No association between previous Caesarean-section delivery and back pain in mid-aged Australian women: an observational study

Michael K Drew, David Sibbritt and Pauline Chiarelli

University of Newcastle
Australia

Question: Is there an association between Caesarean section and back pain over the longer term? **Design:** Secondary analysis of data from the Australian Longitudinal Study on Women's Health. **Participants:** The mid-aged cohort of women within the Australian Longitudinal Study on Women's Health aged 54 to 59 years (n = 9146). **Outcome measures:** Data were included from women who answered the question regarding back pain. Data were extracted on whether they had given birth and, if so, whether it was by Caesarean section. Then, data on confounding variables (such as arthritis, asthma, osteoporosis, hysterectomy, ovaries removed, and repair of prolapsed vagina, bladder or bowel, menopause, smoking) were also extracted. **Results**: After adjusting for confounding factors, women who delivered by Caesarean section had the same odds (OR 1.03, 95% CI 0.81 to 1.31) of having back pain as women who had not had a birth. **Conclusion:** Previous delivery by Caesarean section is not associated with increased back pain in mid-aged Australian women. **[Drew MK, Sibbritt D, Chiarelli P (2008) No association between previous Caesarean-section delivery and back pain in mid-aged Australian women: an observational study. *Australian Journal of Physiotherapy* 54: 269–272]**

Key words: Back pain, Caesarean section, epidemiology

Introduction

The prevalence of low back pain during pregnancy is estimated to be between 36% and 69% (Wang et al 2004, Orvieto et al 2004, and Stapleton, MacLennan and Kristiansson 2002). Noren et al (2004) found that 20% of all women had back pain at three years postpartum. Of these women, one-third had lumbar back pain, 44% had posterior pelvic pain, and 23% had both. No association between Caesarean section and low back pain has been found at 24 weeks (Thompson et al 2002) or 24 months postpartum (To and Wong 2003). However, there have been no studies looking at the long term association. Furthermore, there are no studies comparing Caesarean section and vaginal delivery against nulliparity. Since delivery by Caesarean section has steadily increased to 29% in 2004, with higher rates among older, privately-insured women, it seems reasonable to explore the impacts of such deliveries on health over the longer term (Laws et al 2006).

Urinary incontinence is associated with low back pain (Smith et al 2006, 2007; Eliasson et al 2007) and varied reports of the association between Caesarean section and urinary incontinence have been published. Chin et al (2006) examined postpartum urinary incontinence in relation to the method of delivery and reported that Caesarean section and vaginal delivery had similar risks of postpartum urinary incontinence when age and BMI were adjusted for, while urinary incontinence was significantly lower in the elective Caesarean section group. Foldspang et al (2004) showed that one delivery by Caesarean section was protective but subsequent delivery by Caesarean section did not lower postpartum urinary incontinence. Another longitudinal study (MacArthur et al 2006) found that postpartum urinary incontinence was significantly lowered following Caesarean section, but not if there was another vaginal delivery. The prevalence of persistent symptoms was reported at 14% with exclusive Caesarean section deliveries. MacLennan et al (2000) interviewed 3010 South Australians to determine the prevalence of pelvic floor disorders in relationship to gender, age, parity, and mode of delivery. Multivariate logistic regression analysis showed that, compared with nulliparity, Caesarean section was significantly associated with pelvic floor dysfunction. This was not seen in comparison to spontaneous vaginal deliveries indicating that Caesarean section may not be protective.

It is known that the abdominal musculature is affected by low back pain (Hodges 2001), but is the reverse true? Do interferences in abdominal musculature cause low back pain? During Caesarean section, a Pfannenstiel incision is preferred; this involves a transverse incision of 8–12 cm across the fascia of the rectus sheath, *external oblique*, *internal oblique* and the *transversus abdominis* muscles supra-pubically. The aponeurosis is then separated from the underlying *pyramidalis* and *rectus abdominis* (Kisielinski et al 2004); this incision is surgically repaired following foetal delivery. The pelvic floor is not involved in the surgery.

Spinal stability is comprised of three subsystems (Panjabi 1992): the passive (ligamentous), the active (musculotendinous), and the neural control subsystems. Dysfunction in one or all of these systems is associated with low back pain (Panjabi 1992). Since low back pain has been shown to lead to motor control dysfunction, might abdominal muscle dysfunction lead to low back pain? Might this be the case after a Caesarean section where postoperative pain could disrupt the active (musculotendinous) system, as well as the neural control subsystem? *Transversus abdominis* originates from the internal surfaces of the 7^{th}–12^{th} costal cartilages, thoracolumbar fascia, iliac crest, and lateral third of the inguinal ligament and inserts into the linea alba with the aponeurosis of *internal oblique*, pubic crest, and *pectin pubis* via the conjoint tendon (Moore and Daley 1999). The conjoint tendon is transected by the incision at Caesarean section. Furthermore, the internal and *external oblique* muscles as well as *rectus abdominis* are also transected during Caesarean section.

Transversus abdominis contributes to spinal stability by increasing the segmental stiffness of the spine and reducing the abdominal cross-sectional area (Hides et al 2006) which increases intra-abdominal pressure. This muscle contracts in a feedforward manner, independent of the direction of movement of the limbs, to anticipate the required postural adjustments (Hodges et al 2001). The pelvic floor has also been shown to act in a similar manner (Hodges et al 2007). However, in the presence of low back pain, these motor activation patterns are changed. Namely, a delayed onset of contraction in association with rapid limb movement (Hodges and Richardson 1996) which has been shown to remain altered even when symptoms have subsided (Ferreira et al 2004). Delayed responses to sudden trunk loading have also been found (Hodges et al 2001). While considerable debate exists regarding theoretical explanation of these changes, the evidence for changes in muscle recruitment patterns associated with low back pain is consistent with the pain-adaptation model first described by Lund et al (1991).

Given that the abdominal musculature (*rectus abdominis*, *transversus abdominis*, and the *internal oblique* and *external oblique* muscles) is disrupted during Caesarean section, it would be reasonable to hypothesise that motor activation patterns and postpartum abdominal strength would be altered (at least transiently) following this procedure in all muscles. *Rectus abdominis* has been shown to become thinner, wider, and to have increased inter-recti distance on ultrasound evaluation, and is still not recovered at 12 months postpartum (Coldron et al 2008). While this might translate as chronic *rectus abdominis* weakness following pregnancy (measured indirectly as a decrease in cross-sectional area), no studies have explored the long-term impact of Caesarean section on abdominal musculature. Therefore, the research question for this study was:

> Is there an association between Caesarean section and low back pain over the longer term?

Method

Design

This research used data collected by the Australian Longitudinal Study on Women's Health (commonly known as the Women's Health Australia Study) which was designed to investigate multiple factors affecting the health and well being of women over a 20-year period. Women in three age groups, 'young' (18–23), 'mid-age' (45–50), and 'older' (70–75) years, were randomly selected from the national Medicare database (recognised as the most comprehensive register of Australian citizens and permanent residents) (Brown et al 1998).

Participants

The baseline survey was conducted in 1996 and the respondents (n = 14 779 young, n = 14 099 mid age, and n = 12 939 older women) have been shown to be representative of the national population of women in the target age groups (Brown et al 1999). This study considered only the mid-age cohort, using the data collected in the most recent survey conducted in 2005. There were 9146 women who answered the question regarding back pain. All women who responded that they had been diagnosed with a cancer were excluded from the analyses due to the association of acute malignancy pain and chronic pain often reported by cancer patients, and cancer survivors were excluded. Postcode of residence at the time of the baseline survey was used to classify area of residence as urban or non-urban. In addition, women were asked about the highest educational qualification they had completed. Date of birth was used to calculate the age of the women.

Measures of health status

Data from the Women's Health Australia Study were included if women answered 'sometimes' or 'often' when asked how often they had experienced back pain (amongst a longer list of symptoms) in the previous twelve months. The specific term 'low back pain' was not used. Data were extracted on whether they had given birth and if so, whether it was by Caesarean section. Then, data on confounding variables such as whether they had ever been told by a doctor that they had any of the chronic medical conditions listed (ie, arthritis, asthma, and osteoporosis) or whether they had had a hysterectomy, both ovaries removed, repair of prolapsed vagina, bladder or bowel, or menopause in the previous year, and whether they had a history of smoking were also extracted. The questions from the Australian Longitudinal Study on Women's Health used in this paper can be found at: http://www.alswh.org.au/Surveys_data/Databooks/Mid4Data.pdf.

Data analysis

Simple logistic regression was used to investigate the association between back pain and mode of delivery. Then, multiple logistic regression was used to adjust for potential confounding variables, ie, the model included the independent variables of mode of delivery plus all confounding variables and the dependent variable of back pain. The confounding variables were all the demographic and health status measures described above. Due to the large sample size a statistical significance level was set at $p < 0.005$.

Results

Participants

Cancer resulted in the exclusion of 1320 women. Of the remaining 9146 women who answered the question regarding back pain, 4700 (51%) reported having back pain sometimes or often in the previous 12 months (Table 1). In terms of birth, of the 9146 women 1137 (12%) had delivered by Caesarean section, 7264 (79%) women had delivered without Caesarean section, and 745 (8%) women had not given birth.

Table 1. Number (%) of participants with and without back pain by mode of delivery.

Mode of delivery	Back pain	
	Yes (n = 4700)	No (n = 4446)
Delivery with Caesarean section	594 (13)	543 (12)
Delivery without Caesarean section	3733 (79)	3531 (80)
No birth	373 (8)	372 (8)

Back pain and Caesarean section

There was no association (p = 0.65) between mode of delivery and back pain (Table 1). Women who had delivered by Caesarean section had the same odds (OR 1.05, 95% CI 0.89 to 1.25) of having back pain as women who had not had a birth. Women who had delivered without Caesarean section also had the same odds (OR 1.03, 95% CI 0.90 to 1.19) of having back pain as women who had not given birth. After adjusting for confounding factors, women who had delivered by Caesarean section still had the same odds (OR 1.03, 95% CI 0.81 to 1.31) of having back pain as women who had not given birth. Similarly, women who had delivered without Caesarean section still had much the same odds (OR 1.20, 95% CI 0.98 to 1.46) of having back pain as women who had not given birth. The data from the Australian Longitudinal Study on Women's Health used in this paper can be found at the study website (see above).

Discussion

This study was conducted on data from a large, representative sample of mid-aged Australian women and is the first to explore the relationship between Caesarean section delivery and the onset of low back pain in the longer term. No association was found between Caesarean section and back pain.

That low back pain has been shown to be associated with urinary incontinence (Eliasson et al 2007, Smith et al 2006) and breathing disorders (Smith et al 2006) is not surprising. The pelvic floor muscles, diaphragm, and *transversus abdominis* have dual roles involving postural and respiratory functions (Hodges et al 2007). Where demand for one of these functions is increased the muscle activity is reduced or increased (Smith et al 2007). It has been proposed that the altered muscle activity precipitates low back pain (Ericksen et al 2006, Smith et al 2006). With similar rationale, we hypothesised that trauma to the abdominal wall (via Caesarean section) might predispose women to low back pain over the longer term. Such injury may precipitate low back pain through biomechanical dysfunction arising from reduced muscle force capabilities, with secondary deconditioning from pain inhibition during the postoperative period. Changes in motor activation patterns have been shown not to resolve spontaneously following back pain (Ferreira et al 2004) and therefore hypothetically may not spontaneously resolve following trauma to the muscles directly. The *rectus abdominis* muscle has been shown to become thinner, wider, and to have increased inter-recti distance which does not spontaneously resolve (Coldron et al 2008). No studies have looked at the structure or function of *transversus abdominis*, or the *internal oblique* or *external oblique* muscles following pregnancy. Previous research has shown that pregnancy, independent to mode of delivery, is associated with pelvic floor dysfunction (MacLennan et al 2000) and might explain why no difference was observed between the modes of delivery. The results from this study support previous studies of low back pain in earlier postpartum women (Thompson et al 2002, To and Wong 2003) but do not support our hypothesis that Caesarean section might lead to low back pain over the longer term. While parity may be associated with onset of low back pain in younger women (Smith et al 2007), parity is not associated with back pain in the longer term and neither is Caesarean section.

The main limitation of this study is the reliance on self-reporting and restricted responses to frequency of symptoms which limit data interpretation. However, frequency of back pain has been shown to relate to the *bodily pain* domain of the Short Form 36 questionnaire, with women with more frequent back pain scoring lower (indicative of worse bodily pain) (Smith et al 2006). Although not specific to back pain, confidence in the responses reported in the present study is increased. This study is also limited to the confounding variables asked in the questionnaire which did not include other known risk factors such as genetics/familial traits, emotional distress, occupation, job satisfaction and stress or low social support (Burton and Waddell 2004).

Despite these limitations, this study has identified that delivery by Caesarean section is not associated with long term back pain; furthermore, low back pain in mid-aged women is not associated with parity. This suggests that disruption of the abdominal muscles during Caesarean section does not lead to back pain over the longer term.

Ethics: The University of Newcastle Human Research Ethics Committee and The University of Queensland Medical Research Ethics Committee approved the Women's Health Australia Study.

Competing interests: Nil.

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Correspondence: Assoc. Prof. Pauline Chiarelli, Faculty of Health, University of Newcastle, Callaghan 2308, Australia. Email: pauline.chiarelli@newcastle.edu.au

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