7–35.8)	1721	42.1 (40.6–43.7)	1549	47.1 (45.4–48.8)
One location			1878	25.5 (24.5–26.5)	1250	33.4 (31.8–34.9)	628	17.3 (16.1–18.6)	968	23.7 (22.4–25.0)	910	27.7 (26.1–29.2)
Two or more locations												

CI, confidence interval.

^a Pain at least once a week for at least 3 months, not related to any known disease or injury.^b Three or more musculoskeletal locations, no headache/migraine or abdominal pain.^c Three or more musculoskeletal locations including headache and/or abdominal pain.

especially in the neck/shoulder region (Table 2). Moderate correlations were also found between pain in the neck/shoulder and upper and low back/buttocks. Pain in the chest and upper and lower extremities showed weak correlations with the other pain locations.

Pain once a week was reported by 19.1% of the adolescents, 15.0% reported pain more than once a week, and 10.2% reported pain almost daily (Table 3). Pain almost daily in 3 or more locations was reported by 1.5% of the adolescents. There was no gender or age difference among the adolescents reporting pain once a month. However, with increasing frequency of pain from once a week to almost daily, the gender difference increased.

3.2. Subjective disability

Of all the adolescents reporting chronic pain of any location, 79.7% (data not shown) reported one or more disabilities. Adolescents with multisite pain reported more disabilities than those with pain in only one location (Table 4). Difficulties in daily activities during leisure time were the most frequently reported disability in all pain locations, reported by approximately 60%, followed by difficulties sitting during a school lesson, reported by about 50%. Sleeping difficulties and problems during physical exercise class were also frequently reported. The adolescents with musculoskeletal pain in 3 or more locations, fulfilling the criteria of diffuse idiopathic pain, reported most pain-associated disabilities, but also within this group, disabilities increased when including other pain locations, like headache/migraine and/or abdominal pain. Overall, more girls than boys experienced disabilities; differences between age groups were small (Table 5).

3.3. Subjective disability index

The proportion of adolescents with no disabilities decreased with increasing number of pain locations (Table 6). Among those reporting pain in at least 5 locations, two-thirds reported maximal disability (disability index 3–5). The more frequent the musculoskeletal pain, the higher the scores on the subjective disability index (Table 7). Of the 558 adolescents reporting musculoskeletal pain almost daily (7.6% of the study population), 58.4% reported maximal disability. Among the adolescents reporting chronic idiopathic pain almost daily in 2 or more locations, or 3 or more locations, 66.9% and 75.0%, respectively, reported maximal disability (data not shown).

4. Discussion

This study confirms chronic idiopathic pain as common in adolescents. The overall prevalence of 44.4% is even higher than in other comparable studies [40,43,46]. In the study by Roth-Isigkeit et al. [46], 35.2% of the children and adolescents reported pain at least once a week. A high prevalence of chronic pain among adolescents in Norway is in agreement with a study on adult chronic pain performed in 15 European countries, where the prevalence in Norway was among the highest [5]. Whether these differences are due to organization of health services, economy, cultural differences, or other factors, is not known.

The definitions of recurrent and chronic pain vary in different studies [17,21,28,40,44], from pain at least once a month [44] to pain occurring weekly or more [28], and from recurrent or continuous pain for more than 3 months [40] to pain lasting at least 1 day during the last month [21]. These different definitions make comparison between studies difficult. We chose to focus on idiopathic pain at least once a week during the last 3 months, as pain of this frequency and duration was presumed to be of more clinical rele-

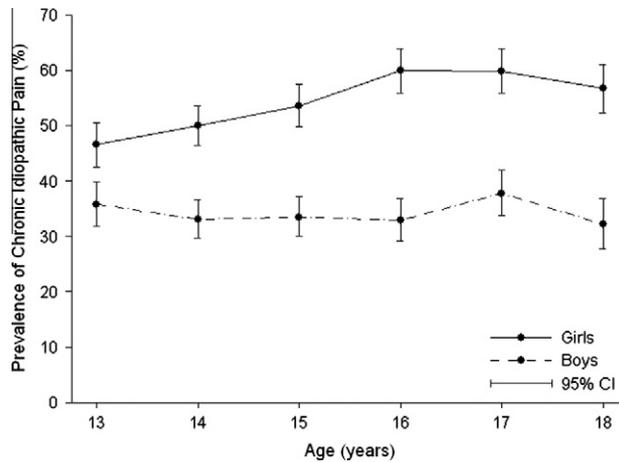


Fig. 1. Chronic idiopathic pain, defined as pain at least once a week for at least 3 months, not related to any known disease or injury, in adolescents aged 13–18 years according to age and gender, $n = 7373$. Prevalence (%) and 95% confidence interval (CI).

vance. Headache, abdominal, and musculoskeletal pain were considered in the same way because they may all be regarded as part of the spectrum of idiopathic pain. The use of the term “medically unexplained symptoms” is controversial [9].

One-third of the adolescents reported chronic idiopathic musculoskeletal pain, which is higher than reported from Sweden [6], but consistent with results from Finland [35]. The neck/shoulder region was the most reported musculoskeletal location, followed by low back/buttocks and lower extremities. The Finnish study [35] reported pain in the lower extremities as most common, followed by neck pain. These differences are probably due to the age difference in the study populations (10–12 vs 13–18 years), as our results show that neck/shoulder pain increases and pain in lower extremities decreases with age. The high prevalence of chronic neck/shoulder pain is worrying, as neck/shoulder pain is

a predictor of widespread pain (WSP) [34] and tends to persist more often than pain in other locations [11]. The prevalence of headache/migraine was consistent with some [2,42], and slightly lower than other studies [35]. Pain almost daily in one or more locations was reported by 10.2%, compared to 5.5% in the Roth-Isigkeit study [46].

The majority of adolescents with chronic pain reported pain in more than one location. High levels of multisite pain are reported in several studies [6,27,35,40,43,50]. The design of the questionnaire made it impossible to evaluate the prevalence of WSP as defined by the American College of Rheumatology [58]. However, the American College of Rheumatology criteria have not been validated in children [47]. We chose to use the criteria suggested by Yunus and Masi [59], further defined as diffuse idiopathic pain syndrome by Malleson et al. [29] and preferred by several [7,8,25,48]. Little research has been done on diffuse idiopathic musculoskeletal pain in children/adolescents in the general population, despite the fact that this represents a common pain condition in clinical pediatric rheumatology practice [7]. In our study, the prevalence of chronic idiopathic musculoskeletal pain in 3 or more locations was high and, though not comparable, consistent with reported prevalence of childhood WSP [34]. Also, in adults, musculoskeletal pain is mostly reported as multisite pain [23], and a recent study indicates that the number of pain locations is a strong predictor of later disability pension [24].

Consistent with other studies [3,10,40,45,50,52,57,60], the prevalence of chronic idiopathic pain was higher in girls than in boys, and this gender difference increased with age [3,18,40,45]. Several explanations for gender differences in pain prevalence have been proposed [1,14,25,55]. Reporting pain once a month showed a different pattern, being equally prevalent among girls and boys. The prevalence of chronic idiopathic pain in most locations increased with age, consistent with previous studies [3,18,40,45,52]. In our study, these age differences were mostly attributable to increased pain prevalence in girls, a result recently supported by others [54].

Adolescents with chronic idiopathic pain experienced disabilities in several areas of daily life, supporting other studies

Table 2
Correlations^a (Spearman's rho) of different chronic idiopathic pain locations.

	Headache/ migraine	Abdomen	Neck/ shoulder	Upper extremities	Chest	Upper back	Low back/ buttocks
Abdomen	.31						
Musculoskeletal	.30	.24					
Neck/shoulder	.30	.22					
Upper extremities	.11	.14	.18				
Chest	.16	.22	.18	.16			
Upper back	.22	.18	.48	.16	.17		
Low back/buttocks	.21	.15	.35	.13	.15	.44	
Lower extremities	.15	.13	.13	.21	.10	.13	.17

^a Weak: <0.29, moderate: 0.30–0.49, strong: >0.50.

Table 3
Frequency of idiopathic pain, and number of pain locations in those with almost daily pain, in adolescents aged 13–18 years, $n = 7373$.

Frequency of pain	Total		Girls		Boys		13–15 years		16–18 years	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Once a month	2362	32.0 (31.0–33.1)	1166	31.1 (29.6–32.6)	1196	33.0 (31.5–34.6)	1298	31.8 (30.4–33.2)	1064	32.4 (30.8–34.0)
Once a week	1410	19.1 (18.2–20.0)	809	21.6 (20.3–22.9)	601	16.6 (15.4–17.8)	750	18.4 (17.2–19.6)	660	20.1 (18.7–21.5)
More than once a week	1106	15.0 (14.2–15.8)	712	19.0 (17.8–20.3)	394	10.9 (9.9–11.9)	579	14.2 (13.1–15.3)	527	16.0 (14.8–17.3)
Almost daily										
One or more locations	754	10.2 (9.5–10.9)	508	13.6 (12.5–14.7)	246	6.8 (6.0–7.7)	392	9.6 (8.7–10.5)	362	11.0 (10.0–12.1)
Two or more locations	299	4.1 (3.6–4.5)	205	5.5 (4.8–6.2)	94	2.6 (2.1–3.2)	144	3.5 (3.0–4.1)	155	4.7 (4.0–5.5)
Three or more locations	113	1.5 (1.3–1.8)	77	2.1 (1.6–2.6)	36	1.0 (0.7–1.4)	58	1.4 (1.1–1.8)	55	1.7 (1.3–2.2)

CI, confidence interval.

Table 4Subjective disability in adolescents aged 13–18 years with single-site and multisite chronic idiopathic pain.^a

	I have difficulties falling asleep because of pain and/or pain disturbs my sleep		I have difficulties sitting during a school lesson		Pain disturbs me if I walk more than 1 km		Pain disturbs me during physical exercise class		Pain has made it difficult to do daily activities in leisure time	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Headache/migraine										
Only headache/migraine	125	25.8 (22.0–30.0)	208	42.5 (38.1–47.1)	63	12.9 (10.1–16.2)	102	20.9 (17.3–24.7)	257	51.5 (47.0–56.0)
At least headache/migraine	641	41.6 (39.1–44.1)	812	52.4 (49.9–54.9)	316	20.5 (18.6–22.7)	601	39.3 (36.8–41.8)	992	63.3 (60.9–65.7)
Abdominal pain										
Only abdominal pain	54	33.3 (26.1–41.2)	76	46.9 (39.0–54.9)	22	13.6 (8.7–19.8)	43	26.4 (19.8–33.8)	83	50.9 (43.0–58.8)
At least abdominal pain	390	48.5 (45.0–52.0)	453	56.1 (52.6–59.6)	204	25.4 (22.5–28.6)	356	44.4 (40.9–47.9)	536	65.8 (62.4–69.0)
Musculoskeletal pain										
Only one musculoskeletal location	120	17.9 (15.1–21.1)	200	29.8 (26.3–33.4)	75	11.2 (8.9–13.8)	185	27.8 (24.4–31.3)	314	46.4 (42.6–50.2)
At least one musculoskeletal location	803	34.0 (32.1–35.9)	1127	47.5 (45.4–49.5)	493	20.9 (19.3–22.6)	968	41.4 (39.4–43.4)	1445	60.3 (58.3–62.2)
Diffuse idiopathic pain ^b										
Pain in at least 3 musculoskeletal locations	75	32.2 (26.2–38.6)	133	56.6 (50.0–63.0)	61	26.2 (20.7–32.3)	113	49.1 (42.5–55.8)	154	65.0 (58.5–71.0)
Including headache/migraine and/or abdominal pain	293	47.9 (43.9–51.9)	395	64.4 (60.5–68.2)	196	32.2 (28.5–36.1)	350	57.9 (53.8–61.8)	447	72.1 (68.4–75.6)
Pain, any location										
Only one location	299	22.7 (20.5–25.1)	484	36.6 (34.0–39.2)	160	12.1 (10.4–14.0)	330	25.0 (22.7–27.5)	654	48.8 (46.1–51.6)
At least one location	1037	33.2 (31.5–34.9)	1465	46.6 (44.8–48.3)	597	19.1 (17.7–20.5)	1149	36.9 (35.2–38.7)	1858	58.5 (56.7–60.2)

CI, confidence interval.

^a Pain at least once a week for at least 3 months, not related to any known disease or injury.^b Chronic idiopathic musculoskeletal pain in 3 or more locations.**Table 5**Subjective disability in adolescents aged 13–18 years with chronic idiopathic pain^a according to age and gender.

	Headache/migraine		Abdominal pain		Musculoskeletal pain		Diffuse idiopathic pain ^b		Pain, any location	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
<i>I have difficulties falling asleep because of pain and/or pain disturbs my sleep</i>										
Girls	518	47.7 (44.7–50.8)	320	51.7 (47.7–55.7)	588	40.7 (38.1–43.2)	213	53.4 (48.4–58.4)	777	39.8 (37.6–42.0)
Boys	123	27.0 (23.0–31.3)	70	37.8 (30.8–45.2)	215	23.5 (20.8–26.4)	80	37.6 (31.0–44.4)	260	22.2 (19.8–24.7)
13–15 years	309	39.6 (36.2–43.1)	203	48.0 (43.1–52.9)	370	30.4 (27.8–33.0)	136	44.7 (39.1–50.5)	505	30.9 (28.6–33.2)
16–18 years	332	43.6 (40.1–47.2)	187	49.1 (44.0–54.2)	433	37.9 (35.1–40.8)	157	51.0 (45.2–56.7)	532	35.7 (33.3–38.2)
<i>I have difficulties sitting during a school lesson</i>										
Girls	611	56.2 (53.2–59.2)	363	58.5 (54.4–62.4)	760	52.4 (49.8–55.0)	268	67.5 (62.7–72.1)	999	50.9 (48.7–53.2)
Boys	201	43.5 (38.9–48.2)	90	48.4 (41.0–55.8)	367	39.7 (36.5–43.0)	127	58.8 (51.9–65.4)	466	39.4 (36.6–42.2)
13–15 years	382	48.8 (45.2–52.4)	229	54.0 (49.1–58.8)	529	43.1 (40.4–46.0)	189	61.8 (56.1–67.2)	721	43.8 (41.4–46.3)
16–18 years	430	56.1 (52.5–59.7)	224	58.5 (53.4–63.5)	598	52.1 (49.2–55.0)	206	67.1 (61.5–72.3)	744	49.6 (47.0–52.2)
<i>Pain disturbs me if I walk more than 1 km</i>										
Girls	241	22.3 (19.9–24.9)	163	26.5 (23.0–30.1)	336	23.3 (21.1–25.5)	135	34.3 (29.6–39.2)	412	21.1 (19.3–23.0)
Boys	75	16.4 (13.1–20.1)	41	22.0 (16.3–28.7)	157	17.1 (14.8–19.7)	61	28.5 (22.6–35.1)	185	15.7 (13.7–18.0)
13–15 years	176	22.7 (19.8–25.8)	122	29.1 (24.8–33.7)	287	23.5 (21.2–26.0)	112	37.1 (31.6–42.8)	360	22.0 (20.0–24.1)
16–18 years	140	18.4 (15.7–21.3)	82	21.4 (17.4–25.9)	206	18.1 (15.9–20.4)	84	27.5 (22.5–32.8)	237	15.9 (14.1–17.8)
<i>Pain disturbs me during physical exercise class</i>										
Girls	460	42.8 (39.8–45.8)	289	47.1 (43.1–51.1)	658	46.0 (43.4–48.6)	242	61.9 (56.9–66.7)	787	40.6 (38.4–42.8)
Boys	141	31.1 (26.8–35.5)	67	35.6 (28.8–42.9)	310	34.1 (31.0–37.2)	108	50.5 (43.6–57.4)	362	30.9 (28.3–33.7)
13–15 years	299	38.5 (35.1–42.1)	194	45.9 (41.0–50.7)	517	42.6 (39.8–45.5)	185	61.5 (55.7–67.0)	628	38.5 (36.1–40.9)
16–18 years	302	40.1 (36.6–43.7)	162	42.7 (37.7–47.9)	451	40.0 (37.1–42.9)	165	54.3 (48.5–60.0)	521	35.3 (32.8–37.7)
<i>Pain has made it difficult to do daily activities in leisure time</i>										
Girls	740	67.2 (64.4–70.0)	424	67.5 (63.7–71.2)	945	64.5 (61.9–66.9)	307	76.2 (71.7–80.3)	1234	62.2 (60.0–64.3)
Boys	252	54.2 (49.5–58.8)	112	59.9 (52.5–68.0)	500	53.7 (50.4–56.9)	140	64.5 (57.8–70.9)	624	52.3 (49.4–55.1)
13–15 years	496	62.2 (58.7–65.5)	289	67.5 (62.9–71.9)	756	61.0 (58.2–63.7)	222	72.1 (66.7–77.0)	989	59.4 (57.0–61.7)
16–18 years	496	64.6 (61.1–68.0)	247	63.8 (58.8–68.6)	689	59.5 (56.6–62.3)	225	72.1 (66.8–77.0)	869	57.5 (54.9–60.0)

CI, confidence interval.

^a Pain at least once a week for at least 3 months, not related to any known disease or injury.^b Chronic idiopathic musculoskeletal pain in 3 or more locations.

[19,26,44,46]. It is alarming that almost half of the adolescent population reports some sort of chronic pain, and of these, nearly 60% describe pain-associated difficulties in leisure time. Sleeping difficulties, reported by one-third, might affect several areas of life [46]. Difficulties sitting during a school lesson, re-

ported by nearly 50%, are likely to influence attention and concentration.

Adolescents with chronic pain in more than one location reported distinctly more disabilities than those with single-site pain, consistent with a Swedish report [44]. In our study the number of

Table 6Subjective disability index in adolescents aged 13–18 years with chronic idiopathic pain^a according to number of pain locations.

Subjective disability index ^b	One location n (%)	Two locations n (%)	Three locations n (%)	Four locations n (%)	At least 5 locations n (%)
0	391 (30.4)	140 (19.0)	51 (10.7)	25 (9.2)	9 (3.4)
1–2	619 (48.1)	374 (50.7)	207 (43.5)	94 (34.6)	77 (28.9)
3–5	278 (21.6)	224 (30.4)	218 (45.8)	153 (56.3)	180 (67.7)
Total	1288 (100)	738 (100)	476 (100)	272 (100)	266 (100)

^a Pain at least once a week for at least 3 months, not related to any known disease or injury.^b One point for each affirmative answer to the following statements/questions: (1) I have difficulties falling asleep because of pain and/or pain disturbs my sleep; (2) because of pain I have difficulties sitting during a lesson; (3) pain disturbs me if I walk more than 1 km; (4) pain disturbs me during physical exercise class; (5) has pain made it difficult to do daily activities in leisure time?**Table 7**

Subjective disability index in adolescents aged 13–18 years with musculoskeletal pain the last 3 months according to frequency of pain.

Subjective disability index ^a	Once a month n (%)	Once a week n (%)	More than once a week n (%)	Almost daily n (%)
0	1329 (45.8)	265 (27.3)	116 (15.2)	45 (8.1)
1–2	1139 (39.3)	457 (47.1)	367 (48.1)	187 (33.5)
3–5	433 (14.9)	248 (25.6)	280 (36.7)	326 (58.4)
Total	2901 (100)	970 (100)	763 (100)	558 (100)

^a One point for each affirmative answer to the following statements/questions: (1) I have difficulties falling asleep because of pain and/or pain disturbs my sleep; (2) because of pain I have difficulties sitting during a lesson; (3) pain disturbs me if I walk more than 1 km; (4) pain disturbs me during physical exercise class; (5) has pain made it difficult to do daily activities in leisure time?

pain locations was more important for the subjective disability than the localization of pain. It is important to know that about two-thirds of adolescents with, for instance, headache/migraine also have pain in other locations, which will have major impact on their disability reports. It may be difficult to analyze the effects of one single pain location without asking for pain in other locations. Overall, a higher proportion of girls than boys reported disabilities, also supporting earlier studies [44,46], although different measures for disabilities were used.

In accordance with Mikkelsen et al. [36], the subjective disability index increased with the frequency of musculoskeletal pain, however, our results showed a higher score for adolescents with pain at least once a week. For adolescents reporting pain almost daily, nearly 60%, compared to 20% in the Finnish study [36], reported maximal disability score. The results are not totally comparable due to the minor difference in the fifth statement of the index, but it is unlikely that this explains the large difference in results. A more likely explanation may be the age difference between the study populations (10–12 years vs 13–18 years). Maximal disability score increased with the frequency of pain and the number of pain locations. As a high score on the disability index has been shown to predict pain persistence [36], this suggests that the more frequent and multisite, the higher the possibility for pain persistence.

Adolescents reporting musculoskeletal pain once a month had a low score on the disability index. This might be an important result regarding the different definitions on recurrent/chronic pain in the literature. Pain once a month might be a normal experience, rather than recurrent or chronic pain [47].

This is, to our knowledge, the only study on pain and disability including a complete adolescent population. The high participation rate and the fact that the county did not differ considerably from other counties in Norway make the results fairly representative for the country's adolescent population. Our strict definition of chronic idiopathic pain is one of the strengths of the study, as it probably excluded minor pain due to everyday harmless accidents or "normal" life events, and also pain due to known diseases or injuries. Another strength is the inclusion of several

aspects of pain, different pain locations, single-site as well as multisite.

Pain and disabilities might be more prevalent among adolescents not participating in the study, and this, together with the low participation among apprentices and dropouts, might signal a selection bias. Even though our definition of chronic pain is strict, it can be argued that pain once a week for the last 3 months does not necessarily indicate a chronic condition. The cross-sectional design of the study made it impossible to evaluate pain persistence. Follow-up studies are needed for this purpose. Answering the questionnaires relies on recollections from the last 3 months, and recall bias cannot be excluded, but others have shown that adolescents are able to accurately recall and report pain experiences [33]. Another limitation in our study is the focus on frequency of pain, and not on pain intensity. However, it has been shown that frequency of pain also reflects intensity fairly well [52]. The study was based on self-report and, as pain is a subjective phenomenon, other ways of measuring would be inaccurate [16]. While the subjective disability index was designed for musculoskeletal pain, we also used the index for headache and abdominal pain. Disability report was regarded as pain-associated, as the questions should be answered only by those who had reported pain in the last 3 months, but we missed the opportunity to compare disabilities between adolescents with and without pain. The study focused on the prevalence of pain, and did not include psychosocial factors, such as depression, which is known to be associated with pain. The general health focus on the questionnaire resulted in rather simple pain questions compared to more multi-dimensional questionnaires.

This study shows that chronic idiopathic pain in adolescence is common, particularly among girls, and may have a major negative impact on everyday life, with high disability. The disability increases with frequency of pain and number of pain locations; and adolescents with musculoskeletal pain in 3 or more locations, as well as those with daily pain, constitute a group with high subjective disability index. Further studies are needed to analyze pain-associated factors, such as psychosocial and lifestyle factors, in order to suggest appropriate intervention strategies.

Conflict of interest statement

The authors declare that there are no financial or other relationships that might lead to a conflict of interest.

Acknowledgements

This work was funded by the Norwegian Women's Public Health Association (Norske Kvinners Sanitetsforening, N.K.S.). We thank the adolescents participating in The Nord-Trøndelag Health Study (HUNT), which is a collaboration between HUNT Research Centre, The Faculty of Medicine, Norwegian University of Science and Technology (NTNU), The Norwegian Institute of Public Health, and Nord-Trøndelag County Council. We are also grateful to Marja Mikkelsen for letting us use the subjective disability statements and index, and for helping with the translation of the index from Finnish to Norwegian.

References

- [1] Aaro LE, Haugland S, Hetland J, Torsheim T, Samdal O, Wold B. Psychological and somatic complaints among adolescents [Norwegian]. *Tidsskr Nor Laegeforen* 2001;121:2923–7.
- [2] Borge AI, Nordhagen R. Recurrent pain symptoms in children and parents. *Acta Paediatr* 2000;89:1479–83.
- [3] Brattberg G. The incidence of back pain and headache among Swedish school children. *Qual Life Res* 1994;3:S27–31.
- [4] Brattberg G. Do pain problems in young school children persist into early adulthood? A 13-year follow-up. *Eur J Pain* 2004;8:187–99.
- [5] Breivik H, Collett B, Ventafridda V, Cohen R, Gallacher D. Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. *Eur J Pain* 2006;10:287–333.
- [6] Brun Sundblad GM, Saartok T, Engstrom LM. Prevalence and co-occurrence of self-rated pain and perceived health in school-children: age and gender differences. *Eur J Pain* 2007;11:171–80.
- [7] Clinch J, Eccleston C. Chronic musculoskeletal pain in children: assessment and management. *Rheumatology (Oxford)* 2009;48:466–74.
- [8] Connelly M, Schanberg L. Latest developments in the assessment and management of chronic musculoskeletal pain syndromes in children. *Curr Opin Rheumatol* 2006;18:496–502.
- [9] Creed F, Guthrie E, Fink P, Henningsen P, Rief W, Sharpe M, White P. Is there a better term than “medically unexplained symptoms”? *J Psychosom Res* 2010;68:5–8.
- [10] Diepenmaat AC, van der Wal MF, de Vet HC, Hirasings RA. Neck/shoulder, low back, and arm pain in relation to computer use, physical activity, stress, and depression among Dutch adolescents. *Pediatrics* 2006;117:412–6.
- [11] El-Metwally A, Salminen JJ, Auvinen A, Kautiainen H, Mikkelsen M. Prognosis of non-specific musculoskeletal pain in preadolescents: a prospective 4-year follow-up study till adolescence. *Pain* 2004;110:550–9.
- [12] El-Metwally A, Salminen JJ, Auvinen A, Kautiainen H, Mikkelsen M. Lower limb pain in a preadolescent population: prognosis and risk factors for chronicity—a prospective 1- and 4-year follow-up study. *Pediatrics* 2005;116:673–81.
- [13] Fearon P, Hotopf M. Relation between headache in childhood and physical and psychiatric symptoms in adulthood: national birth cohort study. *BMJ* 2001;322:1145.
- [14] Fillingim RB, King CD, Ribeiro-Dasilva MC, Rahim-Williams B, Riley 3rd JL. Sex, gender, and pain: a review of recent clinical and experimental findings. *J Pain* 2009;10:447–85.
- [15] Flato B, Aasland A, Vandvik IH, Forre O. Outcome and predictive factors in children with chronic idiopathic musculoskeletal pain. *Clin Exp Rheumatol* 1997;15:569–77.
- [16] Goodman JE, McGrath PJ. The epidemiology of pain in children and adolescents: a review. *Pain* 1991;46:247–64.
- [17] Groholt EK, Stigum H, Nordhagen R, Kohler L. Recurrent pain in children, socio-economic factors and accumulation in families. *Eur J Epidemiol* 2003;18:965–75.
- [18] Haugland S, Wold B, Stevenson J, Aaroe LE, Woynarowska B. Subjective health complaints in adolescence. A cross-national comparison of prevalence and dimensionality. *Eur J Public Health* 2001;11:4–10.
- [19] Hunfeld JA, Perquin CW, Duivenvoorden HJ, Hazebroek-Kampschreur AA, Passchier J, van Suijlekom-Smit LW, van der Wouden JC. Chronic pain and its impact on quality of life in adolescents and their families. *J Pediatr Psychol* 2001;26:145–53.
- [20] Jones GT, Macfarlane GJ. Predicting persistent low back pain in schoolchildren: a prospective cohort study. *Arthritis Rheum* 2009;61:1359–66.
- [21] Jones GT, Silman AJ, Macfarlane GJ. Predicting the onset of widespread body pain among children. *Arthritis Rheum* 2003;48:2615–21.
- [22] Kamaleri Y, Natvig B, Ihlebaek CM, Benth JS, Bruusgaard D. Change in the number of musculoskeletal pain sites: a 14-year prospective study. *Pain* 2009;141:25–30.
- [23] Kamaleri Y, Natvig B, Ihlebaek CM, Bruusgaard D. Localized or widespread musculoskeletal pain: does it matter? *Pain* 2008;138:41–6.
- [24] Kamaleri Y, Natvig B, Ihlebaek CM, Bruusgaard D. Does the number of musculoskeletal pain sites predict work disability? A 14-year prospective study. *Eur J Pain* 2009;13:426–30.
- [25] Keogh E, Eccleston C. Sex differences in adolescent chronic pain and pain-related coping. *Pain* 2006;123:275–84.
- [26] Konijnenberg AY, Uiterwaal CS, Kimpen JL, van der Hoeven J, Buitelaar JK, de Graeff-Meeder ER. Children with unexplained chronic pain: substantial impairment in everyday life. *Arch Dis Child* 2005;90:680–6.
- [27] Kristjansdottir G. Prevalence of pain combinations and overall pain: a study of headache, stomach pain and back pain among school-children. *Scand J Soc Med* 1997;25:58–63.
- [28] Kristjansdottir G, Rhee H. Risk factors of back pain frequency in schoolchildren: a search for explanations to a public health problem. *Acta Paediatr* 2002;91:849–54.
- [29] Malleson PN, al-Matar M, Petty RE. Idiopathic musculoskeletal pain syndromes in children. *J Rheumatol* 1992;19:1786–9.
- [30] Maniadakis N, Gray A. The economic burden of back pain in the UK. *Pain* 2000;84:95–103.
- [31] Mantyselka PT, Kumpusalo EA, Ahonen RS, Takala JK. Direct and indirect costs of managing patients with musculoskeletal pain-challenge for health care. *Eur J Pain* 2002;6:141–8.
- [32] Martin AL, McGrath PA, Brown SC, Katz J. Children with chronic pain: impact of sex and age on long-term outcomes. *Pain* 2007;128:13–9.
- [33] McGrath PA, Speechley KN, Seifert CE, Biehn JT, Cairney AE, Gorodzinsky FP, Dickie GL, McCusker PJ, Morrissy JR. A survey of children's acute, recurrent, and chronic pain: validation of the pain experience interview. *Pain* 2000;87:59–73.
- [34] Mikkelsen M, El-Metwally A, Kautiainen H, Auvinen A, Macfarlane GJ, Salminen JJ. Onset, prognosis and risk factors for widespread pain in schoolchildren: a prospective 4-year follow-up study. *Pain* 2008;138:681–7.
- [35] Mikkelsen M, Salminen JJ, Kautiainen H. Non-specific musculoskeletal pain in preadolescents. Prevalence and 1-year persistence. *Pain* 1997;73:29–35.
- [36] Mikkelsen M, Salminen JJ, Sourander A, Kautiainen H. Contributing factors to the persistence of musculoskeletal pain in preadolescents: a prospective 1-year follow-up study. *Pain* 1998;77:67–72.
- [37] Murphy S, Buckle P, Stubbs D. A cross-sectional study of self-reported back and neck pain among English schoolchildren and associated physical and psychological risk factors. *Appl Ergon* 2007;38:797–804.
- [38] Nilsen SM, Krokstad S, Holmen TL, Westin S. Adolescents' health-related dietary patterns by parental socio-economic position. The Nord-Trøndelag Health Study (HUNT). *Eur J Public Health* 2010;20:299–305.
- [39] Palermo TM. Impact of recurrent and chronic pain on child and family daily functioning: a critical review of the literature. *J Dev Behav Pediatr* 2000;21:58–69.
- [40] Perquin CW, Hazebroek-Kampschreur AA, Hunfeld JA, Bohnen AM, van Suijlekom-Smit LW, Passchier J, van der Wouden JC. Pain in children and adolescents: a common experience. *Pain* 2000;87:51–8.
- [41] Perquin CW, Hunfeld JA, Hazebroek-Kampschreur AA, van Suijlekom-Smit LW, Passchier J, Koes BW, van der Wouden JC. The natural course of chronic benign pain in childhood and adolescence: a two-year population-based follow-up study. *Eur J Pain* 2003;7:551–9.
- [42] Petersen S, Bergstrom E, Brulin C. High prevalence of tiredness and pain in young schoolchildren. *Scand J Public Health* 2003;31:367–74.
- [43] Petersen S, Brulin C, Bergstrom E. Recurrent pain symptoms in young schoolchildren are often multiple. *Pain* 2006;121:145–50.
- [44] Petersen S, Hagglof BL, Bergstrom EI. Impaired health-related quality of life in children with recurrent pain. *Pediatrics* 2009;124:e759–67.
- [45] Roth-Isigkeit A, Thyen U, Raspe HH, Stoven H, Schmucker P. Reports of pain among German children and adolescents: an epidemiological study. *Acta Paediatr* 2004;93:258–63.
- [46] Roth-Isigkeit A, Thyen U, Stoven H, Schwarzenberger J, Schmucker P. Pain among children and adolescents: restrictions in daily living and triggering factors. *Pediatrics* 2005;115:e152–62.
- [47] Schanberg LE. Widespread pain in children: when is it pathological? *Arthritis Rheum* 2003;48:2402–5.
- [48] Sherry DD, Malleson PN. The idiopathic musculoskeletal pain syndromes in childhood. *Rheum Dis Clin North Am* 2002;28:669–85.
- [49] Sled M, Eccleston C, Beecham J, Knapp M, Jordan A. The economic impact of chronic pain in adolescence: methodological considerations and a preliminary costs-of-illness study. *Pain* 2005;119:183–90.
- [50] Smedbraten BK, Natvig B, Rutle O, Bruusgaard D. Self-reported bodily pain in schoolchildren. *Scand J Rheumatol* 1998;27:273–6.
- [51] Stahl M, Kautiainen H, El-Metwally A, Hakkinen A, Ylinen J, Salminen JJ, Mikkelsen M. Non-specific neck pain in schoolchildren: prognosis and risk factors for occurrence and persistence. A 4-year follow-up study. *Pain* 2008;137:316–22.
- [52] Stahl M, Mikkelsen M, Kautiainen H, Hakkinen A, Ylinen J, Salminen JJ. Neck pain in adolescence. A 4-year follow-up of pain-free preadolescents. *Pain* 2004;110:427–31.

- [53] Statistics Norway. Available from: <http://www.ssb.no/folkemengde/arkiv/tab-2010-03-11-01.html> [accessed 2010 Jan 29].
- [54] van Gessel H, Gassmann J, Kroner-Herwig B. Children in pain: recurrent back pain, abdominal pain, and headache in children and adolescents in a four-year-period. *J Pediatr* 2011;158:977–983.e2.
- [55] van Wijk CM, Kolk AM. Sex differences in physical symptoms: the contribution of symptom perception theory. *Soc Sci Med* 1997;45:231–46.
- [56] Walker LS, Dengler-Criss CM, Rippel S, Bruehl S. Functional abdominal pain in childhood and adolescence increases risk for chronic pain in adulthood. *Pain* 2010;150:568–72.
- [57] Watson KD, Papageorgiou AC, Jones GT, Taylor S, Symmons DP, Silman AJ, Macfarlane GJ. Low back pain in schoolchildren: occurrence and characteristics. *Pain* 2002;97:87–92.
- [58] Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, Tugwell P, Campbell SM, Abeles M, Clark P, Fam AG, Farber SJ, Fiechtner JJ, Franklin CM, Gatter RA, Hamaty D, Lessard J, Lichtbroun AS, Masi AT, McCain GA, Reynolds WJ, Romano TJ, Russell IJ, Sheon RP. The American College of Rheumatology 1990 Criteria for the Classification of Fibromyalgia. Report of the Multicenter Criteria Committee. *Arthritis Rheum* 1990;33:160–72.
- [59] Yunus MB, Masi AT. Juvenile primary fibromyalgia syndrome. A clinical study of thirty-three patients and matched normal controls. *Arthritis Rheum* 1985;28:138–45.
- [60] Zwart JA, Dyb G, Holmen TL, Stovner LJ, Sand T. The prevalence of migraine and tension-type headaches among adolescents in Norway. The Nord-Trøndelag Health Study (Head-HUNT-Youth), a large population-based epidemiological study. *Cephalalgia* 2004;24:373–9.