

CLINICAL ISSUES

Risk factors for birth-related perineal trauma: a cross-sectional study in a birth centre

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Aim and objectives. To identify maternal, newborn and obstetric factors associated with birth-related perineal trauma in one independent birth centre.

Background. Risk factors for birth-related perineal trauma include episiotomy, maternal age, ethnicity, parity and interventions during labour including use of oxytocin, maternal position at time of birth and infant birth weight. Understanding more about these factors could support the management of vaginal birth to prevent spontaneous perineal trauma, in line with initiatives to reduce routine use of episiotomy.

Design. Cross-sectional study.

Methods. Data were retrospectively collected from one independent birth centre in Brazil, during 2006–2009. The dependent variable (perineal trauma) was classified as: (1) intact perineum or first-degree laceration, (2) second-degree laceration and (3) episiotomy (right mediolateral or median).

Results. There were 1079 births during the study period. Parity, use of oxytocin during labour, position at time of giving birth and infant birth weight were associated with second-degree lacerations and episiotomies. After adjusting for parity, oxytocin, maternal position at the expulsive stage of labour and infant birth weight influenced perineal outcomes among primiparae only.

Conclusions. Although the overall rate of episiotomies in this study was low compared with national data, it was observed that younger women were most vulnerable to this intervention. In this age group in particular, the use of oxytocin as well as semi-upright positions at the time of birth was associated with second-degree lacerations and episiotomies.

Relevance to clinical practice. The use of upright alternative positions for birth and avoidance of use of oxytocin could reduce the risk of perineal trauma from lacerations and need to perform episiotomy.

Key words: episiotomy, independent birth centres, midwifery-led care, normal birth, normal labour, perineal tears

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Introduction

In 2009, there were approximately 1.4 million vaginal births in Brazil (Brasil 2010). The National Survey of Demography and Health of Women and Child Health (PNDS 2006) reported that episiotomy was performed in 70% of all vaginal births regardless of parity (Berquó *et al.* 2009). However, the conclusions of systematic reviews of the effectiveness of routine compared with restrictive use of episiotomy are that routine use offers no benefit and this practice cannot be justified. Restrictive use of episiotomy has been associated with less severe perineal trauma, less suturing and fewer healing complications, and although it has been associated with more anterior perineal trauma (Carroli & Mignini 2008), this type of trauma is not usually clinically significant. Lacerations classified as first or second degree appear to be more advantageous than performing routine episiotomies as they are reported to heal better and result in less bleeding and less pain for the woman (Eason & Feldman 2000, Hartmann *et al.* 2005).

The results of these studies have impacted on the content of routine birth care and resulted in lower rates of episiotomy, more particularly in countries where midwifery care is available. In general, there is a trend towards lower episiotomy rates in some of the countries where midwives provide the majority of maternity care, including the United Kingdom, Sweden, The Netherlands, Australia and New Zealand, with rates higher in South America, the Middle East and Far East where care is usually obstetric led (Graham *et al.* 2005). The optimal level of appropriate episiotomy use is not known; however, several studies have examined factors associated with risk of spontaneous perineal trauma. Maternal factors include age, race and parity. Obstetric factors identified include routine use of oxytocin (Albers *et al.* 2005, Mikolajczyk *et al.* 2008) and use of particular delivery practices, for example manoeuvres that seek to promote a slow release of the foetal head (da Costa & Riesco 2006) and maternal position at the birth (Soong & Barnes 2005). Neonatal variables such as infant birth weight have also been investigated (Albers *et al.* 2006). Some identified factors may be amenable to intervention to reduce the risk of trauma, while others (for example maternal parity) would require more careful consideration and management to reduce risk. Clearly, evidence suggests that it is more advantageous for women, in the shorter and longer term, to maintain perineal integrity at birth, unless there is a clear maternal or foetal indication for performing episiotomy.

As referred to above, in some parts of the world, changes in routine perineal management reflect evidence-based practice including need to address the skills and competencies of the

midwives and obstetricians and barriers and facilitators to informing 'best practice' (Bick *et al.* 2010). However, in Brazil, many professionals still consider that not performing an episiotomy for spontaneous vaginal birth reflects poor obstetric care (Diniz & Chacham 2004). With respect to where an episiotomy incision is made, midline and medio-lateral episiotomies are used, although the former is much more prevalent in Brazilian maternity services (Riesco *et al.* 2011).

Moreover, non-referral to the international classification of perineal tears (which classifies tears from first to fourth degree) can lead to undiagnosed or 'missed' third and fourth degree tears (NICE 2007) as the attending clinician may be unaware of the need to check the extent of trauma sustained to ensure that the anal sphincters are intact or unfamiliar with the clinical presentation. This classification of perineal tears is not used in Brazil. Current guidance in some countries (for example in England and Wales) also includes that rectal examination should be performed before and after suturing of perineal trauma to detect anal sphincter injury (NICE 2007).

One of the factors that contribute to a persistent high level of perineal interventions in Brazil is the small number of nurse midwives and midwives providing birth care. According to PNDS (2006), 8.6% of the births in Brazil were assisted by nurses and 89% by doctors, notwithstanding the efforts of Ministry of Health to promote nurse midwife and midwifery-led birth care (Berquó *et al.* 2009). Overcoming barriers to beliefs that routine episiotomy is of benefit, and promoting appropriate training in perineal care, including the competencies and skills to implement use of evidence-based suturing methods and materials (Kettle *et al.* 2007, 2010), could reduce episiotomy rates in Brazil and subsequent maternal morbidity.

Although the appropriate use of technology, which includes restricted rather than routine use of episiotomy, is slowly being incorporated into the maternity services in Brazil, the extent to which practice has changed is unknown. To reduce routine episiotomy rates, it is important to also know which factors are associated with aspects of organisation, content and delivery of routine labour and birth care, and maternal and infant characteristics that may be amenable to change, to support implementation of evidence.

Aims and objectives

To identify the prevalence of maternal, newborn and obstetric factors associated with perineal trauma in a population of women who had spontaneous vaginal birth in a freestanding midwifery-led birth centre. Findings will enable clinical

support needs to be identified and implemented to optimise perineal management practices and outcomes.

Methods

Study design

A cross-sectional study with retrospective data collection was undertaken.

Study location

The Sapopemba Birth Centre (SBC) is a freestanding birth centre, located in Brazil. This model of service provision is rare in the current Brazilian Health System. The centre serves low-risk pregnant women and is entirely managed by nurse midwives and midwives. All women receive prenatal care in a primary care centre and are referred to the SBC at 37 weeks gestation. The study was submitted to the Ethics Committee of the Municipal Health Department and approval granted (223/2006/CEP/SMS, CAAE 0098.0.162.000-06).

Study subjects

The study included all women who gave birth in the SBC from January 2006–December 2009 inclusively. Data on perineal management were recorded in a precoded form, included as part of the maternal records. Data collection was completed by the nurse midwife who attended the birth. This included socio-demographic characteristics of the woman, her clinical condition on admission to the centre, her labour progress, mode of birth and infant characteristics. As part of the admission criteria, women who had a previous caesarean section were not admitted to the SBC.

Data collection

Data related to perineal trauma outcomes were extracted from routine data collection forms for purposes of analyses and included: maternal age, education, parity, gestation, use of oxytocin, birth position and infant birth weight. Perineal outcomes were classified as: intact perineum and first-degree lacerations ('minor perineal trauma' which could involve the skin, vaginal mucosa and subcutaneous tissue), second-degree lacerations (skin, subcutaneous tissue and muscle but not involving the anal sphincter) and episiotomy (mediolateral or right median).

If a woman sustained a first- and a second-degree laceration, the greatest degree of laceration was considered for inclusion within the analyses. When there was laceration and

episiotomy, only episiotomy was recorded. In the case of periurethral laceration, it was considered a first-degree laceration, based on the consensus of the staff in the centre.

Women were able to choose their position for the actual birth, during which they were supported by their nurse midwife. Women's ethnicity was defined as white or non-white. Regarding parity, women were divided into nulliparous or multiparous. The use of oxytocin was classified as 'used' or 'not used' during the labour.

Data analysis

To investigate potential associations between perineal outcome and other preselected variables, contingency tables were constructed, using chi-square tests of association. At this stage, the level of significance of the association with the dependent variable (perineal outcome) was set at $p \leq 0.05$. In Tables 1 and 2, samples are treated as independent multinomial samples. Following initial data analyses, we calculated prevalence ratios (PR) of episiotomies among women who had second-degree lacerations and episiotomy, with a confidence interval of 95% (CI) and p -values (Table 3). For variables that were significant following chi-square tests, the analysis was further adjusted for parity, because of the potential confounding effect of this on perineal outcomes (Table 2).

Results

Data on a total of 1079 women were included in the analyses. Among these, 471 (43.6%) women had an intact perineum, 344 (31.9%) had a first-degree laceration, 111 (10.3%) a second-degree laceration, 139 (12.9%) a right mediolateral episiotomy and 13 women (1.2%) a median episiotomy. All women who had second-degree lacerations and episiotomies were sutured. Among women who had first-degree lacerations, 303 women (88.1%) were sutured. Data on one woman who sustained a third-degree laceration were excluded from the analysis, as this number was not sufficient to enable statistical tests to be performed in any meaningful way. None of the women sustained a fourth-degree tear.

The mean age of the women who gave birth was 24 years ($14-43 \pm 5.4$ years), 17.5% (189) women were aged 19 or younger. Most women (825, 76.5%) had eight or more years of education, most had a partner (994, 92.1%) and were not currently in paid employment (679, 62.9%). Two-thirds of the women were white (652, 60.4%), users of the Brazilian Health System that provides care free at the point of access (991, 92.0%) and non-smokers (900, 83.4%). During pregnancy, women had an average of seven antenatal

Table 1 Maternal and newborn characteristics according to perineal trauma

	Minor trauma <i>n</i> (%)	Second-degree lacerations <i>n</i> (%)	Episiotomies <i>n</i> (%)	Total	<i>p</i> -value
	815 (75.6)	111 (10.3)	152 (14.1)	1078 (100)	
Maternal age					
≤19	138 (73.0)	14 (7.4)	37 (19.6)	189 (17.5)	0.076
20–24	297 (74.8)	41 (10.3)	59 (14.7)	397 (36.8)	
25–34	338 (77.0)	48 (10.9)	53 (12.1)	439 (40.8)	
≥35	42 (79.2)	8 (15.10)	3 (5.7)	53 (4.9)	
Education (years)					
Up to 7	195 (76.8)	26 (10.2)	33 (13.0)	254 (23.6)	0.810
8–11	538 (757)	70 (9.9)	103 (14.5)	711 (66.0)	
≥12	82 (72.6)	15 (13.3)	16 (14.2)	113 (10.4)	
Ethnicity					
White	481 (73.8)	68 (10.4)	103 (15.8)	652 (60.5)	0.127
Non-white	334 (78.4)	43 (10.1)	49 (11.5)	426 (39.5)	
Gestational age (weeks)					
≤40	763 (76.2)	100 (10.0)	139 (13.87)	1002 (92.9)	0.291
≥41 or more	52 (68.4)	11 (14.47)	13 (17.11)	76 (7.1)	
Parity					
Nulliparous	309 (62.8)	56 (11.4)	127 (25.81)	492 (45.6)	< 0.001*
Multiparous	506 (86.4)	55 (9.4)	25 (4.27)	586 (54.4)	
Oxytocin use during labour					
Yes	233 (69.8)	32 (9.6)	69 (20.7)	334 (31.0)	< 0.001*
No	582 (78.2)	79 (10.6)	83 (11.2)	744 (69.0)	
Maternal position at birth					
Dorsal	651 (73.4)	93 (10.5)	143 (16.1)	887 (82.3)	< 0.001*
Other	164 (85.9)	18 (9.4)	9 (4.7)	191 (17.7)	
Infant birth weight (g)					
≤2999	270 (81.3)	23 (6.9)	39 (11.8)	332 (30.8)	0.041*
3000–3499	357 (73.9)	51 (10.6)	75 (15.5)	483 (44.8)	
3500–3999)	170 (72.7)	32 (13.7)	32 (13.7)	234 (21.7)	
≥4000	18 (62.1)	5 (17.2)	6 (20.7)	29 (2.7)	

Chi-squared test.

**p* < 0.05.

consultations at their primary healthcare units and three antenatal consultations at the SBC.

With respect to their obstetric history, 493 women (45.7%) were nulliparous and 586 (54.3%) multiparous, of whom 148 (13.7%) had experienced a previous miscarriage.

On admission to the birth centre, women had an average gestation of 39 weeks (range 35–42 weeks), 5.0 cm of cervical dilation and 289 (26.8%) had ruptured membranes on admission (these data are not included in the tables).

During labour, amniotomy was performed on 576 (53.4%) women at an average of 7-cm cervical dilation, and oxytocin was used in a third of women (334, 30.1%). Commonly used methods to support labour pain management included (women could use more than one method): immersion in water (316, 29.3%), shower bath (906, 84.0%), Swiss ball (552, 51.0%), walking (734, 68.0%), massage (648, 60.1%) and others such as aromatherapy and music therapy (148,

13.7%). Most women were recorded as having a light diet and drinks during labour (1032, 95.6%). Twenty-two women (2.0%) required manual removal of placenta. Support during labour from a companion of the woman's choice was reported for nearly all women (1020, 94.5%). Mean infant birth weight was 3200 g.

The variables statistically associated with perineal outcomes were parity, oxytocin use during labour, maternal position at birth and infant birth weight. A semi-sitting position (where the woman was sitting at a 45 degree angle) was recorded for 888 (82.3%) women. The other positions used were left lateral (173, 16.0%), squatting (9, 0.8%), standing (2, 0.2%) and on all fours (7, 0.7%).

Among the 263 women with second-degree tears or episiotomies, 152 (57.8%) had episiotomies. Table 2 shows a higher prevalence of episiotomies among younger women. Among women aged 35 years and over, there was a lower

Table 2 Episiotomy prevalence ratio among women who had second-degree lacerations and episiotomies

	Second-degree lacerations <i>n</i> (%)	Episiotomies <i>n</i> (%)	PR	CI	<i>p</i> -value
Maternal age (years)					
≤19	14 (27.4)	37 (72.6)	1.38	1.15–1.67	0.019*
20–24	41 (41.0)	59 (59.0)	1.12	0.94–1.35	
25–34	48 (47.5)	53 (52.5)	1		
≥35	8 (72.7)	3 (27.3)	0.52	0.19–1.39	
Education (years)					
≤7	26 (44.1)	33 (55.9)	0.94	0.74–1.19	0.675
8–11	70 (40.5)	103 (59.5)	1		
≥12	15 (48.4)	16 (51.6)	0.87	0.61–1.23	
Ethnicity					
White	68 (39.8)	103 (60.2)	1		0.275
Non-white	43 (46.7)	49 (53.3)	0.88	0.72–1.08	
Gestational age (weeks)					
≤40	100 (41.8)	139 (58.2)	1		0.706
≥41	11 (45.8)	13 (54.2)	0.93	0.64–1.35	
Parity					
No previous birth	56 (30.6)	127 (69.4)	1	1	<0.001*
One previous birth or more	55 (68.7)	25 (31.3)	0.45	0.32–0.63	
Oxytocin use					
Yes	32 (31.7)	69 (68.3)	1		0.006*
No	79 (48.8)	83 (51.2)	0.75	0.64–0.88	
Maternal position at delivery					
Dorsal	93 (39.4)	143 (60.6)	1		0.007*
Other	18 (66.7)	9 (33.3)	0.55	0.32–0.94	
Infant birthweight (g)					
≥2999	23 (37.1)	39 (62.9)	1.06	0.86–1.29	0.483
3000–3499	51 (40.5)	75 (59.5)	1		
3500–3999	32 (50.0)	32 (50.0)	0.84	0.65–1.08	
≥4000	5 (45.4)	6 (54.6)	0.92	0.53–1.59	

**p* < 0.05.

PR, prevalence ratio (second-degree lacerations and episiotomies).

prevalence of episiotomies, compared with second-degree trauma. Women who had one or more previous births were 55% less likely to undergo episiotomy, compared with nulliparous women. The non-use of oxytocin during labour meant at least 25% of women were less likely to have an episiotomy.

A non-dorsal position for the birth appeared to be a protective factor for episiotomy, and women who gave birth in this position were at least 45% less likely to have this intervention.

Among the nulliparous women, oxytocin use during labour, position at birth and infant birth weight were identified as risk factors for all classifications of perineal trauma.

The use of oxytocin was more likely to be associated with episiotomies, while non-use of oxytocin was associated with first-degree tears. Women giving birth for the first time were statistically significantly more likely to birth in a dorsal position and have an episiotomy. These women had more

cases of more severe perineal trauma (second-degree tear and episiotomy) with babies weighing 3500 g or more.

Discussion

This study aimed to identify predictors for perineal tears and episiotomy in a midwifery-led care setting, following categorisation of trauma as first- or second degree or episiotomy. Several areas have been highlighted for practice, which could reduce the incidence of perineal trauma.

In our study, there was a higher prevalence of episiotomy among younger women, which is most likely to reflect the association between the age and parity (Samuelsson *et al.* 2002, Albers *et al.* 2006). These findings are corroborated by a cross-sectional study that investigated maternal and neonatal outcomes in 2557 births in the south of Brazil. Adolescent women had higher rates of episiotomy (85.8%) than non-adolescent women (66.0%) (*p* < 0.001), not

Table 3 Oxytocin use, maternal position at birth, infant birth weight and perineal trauma according to parity and perineal trauma

	Minor trauma <i>n</i> (%)	Second-degree laceration <i>n</i> (%)	Episiotomies <i>n</i> (%)	Total <i>n</i> (%)	<i>p</i> -value
Oxytocin use at dilation period					
Multiparous women					
Yes	140 (87.0)	12 (7.5)	9 (5.5)	161 (27.5)	0.406
No	366 (86.1)	43 (10.1)	16 (3.8)	425 (72.5)	
Nulliparous women					
Yes	93 (53.8)	20 (11.6)	60 (34.6)	173 (35.2)	0.003*
No	216 (67.7)	36 (11.3)	67 (21.0)	319 (64.8)	
Position at delivery					
Multiparous women					
Dorsal	418 (85.3)	50 (10.2)	22 (4.5)	490 (83.6)	0.239
Other	88 (91.7)	5 (5.2)	3 (3.1)	96 (16.4)	
Nulliparous women					
Dorsal	233 (58.7)	43 (10.8)	121 (30.5)	397 (80.7)	< 0.001*
Other	76 (80.0)	13 (13.7)	6 (6.3)	95 (19.3)	
Newborn weight					
Multiparous women					
Up to 2999	12 (7.1)	149 (88.7)	7 (4.2)	168 (28.7)	0.734
3000–3499	24 (9.4)	220 (86.3)	11 (4.3)	255 (43.5)	
≥3500+	19 (11.7)	137 (84.0)	7 (4.3)	163 (27.8)	
Nulliparous women					
Up to 2999	11 (6.7)	121 (73.8)	32 (19.5)	164 (33.3)	0.002*
3000–3499	27 (11.8)	137 (60.1)	64 (28.1)	228 (46.4)	
≥3500+	18 (18.0)	51 (51.0)	31 (31.0)	100 (20.3)	

**p* < 0.05.

considering the influence of parity (Cesar *et al.* 2011). Our study was not powered to detect the influence of age on perineal outcomes. This might reflect the conduct of the professional in preferring to perform an episiotomy instead of allowing the occurrence of spontaneous perineal laceration.

The episiotomy rate in the current study was 14.1%, much lower than the overall rate for this intervention in Brazil (Berquó *et al.* 2009), but comparable to countries where midwives routinely care for women with low-risk pregnancies, such as Denmark (12%) and England (13%) (Graham *et al.* 2005).

Even prior to the publication of large randomised controlled trials of routine compared with restrictive use of episiotomy, a perineal incision at birth was seen as resulting in poorer outcomes for women in terms of blood loss and risk of anal sphincter injury (Woolley 1995). A systematic review that included eight trials (with data on a total of 5541 women) comparing restricted with the routine use of episiotomy found less morbidity among the restrictive practice groups, other than for level of recorded blood loss (Carroli & Mignini 2008). The review found that women in the restricted episiotomy group had less severe perineal trauma, less need for suturing and fewer perineal wound healing complications. There was an increased risk of anterior perineal trauma with restrictive episiotomy.

Among the women in the current study, there was one-third-degree tear recorded. It is important to note that at the birth centre, the classification of tears involving the anal sphincter complex did not adhere to international classifications of perineal trauma, including definition of third- and fourth-degree tear (NICE 2007). It is possible that third- and fourth-degree lacerations in our population may not have been identified by the attending nurse midwife.

The issue of the required level of training and competency to accurately detect birth-related anal sphincter trauma needs urgent consideration. In one study from Holland which included midwives and medical residents in three teaching hospitals, women who had sustained a diagnosed second-degree tear (based on a subjective assessment made by the attending clinician) had their trauma re-evaluated in the delivery room by another clinician who was part of the study team. Rates of anal sphincter laceration were significantly higher following a second assessment, compared with rates during the previous year following usual care (van Dillen *et al.* 2010). Similarly to our study, the evaluation by the clinician who assisted the labour and birth could be biased with respect to the assessment of the perineal outcome – or the clinician may be unaware of how to detect anal sphincter injury.

In our study, a woman's educational attainment and ethnic background were not associated with perineal outcomes. However, other studies have found a woman's ethnicity to be associated with her experience of perineal trauma. A study of 1809 women (176 black and 1633 white) at the University of Michigan, USA, found that black women were less likely to have second-, third- or fourth-degree tears ($p < 0.001$) (Howard *et al.* 2000). Multivariate analysis showed that black women were twice as likely to have an intact perineum after a vaginal birth compared with white women. It is noteworthy that the authors considered a first-degree laceration as an 'intact perineum', which increased the proportion of women defined as having an 'intact' perineum in this population (Howard *et al.* 2000). Another study comparing perineal outcomes among Hispanic women and African American women found that Hispanic women had a 1.4 times increased risk of undergoing an episiotomy, whereas African American women had a 1.5 greater chance of having severe lacerations. Episiotomy was independently associated with severe perineal laceration; however, other factors such as macrosomia and primiparity also appeared as important (Ogunyemi *et al.* 2006).

A not unexpected finding, based on the evidence of previous studies, was that parity was significantly associated with perineal outcomes. Women with one or more vaginal births were more likely to have an intact perineum or a first-degree tear. This finding is corroborated by a study that used secondary data from a randomised clinical trial that included 11,176 women who had normal births without episiotomy. They found that 50.2% of the primiparous women had no perineal trauma, compared with 64% of the women with one or more previous births (Albers *et al.* 2006). A study with 2883 pregnant women found that second-degree lacerations and intact perineum occurred in 34.8 and 34.2% of women respectively with one or more births. Among primiparous women, 39.6% had second-degree lacerations and only 6.6% had an intact perineum. However, episiotomy was performed almost three times more frequently in the primiparous (18.6%) than in multiparous women (5.6%) (Samuelsson *et al.* 2002). In our study, primiparous women were even more likely to have an episiotomy: 25.8% of the primiparous women and 4.3% of the multiparous women had this intervention.

The decision to perform an episiotomy at a woman's first vaginal birth may impact on her subsequent births. This practice does not prevent a second-degree laceration at a subsequent birth and may result in a more severe perineal laceration, as highlighted in a study with 6052 births in a hospital in Pennsylvania (Alperin *et al.* 2008). Episiotomy was performed in 47.8% of women at a first birth, with

second-degree lacerations occurring in 51.3% of women who had previous episiotomy, compared with 26.7% of those who had not. Previous episiotomy appeared as a significant risk factor for second-degree laceration at the following delivery (OR 4.47, 95% CI 3.78–5.30). Similar results were found in Dublin, Ireland, in a prospective study that examined perineal outcomes of 1000 women in their second spontaneous vaginal delivery (Mahony *et al.* 2005). Among women who were not sutured following their first birth, 11.3% did not require sutures at their second birth. On the other hand, among women who were sutured following their first birth, 60.5% required sutures again at their subsequent birth. Therefore, when performing an episiotomy for a spontaneous vaginal birth, professionals need to consider the impact of the procedure on any subsequent births. An episiotomy can not only clinically impact on a woman's daily activities, but also her sexual life. Women undergoing episiotomy experience more emotional and sexual complications than those without episiotomy, as dyspareunia and vaginal lubrication, even if orgasm and sexual satisfaction does not change (Ejgaard *et al.* 2008).

Gestational age was not associated with perineal outcomes in the current study. This variable could have influenced the extent of perineal trauma in the sense that babies over 40 weeks tended to have a greater birth weight. However, antenatal women with a uterine fundal height suggestive of foetal macrosomia are referred for hospital care, as a part of the protocol of the birth centre.

Of note in our study were the high rates of artificial rupture of membranes and use of oxytocin, possibly to accelerate prolonged labours as most amniotomies were performed when women had achieved cervical dilation of 7 cm or more. The high rates could be due to the fact that all nurse midwives were trained and gained clinical experience in hospital, prior to working on the birth centre, where these practices are highly prevalent despite not being evidence based.

We also found that intravenous administration of oxytocin during labour was associated with perineal outcomes. This supports the findings of an earlier study in which the proportion of women who had sutured perineal trauma was reported as 49.7% among those who received oxytocin and 42.0% among those who did not, although this was a non-statistically significant difference (Albers *et al.* 2006). A prospective cohort study with 6595 women which aimed to identify risk factors for severe perineal trauma (third- and fourth-degree tears) found that on univariate analysis, the use of oxytocin was associated with a significant increase in risk for this injury (OR 2.8; 95% CI 1.8–4.1). Primiparity, instrumental delivery, Asian ethnicity and heavier babies

were also variables found to be associated with an increase of severe perineal trauma (Dahlen *et al.* 2007). In an earlier observational study in which the risk of second-degree laceration was increased with use of oxytocin in the first (OR 1.2, 95% CI 1.0–1.5) and the second stage of labour (OR 1.4, 95% CI 1.2–1.6), oxytocin did not significantly contribute to the risk of severe perineal trauma in the final model (Samuelsson *et al.* 2002).

A maternal semi-sitting position compared with other positions during the expulsive phase of labour (lateral, squatting, standing and on all fours) represented a greater risk for second-degree lacerations and episiotomies in the current study. These findings support a study of 3756 women from one Australian hospital, which found that a maternal semi-sitting position was significantly associated with the need for perineal repair (OR 1.26, 95% CI 1.0–1.56), without specifying the type of trauma (Soong & Barnes 2005). In another study of 1646 women, no association was found between the position during the expulsive phase and perineal condition, possibly due to the classification that the authors defined of positions taken by birthing women. Lateral positions for birth were analysed in conjunction with supine positions, because both were considered to be recumbent positions (De Jonge *et al.* 2010). Different classifications of perineal trauma and the opinions of women regarding different positions at the time of birth are difficult to compare between studies.

A systematic review that included data on 6135 women from 20 studies found that the use of upright or side-lying positions for normal birth compared with supine positions resulted in shorter labour duration, reduction of episiotomies, increase of second-degree lacerations, increased blood loss, less severe pain during delivery and fewer fluctuations in foetal heart rate. Thus, current evidence supports that women should be advised that their position at birth can effect perineal outcomes, and they should be allowed to choose the position they feel most comfortable in (Gupta and Hofmeyr 2005).

One question not yet addressed in these studies is whether offering the woman a choice about her position for the birth is related to a clinician's decision to perform or not perform an episiotomy. If there is an assumption that this intervention is not a routine requirement, the clinician may feel more confident to offer and support a woman to adopt an alternative position. Likewise, indicators such as foetal stress, a delay during the second stage of labour, a suspected macrosomic baby or concerns about an impending third-degree tear, could be used as a rationale for adopting a more traditional position at birth (lithotomy position) and/or performing an episiotomy. In a cross-sectional study such as ours, it is not possible to determine whether maternal

position at birth independently predicted the performance of episiotomy and factors related to this aspect of clinical decision-making require further investigation.

Infant birth weight of 3500 g or greater was an important factor for perineal trauma among nulliparous women in the current study. These results support the findings of previous studies, in which there was positive relationship between severity of injury and increased foetal weight (Ogunyemi *et al.* 2006).

When considering the limitations of our study, it is important to highlight that the birth centre had rigorous admission criteria that excluded pregnant women with any potential obstetric complications. However, our findings could be generalised to other midwifery-led birth centres providing care for women classed as low risk on admission in labour. Another potential limitation may relate to the combining of a first-degree laceration with women who sustained an intact perineum; however, risk factors for these outcomes are unlikely to differ. As midwives at the SBC also did not use the international classification of perineal trauma (NICE 2007), there is the potential that more severe perineal trauma was not identified.

Conclusion

This study analysed variables frequently associated with perineal outcomes after birth using data collated from one stand-alone midwifery-led birth. The prevalence of episiotomies was lower than the current national rate in Brazil but comparable to countries where midwives routinely care for women with low-risk pregnancies. Just under half of the women giving birth at the centre were documented as having no perineal trauma.

These data provide information on how midwifery practice could be improved. Although the overall rate of episiotomies in this study was low compared with national statistics, it was observed that younger women were most likely to receive this intervention. Among younger women in particular, non-use of oxytocin as well as offering alternative positions to the dorsal position for the birth could enhance perineal integrity. This practice may be even more important as these women are more likely to have other children in future and a poor experience of perineal care could deter some women from having a future vaginal birth.

Relevance to clinical practice

The use of upright alternative positions for birth and avoidance of use of oxytocin could reduce the risk of perineal trauma from lacerations and performance of episiotomy.

Conflict of interest

One of the researchers (FMBS) worked as a nurse midwife at the birth centre where the study was conducted. Another of the researchers (RHO) was the founder of this birth centre.

Contributions

Study design: FMBS, SMJVO, MLGR; data collection and analysis: FMBS, EFT, RHO and manuscript preparation: FMBS, DB, SMJVO, RHO.

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