# Is Chronic Pain in Adulthood Related to Childhood Factors? A Population-Based Case-Control Study of Young Adults

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*ABSTRACT.* *Objective.* To investigate whether recalled childhood pain experiences and illnesses are associated with chronic pain in young adults.
*Methods.* A cross-sectional population-based survey recruited participants aged 18–25 years for a case-control study and obtained information on current pain and recalled childhood experiences. In total, 858 respondents were classified as either non-pain controls (n = 276), non-chronic pain cases (pain for ≤ 3 months in the previous 6 months, n = 435), or chronic pain cases (pain of > 3 months' duration, n = 119).
*Results.* 858 young adults responded to the survey (adjusted response rate 37%). Of the recalled exposures in childhood, family members with pain (OR 2.48, 95% CI 1.48, 4.15), having more than 2 relatives with pain during childhood (OR 3.03, 95% CI 1.44, 6.40), being admitted to hospital during childhood (OR 1.71, 95% CI 1.04, 2.80), and having more illness than one's peer group at secondary school (OR 3.98, 95% CI 1.99, 7.96) were significantly associated with having chronic pain as a young adult, after adjustment for age, sex, and current psychological distress scores. Recall bias was assessed by comparing actual and recalled admission to the neonatal intensive care unit, with no significant differences being found between the participating groups.
*Conclusion.* Several associations were observed between pain status as a young adult and selected self-reported childhood experiences of illness and pain. The role of recall bias cannot be excluded in this retrospective study, but the results emphasize the importance of family and childhood experiences of pain in potentially influencing future adult pain status. (J Rheumatol 2006;33:2286–90)

*Key Indexing Terms:*
CHRONIC PAIN             YOUNG ADULTS             CASE-CONTROL STUDY

Chronic pain affects an estimated 10%–55% of the adult population of developed countries[1]. Most chronic pain in adult life relates to musculoskeletal syndromes such as back and neck pain. Determinants of the onset and persistence of pain in adults, such as occupational or psychosocial factors, have received considerable attention[2-4]. Yet chronic pain is also present, albeit less commonly, in young adults, adolescents, and children[5,6]. In these younger age groups low back pain, neck pain, and headache are the most commonly affected sites[7-11]. Risk factors that appear only later in life cannot explain fully why chronic pain develops in these younger populations.

Like several chronic diseases, adult pain "careers" may begin earlier in life[12] and be determined in part by what happens in childhood. The biopsychosocial model of pain is well established in adulthood and refers to the complex interaction between physical, psychological, and social factors that are involved in both the acquisition and maintenance of many related disorders. Increasingly the contribution of childhood factors to adult pain is being considered. Noxious insults in very early life, for example, may result in longterm neuroplastic changes that affect subsequent pain perception, and children rapidly develop conditioned anxiety responses to pain that if reinforced have the potential to persist.

It is also important to consider the potential influence of family and common childhood experiences. An array of events and processes in childhood have been suggested as possible determinants of chronic pain. These range from childhood disease through to bullying and abuse, and draw on perspectives as diverse as neurophysiological, biomechanical, social learning, and family studies.

We conducted a population-based case-control study of the association between selected childhood-related exposures and the occurrence of chronic pain in young adults. We hypothesized that childhood experiences of pain and of illness, including familial pain and hospital admissions, would be associated with chronic pain in early adult life.

## MATERIALS AND METHODS

*Participants and setting.* Two case groups (persons with chronic pain and persons with non-chronic pain), together with controls who had no pain, were identified from a cross-sectional postal survey of all 2369 young adults aged 18–25 years registered at the time of the survey with 3 urban general practices in Stoke-on-Trent performed in June 2002. In the 2001 UK national census, Stoke-on-Trent had a higher proportion of young adults aged 20–29 years (5.4%) compared with England and Wales (4.9%). The population of Stoke-on-Trent in general was more likely to have a longterm illness, rate their health as "not good," and have no educational qualifications when compared to the entire UK population. Stoke-on-Trent is one of the most deprived areas of the United Kingdom.

Participating practices were members of the North Staffordshire General Practice Research Network, had fully computerized morbidity records, the quality of which were regularly audited, and had a commitment to, and support for, research. Practices were selected on the basis of list size, willingness to host the study, and the absence of other research studies currently being conducted on young adults registered with the practice. In the United Kingdom, about 98% of the population are registered with a general practitioner and so practice registers provide a convenient frame for sampling a local population[13], regardless of the extent or purpose of any contacts with the practice.

*Data collection.* Immediately prior to mailing, the list of all potential participants was checked to exclude recent deaths or departures. General practitioners at the practices then screened the list and excluded those whom they felt were inappropriate for inclusion in a postal survey, e.g., severe psychiatric illness, learning difficulties.

A standard 3-stage mailing procedure was used for the survey questionnaire, with nonrespondents sent a reminder postcard after 2 weeks and a repeat questionnaire after a further 2 weeks. Return of the questionnaires was taken to indicate consent to participation. Respondents were also asked in the questionnaire for written informed consent to medical record review. The study protocol was approved by North Staffordshire Local Research Ethics Committee. The methods of the cross-sectional survey have been reported[14].

Recent pain was assessed by a single questionnaire item adapted from a previous study of low back pain[15]: "Have you had any aches or pain that have lasted for a day or longer over the past six months?" (Yes/No). Participants indicated the location of their pain by shading a manikin (front and back views) and were then asked about the duration of their most troublesome pain: "Thinking back over the past six months, on approximately how many days have you had the most troublesome pain, which you have shaded on the manikin?" (Less than 7 days/1 to 4 weeks/1 to 3 months/over 3 months).

Respondents were split into 3 groups, on the basis of their pain status. Chronic pain cases were defined as those reporting pain lasting > 3 months in the previous 6 months. This corresponds to the definition of "most days in the previous six months" proposed to identify both recurrent and continuous chronic pain[16]. Non-chronic pain cases were individuals who reported pain within the previous 6 months but that had lasted < 3 months. The control group consisted of those who reported no pain in the previous 6 months (non-pain controls). Cases and controls were not matched individually. The use of 2 case groups allowed us to explore possible trends of risk associated with chronicity of pain. Questions about participants' environment and health during childhood were included as potential influences on pain in young adulthood. The exposure variables were: perceived illness relative to peers during 2 time periods ("primary school age" — 5–11 yrs; "secondary school age" — 11-16 yrs); most painful experience during each time period (free text); the number of family members with pain during childhood; and the number of hospital admissions during childhood and reasons for these (free text).

The 16-page questionnaire also provided information on basic sociodemographic status, current physical and psychological health [self-rated general health from a single item of the SF-36[17]; heightened somatic awareness from the Modified Somatic Perceptions Questionnaire[18] (MSPQ); anxiety and depression from the Hospital Anxiety and Depression Scale[19] (HADS)], and the severity of any recent or current pain from the Chronic Pain Grade[20].

*Statistical analysis.* The power calculation was based on an estimated prevalence of any one exposure of 10% in the pain-free control group. With 80% power, the number needed to detect an odds ratio of 2 in the chronic pain cases was 219, at 95% level of confidence. At 90% power, 286 participants would be needed in each group. Our target was therefore to recruit about 300 participants to each group (non-pain controls, non-chronic pain, chronic pain).

Exposure variables with free text responses were coded. Most painful experience was classified as accident/injury, disease/illness, medical procedure, emotional, and other. Reasons for hospital admissions were coded as accident/injury, disease/illness, medical procedure, and other. This is similar to a classification used previously[21].

The distributions of the sociodemographic and current health characteristics and childhood exposures were described for the control and each of the 2 case groups. Using unconditional logistic regression (SPSS version 12), crude odds ratios with 95% confidence intervals were calculated to investigate the association between each of the exposures and pain status in 2 separate case-control comparisons. The analyses were repeated adjusting for age, sex, and current anxiety and depression scores (HAD scores categorized as 0–7, 8–11, 12–21)[19].

To investigate the possible role of recall bias, we compared self-reported admission to neonatal intensive care unit from the questionnaire with documented admission from the medical records for each of the 3 groups.

## RESULTS

In total 858 of 2369 young adults responded to the postal questionnaire (adjusted response 37%). Response was similar across all 3 recruiting practices (38%, 37%, and 36%) and was higher in females than males (45% compared to 29%, difference 16%; 95% CI 12%, 20%). The 858 participants had a similar age and sex distribution to the target population mailed.

The age of chronic pain cases was comparable to that of non-chronic pain cases and non-pain controls [mean 22.4 (SD 2.3), 22.2 (SD 2.3), 22.1 years (SD 2.3), respectively] as was sex distribution (male 41%, 37%, 39%, respectively). Current self-rated health scored as "good/very good/excellent" was reported by 69% of the chronic pain group, 87% of the non-chronic pain group, and 94% of the non-pain group. A similar pattern between the groups was observed for mean MSPQ scores [8.9 (SD 6.7), 6.5 (SD 5.6), 3.2 (SD 3.8), respectively], mean HADS anxiety scores [9.2 (SD 4.6), 8.0 (SD 4.2), 5.6 (SD 3.8)], and mean HADS depression scores [5.6 (SD 3.9), 4.2 (SD 3.5), 2.8 (SD 2.9)]. Of the 2 groups with pain, the commonest locations identified were low back, neck, and headaches, with more than 80% in both groups reporting pain at 3 or more anatomical sites. Among chronic pain cases, 46% met the criteria for Chronic Pain Grade scores III or IV (high intensity pain, moderately or severely limiting activities). Table 1 presents the frequency of each exposure in the 3 study groups.

Table 2 shows the strength of association between each exposure and current pain status. Most exposures were positively associated with the occurrence of pain in young adulthood and the association was stronger with chronic pain than non-chronic pain. The exceptions were recall of a first-degree relative with pain or other relative with pain during childhood, although a simple count of the number of relatives with pain during childhood was strongly associated with current pain status for both non-chronic (crude OR 2.34, 95% CI 1.35, 4.05) and chronic pain (OR 3.43, 95% CI 1.78, 6.64). A number of exposures showed a trend in association with pain status, and were significantly associated with both non-chronic

*Table 1*. Characteristics of chronic pain cases, non-chronic pain cases, and non-pain controls: self-reported childhood illness and family pain.

| | Non-Pain Controls, (n = 276) no. (%) | Non-Chronic Pain, (n = 435) no. (%) | Chronic Pain, (n = 119) no. (%) |
|---|---|---|---|
| Hospital admission (0–16 yrs) | | | |
| Yes | 118 (42.8) | 225 (51.7) | 67 (56.3) |
| No | 147 (53.3) | 178 (40.9) | 40 (33.6) |
| Don't know | 10 (3.6) | 24 (5.5) | 11 (9.2) |
| More than 1 admission | | | |
| Reason: | | | |
| Injury/accident | 30 (10.9) | 60 (13.8) | 18 (15.1) |
| Medical procedure | 61 (22.1) | 116 (26.7) | 35 (29.4) |
| Disease/illness | 45 (16.3) | 100 (23.0) | 24 (20.2) |
| Other | 4 (1.4) | 11 (2.5) | 8 (6.7) |
| Primary school illness compared to peer group | | | |
| A lot more | 5 (1.8) | 17 (3.9) | 8 (6.7) |
| Somewhat more | 13 (4.7) | 49 (11.3) | 12 (10.1) |
| Same | 124 (44.9) | 212 (48.7) | 57 (47.9) |
| Somewhat less | 63 (22.8) | 58 (13.3) | 19 (16.0) |
| A lot less | 67 (24.3) | 92 (21.1) | 22 (18.5) |
| Most painful experience (primary) | | | |
| Injury/accident | 91 (33.0) | 127 (29.2) | 38 (31.9) |
| Disease/illness | 30 (10.9) | 78 (17.9) | 15 (12.6) |
| Medical procedure | 6 (2.2) | 23 (5.3) | 4 (3.4) |
| Emotional | 27 (9.8) | 54 (12.4) | 24 (20.2) |
| Other | 1 (0.4) | 0 (0.0) | 1 (0.8) |
| Secondary school illness compared to peer group | | | |
| A lot more | 2 (0.7) | 17 (3.9) | 15 (12.6) |
| Somewhat more | 18 (6.5) | 56 (12.9) | 17 (14.3) |
| Same | 118 (42.8) | 195 (44.8) | 51 (42.9) |
| Somewhat less | 59 (21.4) | 79 (18.2) | 13 (10.9) |
| A lot less | 71 (25.7) | 83 (19.1) | 21 (17.6) |
| Most painful experience (secondary) | | | |
| Injury/accident | 53 (19.2) | 105 (24.1) | 25 (21.0) |
| Disease/illness | 44 (15.9) | 89 (20.5) | 25 (21.0) |
| Medical procedure | 9 (3.3) | 25 (5.7) | 6 (5.0) |
| Emotional | 34 (12.3) | 85 (19.5) | 25 (21.0) |
| Other | 1 (0.4) | 1 (0.2) | 0 (0.0) |
| Family member with pain during childhood | | | |
| Yes | 64 (23.2) | 184 (42.3) | 52 (43.7) |
| No | 208 (75.4) | 44 (10.1) | 66 (55.5) |
| First-degree relatives with pain during childhood | | | |
| Yes | 51 (79.7) | 134 (72.8) | 44 (84.6) |
| No | 13 (20.3) | 50 (27.1) | 8 (15.4) |
| Other relative with pain during childhood | | | |
| Yes | 32 (50.0) | 120 (65.2) | 31 (59.6) |
| No | 32 (50.0) | 64 (34.8) | 21 (40.4) |
| Number of relatives with pain | 203 (73.6) | 240 (55.2) | 65 (54.6) |
| 0 | 37 (13.4) | 83 (19.1) | 15 (12.6) |
| 1 | 18 (6.5) | 51 (11.7) | 16 (13.4) |
| 2 | 18 (6.5) | 61 (14.0) | 23 (19.3) |
| 3+ | — | — | — |

pain and chronic pain. These associations were weaker but persisted and were still significant after adjustment for age, sex, and current levels of depression and anxiety. They were: recalled hospital admission, more perceived illness than peers at secondary school age, childhood memory of any family member with pain, and a memory of more than 2 relatives having pain during the participant's childhood.

Although a higher proportion of participants with chronic pain (8.4%) reported admission to the neonatal intensive care unit than non-pain controls (4.7%), when actual admission was established following a record review, the ratio of actual to recalled admissions was no different between the groups (Table 3).

## DISCUSSION

Our study found that recalled childhood experiences of per-

*Table 2.* Association of early life and family pain experience and current pain status after adjustment for age, sex, and HAD scores.

| | Non-Chronic Pain | | Chronic Pain | |
| --- | --- | --- | --- | --- |
| | Crude OR (95% CI) | Adjusted OR* (95% CI) | Crude OR (95% CI) | Adjusted OR* (95% CI) |
| Hospital admission | 1.48 (1.09, 2.01) | 1.51 (1.10, 2.08) | 1.75 (1.13, 2.70) | 1.71 (1.04, 2.80) |
| More primary school illness** | 2.57 (1.49, 4.44) | 2.13 (1.21, 3.73) | 2.88 (1.46, 5.67) | 1.59 (0.72, 3.51) |
| Most painful primary school experience (emotional) | 1.12 (0.67, 1.87) | 0.98 (0.58, 1.67) | 1.96 (1.04, 3.68) | 1.44 (0.70, 2.96) |
| More secondary school illness** | 2.54 (1.51, 4.27) | 2.14 (1.25, 3.67) | 4.67 (2.54, 8.60) | 3.98 (1.99, 7.96) |
| Most painful secondary school experience (emotional) | 1.22 (0.77, 1.93) | 1.02 (0.63, 1.65) | 1.41 (0.76, 2.58) | 0.85 (0.41, 1.75) |
| Memory of family pain | 2.45 (1.75, 3.44) | 2.12 (1.49, 3.02) | 2.56 (1.62, 4.05) | 2.48 (1.48, 4.15) |
| First-degree relative with pain | 0.69 (0.35, 3.44) | 0.68 (0.34, 1.36) | 1.59 (0.60, 4.27) | 1.22 (0.43, 3.48) |
| Other relative with pain | 1.52 (0.88, 2.65) | 1.20 (0.66, 2.19) | 1.19 (0.58, 2.44) | 0.90 (0.40, 2.03) |
| More than 2 relatives with pain | 2.34 (1.35, 4.05) | 2.02 (1.14, 3.56) | 3.43 (1.78, 6.64) | 3.03 (1.44, 6.40) |

* Odds adjusted for age, sex, and HAD scores. ** A lot more/somewhat more vs same/somewhat less/a lot less.

*Table 3.* Comparison of respondents recalling admission to the neonatal intensive care unit with those actually admitted to the neonatal intensive care unit, by current pain status.

| | Non-Pain Controls | Non-Chronic Cases | Chronic Pain Cases |
| --- | --- | --- | --- |
| Recalled admission (%) | 13/276 (4.7) | 33/435 (7.6) | 10/119 (8.4) |
| Actual admission (%) | 4 (1.4) | 17 (3.9) | 3 (2.5) |
| Ratio of actual to recalled admissions (%) | 4:13 (30.8) | 17:33 (51.5) | 3:10 (30.0) |

sonal and family pain and illness are associated with current pain status in young adulthood. Young adults with pain remember themselves as having comparatively ill health in childhood, both at primary and secondary school stage, and of being aware of family members with pain during that time. Given the case-control design of the study, it is not possible to determine whether these recalled events represent the truth or simply perception. These associations were stronger in the young adults with chronic pain than in those reporting nonchronic pain, giving some confidence in the strength of the relationship. Although current psychological health might influence the capacity and selectivity of recall of childhood experiences, the associations persisted after adjustment for current anxiety, depression, and somatic distress scores, as well as general health status.

Despite implementing many of the recommendations from the systematic review by Edwards, *et al*[22] such as sending a second copy of the questionnaire and including a stamped addressed envelope, response to the survey was still low, as is frequently found in surveys of this age group[23]. Although nonparticipation might have affected any estimate of pain prevalence in this age group based on our survey, the proportion of respondents with chronic pain was similar to estimates from previous population-based studies[5]. Importantly, the purpose of our case-control analysis was not to describe the prevalence of pain or of any of the risk factors surveyed, but to investigate their association. Associations may remain unbiased even when nonparticipation is high. Selective nonparticipation would only bias these associations if the relationship between childhood factors and chronic pain was substantially different in nonparticipants compared to participants, e.g., nonparticipants with chronic pain were less likely to report adverse childhood events than participants with chronic pain. This cannot be definitively determined but seems a less likely threat to the validity of our findings than recall bias.

Recall bias has been identified as an issue in previous studies. Childhood abuse, for example, has frequently been associated with chronic regional pain[24-26]. This association is often inconsistent, with large cross-sectional surveys being more likely to report a significant effect than prospective studies, which currently represent only a small proportion of the available literature[27]. This may be related to issues of recall.

McBeth, *et al*[28] found that an apparent association between adverse effects in childhood and chronic widespread pain in adulthood may be explained by differential recall. This potential explanation for the associations found was examined in the current study by comparing recalled and actual admission to the neonatal intensive care unit. The findings suggest similar ratios of actual to recalled admissions. This is evidence that bias is unlikely to explain all our findings, although the effect of recall bias may be greater for subjective judgments such as perceived illness compared with peers. However, we also adjusted for current general health and psychological status to further reduce the influence of these concurrent factors on recall.

Our findings are consistent with prospective cohort studies[29-31], which are less susceptible to recall bias and therefore may offer a closer approximation to the truth than the case-control design employed in this study. In a series of studies of secondary school-age children in the North West of

England, low back pain was more strongly associated with psychosocial factors (such as emotional and conduct problems) and other symptoms (such as abdominal pain, sore throats) than with mechanical influences on the spine[29], and new episodes of low back pain at 1 year followup were more likely in those with behavior problems at baseline. The extent to which these findings signal the beginning of a chronic pain "career" in adulthood, and whether childhood factors retain their influence on this, were not ascertained, but findings from birth cohort studies make these seem plausible[30].

The acquisition and maintenance of chronic pain is likely to be multidimensional, encompassing aspects of physical injury and social, psychological, and cultural influences. Examining childhood and developmental factors could provide the opportunity to identify factors that promote a longer-term pain career. Pain related disability is a public health priority in many countries, with a great research effort concentrating on rehabilitation and prevention of common musculoskeletal disorders. The identification of causal factors is essential if preventive approaches are to be implemented, and since common musculoskeletal complaints, such as low back pain, appear to be increasingly prevalent in children, early life is where the search must begin. This study adds further evidence to this, in particular highlighting the potential role of the family and childhood environment on pain in later life. Future studies, particularly those with a prospective design, should include further childhood, family, and social variables to fully explore the potential relationship between early life and pain as an adult.

## ACKNOWLEDGMENT

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