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ORIGINAL PAPER

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Intact Perineum: What are the Predictive Factors in Spontaneous Vaginal Birth?

Silvia Rodrigues¹, Paulo Silva², Andee Agius³, Fatima Rocha⁴, Rosa Castanheira⁴, Mechthild Gross⁵, Jean Calleja-Agius³

ABSTRACT

Introduction: Perineal trauma at birth is distressing for women and can cause serious short and long term morbidity. **Aim:** Investigate the prevalence and predictive factors of intact perineum after normal vaginal birth among Portuguese women who had spontaneous vaginal births. **Methods:** A descriptive, cross-sectional, retrospective study was carried out among pregnant women who had spontaneous vaginal births, between January 1, 2017, and December 31, 2017, in a single birth centre in Portugal. Following ethical approval, the prevalence of intact perineum was calculated and multivariate analysis with logistic regression was carried out, to identify the predictive factors of having an intact perineum after spontaneous vaginal birth. **Results:** A total of 1748 pregnant women had spontaneous vaginal births. Four hundred and forty-one women (25.2%) had intact perineum whereas in 1307 (74.8%) of women, the perineum was not intact. First-degree tears occurred in 23.2% (405/1748) of women, second-degree tears occurred in 4% (70/1748) of women while three women (0.2%) experienced a third-degree tear. The rate of episiotomies was 43.8% (766/1748). Episiotomy and first-degree tears occurred in 2.6% (45/1748), episiotomy and second-degree tears occurred in 0.7% (12/1748), while episiotomy and third-degree tears occurred in 0.3% (6/1748) of women. Having a previous caesarean section reduced the odds of intact perineum by 60%, while nulliparity reduced the odds by 70%. For every 250 grams increase in birth weight, the odds of sustaining an intact perineum were decreased by 13%. Alternative birth positions (excluding lithotomy) doubled the odds of maintaining an intact perineum. **Conclusion:** The prevalence of intact perineum is 25.2%. Predictive factors for intact perineum include birth weight, parity, previous caesarean section and birthing position. Recognizing these factors could support and facilitate the management of spontaneous vaginal birth to promote an intact perineum. Further re-

search is needed to gain better understanding of this phenomenon.

Keywords: Parity, caesarean section, parturition, perineum.

1. INTRODUCTION

Perineal trauma during labour is distressing for women and can cause both short and long term morbidity (1). Perineal trauma can cause perineal pain, postpartum dyspareunia, symptoms of depression and stress (2,3).

Intrapartum perineal trauma is described as the loss of integrity of the perineum or any other damage occurring in the genital region of the birthing woman and may be spontaneous or due to an episiotomy (4). The surgical lesions are those caused by the use of episiotomy. Perineal trauma is initiated by an episiotomy, a perineal tear ranging from first until fourth degree. Episiotomy rates varied widely, around 70% of vaginal deliveries in Cyprus, Poland, Portugal, and Romania, 43-58% in Wallonia, Flanders, the Czech Republic, and Spain, 16-36% in Wales, Scotland, Finland, Estonia, France, Switzerland, Germany, Malta, Slovenia, Luxembourg, Brussels, Latvia, and England. Rates were lowest in Denmark (4.9%), Sweden (6.6%), and Iceland (7.2%) (5). The term obstetric anal sphincter injury (OASIS) is used for both third and fourth-degree perineal tears (6). Tears occurring after an episiotomy are classified as episiotomy and tear.

Since publication of the systematic review involving 5541 women participating in eight randomized trials, demonstrates that restrictive episiotomy policies appear to have a number of benefits compared to policies based on routine episiotomy (7) a huge decrease in episiotomy rates has happened in many European countries especially in the northern part. Episiotomy rates have fallen or stayed the same in many coun-

¹Hospital of Braga and Abel Salazar Biomedical Sciences Institute, Portugal

²Hospital of Braga and Portuguese Catholic University, Portugal

³University of Malta, Malta

⁴Hospital of Braga, Portugal

⁵Hannover Medical School, Germany

Corresponding author: Silvia Rodrigues, PhD, Hospital of Braga and Abel Salazar Biomedical Sciences Institute, Porto, Portugal. E-mail: silvialeiterodrigues@gmail.com. ORCID ID: <http://www.orcid.org/0000-0001-7304-5400>,

tries with data from 2004, with the exception of England, Scotland, and the Netherlands (5). Less episiotomies are accustomed with less significant difference in posterior perineal trauma, less suturing and fewer complications. No significant difference was found on pain measures and the incidence of severe vaginal or perineal trauma (7). A recent Cochrane Review found no evidence to support the routine use of episiotomy (8). The results of the more recent Cochrane review suggest that reducing episiotomies is still an issue in several countries which did not implement this policy thus far. Despite the WHO recommendations, countries such as Poland and Portugal still have high episiotomy rates 68–73% (5). Another Cochrane Review suggests that women who received midwife-led continuity models of care were less likely to experience intervention and more likely to be satisfied with their care with at least comparable adverse outcomes for women or their infants than women who received other models of care. This review has shown the main benefits were that women who received midwife-led continuity of care had less episiotomies, instrumental births and epidural analgesia (9).

Generally, the degree of morbidity is directly related to the degree of the perineal injury sustained (10,11). After a third or fourth degree tear around 8% of women experience incontinence of stool and 45% suffer involuntary escape of flatus following an anal sphincter injury (12). If immediate repair is adequate, the likelihood of better long-term outcomes is improved symptomatically, leading to a better quality of life (QoL) (13). Health professionals should be able to prevent, evaluate and repair perineal trauma with skill and competence to ensure a reduction in postpartum morbidity (4). Women with an intact perineum are more likely to resume intercourse earlier, report less pain with first and subsequent sexual intercourse, report greater satisfaction with sexual experience and report greater sexual sensation and likelihood of orgasm at six months postpartum (10). A qualitative exploratory study carried out amid expert midwives working in two maternity units in the Republic of Ireland and from varied birth settings in New Zealand, showed that a duty of care in preserving the perineum and reducing postpartum morbidity was deemed important while trying to maintain the integrity of the perineum at birth (1).

Several factors have been suggested as potential determinants towards preserving the perineum during birth. Apart from maternal position during the second stage of labour (14) gestational age, newborn weight, analgesia (15) and parity (16) more contributing factors should be investigated as well. This study aims to identify predictive factors of intact perineum with the objective of optimizing care for both the woman and the baby.

2. AIM

Investigate the prevalence and predictive factors of intact perineum after normal vaginal birth among Portuguese women who had spontaneous vaginal births.

3. METHODS

A descriptive, cross-sectional, retrospective study was carried in one Portugal birth centre. Pregnant women who had normal vaginal births between January 1st, 2017, and December 31st, 2017 were included. Women who had an instrumental birth, caesarean section, multiple pregnancies,

or stillbirth were excluded from this study. This study was approved by the hospital Ethics Committee. The prevalence of intact perineum was investigated and a multivariate analysis with logistic regression was conducted to identify the predictive factors. A p value less than 0.05 was considered significant, with a confidence interval of 95 percent. Data were analyzed using SPSS version 22.0

Study criteria for inclusion were fulfilled by 1748 women with singleton pregnancy and cephalic presentation. The primary outcome was defined as intact perineum: qualitative dichotomous (yes or no). Independent variables included parity, previous caesarean section (without a previous vaginal birth), standing up during the first stage of labour, position during the second stage of labour, birth weight, gestational age, attending a prenatal childbirth preparation course, onset of labour, use of hydrotherapy, use of the pilates ball and administration of epidural analgesia. Predictive factors were selected for addition to the regression model if it was clinically plausible that these factors may influence perineal outcomes in addition to those that had been empirically suggested as risk factors for perineal outcomes. This was dependent on the availability of sufficient data for each variable.

4. RESULTS

A total of 1748 pregnant women had spontaneous vaginal births. Four hundred and forty one women (25.2%) had an intact perineum whereas 1307 (74.8%) women did not. First-degree tears occurred in 23.2% (405/1748) of women, second-degree tears in 4% (70/1748) of women while three women (0.2%) experienced a third-degree tear. Episiotomy rate was 43.8% (766/1748). Episiotomy and first-degree tears occurred in 2.6% (45/1748), episiotomy and second-degree tears occurred in 0.7% (12/1748), while episiotomy and third-degree tears occurred in 0.3% (6/1748) of women.

In the cohort of women who had an intact perineum after spontaneous vaginal birth, only 116 (6.6%) were nulliparous whilst 325 (18.6%) were multiparous. In the nulliparous subgroup, only 1 (0.1%) had severe perineal trauma (third and fourth degree tear) without an episiotomy and 4 (0.2%) had severe perineal trauma with an episiotomy. In the multiparous subgroup, 2 (0.1%) had severe perineal trauma without an episiotomy and 4 (0.2%) had severe perineal trauma with an episiotomy ($p < 0.001$). Only 19 (1.1%) women with a vaginal birth after previous caesarean section had an intact perineum, while 422 (24.1%) women who did not have a previous caesarean section sustained an intact perineum. Two (0.1%) women with a previous caesarean section had severe perineal trauma without an episiotomy and 2 (0.1%) women had severe perineal trauma with an episiotomy. One (0.1%) women without a previous caesarean section had severe perineal trauma without an episiotomy and 4 (0.2%) women had severe perineal trauma with an episiotomy ($p < 0.001$).

One hundred and fifty-three women (9.2%) who participated in a prenatal childbirth preparation course had an intact perineum, whereas 273 (16.4%) without prenatal childbirth preparation course sustained an intact perineum. Two (0.1%) women who attended the prenatal childbirth preparation course had severe perineal trauma without an episiotomy and 5 (0.3%) women had severe perineal trauma with an episiotomy. One (0.1%) woman who did not participate in a prenatal childbirth preparation course had severe

		Intact Perineum		No Intact Perineum						
		Intact Perineum	First degree tear	Second degree tear	Third degree tear	Episiotomy	Episiotomy +first-degree tear	Episiotomy +second-degree tear	Episiotomy +third-degree tear	p-value
Clinical Characteristics		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Parity	Nulipara	116(6.6)	119(6.8)	26(1.5)	1(0.1)	530(30.3)	27(1.5)	9(0.5)	4(0.2)	<0.001*
	Multipara	325(18.6)	286(16.4)	44(2.5)	2(0.1)	236(13.5)	18(1)	3(0.2)	2(0.1)	
Previous caesarean section	Yes	19(1.1)	24(1.4)	3(0.2)	2(0.1)	54(3.1)	6(0.3)	3(0.2)	2(0.1)	<0.001*
	No	422(24.1)	381(21.8)	67(3.8)	1(0.1)	712(40.7)	39(2.2)	9(0.5)	4(0.2)	
Birth Position	Lithotomy	282(16.1)	267(15.3)	54(3.1)	3(0.2)	725(41.5)	45(2.6)	12(0.7)	5(0.3)	<0.001*
	Alternative positions	159(9.1)	138(7.9)	16(0.9)	0	41(2.3)	0	0	1(0.1)	
Birthweight (grams)	(<=2499	44(2.5)	13(0.7)	0	1(0.1)	64(3.7)	2(0.1)	0	0	0.001*
	2500-2749	36(2.1)	30(1.7)	2(0.1)	0	63(3.6)	6(0.3)	0	0	
	2750-2999	64(3.7)	69(3.9)	7(0.4)	0	119(6.8)	2(0.1)	3(0.2)	1(0.1)	
	3000-3249	109(6.2)	76(4.4)	17(1)	1(0.1)	181(10.4)	7(0.4)	3(0.2)	0	
	3250-3499	94(5.4)	97(5.6)	15(0.9)	0	164(9.4)	17(1)	3(0.2)	1(0.1)	
	3500-3749	57(3.3)	70(4)	13(0.7)	1(0.1)	112(6.4)	5(0.3)	0	1(0.1)	
	3750-3999	21(1.2)	36(2.1)	13(0.7)	0	42(2.4)	4(0.2)	3(0.2)	1(0.1)	
	4000-4249	13(0.7)	8(0.5)	3(0.2)	0	14(0.8)	2(0.1)	0	1(0.1)	
	4250-4499	1(0.1)	5(0.3)	0	0	3(0.2)	0	0	0	
	>4500	1(0.1)	1(0.1)	0	0	4(0.2)	0	0	0	
Gestational age	23-31	10(0.6)	1(0.1)	0	0	10(0.6)	0	0	0	0.272
	32-36	25(1.4)	21(1.2)	2(0.1)	0	58(3.3)	1(0.1)	0	0	
	37-41	406(23.2)	405(23.2)	70(4.0)	3(0.2)	766(43.8)	45(2.6)	12(0.7)	6(0.3)	
Prenatal childbirth preparation course	Yes	153(9.2)	146(8.8)	26(1.6)	2(0.1)	419(25.2)	23(1.4)	5(0.3)	5(0.3)	<0.001*
	No	273(16.4)	235(14.1)	40(2.4)	1(0.1)	306(18.4)	22(1.3)	7(0.4)	1(0.1)	
Onset of labour	Spontaneous	330(18.9)	303(17.3)	48(2.7)	2(0.1)	561(32.1)	33(1.9)	9(0.5)	6(0.3)	0.857
	Induced	111(6.4)	102(5.8)	22(1.3)	1(0.1)	205(11.7)	12(0.7)	3(0.2)	0	
Hydrotherapy	Yes	126(7.5)	104(6.2)	20(1.2)	2(0.1)	271(16.1)	18(1.1)	3(0.2)	2(0.1)	0.094
	No	302(17.9)	287(17)	47(2.8)	1(0.1)	463(27.5)	26(1.5)	9(0.5)	3(0.2)	
Standing up during first stage of labour	Yes	248(14.7)	245(14.5)	42(2.5)	3(0.2)	489(29)	28(1.7)	8(0.5)	1(0.1)	0.387
	No	180(10.7)	146(8.7)	25(1.5)	0	247(14.7)	16(0.9)	4(0.3)	4(0.2)	
Pilates ball	Yes	80(4.8)	79(4.7)	14(0.8)	2(0.1)	185(11)	15(0.9)	5(0.3)	0	0.133
	No	347(20.7)	309(18.4)	52(3.1)	1(0.1)	548(32.7)	29(1.7)	7(0.4)	5(0.3)	
Epidural analgesia	Yes	404(23.1)	364(20.8)	59(3.4)	2(0.1)	734(42)	43(2.5)	10(0.6)	6(0.3)	<0.001*
	No	37(2.1)	41(2.3)	11(0.6)	1(0.1)	32(1.8)	2(0.1)	2(0.1)	0	
Total		1748								

* statistically significant (p < 0.05)

Table 1. Clinical characteristics of the participants

perineal trauma without an episiotomy and 1 (0.1%) had severe perineal trauma with an episiotomy ($p < 0.001$).

Two hundred and eighty-two women (16.1%) delivered in the lithotomy position during the second stage of labour while 159 (9.1%) delivered in one of the alternative birth positions (hands and knees, lateral, semi-sitting or squatting) during the second stage of labour and both had an intact perineum. Three women (0.2%) who delivered in the lithotomy position during the second stage of labour had severe perineal trauma without an episiotomy and 5 (0.3%) women had severe perineal trauma with an episiotomy. Only one woman (0.1%) who delivered in an alternative position during the second stage of labour had severe perineal trauma with an episiotomy ($p < 0.001$). One hundred and nine women (6.2%) who delivered a newborn weighing 3000-3249 grams had an intact perineum and 1 (0.1%) women had severe perineal trauma without an episiotomy ($p < 0.001$). Considering women who had an intact perineum, 404 (23.1%) underwent epidural analgesia while 37 (2.1%) did not. In the epidural analgesia subgroup, 2 (0.1%) had severe perineal trauma without an episiotomy and 6 (0.3%) had severe perineal trauma with an episiotomy. In the subgroup who had no epidural analgesia, only 1 (0.1%) had severe perineal trauma without an episiotomy ($p < 0.001$). The clinical characteristics of the participants are shown in Table 1. Having a previous caesarean section reduced the odds of intact perineum by 60%, while nulliparity reduced the odds by 70%. For every 250 grams increase in birth weight, the odds of sustaining an intact perineum were decreased by 13%. Alternative positions (excluding lithotomy) during the second stage of labour doubled the odds of maintaining an intact perineum. The adjusted OR for association of clinical characteristics are shown in Table 2.

5. DISCUSSION

This is the first study to investigate predictive factors for an intact perineum after spontaneous vaginal birth in Portuguese women. Parity is one of the most studied predictive factors for perineal trauma. Relationship between primiparity and the performance of episiotomies has been reported in many studies (17-19) and associated with the existence of perineal trauma (20). In our study, nulliparity (first vaginal birth) reduced the odds of sustaining an intact perineum by 70% (OR 0.292; 95% CI 0.220-0.341; $p < 0.001$). Performing an episiotomy in a first birth is a factor that conditions the appearance of tears or the need of episiotomy in the following births (21,22). Unnecessary episiotomies should be avoided to protect the perineum of women particularly those planning future births (15).

Onset of induced labor is one of the least studied factors. In our study, there was no significant difference between onset of labour type and maintaining an intact perineum (OR 0.935; 95% CI 0.691-1.266; $p = 0.666$). This contrasts with other studies in which an association between induced labour and episiotomy rates were reported (17,19). The difference may lie in the gestational age at the time of induction, as well as reason for induction. Our results did not reveal an association between gestational age and intact perineum (OR 0.958; 95% CI 0.885-1.036; $p = 2.82$), and among gestational age and the performance

Clinical Characteristics	OR	CI (95%)	p-value
Parity	Nulipara	0.292	(0.220; 0.341) <0.001*
	Multipara	1	
Previous caesarean section	Yes	0.419	(0.234; 0.749) 0.003*
	No	1	
Birth Position	Alternative positions	2.665	(2.022; 3.513) <0.001*
	Lithotomy	1	
Birthweight (grams)		0.867	(0.804; 0.936) 0.006*
Gestational age		0.958	(0.885; 1.036) 2.82
Prenatal child-birth preparation course	Yes	1.205	(0.910; 1.596) 1.92
	No	1	
Onset of labour	Spontaneous	0.935	(0.691; 1.266) 0.666
	Induced	1	
Hydrotherapy	Yes	0.821	(0.580; 1.162) 0.266
	No	1	
Standing up during first stage of labour	Yes	1.180	(0.841; 1.657) 0.338
	No	1	
Pilates ball	Yes	1.407	(0.957; 2.069) 0.082
	No	1	
Epidural analgesia	Yes	1.201	(0.751; 1.921) 0.444
	No	1	

* statistically significant ($p < 0.05$)

Table 2. Adjusted ORs for association of clinical characteristics and intact perineum in women

of episiotomy (23). Further in-depth studies regarding the effect of induction and gestational age, with respect to perineal tears, are necessary.

In our study the use of epidural analgesia had no impact on sustaining an intact perineum (OR 1.201; 95% CI 0.751-1.921; $p = 0.444$). There is conflicting evidence regarding the relationship on the use of epidural analgesia and the performance of an episiotomy. While some studies demonstrate an association (15,19), other studies do not demonstrate a statistically significant relationship (18). The association of epidural analgesia and severe perineal damage have also been reported (15,24) but this is also controversial, with another study not showing any relationship between these factors (25).

Standing up during the first stage of labor and the pilates ball use are factors which are less studied. In our study, there was no statistically significant association among vertical positions and the use of the pilates ball during the first stage of labour and sustaining an intact perineum (OR 1.180; 95% CI 0.841-1.657; $p = 0.338$).

Our findings show that, alternative positions during the second stage of labour have doubled the odds of maintaining an intact perineum (OR 2.665; 95% CI 2.022-3.513; $p < 0.001$). Although women are encouraged to use positions that are most comfortable for them during labour and birth, some positions have been associated with increased rates of perineal tears (for example the supine position) (26) and are therefore not recommended (27). In the Midwives Expertise in Preserving the Perineum Intact (MEPPI) study, midwives favoured the 'all-

fours' position as besides protecting the perineum, it provided better visualization and less pressure on the perineum (1). The lateral position has been shown to reduce perineal trauma, avoid performing an episiotomy and achieve an intact perineum even in primipara (14,17,20,28). Incorporating lateral decubitus birth into daily practice is feasible following intensive training to midwives in order to acquire the necessary skills to avoid adverse effects on neonates (29). Two randomized controlled trials reported that perineal outcomes did not differ significantly between a kneeling and a sitting upright birth position (30). A randomized controlled trial conducted in 11 hospitals in China showed that women adopting the hands-and-knees position had statistically significant higher rates of intact perineum and first-degree laceration as well as lower rates of episiotomies (31). The study conducted by Warmink-Perdijk et al. (2016) confirmed that women in sitting position at birth had a lower episiotomy rate and a non-significant higher intact perineum rate when compared to those in the horizontal/supine group (32). The same study did not report that more women in supine position had an episiotomy compared to sitting position since health professionals requested the women in upright position to lie down if an episiotomy is necessary (32).

Several systematic reviews show that current evidence is inconclusive and encourage women to give birth in the position they prefer (26).

Our analysis showed no statistically significant association between hydrotherapy and intact perineum (OR 0.821; 95% CI 0.580-1.162; $p=0.266$). In a systematic review on the use of hydrotherapy before conventional childbirth it was concluded that maternity care providers should include hydrotherapy among routine labour pain management options and consider immersion to promote progress of normal or protracted labour, particularly among women with intention to avoid obstetric medications and procedures (33). However, no reference was made about the effect on perineal damage. Attending a prenatal childbirth preparation course is not associated with the rate of episiotomy (34). Our study confirms this since no association was found among women who attended the prenatal childbirth preparation course and having an intact perineum (OR 1.205; 95% CI 0.910-1.596; $p=1.92$).

The results in our study indicated that a previous caesarean (without previous vaginal birth) section decreased the odds of intact perineum by 60% (OR 0.419; 95% CI 0.234-0.749; $p=0.003$), which infers that interventions by midwives and physicians are increased in this situation. One study demonstrated that women have a similar risk for severe perineal trauma after their first vaginal birth and after vaginal birth after caesarean section (35). This suggests that severe perineal trauma can be avoided in women at risk who undergo caesarean birth (36). However more research is needed to confirm this. In several studies the birth weight was found to be associated with severe perineal trauma (25,36-38). Birth weight is an important factor which influences the rates of episiotomies (18,33). Despite this, other studies revealed no effect of birth weight on perineal damage (14) and that birth weight was not associated with the performance of episiotomies (14,39). Nevertheless, in our study, every 250 grams increase in birth weight decreased the odds of maintaining an intact perineum by 13% (OR 0.867; 95% CI 0.804-0.936; $p=0.006$).

The main strength of our study was that caregivers/health professionals were provided with training on the different types

of tears to be able to classify them correctly. This aspect was overlooked in other studies (18,39). A limitation of this study was that other variables reported in other studies such as maternal age, maternal weight, maternal height (40), maternal pathology, perineal protection (15), newborn biparietal diameter (14) duration of first stage of labour, duration of second stage of labour (40) and clinicians' attitudes were not studied (14,40). The wide variation in the use of episiotomy demonstrates the variability in medical practices that exists between the countries in Europe and raises concerns about how scientific evidence can be integrated in clinicians' attitudes (5). The clinicians' attitudes could support more unnecessary interventions as such as active directed pushing and augmentation of labour. Two studies concluded that trauma to the birth genital tract does not seem affected by active directed pushing versus spontaneous pushing (41,42). A Cochrane systematic review concludes that there are insufficient evidence concerning pushing and suggest that women's preferences and clinical situations should guide decisions regardless of the use of epidural analgesia (43). One observational study has demonstrated when oxytocin was used in the second stage of labour during spontaneous vaginal birth of normal size infants, resulted in a higher prevalence of anal sphincter injuries (44). The use of unnecessary interventions should maybe improve the need of more techniques for perineal protection. A Cochrane systematic review conducted by Aasheim (2017) had concluded that there is moderate-quality evidence suggesting that the use of warm compresses, and the use of massage, may reduce the occurrence of third and fourth-degree perineal tears but evidence of the benefits of these techniques on other outcomes was nuclear or inconsistent. There are insufficient data showing results of other perineal techniques in improved outcomes for women and babies (45). Our study included variables which were investigated in other studies such as previous caesarean section, hydrotherapy and use of pilates ball during the first stage of labour therefore findings could be compared.

Findings from our study provide information on how midwifery practice could be improved. Acknowledging the aforementioned factors could support the management of spontaneous vaginal birth to help maintain an intact perineum and prevent short and long term morbidity. Midwives should recognize their privileged position since in their line of work they have a key role in informing and educating couples, thus providing the necessary support during the course of the childbirth experience in order to facilitate and ensure the best outcome for every woman.

6. CONCLUSION

The prevalence of intact perineum is 25.2%. Predictive factors for intact perineum are birth weight, parity, previous caesarean section (without previous vaginal birth) and position during the second stage of labour. Understanding more about the role of these factors could support the management of spontaneous vaginal birth to promote an intact perineum. Further research is needed to understand this phenomenon.

- **Author's contribution:** According to ICMJE-SR, PS, FR and RC gave substantial contributions to the conception or design of the work in acquisition, analysis, or interpretation of data for the work. AA e JCA had a

part in article preparing for drafting or revising it critically for important intellectual content, and MG and JCA gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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