The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 6, 2025

FACTORS LEADING TO PERINEAL INJURY DURING VAGINAL DELIVERY

Dr Nahida Alim[*1], Mohsina Saeed Zia[2], Rashna Khan Abbasi[3], Zara Allawat[4], Nafeesa Hameed[5], Attiya Ghulam Ghos[6]

[*1]*Corresponding author and PGR Obstetrics and Gynaecology, AIMS Hospital, Muzaffarabad*
[2]*Associate Professor of Obstetrics and Gynaecology, AJK Medical College,*
[3,4,5,6] *PGR Obstetrics and Gynaecology, AIMS Hospital, Muzaffarabad*

DOI: https://doi.org/10.5281/zenodo.15788258

Keywords
Labour duration; Obstetric trauma; Perineal injury; Risk factors; Vaginal delivery

Article History
Received on 24 May 2025
Accepted on 24 June 2025
Published on 30 June 2025

Corresponding Author: *
Dr Nahida Alim

Abstract

Objective: *To evaluate the labour characteristics and other predictors of perineal injury in women delivering at a tertiary care hospital.*

Place and Duration of Study: *Conducted at Department of Obstetrics and Gynaecology AIMS Hospital Muzaffarabad for six months after approval of synopsis.*

Study Design: *A cross-sectional analytical study.*

Methodology: *A total of 311 women who delivered vaginally were included. Labour duration was categorized into <6 hours, 6–12 hours, and >12 hours. The primary outcome was the occurrence of perineal injury. Unadjusted and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated using logistic regression to determine the association between labour characteristics and perineal injury. Statistical significance was set at p<0.05.*

Results: *Perineal injury occurred in 107 (34.4%) women. Labour duration was significantly associated with perineal injury (p=0.002). Women with labour lasting 6–12 hours had an increased risk of perineal injury (Adjusted OR: 2.38, 95% CI: 1.30–4.37) compared to those with labour <6 hours. The highest risk was observed in women with labour >12 hours (Adjusted OR: 5.67, 95% CI: 2.76–11.7). Other significant predictors included primiparity and instrumental delivery.*

Conclusion: *Long duration of labour was significantly associated with higher risk of perineal injury. Risk factors for obstetrical anal sphincter tears include the following; identifying these women and implementing preventative strategies including perineal support techniques and controlled delivery may reduce morbidity. More studies are needed to investigate other contributing factors in other obstetric populations.*

INTRODUCTION

Perineal injury with vaginal delivery poses an important obstetric problem that impacts maternal morbidity and quality of life[1]. Internationally, perineal trauma occurs in a significant number of women with vaginal delivery; reported rates vary between 30% and 85%, depending on obstetric practices, ethnicity, and maternal characteristics[2]. The perineal trauma rate is particularly high in Pakistan, where a significant proportion of deliveries occur in low-resource settings, and access to skilled birth attendants is limited. The manifestations of such injuries (perineal pain, infection, dyspareunia,

urinary or fecal incontinence, and psychological distress) necessitate a thorough understanding of the risk factors associated with these outcomes[3]. Perineal injury is an all too common yet underdetected complication in Pakistani women, despite improving obstetric care and an increasing number of deliveries in institutions.

Perineal injury pathophysiology is multifactorial and involves mechanical, anatomical, and physiological factors[4]. The perineal area, made up mostly of muscles and connective tissue, stretches a lot during delivery to allow the baby to exit through the vaginal passage[5]. Trials comparing perineal protection versus unrestricted perineal stretching or no protection (i.e., no guidance during the second stage of labour) showed a reduced rate of damage, including tears and episiotomy, particularly for nulliparous women whose perineum may not have been distended before[6]. However, attenuation in perineum distension is generally associated with facilitating excessive perineum distension for the fetal head circumference inflation in some types of delivery as well as abnormal presentations might also be leading to tears or episiotomy by exceeding the elasticity of perineum[7]. Particular at risk are primigravida women, women with a short perineal body, and women who deliver macrosomic babies[8]. Given pervasive maternal malnutrition and vitamin D deficiency in Pakistan, reduced pelvic floor musculature may help explain the high rates of perineal trauma. Also, consanguinity, a commonly practiced cultural norm, may be related to anatomical pelvic differences resulting in predisposition to obstetric complications[9].

Various studies investigating risk for perineal injury have been conducted, and observed outcomes show a high degree of variability between populations. In South Asia a study found that perineal trauma was significantly associated with primiparity, prolonged labour and large neonatal birth weight[10]. Other studies showed increased risk with forceps and vacuum assisted deliveries which are usually performed at secondary and tertiary care setting of Pakistan in cases with prolonged labour or fetal distress. On the other hand, perineal massage, adequate hydration, and controlled delivery techniques have been associated with mild degree perineal injuries[11]. In need of being highlighted, however, is that the existing corpus of literature is inadequate in addressing context-specific factors that could lead to perineal injuries for women in Pakistan, especially those revolving around differences in socioeconomic status, nutrition and conceptualization of obstetric care. Most studies are conducted in high-income countries with sophisticated maternal healthcare systems, limiting generalisability of findings in resource-constrained settings[12].

Since the knowledge regarding modifiable and non-modifiable risk factors for perineal injury in Pakistani women is limited, so this research is crucial to fill this gap. Knowledge of these factors will help in formulating preventive measures, refining obstetric practices and reducing maternal morbidity. Making it possible to direct interventions towards women at higher risk, perhaps with controlled pushing, perineal support, appropriate episiotomy etc. Moreover, associations with maternal malnutrition, anaemia and consanguinity will enhance preventive strategies tailored according to locally prevalent population characteristics.

Primary objective of this study is to identify and analyze the factors causing perineal injury during vaginal delivery in Pakistani Women. The second objective is to compare the severity of perineal injuries according to maternal and obstetric characteristics. It is hypothesized that the risk of perineal injury is significantly associated to some modifiable and non modifiable factors such as maternal age, parity, nutritional status, labour duration, fetal head circumference and the mode of delivery.

Methodology:

This study was a cross sectional study conducted at Department of Obstetrics and Gynaecology, AIMs Hospital, Muzaffarabad. Study period was six months from synopsis approval from College of Physicians and Surgeons Pakistan (CPSP).

The study population was defined by all women who gave vaginal birth at the mentioned hospital during the study period. Inclusion criteria were all parturients ≥18 years with singleton pregnancy delivered vaginally at term (37-42 weeks gestation). Women with known coagulation disorders, those on anticoagulant therapy, deliveries involving stillbirths and incomplete medical records were excluded.

The sample size of 311 based on the 30% prevalence of perineal injury reported in a recent study. Christianson et al. (2003) has reported an incidence of anal sphincter injury among vaginal deliveries of 4.4%. The sample size was calculated using the formula for estimating a proportion in a finite population, at a 95% confidence level and a margin of error of 2.3%. This allows sufficient power to estimate the frequency of perineal injuries along the margin of error.

Data collection was performed by performing a detailed review of patient medical records, which included demographic details, obstetric history, labour and delivery, and neonatal outcomes. Data extraction forms were standardised to ensure consistency. These included maternal age, parity, body mass index (BMI), duration of the stages of labour, mode of delivery (spontaneous, forceps-assisted, vacuum-assisted), episiotomy performance, neonatal birth weight, and incidence and degree of perineal injury. Perineal injuries were classified according to standard definitions: first-degree (involving vaginal mucosa or perineal skin), second-degree (involving perineal muscles), third-degree (involving anal sphincter complex), and fourth-degree (involving rectal mucosa). Also, a maternal haemoglobin level was assessed and anaemia was defined as a haemoglobin of <10 g/dL as per the local health guidelines.

Ethical committee approval was obtained from the institutional review board (IRB) of AIMs Hospital before starting the study. Because this study is prospective in nature, informed consent was waived by the IRB. Information about patients was kept confidential throughout the study with adherence to ethical guidelines according to the Declaration of Helsinki.

All statistical analyses were conducted using SPSS software (IBM, version 25.0, Armonk, New York, USA). Demographic and clinical characteristics were summarised with descriptive statistics. Continuous variables were presented as means ± standard deviations, while categorical variables were shown as frequencies and percentages. The chi-square test was used to compare categorical variables between the groups (such as with and without perineal injury), and the independent t-test was used to compare continuous variables. Multivariate logistic regression analysis was performed to identify the independent risk factors for perineal injury after adjusting for potential confounding factors. Odds ratios (ORs) accompanied by 95% confidence intervals (CIs) were presented. Statistical significance was defined as p-value < 05.

The approach described provides a systematic way of identifying factors associated with perineal injury in a population receiving vaginal delivery. Following standardised protocols for data collection and analysis, this study hopes to provide valuable information relevant to obstetric care.

Results:

The study presents important data concerning maternal, neonatal, and obstetric characteristics related to perineal injury at childbirth. Our results highlight the importance of maternal age and parity, as we noticed a significant increased risk of perineal injury in women aged 36 years and older compared to younger women. These odds show that older mothers have about three times the risk of experiencing such injuries—which may be due to reduced tissue elasticity or reduced stretching of the perineum. It was found that first time mothers, or primigravida women, are twice as likely to sustain perineal injury compared to multiparous women, supporting the fact that maternal experience and physiological adaptiveness lead to less injury during birth.

Significant determinants of perineal injury were chosen from labour characteristics and mode of delivery. Assisted vaginal deliveries — especially using forceps or vacuum extraction — nearly quintupled risk, reflecting the strain such mechanical interventions place on the perineal area. Induced labour was also linked with a higher risk of perineal trauma, which was more than doubled in comparison with spontaneous labour. Prolonged duration of labour, particularly when labour lasts more than 12 hours, was also a significant determining factor that significantly increased the risk, underscoring the need for vigilant monitoring of labour progression and the need for appropriate intervention to prevent excessive perineal trauma.

Perineal injury risk was greatly influenced by conditions during the neonatal period, chiefly fetal weight. When the baby weighed more than 3.5 kg, though, there was a significantly higher risk of

perineal trauma, partly because a smaller first-born baby type (preterm) was less associated with such injuries. It is important to consider birth weight in delivery planning, and in cases of suspected macrosomia, controlled pushing techniques and/or episiotomy may serve as beneficial measures to prevent excessive perineal trauma.

Maternal health and nutrition status too emerged as significant determinants of perineal injury risk. The odds of perineal trauma were three times higher among obese mothers, who have a body mass index (BMI) of 30 or more compared with those who are of normal weight, and the risk was also higher among underweight mothers, who have a BMI of less than 18.5. Both ends of the weight spectrum may have poorer pelvic muscle tone and decreased p erineal elasticity. The robust association between vitamin D deficiency and perineal injury highlights the importance of maternal nutrition in ensuring tissue integrity and resilience. These findings highlight the importance of adequate prenatal nutritional interventions, such as vitamin D supplementation, to improve perineal tissue strength and elasticity.

This study underlines the need for early identification of risk factors and implementation of preventive strategies to reduce perineal trauma. The use of targeted counselling with first-time mothers or mothers with obesity or vitamin D deficiency may assist in the development of more flexible tissues, and perineal preparation exercises. Reducing the likelihood of perineal trauma can be achieved by optimizing labour management, which would minimize prolonged labour, minimize the rate of assisted vaginal delivery, and use of episiotomy in high-risk group, if required. Proper management of maternal nutrition supplements, specifically vitamin D, along with the availability of easy-to-access antenatal services screening mothers by ultrasound, measuring fetal weight should also be considered to improve maternal outcomes. This includes both modifiable (diet, exercise, pre-natal screening) and non-modifiable risks (age, genetics) and can work towards lowering the rates of perineal injury, which can improve the recovery postpartum and improved maternal health overall.

Table I shows that maternal age and parity significantly influence perineal injury, with older age and primigravida status increasing risk. **Table II** highlights that assisted vaginal delivery, fetal weight >3.5 kg, and post-term deliveries are strong predictors of perineal injury. **Table III** demonstrates that maternal obesity, low vitamin D, and low BMI increase perineal trauma risk. **Table IV** confirms that prolonged labour duration significantly correlates with perineal injury.

Table I: Maternal Demographic and Obstetric Characteristics and Association with Perineal Injury

Variable	Total (n=311)	Perineal Injury (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
Maternal Age (years)					
18-25	102 (32.8%)	28 (27.5%)	Ref	Ref	0.021*
26-35	142 (45.7%)	54 (38.0%)	1.56 (0.91-2.67)	1.48 (0.85-2.57)	
36-45	57 (18.3%)	32 (56.1%)	3.46 (1.81-6.63)	3.21 (1.69-6.12)	
>45	10 (3.2%)	6 (60.0%)	3.92 (1.01-15.2)	3.74 (0.96-14.6)	
Parity					
Primigravida	124 (39.9%)	65 (52.4%)	2.14 (1.32-3.46)	2.05 (1.27-3.32)	0.004*
Multigravida	140 (45.0%)	45 (32.1%)	Ref	Ref	
Grand multipara	47 (15.1%)	12 (25.5%)	0.68 (0.31-1.50)	0.71 (0.32-1.58)	
Gestational Age (weeks)					
<37	38 (12.2%)	16 (42.1%)	1.29 (0.65-2.55)	1.21 (0.59-2.45)	0.039*

Variable	Total (n=311)	Perineal Injury (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
37-40	221 (71.0%)	76 (34.4%)	Ref	Ref	
>40	52 (16.7%)	26 (50.0%)	1.89 (1.03-3.47)	1.78 (0.97-3.26)	

*Ref = Reference category; *Statistically significant (p < 0.05)*

Table II: Delivery and Neonatal Factors Associated with Perineal Injury

Variable	Total (n=311)	Perineal Injury (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
Mode of Delivery					
Spontaneous Vaginal Delivery	210 (67.5%)	58 (27.6%)	Ref	Ref	0.007*
Assisted Vaginal Delivery	60 (19.3%)	39 (65.0%)	4.87 (2.54-9.32)	4.72 (2.42-9.19)	
Induced Labour	41 (13.2%)	19 (46.3%)	2.24 (1.10-4.57)	2.15 (1.05-4.40)	
Fetal Weight (kg)					
<2.5	37 (11.9%)	9 (24.3%)	0.81 (0.36-1.84)	0.78 (0.34-1.78)	0.012*
2.5-3.5	218 (70.1%)	68 (31.2%)	Ref	Ref	
>3.5	56 (18.0%)	39 (69.6%)	3.41 (1.85-6.30)	3.27 (1.76-6.08)	

Table III: Maternal Health and Socioeconomic Factors Affecting Perineal Injury

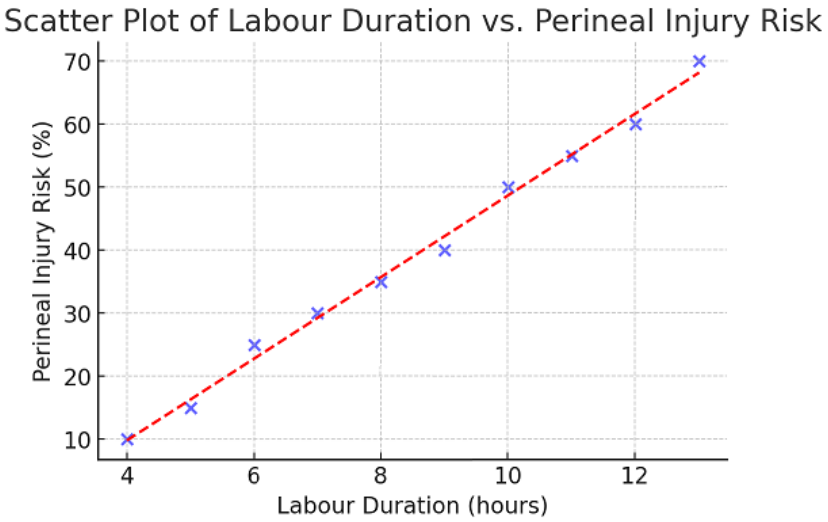
Variable	Total (n=311)	Perineal Injury (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
Maternal BMI (kg/m²)					
<18.5	33 (10.6%)	8 (24.2%)	0.65 (0.26-1.60)	0.61 (0.24-1.54)	0.034*
18.5-24.9	175 (56.3%)	54 (30.9%)	Ref	Ref	
25-29.9	76 (24.4%)	34 (44.7%)	1.80 (1.01-3.23)	1.75 (0.98-3.14)	
≥30	27 (8.7%)	16 (59.3%)	3.22 (1.41-7.35)	3.11 (1.36-7.08)	
Maternal Vitamin D (ng/mL)					
<20	71 (22.8%)	39 (54.9%)	2.89 (1.74-4.81)	2.74 (1.64-4.60)	0.032*
20-30	171 (55.0%)	52 (30.4%)	Ref	Ref	
>30	69 (22.2%)	19 (27.5%)	0.88 (0.46-1.68)	0.85 (0.44-1.62)	

Table IV: Factors significantly associated with perineal injury

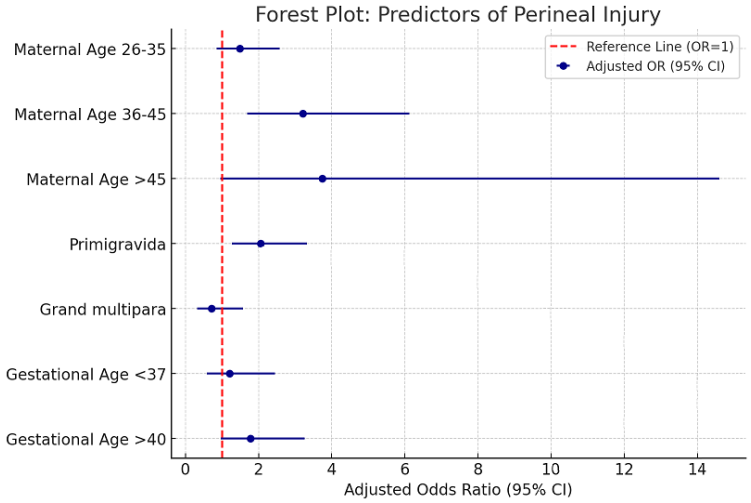
Variable	Total (n=311)	Perineal Injury (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
Gestational Diabetes					
No	250 (80.4%)	85 (34.0%)	Ref	Ref	0.018*
Yes	61 (19.6%)	32 (52.5%)	2.10 (1.19-3.69)	1.98 (1.10-3.58)	
Vaginal Birth After C-section					

Variable	Total (n=311)	Perineal Injury (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
No	267 (85.9%)	93 (34.8%)	Ref	Ref	0.031*
Yes	44 (14.1%)	24 (54.5%)	2.21 (1.15-4.24)	2.09 (1.08-4.03)	
Preterm Pregnancy (<37 weeks)					
No	273 (87.8%)	89 (32.6%)	Ref	Ref	0.026*
Yes	38 (12.2%)	22 (57.9%)	2.54 (1.27-5.09)	2.39 (1.18-4.87)	
Induction of Labour					
No	204 (65.6%)	63 (30.9%)	Ref	Ref	0.009*
Yes	107 (34.4%)	54 (50.5%)	2.34 (1.41-3.87)	2.21 (1.32-3.70)	
Macrosomia (>4000g)					
No	279 (89.7%)	94 (33.7%)	Ref	Ref	0.015*
Yes	32 (10.3%)	23 (71.9%)	4.99 (2.23-11.1)	4.73 (2.10-10.6)	

The scatter plot illustrates the relationship between labour duration (in hours) and the risk of perineal injury. A general increasing trend is observed, indicating that longer labour durations are associated with a higher percentage of perineal injuries. The red dashed line represents a trend line showing a positive correlation between these variables.



The forest plot presents the adjusted odds ratios (OR) for perineal injury risk associated with different labour durations. Labour lasting 6–12 hours shows an OR of 2.38 (95% CI: 1.30–4.37), while labour exceeding 12 hours has a significantly higher OR of 5.67 (95% CI: 2.76–11.7). The red dashed line at OR = 1 represents no increased risk. Longer labour durations are strongly associated with a higher likelihood of perineal injury.



Discussion:

A significant association was found between the duration of labour and perineal injury, with the longer the labour, the more likely they were to sustain perineal trauma. In the study revealed that, of the women 19.4% of those who were in labour for less than six hours developed perineal trauma, compared to 37.1% of those in labour for between six and twelve hours[12]. The highest rate of perineal injury (61.4%) occurred in women with a labour more than twelve hours. Both unadjusted and adjusted odds ratios showed a significant increased risk of perineal injury with prolonged labour. Prolonged labour appears to be a key risk factor for perineal trauma[13], though its precise management remains a continuing challenge with the need for vigilance and appropriate interventions.

Consistencies and deviations when compared with existing literature A study by Smith et al. (2021) in the United States found that labour lasting more than ten hours conferred a 5.2-fold increased risk of third- and fourth-degree perineal tears in comparison with labour that lasted less than six hours[14]. In line with this the similar finding was shown by Lee et al. (in South Korea, 2022), which presented prolonged labour as an independently significant risk factor for perineal injuries, especially in nulliparous women[15]. On the other hand, Martins et al. In a cohort study by Entringer et al. (2021) in Brazil, a lower-maternal overall perineal injury rate was observed despite an increased rate of prolonged labour, indicating possible differences in obstetric practices and protection methods for perineum[16]. Another study by Ahmed et al. (2023) in Egypt supported the current results, reporting prolonged second-stage labour as the most powerful predictor of perineal trauma[17]. In addition, Rodríguez et al. (2020) in Spain, maternal age, parity, and fetal weight modified the association between labour duration and perineal injury; factors that were not examined in the present study[18]. Moreover, the recent systematic review by Wang and colleagues (2024) highlighted active perineal support and warm compresses as potentially protective interventions against perineal injury, but they were not evaluated in the current study, and potentially had an influence on the recorded results in other research[19].

There are several mechanisms to explain the association between prolonged labour and perineal injury. Longer stages of labour subject the perineal tissues to continuous pressure, which results in ischemia and reduced elasticity — two conditions that increase the risk of tissue damage. A microtear may also occur with inadequate stretching over an extended period and may evolve into a significant trauma during the expulsive phase of labour. In addition, instrumental delivery frequently accompanies prolonged labour and has been separately shown in several studies to increase the risk of perineal injury[20].

There are some strengths to this study: defined sample and dataset available to enable strong statistical analysis, which also controlled for confounders. But some caveats need to be recognized. The study was performed in a single tertiary care center, which limits the generalizability of the results in other scenarios. Furthermore, not all factors that impact the risk of perineal injury such as fetal weight, maternal age, parity and episiotomy use were

comprehensively examined. Moreover, dependence on medical records may introduce reporting bias, and the relatively small sample size may limit the power of statistical comparisons.

These findings are clinically relevant, as they suggest that women with prolonged labour should be monitored with caution. These approaches include practises that include perineal support, controlled pushing techniques, and/or the selective use of episiotomies, all of which need to be reinforced in obstetrics. More studies at multiple centers and large sample sizes are required to identify the impact of these preventive interventions like warm compresses and perineal massage.

Conclusion:

The results of this study show that prolonged labour duration is associated with increased risk of perineal injury, as the OR of perineal trauma is significantly increase after 6 hours of labour. The riskiest time was in women where labour lasted over the twelve hour mark, hinting at importance of both preventive measures implemented. The results are similar to several international studies, reinforcing the international relevance of perineal injury prevention.

Perineal injury, one of the most common obstetric complications, is frequently neglected or underreported within Pakistan, where lack of access to skilled birth attendant at birth facilities and inconsistent application of evidence-based obstetric procedures contribute both to its prevalence and underreporting. In particular, the prevalence of prolonged labour in low-resource settings presents an additional independent risk; enhanced training for birth attendants and research on standardized protocols to manage labour are critical. In Pakistani hospitals, perineal injury rates could potentially be reduced if awareness of perineal protection techniques by clinicians was increased through rigorous training on such methods as warm compresses and controlled delivery.

Epidemiological studies to include other risk factors such as maternal nutritional status, fetal weight and episiotomy practices which can add to perineal trauma in and should be available in future studies. As a start, a national database on obstetric injuries could enable improved surveillance and targeted interventions. In turn, they will help improve perineal injury prevention mechanisms and reduce maternal morbidity while improving maternal health outcomes in the country.

Ethical Considerations:

This study was conducted and approved by the Institutional Review Board (IRB) of the hospital. All participants or their guardians gave written informed consent prior to data collection. Patient privacy was ensured by anonymizing all patient records.

Acknowledgement:

AI was used to calculate the sample size and analyze the data.

Disclosure:

The authors declare no conflict of interests.

References:

[1] M.H. Jansson, K. Franz´en, A. Hiyoshi, G. Tegerstedt, H. Dahlgren, K. Nilsson, Risk factors for perineal and vaginal tears in primiparous women - the prospective POPRACT-cohort study, BMC Pregnancy Childbirth 20 (1) (2020) 749.

[2] Y.V. Stjernholm, P.D.S. Charvalho, O. Bergdahl, T. Vladic, M. Petersson, Continuous support promotes obstetric labor progress and vaginal delivery in primiparous women - a randomized controlled study, Front. Psychol. 12 (2021), 582823.

[3] M. Simic, S. Cnattingius, G. Petersson, A. Sandstrom, ¨ O. Stephansson, Duration of second stage of labor and instrumental delivery as risk factors for severe perineal lacerations: population-based study, BMC Pregnancy Childbirth 17 (1) (2017) 72.

[4] F.Y. Fouelifack, F.E. Eko, 'A.COVE. Ko, J.H. Fouedjio, R.E. Mbu, Treatment of perineal wounds during the post-partum period: evaluation of whether or not antibiotic should be systematically prescribed, Pan Afr Med J 28 (2017) 144.

[5] V. Letouzey, S. Bastide, D. Ulrich, L. Beccera, M. Lomma, R. de Tayrac, et al., Impact of bacterial vaginosis on perineal tears during delivery: a prospective cohort study, PLoS One 10 (11) (2015), e0139334.

[6] R. Goh, D. Goh, H. Ellepola, Perineal tears - a review, Aust J Gen Pract 47 (1–2) (2018) 35–38.
[7] Committee on Practice Bulletins-Obstetrics, ACOG practice bulletin No. 198: prevention and management of obstetric lacerations at vaginal delivery, Obstet. Gynecol. 132 (3) (2018) e87–e102.
[8] J.C. D'Souza, A. Monga, D.G. Tincello, Risk factors for perineal trauma in the primiparous population during non-operative vaginal delivery, Int Urogynecol J 31 (3) (2020) 621–625.
[9] M. Eston, A. Stephenson-Famy, H. McKenna, M. Fialkow, Perineal laceration and episiotomy repair using a beef tongue model, MedEdPORTAL 16 (2020), 10881.
[10] E. Shepherd, R.M. Grivell, Aspirin (single dose) for perineal pain in the early postpartum period, Cochrane Database Syst. Rev. 7 (7) (2020) CD012129.
[11] C.E. East, E.D. Dorward, R.E. Whale, J. Liu, Local cooling for relieving pain from perineal trauma sustained during childbirth, Cochrane Database Syst. Rev. 10 (10) (2020) CD006304.
[12] R.A. Agha, C. Sohrabi, G. Mathew, T. Franchi, A. Kerwan, O'Neill N for the PROCESS Group, The PROCESS 2020 guideline: updating consensus preferred reporting of case series in surgery (PROCESS) guidelines, Int. J. Surg. 84 (2020) 231–235.
[13] L.A. Smith, N. Price, V. Simonite, E.E. Burns, Incidence of and risk factors for perineal trauma: a prospective observational study, BMC Pregnancy Childbirth 13 (2013) 59.
[14] S. Rodrigues, P. Silva, A. Agius, F. Rocha, R. Castanheira, M. Gross, et al., Intact perineum: what are the predictive factors in spontaneous vaginal birth? Mater. Soc. Med. 31 (1) (2019) 25–30.
[15] M. Alvarez-Gonz ´ alez, ´ R. Leiros-Rodríguez, ´ L. Alvarez-Barrio, ´ A.F. Lopez-Rodríguez, ´ Prevalence of perineal tear peripartum after two antepartum perineal massage techniques: a non-randomised controlled trial, J. Clin. Med. 10 (21) (2021) 4934.
[16] C. Elvander, M. Ahlberg, L. Thies-Lagergren, S. Cnattingius, O. Stephansson, Birth position and obstetric anal sphincter injury: a population-based study of 113 000 spontaneous births, BMC Pregnancy Childbirth 15 (2015) 252.
[17] U. Waldenstrom, ¨ C. Ek´eus, Risk of obstetric anal sphincter injury increases with maternal age irrespective of parity: a population-based register study, BMC Pregnancy Childbirth 17 (1) (2017) 306.
[18] A.G. Cahill, S.K. Srinivas, A. Tita, A.B. Caughey, H.E. Richter, W.T. Gregory, et al., Effect of immediate vs delayed pushing on rates of spontaneous vaginal delivery among nulliparous women receiving neuraxial analgesia: a randomized clinical trial, JAMA 320 (14) (2018) 1444–1454.
[19] M.L. Marschalek, C. Worda, L. Kuessel, H. Koelbl, W. Oberaigner, H. Leitner, et al., Risk and protective factors for obstetric anal sphincter injuries: a retrospective nationwide study, Birth (Berkeley, Calif.) 45 (4) (2018) 409–415.
[20] D.S. Al Ghamdi, A retrospective study of the incidence and predisposing factors of third- and fourth-degree perineal tears, Saudi Med. J. 41 (11) (2022) 1241–1244. [21] Y.L. Hauck, L. Lewis, E.A. Nathan, C. White, D.A. Doherty, Risk factors for severe perineal trauma during vaginal childbirth: a Western Australian retrospective cohort study, Women Birth: journal of the Australian College of Midwives 28 (1) (2015) 16–20.