

Association of Parental Chronic Pain With Chronic Pain in the Adolescent and Young Adult

Family Linkage Data From the HUNT Study

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Objectives: To examine a possible association of parental chronic pain with chronic pain in the adolescent and young adult and to explore whether a relationship could be explained by socioeconomic and psychosocial factors or may be affected by differences in family structure.

Design: Unselected, population-based, cross-sectional study.

Setting: Nord-Trøndelag County, Norway.

Participants: All inhabitants of Nord-Trøndelag County who were 13 years or older were invited to enroll in the study. In total, 8200 of 10 485 invitees (78.2%) participated in the investigation. Among 7913 participants in the target age group (age range, 13-18 years), 7373 (93.2%) completed the pain questions. The final study population consisted of 5370 adolescents or young adults for whom one or both parents participated in the adult survey.

Main Outcome Measures: The primary outcome measure was chronic nonspecific pain in adolescents and young adults, defined as pain in at least 1 location, unrelated to any known disease or injury, experienced at least once a week during the past 3 months. Chronic multisite pain was defined as chronic pain in at least 3 locations.

Results: Maternal chronic pain was associated with chronic nonspecific pain and chronic multisite pain in adolescents and young adults (odds ratio, 1.5; 95% CI, 1.3-1.8). Paternal chronic pain was associated with increased odds of pain in adolescents and young adults. The odds of chronic nonspecific pain and chronic multisite pain in adolescents and young adults increased when both parents reported pain. Adjustments for socioeconomic and psychosocial factors did not change the results, although differences in family structure did. Among offspring living primarily with their mothers, clear associations were observed between maternal pain and pain in adolescents and young adults, but no association was found with paternal pain.

Conclusions: Parental chronic pain is associated with chronic nonspecific pain and especially with chronic multisite pain in adolescents and young adults. Family structure influences the relationship, indicating that family pain models and shared environmental factors are important in the origin of chronic pain.

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CHRONIC NONSPECIFIC PAIN among children and adolescents is common,^{1,4} and the prevalence may be increasing.⁵ Youth with

chronic pain experience disabilities in several areas of daily life,^{1,3,6,7} and pain causes many difficulties in children and their families.^{8,9} Although studies have shown associations between pain and adverse psychosocial variables¹⁰⁻¹³ and several lifestyle factors,^{11,14-18} the causes of chronic nonspecific pain in adolescence are poorly understood.

Studies¹⁹⁻²⁴ examining the relationship between parental and child pain show conflicting results. Nevertheless, many

possible explanations may elucidate a potential association between pain in the parent and pain in the child. The relationship may have a genetic component, be a result of learned pain behavior, or be due

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to shared environmental factors promoting pain in children and parents. Studies^{25,26} have identified several genes that may contribute to pain sensitivity and the development of chronic pain. Social learning through observation of parents is important in a child's pain perception and behavior, including the tendency to ignore or

overemphasize symptoms, the interpretation of symptoms, and a choice of coping strategies,²⁷ factors that may influence pain vulnerability. Moreover, parental responses to child pain behaviors may be important in the development and maintenance of pain.²⁸ Environmental factors shared within the family, including socioeconomic variables, such as education and income, and psychosocial variables, such as divorce, anxiety, and depression, have been shown to be related to pain in children and adults,²⁹⁻³³ and marital breakdowns and new family constellations may influence pain reports. Few investigations have examined the various associations of chronic pain in mothers, fathers, or both with pain in the adolescent, including psychosocial factors. Furthermore, it is unclear whether different family structures comprising children living primarily with their mothers or fathers affect a potential association, an important aspect concerning the hypotheses of parental role models and shared environment vs genetic causes of pain.

The primary objective of this study was to examine a possible association of chronic pain in mothers, fathers, or both and chronic nonspecific pain in adolescents and young adults in a large, unselected population. Second, we aimed to explore whether this potential relationship could be explained by socioeconomic and psychosocial factors and whether differences in family structure could have an influence on the association.

METHODS

STUDY POPULATION AND PROCEDURE

The study was conducted from October 2006 to June 2008, in Nord-Trøndelag County, Norway, as part of a large cross-sectional health survey (HUNT 3 Study³⁴). All inhabitants of the county who were 13 years or older were invited to participate in the study. The HUNT Study³ has previously been described in detail. Briefly, the adolescents and young adults completed a comprehensive questionnaire during a school period and subsequently underwent a clinical examination. In total, 8200 of 10 485 invitees (78.2%) participated in the investigation. Among 7913 participants in the target age group (age range, 13-18 years), 7373 adolescents and young adults (93.2%) completed the pain questions. In the adult part of the survey, all inhabitants 20 years or older received an initial postal questionnaire and an invitation to participate in a subsequent clinical examination. Those participating in the examination received a second questionnaire to be returned by mail. In total, 50 811 of 93 864 adults invited participated in questionnaire 1, and 41 206 participated in questionnaire 2. Information from Statistics Norway enabled us to link the questionnaires from the offspring with their parents' questionnaires through the use of personal identification numbers, specific for all Norwegian inhabitants.

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 and young adults and from their parents.

MEASURES

Outcome

In the questionnaire, the adolescents and young adults were asked if they had experienced any pain, unrelated to any known disease or injury, during the past 3 months.³ Furthermore, they

were asked to specify the location of the pain as headache/migraine, abdominal pain and/or pain from neck/shoulders, chest, upper back, lower back/buttocks, and/or upper and/or lower extremities. They were also asked to indicate the frequency of pain in each location as never or seldom, once a month, once a week, several days a week, or almost daily. As in earlier studies,^{3,13,35} chronic nonspecific pain was defined as pain in at least 1 location, unrelated to any known disease or injury, experienced at least once a week during the past 3 months. Chronic multisite pain was defined as chronic nonspecific pain in at least 3 locations.

Exposure

In questionnaire 1, adults were asked, "Do you have physical pain now that has lasted more than 6 months?" and "How strong has your physical pain been during the last 4 weeks?" The last question had 6 response alternatives (no pain, very mild, mild, moderate, strong, or very strong). This verbal rating subscale is included in the 36-Item Short Form Health Survey,³⁶ and the bodily pain subscale has been recommended as an efficient, reliable, and valid assessment of global pain severity.³⁷ Distinguishing those experiencing moderate, strong, or very strong pain has been shown to be useful in recognizing persons with chronic, noncancer pain of a complex nature in population investigations.³⁸ Hence, parental chronic pain was defined as pain lasting for more than 6 months and being of moderate, severe, or very severe intensity during the past month.³⁹

Information on family structure was made available from Statistics Norway. Data were categorized into 3 groups (both parents, mother alone or with new partner, or father alone or with new partner).

COVARIATES

Socioeconomic status was assessed using data on both parents' education and income made available from Statistics Norway. The highest attained level of education for both parents in 2007 was used. Educational data were reclassified into the following 5 levels: primary school (7-10 years of education), secondary school (11-12 years), high school (13-14 years), less than 5 years of higher education, and 5 or more years of higher education. Pensionable income in 2007 was divided into fifths.

Adolescent and young adult anxiety and depression symptoms were measured using the Symptom Checklist 5, a 5-item version of the Symptom Checklist 25, for which reliability has been shown.⁴⁰ A mean score above 2.0 was set as the cutoff for anxiety and depression symptoms.⁴⁰

Adult anxiety and depression were measured using the Hospital Anxiety and Depression Scale,⁴¹ which was included in questionnaire 2. The Hospital Anxiety and Depression Scale is a well-established instrument that includes a 7-item anxiety subscale (Hospital Anxiety and Depression Scale A) and a 7-item depression subscale (Hospital Anxiety and Depression Scale D). A cutoff score of 8 on both subscales has been shown to perform well in screening for anxiety and depression disorders in the general population.⁴²

DATA ANALYSIS

We used binary logistic regression to estimate odds ratios (ORs) and 95% CIs for the association of parental chronic pain with chronic nonspecific pain or chronic multisite pain in the adolescent or young adult. Potential confounding factors were identified by a priori knowledge.⁴³ In multivariable models, we adjusted for parental education and income and for offspring sex and age. Analyses were stratified according to differences in fam-

Table 1. Prevalence of Chronic Nonspecific Pain and Chronic Multisite Pain Among Adolescents and Young Adults and Chronic Pain Among Parents, by Sociodemographic Factors

Variable	Offspring			Mother		Father	
	No. (%)	Chronic Nonspecific Pain, % ^a	Chronic Multisite Pain, % ^b	No. (%)	Chronic Pain, % ^c	No. (%)	Chronic Pain, % ^c
Total	5370	43.4	14.1	4394	28.5	3508	24.2
Sex							
Female	2718 (50.6)	53.1	19.1	2207 (50.2)	27.7	1762 (50.2)	23.9
Male	2652 (49.4)	33.4	8.9	2187 (49.8)	29.2	1746 (49.8)	24.5
Age group, y							
13-15	2940 (54.7)	41.4	12.3	2414 (54.9)	27.8	1916 (54.6)	23.7
16-18	2430 (45.3)	45.7	16.3	1980 (45.1)	29.3	1592 (45.4)	24.7
Mother's education level							
Primary school, 7-10 y	695 (12.9)	49.2	15.3	523 (11.9)	40.7	...	...
Secondary school, 11-12 y	705 (13.1)	44.7	16.3	578 (13.2)	34.8	...	...
High school, 13-14 y	1785 (33.2)	43.4	14.1	1480 (33.7)	31.8	...	...
<5 y Of higher education	1966 (36.6)	41.1	13.1	1634 (37.2)	20.7	...	...
≥5 y Of higher education	199 (3.7)	38.7	12.1	164 (3.7)	15.2	...	...
Missing	20 (0.4)	...	...	15 (0.3)	...	...	...
Father's education level							
Primary school, 7-10 y	827 (15.4)	47.6	14.0	...	...	461 (13.1)	34.7
Secondary school, 11-12 y	797 (14.8)	39.1	14.2	...	...	541 (15.4)	27.9
High school, 13-14 y	2350 (43.8)	45.4	15.5	...	...	1567 (44.7)	24.6
<5 y Of higher education	974 (18.1)	40.3	12.1	...	...	672 (19.2)	18.3
≥5 y Of higher education	376 (7.0)	36.4	10.1	...	...	260 (7.4)	9.6
Missing	46 (0.9)	...	...	...	...	7 (0.2)	...
Family structure							
Both parents	3780 (70.4)	41.0	12.5	3188 (72.6)	27.0	2770 (79.0)	23.8
Mother alone or with new partner	1194 (22.2)	48.9	17.8	962 (21.9)	32.4	479 (13.7)	26.3
Father alone or with new partner	344 (6.4)	45.6	14.5	207 (4.7)	30.4	230 (6.6)	24.8
Missing	52 (1.0)	...	...	37 (0.8)	...	29 (0.8)	...

Abbreviation: Ellipses, not applicable.

^aChronic nonspecific pain in adolescents and young adults was defined as pain in at least 1 location, unrelated to any known disease or injury, experienced at least once a week during the past 3 months.

^bChronic multisite pain in adolescents and young adults was defined as chronic pain in at least 3 locations.

^cParental chronic pain was defined as pain lasting for more than 6 months and being of moderate, severe, or very severe intensity during the past month.

ily structure. In subsequent models, we adjusted for parental anxiety and depression symptoms and for offspring anxiety and depression symptoms. In further analyses, we stratified for offspring sex and for 2 age groups (13-15 years and 16-18 years). All statistical analyses were performed using commercially available software (SPSS 19; IBM).

RESULTS

The final study population consisted of 5370 adolescents or young adults for whom one or both parents participated in the adult survey. The participants did not differ from the whole group of 7373 adolescents and young adults in sex or age distribution, prevalence of chronic pain, or symptoms of anxiety and depression. However, compared with the whole group of 7373 offspring, the included adolescents and young adults had fewer parents in the lowest education level (12.9% vs 15.5% for mothers and 15.4% vs 17.6% fathers) and in the lowest income group (16.6% vs 19.2%); a larger proportion was living with both parents (70.4% vs 65.3%).

Characteristics of the study participants are given in **Table 1**. More female offspring than male offspring reported chronic nonspecific pain and chronic multisite

pain, and more mothers than fathers reported chronic pain. The prevalence of chronic pain among offspring decreased with increasing education level of mothers. Among both mothers and fathers, report of chronic pain decreased with higher education. Although the prevalence of parental chronic pain decreased with increasing income, only small and inconsistent changes were observed in the prevalence of chronic pain among offspring with higher income (data not shown). The prevalence of adolescent and young adult pain was lower among those living with both parents. For adolescents and young adults reporting symptoms of anxiety and depression, the prevalence of pain was higher among parents and among offspring (**Table 2**). Mothers and fathers with anxiety or depression had higher prevalences of pain.

Chronic pain both in mothers and fathers was associated with chronic nonspecific pain and with chronic multisite pain in offspring (**Table 3**). The odds of chronic nonspecific pain and chronic multisite pain in offspring increased when both parents reported pain. The associations remained generally unchanged when adjusting for sex, age, and socioeconomic status and when examining the same relationships in adolescents and young adults living with both parents. Among adolescents and

Table 2. Prevalence of Chronic Nonspecific Pain and Chronic Multisite Pain Among Adolescents and Young Adults and Chronic Pain Among Parents, by Anxiety and Depression Symptoms

Variable	Offspring (n = 5370)			Mother (n = 4394)		Father (n = 3508)	
	No. (%)	Chronic Nonspecific Pain, % ^a	Chronic Multisite Pain, % ^b	No. (%)	Chronic Pain, % ^c	No. (%)	Chronic Pain, % ^c
Offspring anxiety and depression symptoms score on the Symptom Checklist 5							
≤2.0	4645 (86.5)	38.8	10.3	3801 (86.5)	27.8	3036 (86.5)	23.4
>2.0	613 (11.4)	78.0	42.6	503 (11.4)	33.4	392 (11.2)	29.3
Missing	112 (2.1)	...	...	90 (2.0)	...	80 (2.3)	...
Maternal score on the HADS-A (n = 3779)							
<8	3122 (82.6)	41.7	13.2	2950 (78.1)	24.6	...	...
≥8	591 (15.6)	46.9	16.8	556 (14.7)	44.8	...	...
Missing	66 (1.7)	...	...	273 (7.2)	...	...	...
Maternal score on the HADS-D (n = 3779)							
<8	3421 (90.5)	42.1	13.3	3230 (85.5)	26.2	...	...
≥8	279 (7.4)	48.4	18.6	263 (7.0)	46.4	...	...
Missing	79 (2.1)	...	...	286 (7.6)	...	...	...
Paternal score on the HADS-A (n = 2807)							
<8	2462 (87.7)	42.6	12.8	...	...	2342 (83.4)	21.2
≥8	279 (9.9)	47.3	14.3	...	...	259 (9.2)	45.2
Missing	66 (2.4)	...	...	...	...	206 (7.3)	...
Paternal score on the HADS-D (n = 2807)							
<8	2520 (89.8)	43.1	12.5	...	...	2394 (85.3)	22.0
≥8	230 (8.2)	41.7	16.1	...	...	214 (7.6)	40.7
Missing	57 (2.0)	...	...	...	...	199 (7.1)	...

Abbreviations: Ellipses, not applicable; HADS-A, Hospital Anxiety and Depression Scale anxiety subscale; HADS-D, Hospital Anxiety and Depression Scale depression subscale.

^aChronic nonspecific pain in adolescents and young adults was defined as pain in at least 1 location, unrelated to any known disease or injury, experienced at least once a week during the past 3 months.

^bChronic multisite pain in adolescents and young adults was defined as chronic pain in at least 3 locations.

^cParental chronic pain was defined as pain lasting for more than 6 months and being of moderate, severe, or very severe intensity during the past month.

young adults living primarily with their mother alone or mother with a new partner, maternal chronic pain was associated with increased odds of chronic nonspecific pain and chronic multisite pain in offspring, but no clear association was found with paternal pain. Among adolescents and young adults living primarily with their father alone or with a new partner, maternal chronic pain and paternal chronic pain were associated with pain in offspring. However, compared with maternal chronic pain, paternal chronic pain was associated with higher odds of chronic multisite pain in offspring.

We performed separate analyses among adolescents and young adults living with their mother alone, with their mother and a new partner, with their father alone, or with their father and a new partner (data not shown). Overall, the relationships were consistent with the other results. However, associations between maternal chronic pain and chronic multisite pain in offspring were stronger among adolescents and young adults living with their mother and a new partner (OR, 2.5; 95% CI, 1.4-4.4) vs living with their mother alone (1.6; 1.0-2.7).

Inclusion of adolescent and young adult anxiety and depression symptoms in the model did not change the associations between maternal chronic pain or paternal chronic pain and chronic pain in offspring; however, as-

sociations between both parents' reporting chronic pain and chronic nonspecific pain and chronic multisite pain in their offspring were attenuated (**Table 4**). Adjusting for parental anxiety and depression did not considerably alter the results (**Table 5**).

Stratifying the analyses according to sex and age gave only minor differences in the results (data not shown). Chronic pain in male offspring and in the oldest age group was more strongly associated with maternal chronic pain (OR, 1.4; 95% CI, 1.1-1.7; and 1.4; 1.1-1.7; respectively) than with paternal chronic pain (1.2; 0.9-1.5; and 1.1; 0.9-1.4; respectively).

COMMENT

This study showed that both maternal chronic pain and paternal chronic pain are associated with chronic nonspecific pain and especially with chronic multisite pain in adolescents and young adults. Moreover, we found a substantial increase in pain among offspring for whom both parents reported chronic pain. Adjusting for socioeconomic and psychosocial factors did not markedly change the results; however, differences in family structure had a major influence. Among adolescents and young

Table 3. Chronic Nonspecific Pain and Chronic Multisite Pain in Adolescents and Young Adults in Relation to Parental Chronic Pain, by Family Structure^a

Variable	No. (%)	Offspring Chronic Nonspecific Pain ^b			Offspring Chronic Multisite Pain ^c		
		Prevalence, %	OR (95% CI)		Prevalence, %	OR (95% CI)	
			Crude	Adjusted ^d		Crude	Adjusted ^d
Independent of Family Structure							
Mother (n = 4283)							
No chronic pain	3072 (71.7)	40.5	1.0 [Reference]	1.0 [Reference]	12.4	1.0 [Reference]	1.0 [Reference]
Chronic pain	1211 (28.3)	47.9	1.4 (1.2-1.5)	1.3 (1.2-1.5)	17.8	1.5 (1.3-1.8)	1.5 (1.3-1.8)
Father (n = 3474)							
No chronic pain	2636 (75.9)	41.3	1.0 [Reference]	1.0 [Reference]	12.0	1.0 [Reference]	1.0 [Reference]
Chronic pain	838 (24.1)	46.7	1.3 (1.1-1.5)	1.2 (1.0-1.4)	17.5	1.6 (1.3-1.9)	1.5 (1.2-1.9)
Both parents (n = 2654)							
None with chronic pain	1495 (56.3)	39.0	1.0 [Reference]	1.0 [Reference]	10.1	1.0 [Reference]	1.0 [Reference]
One with chronic pain	947 (35.7)	43.2	1.2 (1.0-1.4)	1.2 (1.0-1.4)	15.2	1.6 (1.3-2.0)	1.6 (1.2-2.0)
Both with chronic pain	212 (8.0)	50.9	1.6 (1.2-2.2)	1.6 (1.2-2.1)	20.3	2.3 (1.6-3.3)	2.3 (1.5-3.3)
Living With Both Parents							
Mother (n = 3176)							
No chronic pain	2321 (73.1)	39.4	1.0 [Reference]	1.0 [Reference]	11.7	1.0 [Reference]	1.0 [Reference]
Chronic pain	855 (26.9)	45.0	1.3 (1.1-1.5)	1.2 (1.1-1.5)	15.0	1.3 (1.1-1.7)	1.3 (1.1-1.7)
Father (n = 2759)							
No chronic pain	2105 (76.3)	39.9	1.0 [Reference]	1.0 [Reference]	11.2	1.0 [Reference]	1.0 [Reference]
Chronic pain	654 (23.7)	45.0	1.2 (1.0-1.5)	1.2 (1.0-1.4)	16.8	1.6 (1.3-2.0)	1.6 (1.2-2.1)
Both parents (n = 2244)							
None with chronic pain	1284 (57.2)	38.5	1.0 [Reference]	1.0 [Reference]	10.0	1.0 [Reference]	1.0 [Reference]
One with chronic pain	790 (35.2)	42.7	1.2 (1.0-1.4)	1.1 (0.9-1.4)	14.7	1.6 (1.2-2.0)	1.5 (1.2-2.0)
Both with chronic pain	170 (7.6)	50.0	1.6 (1.2-2.2)	1.6 (1.1-2.2)	20.0	2.3 (1.5-3.4)	2.3 (1.5-3.6)
Living With Mother Alone or Mother With New Partner							
Mother (n = 870)							
No chronic pain	591 (67.9)	44.3	1.0 [Reference]	1.0 [Reference]	14.9	1.0 [Reference]	1.0 [Reference]
Chronic pain	279 (32.1)	55.6	1.6 (1.2-2.1)	1.6 (1.2-2.2)	24.7	1.9 (1.3-2.7)	1.9 (1.3-2.8)
Father (n = 477)							
No chronic pain	352 (73.8)	46.6	1.0 [Reference]	1.0 [Reference]	16.5	1.0 [Reference]	1.0 [Reference]
Chronic pain	125 (26.2)	52.0	1.2 (0.8-1.9)	1.2 (0.8-1.8)	19.2	1.2 (0.7-2.0)	1.1 (0.6-1.9)
Living With Father Alone or Father With New Partner							
Mother (n = 205)							
No chronic pain	142 (69.3)	38.0	1.0 [Reference]	1.0 [Reference]	11.3	1.0 [Reference]	1.0 [Reference]
Chronic pain	63 (30.7)	49.2	1.6 (0.9-2.9)	1.6 (0.8-3.3)	17.5	1.7 (0.7-3.8)	1.8 (0.7-4.7)
Father (n = 210)							
No chronic pain	158 (75.2)	43.7	1.0 [Reference]	1.0 [Reference]	10.1	1.0 [Reference]	1.0 [Reference]
Chronic pain	52 (24.8)	55.8	1.6 (0.9-3.1)	1.8 (0.9-3.7)	21.2	2.4 (1.0-5.5)	2.4 (0.8-6.7)

Abbreviation: OR, odds ratio.

^aParental chronic pain was defined as pain lasting for more than 6 months and being of moderate, severe, or very severe intensity during the past month.

^bChronic nonspecific pain in adolescents and young adults was defined as pain in at least 1 location, unrelated to any known disease or injury, experienced at least once a week during the past 3 months.

^cChronic multisite pain in adolescents and young adults was defined as chronic pain in at least 3 locations.

^dAdjusted for socioeconomic status (parental education and income) and for offspring sex and age.

adults living primarily with their mothers, chronic pain was mainly associated with maternal chronic pain, while among adolescents and young adults living primarily with their fathers, chronic multisite pain tended to be more strongly related to paternal chronic pain. Whereas parental chronic pain was closely related to socioeconomic status, chronic pain in offspring showed consistent relationships only with maternal education level.

The strengths of the study include the large, unselected adolescent and young adult population. The high participation rate and the fact that offspring with participating parents did not differ considerably from the whole adolescent and young adult population confirm the representativeness of the study population. Also, the prevalences of parental chronic pain, anxiety, and depression agree with the findings of earlier studies^{39,44} among adult populations. Information from offspring

Table 4. Chronic Nonspecific Pain and Chronic Multisite Pain in Adolescents and Young Adults in Relation to Parental Chronic Pain, Adjusted for Offspring Anxiety and Depression Symptoms on the Symptom Checklist 5

Variable	No. (%)	Offspring Chronic Nonspecific Pain ^a			Offspring Chronic Multisite Pain ^b		
		Prevalence, %	OR (95% CI)		Prevalence, %	OR (95% CI)	
			Crude	Adjusted ^c		Crude	Adjusted ^c
Mother (n = 4194)^d							
No chronic pain	3011 (71.8)	40.4	1.0 [Reference]	1.0 [Reference]	12.5	1.0 [Reference]	1.0 [Reference]
Chronic pain	1183 (28.2)	48.0	1.4 (1.2-1.6)	1.3 (1.1-1.5)	17.9	1.5 (1.3-1.8)	1.5 (1.2-1.8)
Father (n = 3394)^d							
No chronic pain	2579 (76.0)	41.3	1.0 [Reference]	1.0 [Reference]	11.9	1.0 [Reference]	1.0 [Reference]
Chronic pain	815 (24.0)	47.0	1.3 (1.1-1.5)	1.2 (1.0-1.4)	17.9	1.6 (1.3-2.0)	1.5 (1.2-1.9)
Both Parents (n = 2595)^d							
None with chronic pain	1466 (56.5)	38.9	1.0 [Reference]	1.0 [Reference]	10.0	1.0 [Reference]	1.0 [Reference]
One with chronic pain	922 (35.5)	43.6	1.2 (1.0-1.4)	1.1 (1.0-1.4)	15.5	1.6 (1.3-2.1)	1.6 (1.2-2.1)
Both with chronic pain	207 (8.0)	50.2	1.6 (1.2-2.1)	1.4 (1.0-1.9)	20.3	2.3 (1.6-3.3)	2.0 (1.4-3.1)

Abbreviation: OR, odds ratio.

^aChronic nonspecific pain in adolescents and young adults was defined as pain in at least 1 location, unrelated to any known disease or injury, experienced at least once a week during the past 3 months.

^bChronic multisite pain in adolescents and young adults was defined as chronic pain in at least 3 locations.

^cAlso adjusted for socioeconomic status (parental education and income) and for offspring sex and age.

^dParental chronic pain was defined as pain lasting for more than 6 months and being of moderate, severe, or very severe intensity during the past month.

Table 5. Chronic Nonspecific Pain and Chronic Multisite Pain in Adolescents and Young Adults in Relation to Parental Chronic Pain, Adjusted for Parental Symptoms on the Anxiety and Depression Subscales of the Hospital Anxiety and Depression Scale

Variable	No. (%)	Offspring Chronic Nonspecific Pain ^a			Offspring Chronic Multisite Pain ^b		
		Prevalence, %	OR (95% CI)		Prevalence, %	OR (95% CI)	
			Crude	Adjusted ^c		Crude	Adjusted ^c
Mother (n = 3401)^d							
No chronic pain	2464 (72.4)	40.3	1.0 [Reference]	1.0 [Reference]	12.2	1.0 [Reference]	1.0 [Reference]
Chronic pain	937 (27.6)	47.8	1.4 (1.2-1.6)	1.3 (1.1-1.5)	17.9	1.6 (1.3-1.9)	1.5 (1.2-1.9)
Father (n = 2552)^d							
No chronic pain	1958 (76.7)	42.1	1.0 [Reference]	1.0 [Reference]	12.0	1.0 [Reference]	1.0 [Reference]
Chronic pain	594 (23.3)	45.8	1.2 (1.0-1.4)	1.1 (0.9-1.4)	16.5	1.4 (1.1-1.9)	1.4 (1.1-1.8)
Both Parents (n = 1712)^d							
None with chronic pain	1001 (58.5)	38.9	1.0 [Reference]	1.0 [Reference]	9.3	1.0 [Reference]	1.0 [Reference]
One with chronic pain	584 (34.1)	44.2	1.2 (1.0-1.5)	1.2 (1.0-1.5)	14.6	1.7 (1.2-2.3)	1.7 (1.2-2.4)
Both with chronic pain	127 (7.4)	48.8	1.5 (1.0-2.2)	1.5 (1.0-2.2)	19.7	2.4 (1.5-3.9)	2.7 (1.6-4.5)

Abbreviation: OR, odds ratio.

^aChronic nonspecific pain in adolescents and young adults was defined as pain in at least 1 location, unrelated to any known disease or injury, experienced at least once a week during the past 3 months.

^bChronic multisite pain in adolescents and young adults was defined as chronic pain in at least 3 locations.

^cAlso adjusted for socioeconomic status (parental education and income) and for offspring sex and age.

^dParental chronic pain was defined as pain lasting for more than 6 months and being of moderate, severe, or very severe intensity during the past month.

and from parents was collected, avoiding information bias of parental report on chronic pain in their offspring.⁴⁵ Moreover, the study groups independently participated in the study and did not influence each other when completing the questionnaires. It is well established that pain measurement should be based on self-report.⁴⁶ The general health focus of the questionnaire helped avoid a narrow concentration on pain and enabled us to adjust for potential confounding from anxiety and depression in parents and offspring. Possible confounding from socioeconomic factors was re-

duced by objective measures of parental education and income.

The limitations of the study include the cross-sectional design, rendering causal inference difficult to make. Although the participation rate was high among adolescents and young adults, a possibility exists for more pain among offspring who did not participate. Also, pain prevalence might have been higher among nonparticipating parents. Although this could result in a potential selection bias, there is no reason to expect that the associations between parental chronic pain and offspring

chronic pain should be systematically different among those not included in the study. The questionnaires were based on self-report, and the recall periods for pain reports were 3 months for the adolescents and young adults and 6 months for the parents, revealing an opportunity for recall bias. However, it has been shown that adolescents are able to accurately recall and report their pain experiences during a 3-month period.⁴⁷ Although many adolescents and young adults were living primarily with one of their parents, they could still be influenced by the other parent. Furthermore, we had no information about pain in potential new partners. Finally, although we adjusted for a range of potential confounding factors, unmeasured confounders may have been present.

Investigations on the relationship between parental pain and adolescent pain have shown conflicting results. While some studies^{22-24,48,49} found an association, other studies^{19-21,50,51} did not. Several interpretations may explain this discrepancy. Pain definitions have varied from the existence of low back pain ever,^{20,51} to any pain lasting 1 day or longer during the past month¹⁹ or past 6 months,²² to continuous or recurrent pain for at least 3 months.²¹ We decided to study the association between parental chronic pain and offspring chronic pain using strict definitions for chronic pain. The intention was to avoid the consideration of pain due to normal life events. We did not focus on specific pain because children tend to report pain from more than 1 location,^{2,11,52} as shown earlier in this population.³ The age of the children and adolescents has varied across investigations and may lead to different conclusions; for instance, a Swiss study⁵³ found a relationship between parental treatment for low back pain and children's (age range, 8-16 years) history of low back pain, while no relationship was observed in those aged 12 to 17 years when the same survey was conducted 3 years later.⁵¹ It was hypothesized that parental history may be more important among younger children.⁵¹ This was contradicted by our study results because we found a clear association in adolescents and young adults aged 13 to 18 years and no considerable differences between the groups aged 13 to 15 years and 16 to 18 years in relation to parental chronic pain. Reporting has also varied; some studies^{45,53} have used parental report of children's pain, one study⁵¹ used children's report about their parents' pain, and other studies^{19,20} have used pain reports both from the children and from the parents. However, other studies^{22,23,49} have reported from only one parent, usually the mother. When examining the relationship between parental pain and adolescent pain, it is essential to have self-reports from all involved.⁴⁶ Although the results of a 2010 study⁴⁹ suggested sex-specific modeling, with girls being sensitive to maternal pain and boys being sensitive to paternal pain, we found no evidence of such relationships; however, chronic pain in boys was slightly more strongly associated with maternal chronic pain than with paternal chronic pain. The lack of paternal pain reports in the mentioned recent study might be one of several explanations for these differences. Furthermore, only some of the studies^{19,21,49-51} included socioeconomic status. According to our study, these adjustments may be important because of the close relationship between socioeco-

omic status and parental pain, as well as the relationship between maternal education level and offspring chronic pain. Adverse psychosocial factors have been shown to be related to chronic pain.^{10,12,13,54} Also, our study showed higher prevalences of chronic pain among adolescents and young adults and among parents with anxiety or depression, emphasizing the potential importance of adjusting for these factors because they might influence both parental chronic pain and offspring chronic pain.

Few studies have examined the relationship between both parents' having chronic pain and chronic pain in their offspring. Although we observed substantially higher odds of pain in adolescents and young adults when both parents reported pain, others studies^{19,50} have not found such an association. Different definitions of pain and small sample sizes may explain some of the differences. The stronger association between parental chronic pain and adolescent and young adult chronic multisite pain is in line with a study²² finding a stronger relationship between multiple pains in mothers and adolescents. Some of the suggested explanations for these results may also to some extent explain our results regarding pain in both parents.²² First, increased pain in parents may provide more opportunities for learning pain behavior. Second, parents experiencing pain may be more aware of pain in their children. Several studies have focused on parental reinforcement of children's pain. It may be that parental attention increases pain and distraction reduces pain,⁵⁵ while overprotectiveness may result in greater impairment and somatic symptoms in the offspring.⁵⁶ The relationship between maternal protectiveness and low maternal education agrees with our study results showing an increase in offspring pain associated with lower maternal education.⁵⁷ Third, both parents' having chronic pain could be a manifestation of family distress. In a recent review, the authors concluded that families of children with chronic pain have poorer familial functioning than healthy populations.⁵⁸ Although we adjusted for socioeconomic factors and for anxiety and depression in adults and offspring, the parents and their adolescents and young adults may share other environmental stressors not controlled for in this study, promoting pain in the parents and in the offspring.

We found no other studies examining the diverse associations between parental chronic pain and offspring chronic pain in various family structures. Although chronic pain in adolescents and young adults living with both parents showed similar associations to chronic pain in mothers and fathers, this was not true for offspring living primarily with one of their parents. The finding of a stronger relationship between chronic pain in one parent and the adolescent or young adult living together may be an important contribution to the understanding of intergenerational transmission of pain that favors family pain models and shared environmental factors.

In summary, parental chronic pain is associated with adolescent and young adult chronic nonspecific pain and especially chronic multisite pain and suggests a strong relationship between chronic pain in the parent and offspring living together, indicating that family pain models and shared environmental factors are important in the origin of chronic pain. These findings illustrate the im-

portance of parental and family involvement in the management of adolescent and young adult chronic pain. Future longitudinal studies are needed to establish the causal relationship between parental and offspring chronic pain, as well as more research on clinical family-centered approaches for managing chronic pain problems in adolescents and young adults.

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