ORIGINAL ARTICLE

Impact of Intrapartum Physiotherapy on the Pelvic Floor: A Cross-Sectional Study

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ABSTRACT

Introduction: Perineal trauma can occur during vaginal delivery due to spontaneous perineal lacerations or episiotomy. However, further studies are needed to investigate whether intrapartum physiotherapeutic care can impact outcomes related to labor and delivery, such as perineal trauma. **Objective:** To examine the relationship between intrapartum physiotherapeutic intervention, perineal trauma, obstetric, and neonatal variables. **Methods:** Analytical observational cross-sectional study conducted at Ana Bezerra University Hospital (HUAB), Santa Cruz, Rio Grande do Norte, Brazil. A survey and data analysis were performed on parturients aged 18 to 40 years, primiparous and multiparous, with a single fetus and gestational age between 37 and 42 weeks. The study's dependent variable was perineal trauma (episiotomy and spontaneous perineal lacerations), and the independent variables included intrapartum physiotherapeutic intervention, physiotherapeutic resources, obstetric, sociodemographic, and neonatal variables. Bivariate analysis (Chi-square) was conducted between the dependent and independent variables. Binary Logistic Regression was applied to determine whether independent variables predicted perineal trauma. A significance level of $p<0.05$ was adopted. **Results:** Data were collected from 171 women with a mean age of 26.0 (±5.7) years and a mean gestational age of 39.3 (±1.3) weeks. Of these, 48.5% were nulliparous, and 77.8% experienced perineal trauma, with spontaneous perineal lacerations (64.9%) predominating, particularly grade 1 (35.1%). 22.2% had an intact perineum, and 12.9% underwent episiotomy. 67.3% of women were accompanied by physiotherapists during labor. A significant association was found between perineal trauma and slow and deep breathing during the expulsion phase ($p=0.026$), previous pregnancies ($p=0.001$), and number of vaginal deliveries (VD) ($p=0.001$). In multivariate analysis, a 59.8% reduction in perineal trauma was observed (OR: 0.402 95% CI: 0.164; 0.982) in women who received respiratory guidance during the expulsion phase. Meanwhile, women with up to two VDs have 5.38 times more chances of presenting perineal trauma compared to those with more than two VDs (OR: 5.380 95% CI: 1.817; 15.926). **Conclusion:** The results of this study suggest that respiratory techniques guided by physiotherapists during the expulsion phase appear to have a positive impact on the pelvic floor of low-risk or habitual-risk parturients.

Keywords: Labor, Pelvic floor, Physiotherapy modalities.

INTRODUCTION

Pregnancy and childbirth can be considered factors influencing the weakening of the pelvic floor muscles (PFM) and the development of pelvic dysfunctions in young women[1]. This is due to damage to the tissues' fasciae, ligaments, muscles, and peripheral nerves necessary for supporting and controlling the continence mechanism[2]. However, the primary risk factors for neuromuscular damage to the pelvic

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floor include episiotomy, third or fourth-degree lacerations, fetal macrosomia, a large circumference of the newborn's head[3], advanced maternal age, nulliparity, induction of labor with oxytocin, forceps use[4,5,6], and directed pushing by the parturient during the expulsion phase[7].

Perineal trauma can occur during vaginal delivery due to spontaneous perineal lacerations or episiotomy[8,9]. It is estimated that approximately 70% of women having a vaginal delivery will experience some degree of perineal trauma, with three-quarters of them requiring sutures to facilitate the healing of the injured tissue[10].

Perineal trauma is associated with short- and long-term postpartum complications. Short-term complications include bleeding, suturing, perineal pain, prolonged postpartum recovery, and hindered or delayed mother-infant contact[11]. Long-term complications include urinary and fecal incontinence and sexual dysfunction. These effects are worse in women undergoing episiotomy compared to those with spontaneous lacerations[12,13]. According to Leeman et al.[14], women with an intact perineum or first-degree lacerations during the expulsion phase had less perineal pain and greater pelvic floor muscle strength six months postpartum compared to those with more extensive lacerations.

Therefore, preventing the occurrence of perineal trauma promotes women's postpartum health and reduces the prevalence of these short- and long-term complications[6,11]. According to Scarabotto et al.[15], perineal trauma can be prevented by good obstetric care, which includes changing practices, such as restricting the use of episiotomy and the horizontal position[15].

In this context, intrapartum physiotherapeutic intervention in routine obstetric care includes promoting ambulation, adopting vertical positions, and respiratory exercises[16]. It is known that guiding slow and prolonged breathing patterns increases oxygenation for both the mother and the fetus, promoting relaxation, increasing confidence, and reducing discomfort, thus providing a better satisfaction with the childbirth experience[17]. However, further studies are needed to investigate whether intrapartum physiotherapeutic care can impact outcomes related to labor and delivery, such as perineal trauma.

Therefore, this article presents a cross-sectional study to examine the relationship between intrapartum physiotherapeutic intervention, perineal trauma, obstetric variables, and neonatal outcomes.

METHOD

This is an analytical observational cross-sectional study conducted at Ana Bezerra University Hospital (HUAB), located in the municipality of Santa Cruz, Rio Grande do Norte, Brazil. A survey and analysis of the records of parturients attended at the Pre-partum, Labor, and Puerperium (PPP) unit in the years 2017 and 2018 were carried out. Data collection took place between February and December 2019, conducted by adequately trained researchers to avoid measurement bias or incorrect data filtering.

To determine the minimum number of individuals required for this investigation, sample size calculation was performed using G* Power 3.1.0 software. A medium effect size of 0.3, alpha of 0.05, and power of 80% were utilized, resulting in a sample size of 143.

Inclusion criteria encompassed women aged 18 to 40 years, nulliparous, primiparous, and multiparous, with a single fetus and gestational age between 37 and 42 weeks. Exclusion criteria included women with neurological disorders or high-risk pregnancies such as pre-eclampsia, eclampsia, gestational diabetes, cardiac, pulmonary, renal, endocrine (thyroid disorders), hematologic, epileptic, infectious, autoimmune, gynecological, neoplastic disorders, premature rupture of membranes, cervical isthmus insufficiency, and alloimmunization.

The dependent variable in the study was perineal trauma (episiotomy and spontaneous perineal lacerations). The adopted independent variables were: intrapartum physiotherapeutic intervention (yes, no), physiotherapeutic resources (squatting position, use of a stool, squatting, Swiss ball use, ambulation, massage, spraying, diaphragmatic breathing, pelvic mobility, compress, music therapy, and slow and deep breathing during the expulsion phase), obstetric variables (number of pregnancies and number of vaginal deliveries), sociodemographic variables (maternal age and education), and neonatal variables (newborn body weight, length, and head circumference).

Statistical analyses were conducted using the Statistical Package for the Social Sciences - SPSS, version 20.0. Initially, the Kolmogorov-Smirnov test was employed to assess data normality. Subsequently, descriptive statistics were performed, using medians and interquartile ranges for non-parametric data and mean and standard deviation for parametric data.

Bivariate analysis (Chi-square test) was carried out between the dependent variable and the independent variables. Only those variables that showed a statistically significant association with the occurrence of perineal trauma were included in the multivariate analysis (Binary Logistic Regression).

Binary logistic regression was employed to assess whether independent variables could predict perineal trauma (dependent variable). The Backward method was utilized for variable insertion into the model. The criterion for selecting the best explanatory model was the highest Nagelkerke's coefficient of determination (R^2 Nagelkerke) associated with variables with $p<0.05$. The model included the following information: Nagelkerke's coefficient of determination (R^2 Nagelkerke), constant (β), standard error (S.E.), significance level (P), odds ratio (OR), and 95% confidence interval (CI 95%). A significance level of $p<0.05$ was adopted.

This study adhered to the principles outlined in Resolution 466/2012 of the National Research Ethics Committee (CONEP), which addresses studies involving human subjects[18], and it was approved by the Research Ethics Committee (CEP) of the Federal University of Rio Grande do Norte/Faculty of Health Sciences of Trairi (Protocol No. 3,015,108).

RESULTS

Data collection was conducted from 171 medical records of low-risk pregnant women. Study participants had an average age of 26.0 (±5.7) years, with a mean gestational age of 39.3 (±1.3) weeks. Concerning the obstetric history of the parturients at the time of care, the majority were nulliparous (48.5%), followed by primiparous (24.6%). Among the latter, vaginal delivery predominated, with a prior vaginal delivery

(22.8%) preceding the current one. Of the study participants, 77.8% experienced perineal trauma, with the majority being spontaneous perineal lacerations (64.9%), predominantly of grade 1 (35.1%), and 12.9% underwent episiotomy. It was observed that 67.3% of the women were attended by physiotherapists during labor (Table 1).

Table 1. Sample characterization (n=171).

	(n=171)	%
Parity		
Nulliparous	83	48,5%
Primiparous	42	24,6%
Secondiparous	30	17,5%
Multiparous	16	9,4%
Vaginal Delivery (VD)		
None	87	50,9%
1 VD	39	22,8%
Up to 2 VD	29	17%
More than 2 VD	16	9,3%
Cesarean Section		
None	167	97,7%
1 Cesarean	4	2,3%
Perineal Trauma		
Yes	133	77,8%
No	38	22,2%
Characteristics of Perineal Trauma		
Spontaneous Laceration	111	64,9%
Intact Perineum	38	22,2%
Episiotomy	22	12,9%
Degree of Laceration		
Grade 1	60	35,1%
Grade 2	51	29,8%
Physical therapy assistance during labor		
Yes	115	67,3%
No	56	32,7%

Note: Values in absolute and relative frequencies.

In relation to sociodemographic data, regarding education, 32.2% of the parturients had completed high school, and 27.5% were illiterate. The majority reported being in a stable union (53.8%), and 68.4% self-identified as being of mixed race (Table 2).

Table 2. Sociodemographic characterization of the study sample (n=171).

Sociodemographic variables	(n=171)	%
Education		
Illiterate	47	27,5%
Incomplete fundamental	15	8,8%
Complete fundamental	35	20,5%
Incomplete midfielder	4	2,3%
Full medium	55	32,2%
Incomplete higher	4	2,3%
Graduated	8	4,7%
Marital status		
Stable union	92	53,8%
Married	40	23,4%
Single	34	19,9%
Widow	3	1,8%
Race		
Brown	117	68,4%
White	43	25,1%
Black	5	2,9%
Yellow	4	2,3%

Note: Values in absolute and relative frequencies.

Regarding the characteristics of the neonates, they were characterized by newborns with an average body weight of 3.3 (±0.4) kilograms, length of 49.1 (±2.4) centimeters, and head circumference of 34.2 (±1.5) centimeters, on average (Table 3).

Table 3. Characterization of Neonates.

Characteristics	Mean	Standard deviation
Body Mass (kg)	3,3	(±0,4)
Length (cm)	49,1	(±2,4)
Head circumference (cm)	34,2	(±1,5)

Note: Values in mean and standard deviation.

Among the physiotherapeutic resources employed, the most utilized were diaphragmatic breathing (62.0%), followed by massage (53.2%) and pelvic mobility exercises (46.8%) (Table 4). Conducting the Chi-square test in the bivariate analysis, examining the outcome variable "perineal trauma" and the independent variables, which encompassed intrapartum physiotherapeutic interventions, obstetric variables, sociodemographic factors, and neonatal characteristics, a significant association was observed between the variables of slow and deep breathing during the expulsion phase (p=0.026), previous pregnancies (p=0.001), and the number of vaginal deliveries (p=0.001) (Tables 4 and 5).

Table 4. Association between physiotherapeutic interventions and perineal trauma.

Physical Therapy Interventions	%	Perineal Trauma (%)	No Perineal Trauma (%)	*P-value*
Deep Breathing	62,0%	46,2%	15,8%	0,19
Massage	53,2%	41,5%	11,7%	0,93
Pelvic mobility	46,8%	35,7%	11,1%	0,65
Warm shower spray	38,6%	32,2%	6,4%	0,16
Ambulation	29,2%	23,9%	5,3%	0,12
Use of the birthing ball	21,1%	15,8%	5,3%	0,65
Slow and deep breathing during the expulsion period	16,9%	10,5%	6,4%	0,026*
Squatting	12,3%	11,1%	1,2%	0,13
Free Squat	9,9%	8,2%	1,7%	0,63
Music therapy	7,0%	4,1%	2,9%	0,09

Compress	4,7%	4,1%	0,6%	0,49
Birth stool	4,1%	4,1%	0	0,14

Note: *Chi-square test.

Table 5. Association between obstetric variable, sociodemographic variables, neonatal characteristics, and perineal trauma.

Outcome Variable	Predictor variables	*P-value*
Perineal Trauma	**Obstetric variable**	
	Number of Vaginal Deliveries	0,001*
	Sociodemographic variables	
	Education	0,25
	Age	0,08
	Characteristics of Newborns	
	Body mass (kg)	0,09
	Length (cm)	0,77
	Cephalic perimeter (cm)	0,53

Note: *Chi-square test.

In the multivariate analysis, it was observed that there was a 59.8% decrease in perineal trauma (OR: 0.402, 95% CI: 0.164; 0.982) in women who received respiratory guidance during the expulsion period. On the other hand, women with up to two VD have 5.38 times more chances (OR: 5.380, 95% CI: 1.817; 15.926) of presenting perineal trauma compared to those with more than two VD (Table 6).

Table 6. Multivariate Analysis between variables with statistically significant association and perineal trauma (p<0.05).

Variables	Nagelkerk R^2	β	Wald	*P*	OR	IC 95%	
						Lower	**Upper**
Model 1 (Constant)	0,117	-0,733	3,270	0,071	0,481		
Slow and deep breathing during the expulsion period		-0,912	3,995	0,046	0,402	0,164	0,982
Number of vaginal deliveries		1,63	9,235	0,002	5,380	1,817	15,926

Note: Binary Logistic Regression.

DISCUSSION

The sample consisted of low-risk or usual-risk pregnant women, including nulliparous and primiparous individuals. The majority of cases exhibited some form of perineal trauma, with first-degree spontaneous perineal lacerations being the most prevalent. Most women (67.3%) were attended by physiotherapists during labor, and those who received respiratory guidance during the expulsion phase from these professionals had a lower likelihood of experiencing perineal trauma. Additionally, women with up to two vaginal deliveries were more likely to present with this trauma.

Among the other physiotherapeutic techniques employed, diaphragmatic breathing (62.0%) stood out, followed by massage (53.2%) and pelvic mobility exercises (46.8%). None of the other techniques used showed a significant association with perineal trauma, possibly due to the fact that these techniques function more as overall relaxation methods and do not exert a direct impact on the pelvic floor. It is worth noting the distinctive aspect of this study, which sought to investigate the association between intrapartum physiotherapeutic interventions and perineal trauma, as these aspects were not explored in previous studies.

The type of breathing used during the expulsion phase, as guided by the physiotherapists in the service, was slow and prolonged breathing, avoiding the Valsalva maneuver. This technique is characterized by a prolonged expiratory apnea for a period of ten seconds or more, associated with abdominal and diaphragmatic contractions[19].

In agreement with these findings, the study by Ahmadi et al[20] aimed to investigate the effect of breathing technique on the extent of perineal damage in Iranian women in labor through a randomized clinical trial. The trial involved 166 primiparous women who were randomly allocated to two groups: breathing techniques (case group= 83) and Valsalva maneuver (control group=83). In the case group, women were instructed to perform deep breaths associated with exhalation with an open glottis during the expulsion phase. Intact perineum was more frequently observed in the case group (p= 0.002), while perineal lacerations (grades 1, 2, and 3) were considerably higher in the control group (p= 0.003). It was concluded that the respiratory technique could be a good alternative to the Valsalva maneuver to reduce perineal damage in parturients[20].

Studies have demonstrated that respiratory techniques in women during the expulsion phase are an effective method to reduce the pressure exerted on the perineum, as the slow expansion of perineal tissues can decrease damage during childbirth[21-26]. However, there is a gap in scientific evidence regarding the physiotherapeutic role in prescribing these techniques during this stage of labor.

In addition to the repercussions on the pelvic floor, the results of a cross-sectional study conducted by Lemos et al[27] with thirty-three pregnant women, including primiparous and multiparous individuals, aimed at examining the effects of the Valsalva maneuver and its duration on the acid-base balance of newborns. The study supported that a prolonged period of apnea during the expulsive phase of labor can negatively affect fetal acid-base balance, as demonstrated by a reduction in umbilical vein base excess[27]. Abnormal acid-base balance has been associated with increased fetal stress and birth-related injuries[28].

Another factor observed in the present study is the absence of third or fourth-degree lacerations in the participants. According to the review conducted by Gutzeit et al[29], these types of lacerations are strongly associated with postpartum sexual dysfunction, with a higher incidence of dyspareunia and a longer time for the resumption of sexual activity postpartum. On the other hand, it was found that first and second-degree lacerations do not have a significant effect on perineal pain or dyspareunia during the postpartum period[29].

Regarding perineal integrity, 22.2% had an intact perineum, and 12.9% underwent episiotomy. However, the current recommendation from the World Health Organization (WHO) is that the episiotomy rate should not exceed 10%[30]. In Brazil, data from the national survey "Nascer no Brasil," a nationwide hospital-based study, revealed the performance of episiotomy in 53.5% of the evaluated women[31]. Through the analysis of these results, we can infer that, in the studied sample, this intervention does not appear to be routinely used in obstetric care. This is noteworthy as the hospital is a reference institution for maternal and child health in the region.

This type of procedure, according to current literature, is associated with negative repercussions on the pelvic floor of postpartum women. According to the systematic review conducted by Manresa et al[32], women who underwent episiotomy reported a higher rate of perineal pain after childbirth compared to other degrees of perineal trauma[32].

A systematic review with meta-analysis aimed to investigate whether there was a difference in the function of pelvic floor muscles (MAP) in the short term after childbirth in primiparous women who underwent cesarean section compared to those who had a vaginal delivery. The study concluded that there was no difference in the strength of pelvic floor muscles in the short term after childbirth between primiparous women who underwent cesarean section or vaginal delivery. However, a reduction in pelvic floor muscle strength was identified in women who underwent episiotomy or instrumental vaginal delivery compared to those who had a cesarean section[1].

In the present study, it was observed that women with up to two previous vaginal deliveries before the current pregnancy were more likely to experience perineal trauma compared to those with more than two previous vaginal deliveries. Supporting these results, the study by Riesco et al[33], which aimed to associate perineal integrity, spontaneous laceration, and episiotomy in normal deliveries with maternal age, parity, gestational age, body mass, and newborn vitality in a Normal Birth Center in the state of São Paulo, Brazil, found that the greater the number of deliveries, the lower the chance of episiotomy occurrence. Women without a previous vaginal delivery have three times more chance of undergoing episiotomy[33].

In this study, no statistically significant association was found between neonatal variables (body weight, length, and head circumference) and perineal trauma. However, in a study conducted in Poland by Gebuza et al[34], aiming to identify factors associated with episiotomy and perineal lacerations involving 4493 women, it was observed that the risk of episiotomy was related to a birth weight greater than 3.5 kilograms and instrumental deliveries, such as forceps or vacuum extraction34. In contrast to the current study, where newborns

had an average body weight of 3.3 (±0.4) kilograms, and instrumental deliveries were not identified in the studied sample. Furthermore, in the study by Riesco et al[33], regarding spontaneous perineal laceration, the newborn's body weight emerges as the only associated variable, indicating that the higher the body weight, the greater the chance of its occurrence. It was found that women with babies weighing over 3.3 kilograms have 1.6 times more chance of second-degree laceration[33].

This study did not reveal an association between maternal age and perineal trauma, whereas a study conducted by Braga et al[35] at the Instituto de Medicina Integral (IMIP) in Pernambuco, Brazil, which analyzed maternal risk factors for episiotomy, showed a higher likelihood of performing this procedure in adolescents (OR = 2.22; 95% CI: 1.48-3.32) compared to other age groups[35]. However, in the present study, only women aged 18 to 40 years were included.

Given the need to support obstetric care in investigating factors related to perineal trauma, studies of this nature are important. It is worth noting that this study demonstrates significant results by highlighting the physiotherapeutic role in guiding respiratory techniques during the expulsion phase to prevent perineal trauma. This is particularly relevant due to the lack of scientific evidence in this regard. The inclusion of a physiotherapist in a multidisciplinary team is crucial in providing care to parturients, as the actions of this professional involve techniques that encourage women to recognize that their active bodies can be a facilitating tool in the labor process[16,36].

The outcomes of this research may have been influenced by some limitations, such as incomplete medical record documentation, with missing data from the initial obstetric assessment and delivery, including the position adopted during the expulsion phase, duration of labor, and expulsion period.

CONCLUSION

This study has demonstrated that parturients who received respiratory guidance during the expulsion phase by physiotherapists had a lower likelihood of experiencing perineal trauma, while women with up to two vaginal deliveries were more likely to present with this trauma. The findings of this study suggest that intrapartum physiotherapeutic intervention during the expulsion phase may have a positive impact on the pelvic floor of low-risk or usual-risk parturients. However, further research with well-established protocols and methodologies is needed to assess not only the outcomes analyzed in this study but also the impact of this intervention on the duration of labor, expulsion period, maternal satisfaction and fatigue, as well as the neonatal conditions at birth.

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4. Agreement to be accountable for the accuracy or integrity of any part of the study: MELO, J. A. L.; ALMEIDA, A. M.; EUFRASIO, L.S.; MAGALHÃES, A.G.

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