Carer Experience of Back Pain Is Associated With Adolescent Back Pain Experience Even When Controlling for Other Carer and Family Factors

Peter B. O'Sullivan, PhD,* Leon M. Straker, PhD,* Anne Smith, PhD,* Mark Perry, PhD,* and Garth Kendall, PhD‡

Objectives: The study objectives were (1) to determine if adolescent back pain is related to carer back pain; and (2) to examine whether other carer and family factors accounted for any such relationship.

Methods: Back pain experience was collected independently from 1608 fourteen-year-old adolescents and their care givers by questionnaire. Measures of back pain impact on carers were also collected (modified activities, missed work, sought professional help, took medication). Other carer factors examined were age, sex, smoking habits, depression, anxiety, and stress. Familial factors examined included income, stressful events, and family functioning. Odds ratios were calculated to describe familial associations with multivariate modeling used to examine the influence of other carer and family factors.

Results: Lifetime prevalence of back pain was 46.5% for adolescents and 72% for their carers. Having a carer with back pain increased the risk of back pain for adolescents, and this was magnified if both carers had back pain (odds ratio 1.61). Adolescent back pain was not associated with primary carer age, sex, depression, anxiety, or stress but was related to family stressful events. However, these other factors did not diminish the association between carer back pain and adolescent back pain.

Discussion: Carer experience of back pain is clearly associated with adolescent experience of back pain. Although other carer and family factors are also associated, the carer’s back pain experience is not a surrogate measure of these other factors suggesting other genetic and behavioral mechanisms may be important for adolescent back pain development.

Key Words: back pain, familial link, adolescent, carer, parent

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Back pain has been shown to be common in adolescence. In studies with cohort ages of between 10 and 18 years, back pain lifetime prevalences for mixed male and female cohorts have ranged between 10% and 84%. The prevalence of chronic back pain in adolescents has been shown to range from around 3% up to around 20%. Late adolescent life prevalences are only slightly less than those seen in adults (eg, 74%), suggesting that for much of the population back pain commences in adolescence.

It is now recognized that adolescent back pain should be viewed from a biopsychosocial perspective, where all potential contributing factors, such as pathoanatomic, physical, social, psychologic, and genetic factors, are considered. Behavioral and genetic factors are transmitted from parents to their children, and yet to date there remains conflicting evidence for the role that these familial influences play in the development of adolescent back pain. This is despite evidence for familial links in other health problems, including cardiovascular diseases, metabolic disorders, respiratory disorders, and cancers, as well as familial links for physical and psychosocial risk factors of disabling back pain in adults.

The studies that have investigated the link between back pain in children and their parents have had mixed findings. Although a number of studies have demonstrated a parental back pain link, the majority of these asked the child’s opinion of parental back pain and their own, or parents provided data for both child and parent potentially leading to bias. Two studies provided separate questionnaires for the parent and child, although one of these was concerned with back and/or neck pain rather than back pain alone and the other only investigated maternal links. However, Saunders et al did report a dose-response relationship between maternal multiple pain sites and the presence of back pain, headache, and stomach pain.

In contrast, other studies have not detected a familial link. Kovacs et al and Jones et al both
reported that there was no association between back pain in the child and back pain of their mother and father. However Jones et al.\(^{25}\) only received responses from both parents for 52% of the cohort and both Kovacs et al.\(^{1}\) and Jones et al.\(^{25}\) categorized parents as “mother” and “father.” A recent review of international paternity research\(^{26}\) has shown that nonpaternity rates range from around 2% in “high paternity confidence” fathers to over 50% in “low paternity confidence” fathers. Further, many contemporary families comprise step-parents, grandparents, and other relatives who provide the primary child care. Therefore, it may be more accurate to investigate the relationship between primary/secondary carer experience of back pain and adolescent risk of back pain, particularly if behavioral mechanisms are important.

Psychosocial factors such as depression, anxiety, family issues, and economic stress are associated with adult low back pain. However, it is not known whether these factors, if present for a carer or within a family environment, influence adolescent experience of back pain. It is also not known whether any parent-child pain relationship is determined by individual carer factors such as age, sex, smoking, depression, anxiety, and stress, or by family factors such as family income, family functioning, and life stress events. Jones et al.\(^{25}\) stated that where a parent-child pain relationship exists it would be pertinent to measure characteristics of the family and Saunders et al.\(^{22}\) has suggested parental pain may be a proxy of family distress.

The principal aim of this study was to determine if there is an association between primary carer back pain and their adolescent child’s back pain. The second aim was to examine whether any primary carer back pain association is maintained when other individual carer factors and family environmental factors are considered.

### MATERIALS AND METHODS

#### Study Sample

Data from 1608 adolescents (825 females, 783 males) of mean (SD) age 14.06 (0.21) years were collected as part of their participation in the Western Australian Pregnancy Cohort “Raine” Study. This long-term project is collecting data on a range of health and developmental outcomes and started as a pregnancy cohort in which women attending antenatal clinics at King Edward Memorial Hospital for Women (Perth, Western Australia) who were enrolled between 1989 and 1991. The children have been followed at birth, 1, 2, 3, 5, 8, 10, and now 14 years of age. Original cohort inclusion criteria included gestational age between 16 and 20 weeks, sufficient proficiency in English to understand the implications of participation, and an intention to remain in Western Australia so that follow-up through childhood would be possible. A comparison of this cohort with the general population of Western Australia\(^{27}\) showed higher proportions of high-risk births as would be expected given the hospital’s role as the state’s specialist maternity hospital. At the 14-year follow-up, of the 2868 children included at birth, 651 were no longer eligible for the study: 32 (1.1%) had died, 207 (7.2%) had been lost to follow-up, and 412 (14.4%) had withdrawn. Three hundred fifty-seven (12.5%) agreed to participate but did not complete any assessment, with 1860 (64.9%) providing some data. Spinal pain data was available for 1608 adolescents (72.5% of those eligible).

#### Procedure

At around the time of the adolescent’s 14th birthday, eligible cohort families were contacted and invited to participate. Families agreeing to participate were sent consent forms, questionnaires for completion by primary and secondary carers, and appointments were arranged for physical assessments of the child and both carers. Adolescents completed a series of questionnaires on a laptop at the assessment center with the help of a research assistant. The questionnaires contained 130 multiple choice questions concerning a broad range of physical, medical, nutritional, psychosocial, and developmental issues and took about 1 hour to complete. A physical assessment of the adolescent including anthropometrics, posture, strength, co-ordination, and fitness was carried out after the questionnaire and took a further 1.5 hours to complete. The primary carer (family-selected parent/guardian taking the major responsibility for looking after the child) and secondary carer (family-selected parent/guardian taking the lesser responsibility) brought their completed questionnaires to the assessment center and also underwent a physical assessment.

#### Measures

The adolescent back pain questions covered lifetime, point, and month prevalence (“Have you ever had back pain?”; “Is your back painful today?”; “Has your back been painful in the last month? after) and pain duration (“Did your back pain last for more than 3 mo?”). These questions were based on prior questions with demonstrated test-retest reliability and validity in comparison to clinical interview.\(^{28-30}\) The carer questionnaires covered back pain lifetime prevalence, as per the adolescent (“Have you ever had back pain?”) and also included measures of the severity and impact of the carer’s back pain (“Did you seek health professional advice/treatment?”; “Did you take medication to relieve the pain?”; “Did you miss work due to the pain?”; “Did the pain interfere with your normal activities?”) drawn from the same published questionnaires.\(^{28-30}\) Carers reported their age, sex, personal smoking habits, and completed the Depression, Anxiety, and Stress Scale.\(^{31}\) The test-retest reliability and construct validity of this scale has been demonstrated.\(^{32}\) Both carers also reported the time they spent with the adolescent on weekdays and weekend days. The primary carer reported health problems of the adolescent as diagnosed by a health professional including back pain and provided information on the family in the form of family income, the general functioning subscale of the McMaster Family...
Assessment questionnaire, and the Stressful Life Events questionnaire. The reliability (internal consistency and split half) and construct validity of these instruments have been demonstrated.

**Data Analysis**

Data were screened and scales calculated as per the questionnaire publications. Simple differences in proportions were analyzed using Pearson $\chi^2$ test.

To determine whether there was an association between adolescent back pain experience and carer back pain experience, univariate logistic regression analyses were conducted. Odds ratios (ORs) were calculated for primary and secondary carer back pain and adolescent back pain ever and back pain of more than 3 months duration. ORs were also calculated for having 1 carer with back pain (regardless of whether they were primary or secondary) and having both carers with back pain.

To examine whether any primary carer back pain association was due to other individual carer characteristics or family characteristics, univariate logistic regression analysis was conducted for each of these factors with adolescent back pain ever and back pain of more than 3 months duration. Finally, carer factors and family factors with a univariate significance of $P < 0.1$ for either lifetime or chronic adolescent back pain outcomes were included in multivariate logistic regression models to examine the influence of individual carer and family covariates on the primary carer-adolescent back pain association. A critical level of $\alpha = 0.05$ was used to determine statistical significance. Statistical analysis was performed using SPSS Version 14 (SPSS Inc, Chicago).

**Ethics**

Participants assented to take part, and parents gave informed consent. Approval was granted by the Human Research Ethics Committees of Curtin University of Technology and Princess Margaret Hospital, Perth.

**RESULTS**

**Adolescent Back Pain Prevalence**

Adolescent self-reported life, month, point, and chronic back pain prevalence along with carer-reported adolescent diagnosed back pain are presented in Table 1. There is weak evidence of a higher life, month, and diagnosed prevalence in females than males ($P = 0.052$ and $0.070$, respectively) but similar point and chronic back pain prevalence between sexes.

**Carers**

The various primary and secondary carer relationships are presented in Table 2. In the majority of cases, the adolescent’s primary carer was the mother (1404 of 1549, 90.6%) and the secondary carer the father (999 of 1172, 85.0%). Of all primary carers, 92.0% (1425 of 1549) were female. Of all secondary carers, 94.9% (1112 of 1172) were male. Sixty-three percent of primary carers reported spending 3 or more hours with the adolescent on weekdays (53% on weekend days) whereas only 26% of secondary carers spent 3 or more hours with the adolescent on weekdays (35% on weekend days) (weekday difference $Z = 18.6, P < 0.001$; weekend day difference $Z = 9.8, P < 0.001$). Data were available for 96.3% of primary carers, 72.9% of secondary carers, and 72.2% for both carers.

**Carer Back Pain Prevalence**

The prevalence of back pain and various measures of the impact of back pain upon carers are presented in Table 3. For each of these measures, there was no significant difference in the proportions of males and females in each pain group. Of the 2701 primary and secondary carers surveyed overall, 1939 (71.8%) had experienced back pain.

**Carer Back Pain and Adolescent Back Pain**

Adolescents whose primary carer reported back pain ever were significantly more likely to experience back pain ever or back pain of 3 months or more duration [unadjusted OR = 1.41, 95% confidence interval (CI); 1.13-1.77, $P = 0.003$ and OR = 1.76, 95% CI; 1.18-2.62, $P = 0.005$]. Similar, significant associations were present between both measures of adolescent back pain and the other measures of the impact of carer back pain. Similar associations were also found when using carer-reported health professional diagnosed adolescent back pain as the outcome. Adolescents whose secondary carer reported back pain ever were more likely to experience back pain.

**TABLE 1. Life, Month, Point, and Chronic Prevalence (%) of Back Pain in 1608 Australian Adolescents by Sex**

<table>
<thead>
<tr>
<th>Prevalence</th>
<th>Overall</th>
<th>Male</th>
<th>Female</th>
<th>Difference, $P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life</td>
<td>46.0</td>
<td>43.7</td>
<td>48.5</td>
<td>0.052</td>
</tr>
<tr>
<td>Month</td>
<td>28.1</td>
<td>26.1</td>
<td>30.2</td>
<td>0.070</td>
</tr>
<tr>
<td>Point</td>
<td>6.5</td>
<td>6.5</td>
<td>6.4</td>
<td>0.930</td>
</tr>
<tr>
<td>Chronic (&gt; 3 mo in life)</td>
<td>11.3</td>
<td>10.8</td>
<td>11.8</td>
<td>0.535</td>
</tr>
<tr>
<td>Diagnosed back pain</td>
<td>11.4</td>
<td>10.0</td>
<td>12.9</td>
<td>0.065</td>
</tr>
</tbody>
</table>

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<tr>
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</tr>
</tbody>
</table>

**TABLE 2. Relationships of Primary and Secondary Carers to Adolescent**

<table>
<thead>
<tr>
<th></th>
<th>Primary Carer</th>
<th>Secondary Carer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (1549)</td>
<td>%</td>
</tr>
<tr>
<td>Mother</td>
<td>1404</td>
<td>90.6</td>
</tr>
<tr>
<td>Father</td>
<td>113</td>
<td>7.3</td>
</tr>
<tr>
<td>Step, adoptive, or foster mother</td>
<td>10</td>
<td>0.7</td>
</tr>
<tr>
<td>Step, adoptive, or foster father</td>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>Grandmother</td>
<td>11</td>
<td>0.7</td>
</tr>
<tr>
<td>Grandfather</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>0.5</td>
</tr>
</tbody>
</table>
ever or back pain of 3 months or more duration, although this only approached statistical significance (unadjusted OR = 1.29, 95% CI; 1.00-1.67, P = 0.053 and OR = 1.58, 95% CI; 0.99-2.53, P = 0.054).

Of adolescents with no carers reporting back pain, 36% had back pain. In comparison, 43% of adolescents had back pain if one carer reported back pain and 48% of adolescents had back pain if both carers reported back pain. The unadjusted OR for increased risk of adolescent back pain if both carers reported back pain, compared with no carer with back pain, was 1.61 (95% CI: 1.07-2.48, P = 0.023).

Other Individual Carer Factors and Adolescent Back Pain

Primary carer sex was not associated with the adolescents’ experience of back pain ever or back pain of 3 months or more duration (OR [female to male] = 0.75, 95% CI; 0.51-1.09, P = 0.131 and OR = 0.61, 95% CI; 0.36-1.03, P = 0.062, respectively). There was no interaction effect between adolescent and primary carer sex for either outcome (P = 0.564 and 0.224, respectively). Primary carer age was not associated with the adolescents’ experience of back pain ever or back pain of 3 months or more duration (OR = 0.99, 95% CI; 0.97-1.00, P = 0.147 and OR = 0.99, 95% CI; 0.96-1.02, P = 0.535, respectively). Adolescents whose primary carer smoked were significantly more likely to have back pain ever (OR = 1.28, 95% CI; 1.01-1.62, P = 0.044), but not back pain of 3 months or more duration (OR = 1.14, 95% CI; 0.79-1.65, P = 0.485).

Adolescents’ experience of back pain ever was not associated with the primary carers’ depression, anxiety, or stress subscales (P = 0.550, 0.671, and 0.564, respectively). Likewise, adolescents’ experience of back pain of 3 months or more duration was not associated with the primary carers’ depression, anxiety, or stress subscales (P = 0.679, 0.369, and 0.322, respectively).

Family Factors and Adolescent Back Pain

The tendency for a higher household income to be associated with a decrease in the likelihood of a adolescent experiencing back pain ever or back pain of 3 months or more duration was not statistically significant (OR = 0.97, 95% CI; 0.94-1.00, P = 0.076 and OR = 0.97, 95% CI; 0.92-1.02, P = 0.223, respectively). Poorer family functioning was associated with an increase in the likelihood of an adolescent experiencing back pain ever or back pain of 3 months or more duration, although this only approached statistical significance (OR = 1.26, 95% CI; 1.00-1.58, P = 0.052 and OR = 1.41, 95% CI; 0.99-2.02, P = 0.058, respectively).

A greater number of family life stress events was associated with a significant increase in the likelihood of an adolescent experiencing back pain ever or back pain of 3 months or more duration, (OR = 1.12, 95% CI; 1.04-1.20, P = 0.002 and OR = 1.13, 95% CI; 1.02-1.26, P = 0.018, respectively). Family factors tended to be related to each other. For example, life stress was significantly and negatively correlated with household income (Pearson r = −0.291, P < 0.001) and significantly and positively correlated with poorer family functioning (Pearson r = 0.259, P < 0.001) and household income was significantly and negatively correlated with poorer family functioning (Pearson r = −0.127, P < 0.001).

Multivariate Models

Primary carer report of ever experiencing back pain remained a significant predictor of adolescent report of ever experiencing back pain, after adjustment for adolescent and carer sex, carer smoking, household income, family functioning, and number of life stress events, using multivariate logistic regression. Table 4 presents the adjusted ORs for each covariate. The adjusted ORs for a history of carer back pain versus no carer back pain for adolescent back pain ever and adolescent back pain of 3 months or more duration are similar to the unadjusted ratios (OR = 1.38, 95% CI; 1.09-1.74, P = 0.007 and OR = 1.62, 95% CI; 1.07-2.43, P = 0.022).

DISCUSSION

Prevalence

The lifetime prevalence of 46.5% for back pain in 14-year-old Australians is in broad agreement with
TABLE 4. Multivariate Logistic Regression Model for Adolescent Back Pain (Statistically Significant Associations in Bold)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Ever (n = 1455)</th>
<th></th>
<th>3mo or More Duration (n = 1455)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (Exp-β)</td>
<td>95% CI</td>
<td>P</td>
<td>OR (Exp-β)</td>
</tr>
<tr>
<td>Carer history of back pain</td>
<td>1.38</td>
<td>1.09-1.74</td>
<td>0.007</td>
<td>1.62</td>
</tr>
<tr>
<td>Female adolescent</td>
<td>1.26</td>
<td>1.02-1.55</td>
<td>0.033</td>
<td>1.11</td>
</tr>
<tr>
<td>Female carer</td>
<td>0.75</td>
<td>0.51-1.11</td>
<td>0.150</td>
<td>0.59</td>
</tr>
<tr>
<td>Carer smokes</td>
<td>1.17</td>
<td>0.90-1.51</td>
<td>0.245</td>
<td>0.97</td>
</tr>
<tr>
<td>Household income</td>
<td>1.00</td>
<td>0.96-1.03</td>
<td>0.798</td>
<td>1.00</td>
</tr>
<tr>
<td>Female adolescent</td>
<td>1.13</td>
<td>0.88-1.44</td>
<td>0.330</td>
<td>1.20</td>
</tr>
<tr>
<td>Carer back pain</td>
<td>1.08</td>
<td>1.00-1.17</td>
<td>0.042</td>
<td>1.11</td>
</tr>
</tbody>
</table>

The Association Between Carer Back Pain and Adolescent Back Pain

This study collected data specifically on adolescents and primary/secondary carers with back pain, directly from those experiencing the pain. The results support the proposition that a primary carer’s experience of back pain is associated with the adolescent child experiencing back pain, for both back pain ever and back pain of 3 months or more duration. This was also the case for secondary carer although this only approached statistical significance. Furthermore, the impact of back pain on the primary carer (medication use, seeking treatment for back pain, modification of activity levels, and work absence) was also associated with the adolescent’s experience of back pain. In addition, if both carers experienced back pain this had a magnifying effect on the association with the adolescent’s experience of back pain.

The prior literature on the relationship between parent’s experience of back pain and their children’s has been limited. Two of the three large studies that collected data from parents and children separately did not note any relationship, and this may be due to both defining parents as mother and father rather than primary or secondary carer and a poor response rate from parents. The large study which did find an association only examined mother-child relationships. The current study, therefore, provides further evidence that there is a familial association with adolescent back pain.

Carer Back Pain is not a Surrogate Measure for Other Likely Individual and Family Risk Factors

The association between primary carer back pain and adolescent back pain remained regardless of carer characteristics (age, sex, smoking habit, depression, anxiety, and stress levels of the carer) and family characteristics (income, functioning, and stress). This finding suggests that there may be other mediating factors that were not measured within this study. There is substantial experimental evidence that parents exert a direct impact on children’s pain experiences and behavior through modeling reactions to pain stimuli. Primary carer attitudes and beliefs, such as those relating to pain and pain behaviors, may be important in influencing the experience and perception of pain in adolescents. Given the evidence for a genetic link to back pain experience, it is likely that both genetic and behavioral factors are important, although the influence of behavioral factors may be dominant in early adolescence. It may be that other factors such as genetics, back pain behaviors, and beliefs as well as other shared environmental factors such as diet, movement, and activity behaviors not investigated in this study may influence the carer and adolescent back pain relationship. Further studies are required to examine the independent and interactive contributions of genetic and other behavioral aspects of familial links at different ages.

Limitations and Strengths

This study only investigated the presence of adolescent back pain and did not investigate pain severity, impact, or level of disability associated with back pain in the adolescents. Further research is being conducted to investigate these factors. The sample is not random, due to both sampling and drop-out, and this may limit the generalization to other adolescents. However, the strengths of our study include the large sample size, accessing data directly from carers and adolescents, and the clarification of primary/secondary carer status as well as carer back pain impact measures. Further, the consistency of the relationships using different aspects of the back pain construct (lifetime, chronic, diagnosed, and impact) reinforces the likelihood of the links. Importantly, this paper investigated the association of individual carer factors as well as family environmental factors and the adolescents’ experience of back pain.

Back pain is a problem of significant proportion for adolescents. A clear and consistent familial relationship was observed between the carer’s experience and impact of back pain and that of the adolescent’s, even when other carer and family factors were examined. With adult back pain causing a significant burden on society, further
research into the familial factors associated with the development of back pain in adolescent populations is warranted so that community-based preventative strategies can be developed.

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