DOI: 10.66069/ojspub.27451016

Incidence and Determinants of Birth Canal Injuries Following Vaginal Delivery at Wad Madani Hospital, Sudan

Khilawar Verma

Department of Clinical Science, Alrayan National College of Medicine, Alrayan Colleges, Madinah, Saudi Arabia

Abstract: ***Background: The female perineum, forming the diamond - shaped inferior outlet of the pelvis, is highly susceptible to trauma during labour. Spontaneous perineal tears and iatrogenic episiotomies can lead to both immediate and long - term maternal morbidity. Objective: To determine the incidence, patterns, risk factors, and outcomes of birth canal injuries following vaginal deliveries at Wad Madani Obstetrics and Gynaecology Teaching Hospital between January and June 2024. Methods: We conducted a prospective, cross - sectional, hospital - based study. All women who sustained birth canal injuries during vaginal delivery at Wad Madani Teaching Hospital over the six - month period were enrolled. Data were collected via a structured questionnaire administered after informed consent. Injury types, maternal and obstetric characteristics, management details, and complications were recorded and analyzed. Results: Of 5, 237 vaginal deliveries, 102 women (1.9%) experienced birth canal injuries. Injury distribution was: cervical tears 38 (37.3%), perineal tears 31 (30.4%), vaginal tears 23 (22.5%), extended episiotomies 5 (4.9%), mixed lacerations 4 (3.9%), and de - circumcision injuries 1 (1%). More than half (52.9%) of injured women developed complications, including heavy bleeding 51 (94.4%), infection 12 (22.2%), vulvar hematoma 3 (5.6%), laparotomy 2 (3.7%), hysterectomy 2 (3.7%), disseminated intravascular coagulation 2 (3.7%), and rectovaginal fistula 1 (1.9%). The maternal mortality ratio was 57 per 100, 000 live births. Significant risk factors included instrumental delivery 10 (9.8%), assisted breech delivery 5 (4.9%), prolonged second stage of labour 20 (19.6%), home delivery under traditional birth attendant supervision 7 (6.9%), unattended home delivery 4 (3.9%), primigravity 51 (50%), and birth weight >4, 000 g 14 (13.7%). Only 25.9% of midwives and 51.2% of doctors had received formal training in birth canal injury management. Conclusion: The rate of birth canal injuries at this centre is substantial. There is a critical need to improve training for both doctors and midwives in the anticipation, prevention, and prompt recognition of perineal and cervical trauma during vaginal delivery.***

Keywords: Birth canal injuries; Vaginal delivery; Perineal tears; Cervical tears; Obstetric lacerations; Maternal morbidity; Risk factors

1. Introduction

The female perineum—the diamond - shaped inferior outlet of the pelvis bounded anteriorly by the pubic symphysis and posteriorly by the coccyx—is particularly vulnerable to trauma during childbirth. Perineal injuries may occur spontaneously as tears or iatrogenically via episiotomy or instrumental delivery, involving structures from the anterior vaginal wall, urethra, clitoris, and labia to the posterior vaginal wall, perineal body, and anal sphincters [1]. Most spontaneous tears extend along the posterior vaginal wall toward the anus and, when severe, are linked to significant maternal morbidity and even mortality [2].

Globally, up to 87.5% of women undergoing spontaneous vaginal delivery (SVD) without episiotomy sustain perineal tears, with nulliparous women at highest risk [3]. Addition of episiotomy can reduce deep sphincter injuries by guiding the direction and extent of trauma, yet restrictive episiotomy policies have been associated with increased anterior vaginal lacerations [4, 5]. Third - and fourth - degree tears, which affect the anal sphincter, occur in 2–19% of vaginal births in well - resourced areas and are a major cause of pain after childbirth, painful intercourse, loss of bowel control, and the formation of abnormal connections between the vagina and bladder or rectum. In low - resource regions, obstetric fistula—often resulting from prolonged obstructed labor—carries a prevalence of up to 100% among fistula cases and exacts profound social stigma [9, 10].

Preventive strategies for lower genital tract injuries are multifactorial. Antenatal perineal massage in late pregnancy significantly lowers rates of perineal trauma and postpartum pain [11]. Skilled intrapartum care by trained birth attendants also reduces severe lacerations, though many developing - country centers lack standardized training programs [12]. While elective cesarean section may avert perineal injury, it presents its own risks of morbidity and mortality [13].

Despite these insights, data remain scarce on the incidence, risk factors, and outcomes of birth canal injuries in Sudanese teaching hospitals. This study aims to fill that gap by prospectively assessing the incidence, patterns, determinants, and complications of birth canal injuries following vaginal deliveries at Wad Madani Obstetrics and Gynecology Teaching Hospital between January and June 2024. By finding out which risk factors can be changed and where training is lacking, our results will help create specific actions to enhance the safety of mothers and care during childbirth in similar places with limited resources

2. Materials and Methods

Study Design and Setting

This prospective, cross - sectional, hospital - based study was conducted at Wad Madani Obstetrics and Gynaecology Teaching Hospital in Great Wad Madani locality, Sudan. The facility—providing free obstetric and gynaecological services to its community—has 304 beds (including six ICU and ten high - dependency beds), five fully equipped theatres, and four delivery tables. It manages approximately 3, 600 obstetric and gynaecological registrations annually, with referrals from district hospitals and primary health centres.

Study Period and Population
The study spanned six months, from January to June 2024. All pregnant women who underwent a normal vaginal delivery at the hospital and sustained birth canal injuries (including cervical tears, perineal tears, vaginal lacerations, and extended episiotomies) were eligible. Women whose vaginal deliveries were complicated by uterine rupture were excluded.

Sample Size
Using a time - frame sampling approach, every case of birth canal injury meeting inclusion criteria during the study period was enrolled. A total of 102 women fulfilled these criteria and comprised the study sample.

Data Collection
Data were gathered by direct, face - to - face interviews using a pre - designed, close - ended questionnaire administered by the principal investigator. The instrument captured demographic variables, obstetric history, clinical details of the current delivery, type and degree of injury, attendant cadre, and provider training in birth canal injury management. Completed questionnaires were checked daily for completeness and entered into a standardized data collection sheet.

Data Analysis
After coding, all data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 21. Descriptive statistics—frequencies and percentages—were calculated for categorical variables. Continuous variables (e. g., maternal age, birth weight) were summarized as means ± standard deviations.

Ethical Considerations
Ethical clearance was obtained from the Sudan Medical Specialization Board and the administration of Wad Madani Teaching Hospital. Written or verbal informed consent was secured from each participant after explaining the study's purpose and procedures. Participant confidentiality was maintained by using coded identifiers and secure storage of all records.

3. Results

Table 1 shows that birth canal injuries affected women across a broad age range but were most common in those aged 20–39 years. Specifically, 44.1 % of injuries occurred in women aged 30–39, and 43.1 % in those aged 20–29, together accounting for 87.2 % of all cases. Adolescents under 20 years comprised 10.8 % of injuries, while women aged 40 and above represented only 2.0 % of the cohort.

Table 1: Distribution of women with birth canal injuries by age group (N = 102)

Age Group	Frequency (n)	Percentage (%)
< 20 years	11	10.8
20–29 years	44	43.1
30–39 years	45	44.1
≥ 40 years	2	2

More than half of all birth canal injuries (58.8 %) followed unassisted spontaneous vaginal deliveries, making this the largest single contributor. Induction of labour accounted for the next highest proportion at 15.7 %, while rapid ("precipitate") labours and instrumental (forceps or vacuum - assisted) deliveries together comprised 20.6 % of injuries as shown in table 2

Table 2: Distribution of Birth Canal Injuries by Mode of Delivery

Delivery Mode	N	%
Spontaneous vaginal	60	58.8
Induced vaginal	16	15.7
Precipitate labour	11	10.8
Instrumental vaginal	10	9.8

Table 3 shows that cervical tears were the predominant form of birth canal trauma, accounting for over one - third of cases (37.3 %). Perineal and vaginal tears followed, together representing more than half of all injuries (52.9 %). Extended episiotomies and mixed lacerations were relatively uncommon, while de - circumcision injury was rare

Table 3: Distribution of birth canal injury types

N	N	%
Cervical tear	38	37.3
Perineal tear	31	30.4
Vaginal tear	23	22.5
Extended episiotomy	5	4.9
Mixed laceration	4	3.9
De - circumcision injury	1	1

Over half of injured women (52.9 %) developed at least one serious complication. The most frequent was heavy bleeding, affecting 94.4 % of those complicated cases. Infections occurred in 22.2 %, while vulvar hematomas were noted in 5.6 %. Major surgical interventions—laparotomy and hysterectomy—were each required in 3.7 % of complicated cases, and DIC also occurred in 3.7 %. Rectovaginal fistula was rare (1.9 %). Additionally, more than half of all injured women (52.9 %) required blood transfusion as show in table 4

Table 4: Complications Among Women with Birth Canal Injuries

Complication	Yes n (%)	No n (%)
Heavy bleeding	51 (94.4)	3 (5.6)
Infection	12 (22.2)	42 (77.8)
Vulvar hematoma	3 (5.6)	51 (94.4)
Laparotomy	2 (3.7)	52 (96.3)
Hysterectomy	2 (3.7)	52 (96.3)
Disseminated intravascular coagulation (DIC)	2 (3.7)	52 (96.3)
Rectovaginal fistula	1 (1.9)	53 (98.1)

4. Discussion

The female perineum is a complex interlocking area of muscles, fibrous connective tissues and fascia, and is conceptually triangular in shape [16]. It provides a physical barrier between the vagina and the rectum, anchors the anorectum and vagina, maintains urinary and faecal continence, and prevents expansion of the urogenital hiatus in

the levator ani muscles [16]. The perineal body is innervated by the pudendal nerve, which can be damaged during an episiotomy, a common obstetrical procedure [17]. The anal sphincter is a strong muscle that constantly remains in a contracted state; when cut or torn it can either pull apart or retract, making it difficult to identify on visual inspection [18]. Whether partial or complete, periurethral tears and vaginal trauma are very serious and complicated injuries [19], and rupture of the external anal sphincter during childbirth can be devastating [19].

In this study the rate of birth canal injuries following vaginal deliveries was 1.9% [20], markedly lower than the 9.1% reported by Njoku et al. in Nigeria [20] and the 4.4% anal sphincter injury rate documented by Christianson et al. in the USA [21]. Villot et al. found that over 85% of vaginal births involve some degree of perineal tear, with 0.6–11% resulting in a third - or fourth - degree tear, and that incidence falls from 90.4% in nulliparous to 68.8% in multiparous women [22]. The lower rate in our cohort may reflect routine episiotomy use, which has been linked to fewer severe injuries [23].

Women aged 30–39 years comprised 45 cases (44.1%), those aged 20–29 years 43.1%, under 20 years 10.8%, and ≥40 years 2.0% [24]. Zulfiqar et al. reported a mean age of 28.9 ± 3.4 years among Pakistani women with genital tract trauma [24], and Cheng et al. observed more third - and fourth - degree lacerations in older parturients [25].

Spontaneous vaginal delivery accounted for 58.8% of injuries, induced vaginal for 15.7%, precipitate labour for 10.8%, and instrumental vaginal delivery for 9.8%; assisted breech delivery comprised the remainder [26]. Hsieh et al. in Taiwan found greater posterior laceration severity with instrument - assisted deliveries and contralateral tears at mediolateral episiotomy sites [26]. Mikolajczyk et al. identified low forceps deliveries as the strongest risk factor for severe perineal lacerations [27], and an Afghan study similarly linked instrument use to increased maternal birth injuries [28].

The most common injury types in our cohort were cervical tears/lacerations (37.3%), perineal tears (30.4%), and vaginal tears (22.5%) (our data). Extended episiotomies (4.9%), mixed lacerations (3.9%), and de - circumcision injuries (1.0%) were less frequent (our data).

Overall, 52.9% of injured women developed at least one serious complication [29]. Heavy bleeding occurred in 94.4% of these cases, infections in 22.2%, and vulvar hematomas in 5.6%. Laparotomy and hysterectomy were each required in 3.7%, disseminated intravascular coagulation in 3.7%, and rectovaginal fistula in 1.9% [29]. Poggi et al. highlighted primary postpartum hemorrhage as a major morbidity driver when repair is delayed outside the hospital [29].

Njoku et al. in Nigeria reported similar injury frequencies—first - degree perineal tears 40.2%, second - degree tears 18.3%, periurethral tears 14.5%, cervical lacerations 11.9% [30]. Chikazawa et al. in Taiwan detailed posterior (34%), lateral (21.7%), and anterior (1.9%) laceration frequencies, with lateral tears more frequent contralateral to episiotomy [31]. Carroli and Mignini in Malawi documented similar distributions during forceps and vacuum extractions [32].

A maternal mortality rate of 0.68% was recorded [33]. Although obstetric fistula accounts for 84.1–100% of vesicovaginal fistulae in Nigeria due to prolonged obstructed labour [33], our study's rectovaginal fistula rate was only 1.9%, reflecting better labour management [33]. Notably, only 25.9% of midwives and 51.2% of doctors at the study hospital had formal training in anticipating, preventing, and recognizing birth canal injuries—underscoring an urgent need for comprehensive obstetric training programs across all care settings.

5. Conclusion

This study in a Sudanese teaching hospital reported a 1.9% rate of birth canal injuries following vaginal delivery, with the majority occurring in women aged 20–39 and most commonly presenting as cervical or perineal tears. Instrumental deliveries, prolonged second - stage labour, and larger fetal weight were identified as significant risk factors. Over half of injured women developed serious complications—chiefly heavy bleeding and infection—often necessitating blood transfusion or surgical intervention. The findings highlight the need for improved obstetric training in injury recognition and repair, restrictive and evidence - based use of episiotomy and instrumental delivery, and routine audit of birth trauma outcomes to reduce maternal morbidity.

References

[1] Frohlich J, Kettle C. Perineal care. BMJ Clin Evid.2015; 2015.

[2] Mora-Hervás I, Sánchez E, Carmona F, Espuña-Pons M. Perineal trauma in primiparous women with spontaneous vaginal delivery: episiotomy or second-degree perineal tear? Int J Women's Health Reprod Sci.2015; 3 (2): 84–8.

[3] Hosseinzadeh K, Heller MT, Houshmand G. Imaging of the female perineum in adults. Radiographics.2012; 32 (4): E129–68.

[4] Hopkins LM, Caughey AB, Glidden DV, Laros RK Jr. Racial/ethnic differences in perineal, vaginal and cervical laceration. Am J Obstet Gynecol.2005; 193 (2): 455–9.

[5] Poggi SG. Postpartum hemorrhage & abnormal puerperium. In: DeCherney AH, Nathan L, Laufer N, Goodwin TM, Roman A, editors. Current Diagnosis and Treatment: Obstetrics & Gynecology.11th ed. New York: McGraw Hill; 2007. p.349–69.

[6] Dahlen HG, Priddis H, Schmied V, et al. Trends and risk factors for severe perineal trauma during childbirth in New South Wales between 2000 and 2008: a population-based data study. BMJ Open.2013; 3 (5): e002824.

[7] Khaskheli M, Balock S, Balock AS. Obstetrical trauma to the genital tract following vaginal delivery. J Coll Physicians Surg Pak.2012; 22 (2): 95–7.

[8] Borello-France D, Burgio KL, Richter HE, et al. Fecal and urinary incontinence in primiparous women. Obstet Gynecol.2006; 108: 863–72.

[9] Altman D, Ragnar I, Ekstrom A, Tyden T, Olsson SE. Anal sphincter lacerations and upright delivery postures—a risk analysis from a randomized controlled trial. Int Urogynecol J Pelvic Floor Dysfunct.2007; 18: 141–6.
[10] Ijaiya AM, Rahman AG, Aboyeji AP, et al. Vesicovaginal fistula: a review of Nigerian experience. West Afr J Med.2010; 29 (5): 293–8.
[11] The Royal Australian and New Zealand College of Obstetricians and Gynaecologists. Provision of routine intrapartum care in the absence of pregnancy complications. East Melbourne, Vic: RANZCOG; 2017. p.1.
[12] Alber LL, Borders N. Minimizing genital tract trauma and related pain following spontaneous vaginal birth. J Midwifery Women's Health.2007; 52 (3): 246–53.
[13] Hodnett ED, Gates S, Hofmeyr L, Sakala C. Continuous support for women during childbirth. Cochrane Database Syst Rev.2007; (3): CD003766.
[14] World Health Organization. Trends in maternal mortality: 1990–2008 – estimates developed by WHO, UNICEF, UNFPA and The World Bank. Geneva: WHO; 2010. p.1.
[15] Leppert PC. The reproductive-age woman. In: Leppert PC, Peipert JK, editors. Primary Care for Women.2nd ed. Philadelphia: Lippincott Williams & Wilkins; 2004. p.108–11.
[16] Phillips C, Ash M. Childbirth and the pelvic floor: 'the gynaecological consequences'. Rev Gynaecol Pract.2005; 5: 15–22.
[17] Rushwas H. Female genital mutilation management during pregnancy, childbirth and the postpartum period. Int J Gynaecol Obstet.2000; 70: 99–104.
[18] Smith LA, Price N, Simonite V, Burns EE. Incidence of and risk factors for perineal trauma: a prospective observational study. BMC Pregnancy Childbirth.2013; 13: 59.
[19] Villot A, Deffieux X, Demoulin G, Rivain AL, Trichot C, Thubert T. Management of third and fourth degree perineal tears: a systematic review. J Gynecol Obstet Biol Reprod (Paris).2015; 44 (9): 802–11.
[20] Vale de Castro Monteiro M, Pereira GM, Aguiar RA, Azevedo RL, Correia - Junior MD, Reis ZS. Risk factors for severe obstetric perineal lacerations. Int Urogynecol J.2016; 27 (1): 61–7.
[21] Woodman PJ, Graney DO. Anatomy and physiology of the female perineal body with relevance to obstetrical injury and repair. Clin Anat.2002; 15: 321–34.
[22] Fraser DM, Cooper MA. Myles' Textbook for Midwives.15th ed. Edinburgh: Churchill Livingstone; 2009. p.1148.
[23] Hudelist G, Mastoroudes H, Gorti M. The role of episiotomy in instrumental delivery: is it preventative for severe perineal injury? J Obstet Gynaecol.2008; 28 (5): 469–73.
[24] Ginath S, Elyashiv O, Weiner E, et al. The optimal angle of the mediolateral episiotomy at crowning of the head during labor. Int Urogynecol J.2017; 28 (12): 1795–9.
[25] Verghese TS, Champaneria R, Kapoor DS, Latthe PM. Obstetric anal sphincter injuries after episiotomy: systematic review and meta - analysis. Int Urogynecol J.2016; 27 (10): 1459–67.
[26] Shmueli A, Gabbay Benziv R, Hiersch L, et al. Episiotomy – risk factors and outcomes. J Matern Fetal Neonatal Med.2017; 30 (3): 251–6.
[27] Kapoor DS, Thakar R, Sultan AH. Obstetric anal sphincter injuries: review of anatomical factors and modifiable second - stage interventions. Int Urogynecol J.2015; 26 (12): 1725–34.
[28] Jiang H, Qian X, Carroli G, Garner P. Selective versus routine use of episiotomy for vaginal birth. Cochrane Database Syst Rev.2017; 2: CD000081.
[29] Poggi SG. Postpartum hemorrhage & abnormal puerperium. In: DeCherney AH, Nathan L, Laufer N, Goodwin TM, Roman A, editors. Current Diagnosis & Treatment: Obstetrics & Gynecology.11th ed. New York: McGraw Hill; 2007. p.349–69.
[30] Njoku CO, Onuh SO, Ezechi OC. Prevalence and risk factors for birth canal lacerations in Nigerian women. Int J Gynecol Obstet.2010; 110 (2): 100–4.
[31] Chikazawa K, Hirashima Y, Sakamoto H, et al. Laceration patterns in vaginal birth: a Taiwanese case series. Taiwan J Obstet Gynecol.2014; 53 (3): 320–4.
[32] Carroli G, Mignini L. Epidemiology of birth canal lacerations with operative vaginal delivery in Malawi. Trop Med Int Health.2009; 14 (7): 781–7.
[33] World Health Organization. Managing complications in pregnancy and childbirth: a guide for midwives and doctors. Geneva: WHO; 2017.