MEDICINE UPDATES JOURNAL

Faculty of Medicine Port Said University

Volum: 29 No: 2 PP: 26 - 36

" *Anovaginal Distance Measured by Transperineal Ultrasound as a Predictor for Birth- Related perineal Trauma* "

Authors

Menatallah Mohamed Dawoud [1], Mohamed Abdel-Hamied Metawie[2], Mohamed Hafez Mohamed Younis [3], Bedour Saied Mohamed Abdelghany [4]

[1] Faculty of Medicine Port Said University Hospital

[2] Professor of obstetrics and gynecology in Faculty of medicine PortSaid University

[3]Lecturer in Obstetrics & gynecology Department, Faculty of Medicine, Port Said University

[4]Lecturer of Obstetrics & gynecology Department, Faculty of Medicine, Port-Said University, Egypt

Submitted: 2025-09-07

Accepted: 2025-09-28

DOI: 10.21608/muj.2025.421536.1261

ISSN : 2682-2741

https://muj.journals.ekb.egdean@med.psu.edu.eg

vice_dean_postgraduate@med.psu.edu.eg

ABSTRACT:

Background: Birth- related perineal trauma (BPT) complicates more than 90% of vaginal deliveries and obstetric anal sphincter injuries (OASIS) are the severe degree of BPT. Transperineal Ultrasonography (TPUS) can be used to measure Anovaginal distance (AVD) which probably relates to OASIS.

Aim: To determine the relation between AVD measured by TPUS and BPT.

Patients and methods: Prospective Observational study included 140 Nulliparous women in the obstetric emergency department in the Hospital of Suez Canal University from June 2024 to May 2025. After the approval of the ethical committee and after participants consent, nulliparous women with singleton vertex pregnancy who gave spontaneous vaginal delivery between 37 to 40 weeks of gestation were recruited. Each participant was interviewed for history, examination and ultrasound (US) assessment then observed through and after delivery.

Results: Analysis revealed an extremely statistically significant association between AVD measured by TPUS and the degree of perineal tears ($p<0.001$).

Conclusion: Short maternal AVD is considered a risk factor for BPT and OASIS.

Background

Birth- related perineal trauma (BPT) complicates more than 90% of vaginal deliveries.[1] There is lack of updated evidence about BPT incidences worldwide.[2,3] Severe perineal lacerations are known as obstetric anal sphincter injuries (OASIS).[4] OASIS can lead to anal incontinence, urge symptoms,[5] chronic dyspareunia,[6] rectovaginal fistulas or rectoperineal fistulas.[7] Meticulous timely examination of BPT after childbirth by skillful specialist is indispensable.[8] Early detection, surgical repair and post-operative care and follow up of OASIS should be offered.[8,9] Short maternal Anovaginal distance (AVD) is thought to be a potential indicator of perineal body deficiency and OASIS risk subsequently.[10] OASIS risk factors identification is the key to optimize the obstetrical practice and set a prevention plan to reduce the incidence of BPT, OASIS and their associated morbidities.[8] Transperineal Ultrasonography (TPUS) is a safe, feasible, noninvasive diagnostic tool. Perinatal TPUS is a successful tool for AVD measurement.[10-12] Therefore, this study get use of TPUS applications to investigate the relation between AVD and the degree of BPT. Utilizing clinical observations, this study provided updated evidence about the current incidence of BPT and its risk factors at the Suez canal region.

Aim and objectives:

To determine the relation between the AVD measured by TPUS and the degree of BPT among nulliparous women with singleton pregnancy.

To determine incidence of BPT and its related risk factors among nulliparous women with singleton pregnancy.

To test the validity of US in estimating fetal birth weight.

Patients and methodology of the study:

Prospective Observational study was conducted in agreement with the standards of ethical committee of Port Said University on 140 Nulliparous women with singleton vertex pregnancy who attended to the obstetric emergency department in Suez Canal University Hospital to give spontaneous vaginal birth between 37 to 40 weeks of gestation from June 2024 to May 2025. Cases with medical disorders, anatomical perineal disorders, fetal macrosomia, fetal malpresentations, complicated labors or who refused to participate were excluded and replaced by other eligible cases.

Methods: history, examination and ultrasound (US) assessment then the participants were observed through and after delivery.

- Firstly, relevant general and obstetric history then general examination to determine eligibility for the study. Measurement of body mass index (BMI) in kg/m^2,[13]uterine contractions assessment and Pervaginal (PV) examination was done.

- Secondly, US examination started by transabdominal US for routine fetal well-being assessment, expected fetal birth weight (EFBW) measurement and confirmation of gestational age (GA). GA at time of assessment was estimated by subtracting the number of days remaining until the estimated date of delivery (EDD) from the standard gestational period of 280 days. EDD was

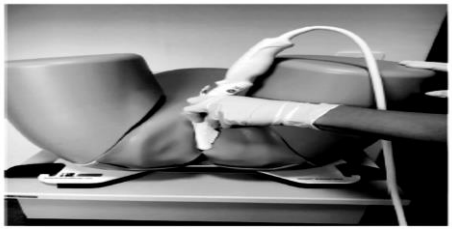
calculated based on LMP using Naegele's rule[14] provided by availability of reliable last menstrual period (LMP) or documented fetal biometry US examination. EFBW was estimated using transabdominal US. through validated formulas integrated into the US system such as Hadlock formula.[15]

Then, TPUS examination for measuring AVD was standardized in each case as following :

- The patient was examined in lithotomy position during the 1st stage of labor.
- The same US device and probe was used by the same investigator with the same device measurement parameters in each case. The vaginal probe of ARIETTA 65 device (Japan, Hitachi) equipped with endovaginal probe 5-9 MHz and abdominal probe 3.5 – 5 MHZ was used.
- The same technique that was used to measure AVD in each case as shown in **figure1.** [10] The transvaginal probe placed at right angle to the posterior vaginal wall and the probe moved in cranial direction in the mid line plane without excessive pressure until anal sphincters could be seen. The distance between the anal edge of the internal anal sphincter and the probe was recorded in millimeters (mm) as AVD for each case.

▪ Thirdly, Highlighted intrapartum events and potential risk factors of BPT for each participant were observed using Labor Care Guide (LCG) that issued by the World health organization (WHO) in 2018.)[16]

Figure (1): TPUS Technique for measuring the AVD[10].



▪ Finally, examination of perineum immediately after labor was standardized by:

- Assessment was in lithotomy position under adequate lighting.
- perineal tear type was classified according to the Royal College of Obstetricians and Gynecologists (RCOG) classification as shown in table1[1].

▪ Actual fetal birth weight was measured to determine the relation between EFBW and actual weight after birth.

Table (1): Degrees of perineal tears[1].

Degree		Definition
First		Laceration of the vaginal mucosa or perineal skin only
Second		Laceration involving the perineal muscles
Third		Laceration involving the anal sphincter muscles, being further subdivided into 3A, 3B and 3C:
	3A	Where <50% of the EAS is torn
	3B	Where >50% of the EAS is torn
	3C	Where the EAS and IAS are torn
Fourth		Laceration extending through the anal epithelium (resulting with a communication of the vagina epithelium and anal epithelium)

Results:

All collected data was revised, coded and managed using Statistic Package for Social Science Version 22 (SPSS 22).

Descriptive statistics: The study included 140 women between 18 to 35 years old. The mean BMI of the participants was 31.3 kg/m2. Regarding physical activity, only 29% of the women were used to do regular exercise activities as shown in **table2.** Regarding the TPUS examination, the AVD measured in the studied population ranged between 19 and 36 mm, and the mean AVD was 26 mm (SD: 3.2) as shown in **table3**. Example of TPUS image illustrating AVD measurement is shown in **figure2** regarding intrapartum events, Episiotomy was used in prim parous deliveries at a rate of 75.7%. Oxytocin was used in 69.3% of the cases. Most of the deliveries, about 91.4%, were managed using "hands-on" technique to support the perineum, and controlled head delivery was done. 87.9% of the women delivered in the lithotomy position. The mean duration of the second stage of labor was 45.1 minutes as shown in **table 4**. Postpartum assessment showed that only 16 women (11.4%) did not have tears after delivery, while 88.6% experienced BPT, as explained in **table5**.

Table (2): General demographic description of the participating women (N=140)

Age (years)	**Range**	**18 – 35**
	Mean ± SD	**24.6 ± 3.6**
BMI (Kg/m^2)	**Range**	**41.6 – 22.9**
	Mean ± SD	**31.3 ± 3.8**
Physical activity	**Regular N (%)**	**29 (20.7 %)**
	Sometimes N (%)	**12.9 (12.9 %)**
	No N (%)	**93 (66.4 %)**

Table (3): Clinical observations at time of assessment (N=140)

Cervical dilatation (cm)	**Mean ± SD**	**4.4 ± 1.6**
Cervical effacement (%)	**Mean ± SD**	**64.1 ± 16.8**
GA (weeks)	**Mean ± SD**	**38.7 ± 0.79**
EFBW (gm)	**Mean ± SD**	**3761.3 ± 160.2**
Actual fetal weight after birth (gm)	**Mean ± SD**	**3607 ± 281.3**
AVD (mm)	**Range**	**19 – 36**
	Mean ± SD	**26 ± 3.2**

Figure (3) TPUS image of AVD measurement

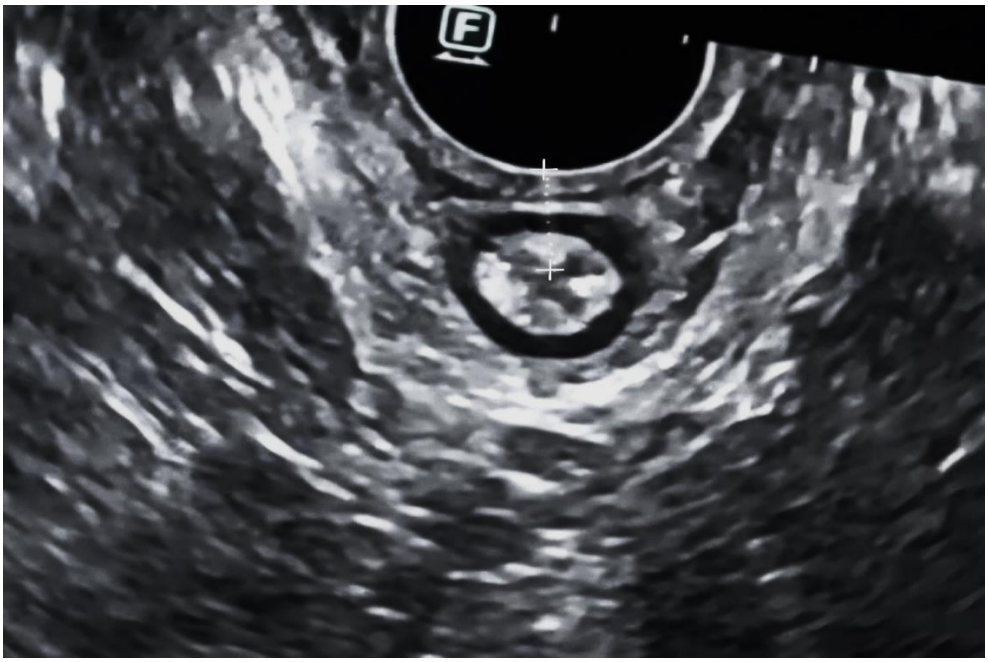


Table (4): Intrapartum observations of the study population (N=140)

	Yes N (%)	**No N (%)**
Oxytocin for labor augmentation	**97 (69.3)**	**43 (30.7)**
Episiotomy	**106 (75.7)**	**34 (24.3)**
Mother's position at head delivery		
lithotomy	**123 (87.9)**	
Squat	**9 (6.4)**	
Lying on side	**8 (5.7)**	
Perineal support	**128 (91.4)**	
controlled Head delivery	**128 (91.4)**	
2nd stage of labor duration (Min.)	**Mean ± SD**	**45.1#(20.5)**

Table (5): Incidence of postpartum perineal tears in population (N=140)

	item		Frequency (N)	Percentage (%)
BPT	**All types of tears**		**124**	**88.6**
	Para urethral tear	**Yes**	**20**	**14.3**
		No	**120**	**85.7**
	Lateral vaginal tear	**Yes**	**41**	**29.3**
		No	**99**	**70.7**
	Perineal tear (posterior)	**Yes**	**124**	**88.6**
		No	**16**	**11.4**
		1st degree	**96**	**68.5**
		2nd degree	**24**	**17.1**
		3rd degree	**4**	**2.9**
No BPT	**No tears at all**		**16**	**12.1**

Analytic statistics: An extremely statistical significant association ($p < 0.001$) between maternal AVD and the degree of perineal tears as shown in **table 6**. Fetal weight at birth demonstrated An extremely statistically significant association ($p<0.001$) with degrees of perineal tears as well. In contrast, maternal age and weight did not differ significantly as illustrated in **table 7**. Regarding the independent factors observed during the labor, it was found that the duration of the second stage of labor had a high statistically significant association with the degree of perineal tears ($p= 0.007$). as shown in **table 8**. Oxytocin usage had a high statistically significant association with perineal tears ($p=0.036$). The mother's position at head delivery had a remarkable statistically significant association with the degree of perineal tears ($p=0.012$). A strong statistically significant relationship between the degree of perineal tears and techniques of Perineal support and controlled Head delivery ($p=0.039$) and ($p= 0.036$) respectively as shown in **table 9**. Besides, the results demonstrated a moderately strong positive correlation ($r = 0.556$, $p<0.001$) between EFBW and actual fetal weight after birth as illustrated in **figure 3**.

Table(6) Relation of maternal AVD and degree of perineal tears (N=140)

		Maternal AVD Mean ± SD	P-value
Degree of perineal tears	**No perineal tear**	**28.6 ± 3.6**	**<0.001*[a]**
	1st degree	**26.3 ± 2.5**	
	2nd degree	**23.8 ± 3.4**	
	3rd degree	**19.8 ± 0.5**	

a: One-way ANOVA test; * Statistically significant at p < 0.05

Table(7): maternal and fetal characteristics Association with perineal tears (N =140)

	Degree of perineal tears Mean ± SD				P-value
	No tears	**1st degree**	**2nd degree**	**3rd degree**	
Maternal Age (year)	**24.6 ± 3.9**	**24.9 ± 3.7**	**23.9 ± 2.9**	**22 ± 3.6**	0.278
Maternal Weight (Kg)	**83.1 ± 10.1**	**81.5 ± 9.5**	**85.1 ± 11.9**	**89.4 ± 4.8**	0.215
Fetal weight (gm)	**3466 ± 254**	**3582 ± 236**	**3704 ± 330**	**4240 ± 55**	**<0.001*a**

a: one-way ANOVA test, *: statistically significant at P< 0.05

Table (8): Duration of second stage of labor and degree of perineal tears (N=140)

	Degree of perineal tears Mean ± SD				**P-value**
	No tears	**1st degree**	**2nd degree**	**3rd degree**	
Duration of second stage (Min.)	**45.9 ± 15.3**	**44.2 ± 20.2**	**42.4 ± 18.4**	**79.5 ± 33.8**	**0.007*a**

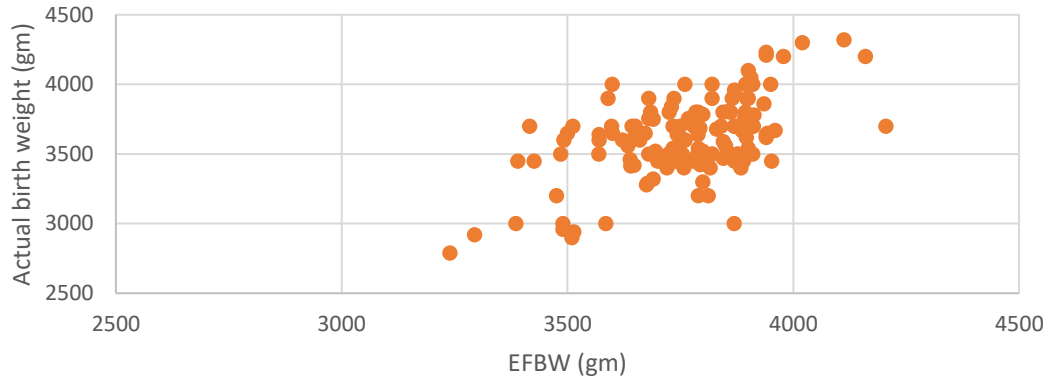
a: one-way ANOVA test, *: statistically significant at P< 0.05

Table (9): Association between delivery practices and perineal tears (N = 140)

		Degree of perineal tears N (%)				**P-value**
		No tears	**1st degree**	**2nd degree**	**3rd degree**	
Mother's position at head delivery	**Lithotomy**	**17 (100)**	**87 (91.6)**	**16 (66.7)**	**3 (75)**	**0.012*c**
	Squat	**–**	**3 (3.2)**	**5 (20.8)**	**1 (25)**	
	On side	**–**	**5 (5.3)**	**3 (12.5)**	**–**	
Head support	**Yes**	**17 (100)**	**89 (93.7)**	**19 (79.2)**	**3 (75)**	**0.036*c**
	No	**–**	**6 (6.3)**	**5 (20.8)**	**1 (25)**	
Perineal support	**Yes**	**17 (100)**	**90 (94.7)**	**17 (70.8)**	**4 (100)**	**0.039*c**
	No	**–**	**5 (5.3)**	**7 (29.2)**	**–**	
Usage of oxytocin	**Yes**	**9 (52.9)**	**72 (75.8)**	**9 (37.5)**	**1 (25)**	**0.007*c**
	No	**8 (47.1)**	**23 (24.2)**	**15 (62.5)**	**3 (75)**	

C: Fisher's exact test; *: statistically significant at P< 0.05

Figure (3): The relation between EFBW and the actual fetal weight at birth



Discussion: This prospective observational study investigates the relation between the AVD and the degree of BPT. It was found that the AVD mean ± SD was 26 ± 3.2 mm. Nearly similar results were reported in a Swedish study where The mean AVD was 24.3, 24.9, and 27.0 mm in the normal weight, overweight, and obesity group respectively.[17]Varied results were reported by an Italian study carried on 416 pregnant women between 18:32 weeks of gestation. AVD mean #SD in the Italian study was 22mm#8.[18] The variations in AVD values maybe due to variations in the study population GA and parity.

An extremely statistically significant inverse relationship ($p < 0.001$) between AVD and the severity of perineal tears was found along with an Italian study that reported AVD (<20 mm) as a Potential risk of BPT.[19] In this study, 2.9% had severe degrees of perineal tears i.e.OASIS and only 11.4% did not have any tears along with a study reported that BPT incidence is 75–85% but third- and fourth-degree tears incidence ranges from 5.1 to 8.3% .[20] Similarly, a study carried in Kasr Alainy OBGYN Hospital in Egypt reported that up to 75% of women had BPT of any type.[3]

Concerning the BPT independent risk factor, this study reported many statistically significant relations align with existing literature. Fetal macrosomia has been repeatedly identified as a key risk factor for severe perineal trauma. [21] a study was done in Southwestern Uganda and a study at Northwest Ethiopia, reported that long second stage of is a risk factor for OASIS. [22,23] This may reflect the fact that cumulative strain on the perineum over time increases the possibility for high degree perineal tears.

The use of oxytocic augmentation during labor has been reported to be significantly associated with severe perineal trauma. [١,20] . When oxytocin speeds labor, there will not be enough time for physiological adaption of perineal tissues to be stretchable enough and resist force at time of the fetal head delivery this may be the explanation for high BPT incidences.

In 2016, a systematic review revealed sitting, squatting or using a birth-stool had the greatest incidence of BPT.[24] this may be due to the increased tension of fetal head in such vertical positions. However, It is reported that the rates BPT are equivocal in lying and upright birthing modes. [25] This study found that perineal support and controlled fetal head delivery technique are highly statistically significant relation with degree of perineal tear. In A randomized trial, the “hands-on” technique reduced the

rate of OASIS, especially when combined with warm compresses and controlled delivery of the head. [26] From clinical observations, the supine lying position of the mother at time of fetal head delivery is usually ordered by physicians to facilitate the physician manipulations and accordingly, perfect perineal support and controlled head delivery practices can be applied. This is probably the reason of low incidence of BPT at women giving birth in lithotomy position. That is why judgment of the maternal position effect on incidence of BPT requires standardization of other factors in compared maternal positions at time of head delivery.

Besided, Along with a Nigerian study findings, this study analysis revealed a strongly positive correlation between EFBW and actual birth weight of babies.[28]

In contrast to this study findings, many studies reported maternal age as independent risk factors for BPT. A Swedish population-based register study from 1999 to 2011 concluded that risk of PBT increased from 25-29 years in primiparous women and the risk was doubled at age equal or more than 35 years. [27] This disagreement may be due exclusion criteria in this study that probably deviate the normal distribution of data. Therefore future studies on larger population samples can determine the relation between BPT and maternal age precisely.

Conclusion: AVD measured by TPUS can predict the risk of BPT. Large fetal birth weight, long second stage of labor, oxytocin usage during labor, mother position during head delivery, "hands on" technique of perineal support and controlled head delivery were statistically significant factors for the occurrence and severity of BPT.

Recommendations: Women with short AVD should have optimal obstetric care and preventive measures.

References:

1. Okeahialam NA, Sultan AH, Thakar R. The prevention of perineal trauma during vaginal birth. American Journal of Obstetrics and Gynecology. 2023 Aug 11;230(3).

2. Aguiar M, Farley A, Hope L, Amin A, Shah P, Manaseki-Holland S. Birth-Related Perineal Trauma in Low- and Middle-Income Countries: A Systematic Review and Meta-analysis. Maternal and Child Health Journal. 2019 Mar 26;23(8):1048–70

3. Sadek O, Fahim N, Yehia H, Elmashad M, Alaa F, Rakha A, et al. Incidence of Episiotomy in Kasr Alainy OBGYN Hospital in Cairo, Egypt: a Cross-Sectional Study. Obstetrics and Gynecology International. 2025 Jan;2025(1).

4. ACOG Committee on Practice Bulletins-Obstetrics. ACOG Practice Bulletin No. 198: Prevention and Management of Obstetric Lacerations at Vaginal Delivery. Obstetrics & Gynecology. 2018 Sep;132(3):e87–102.

5. Pihl S, Blomberg M, Uustal E. Internal anal sphincter injury in the immediate postpartum period; Prevalence, risk factors and diagnostic methods in the Swedish perineal laceration registry. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2020 Feb;245:1–6.

6. Rodaki E, Diamanti A, Sarantaki A, Lykeridou A. The Effects of Perineal Tears during Childbirth on Women's Sex Life. Maedica . 2022;17(2):297–305.

7. Sartore A, Maria Sole Scalia, Francesco Paolo Mangino, Savastano G, Magni E, Ricci G. Pelvic floor function after third and fourth degree perineal lacerations: a case-control study on quality of life. BMC women's health (Online). 2024 Jan 3;24(1).

8. Goh R, Goh D, Ellepola H. Perineal tears – A review. Australian Journal of General Practice. 2018 Jan 1;47(1-2):35–8.

9. Fernando R, Sultan A, Freeman R. The Management of Third- and Fourth-Degree Perineal Tears ,Green-top Guideline No. 29. The Royal College of Obstetricians and Gynaecologists; 2015 Jun :5–6.

10. Pihl S, Uustal E, Hjertberg L, Blomberg M. Interobserver agreement in perineal ultrasound measurement of the anovaginal distance: a methodological study. International urogynecology journal. 2017 Jun 17;29(5):697–701.

11. Stickelmann AL, Kennes LN, Hölscher M, Graef C, Kupec T, Wittenborn J, et al. Obstetric anal sphincter injuries (OASIS): using transperineal ultrasound (TPUS) for detecting, visualizing and monitoring the healing process. BMC Women's Health. 2022 Aug 10;22(1).

12. Hakim S, Santoso BI, Djusad S, Moegni F, Surya R, Kurniawan AP. Diagnostic capabilities of transperineal ultrasound (TPUS) to evaluate anal sphincter defect post obstetric anal sphincter injury (OASIS). A systematic review. Journal of Ultrasound. 2023 Jan 11.

13. Ellis SG, Elliott JE, Horrigan M, Raymond RE, Howell G. Low-Normal or Excessive Body Mass Index: Newly Identified and Powerful Risk Factors for Death and Other Complications With Percutaneous Coronary Intervention. Eur J Clin Nutr. 1996 Sep 1;78(6):642–6.

14. Lawson.GW.Naegele's rule and the lenghth of pregnancy- a review. Aust N Z J Obstet Gynaecol. 2021;61(2):177-82

15. Hadlock FP, Harrist RB, Martinez-Poyer J.In utero analysis of fetal growth : a sonographic weight standard. Radiology. 1991; 181 (1) : 129-33

16. Ghulaxe Y, Tayade S, Huse S, Chavada J. Advancement in Partograph: WHO's Labor Care Guide. Cureus. 2022 Oct 12;14(10).

17. Hjertberg L, Uustal E, Pihl S, Blomberg M. Maternal Body Mass Index and Anovaginal Distance in Active Phase of Term Labor. BioMed Research International. 2018;2018(7):1–6.

18. Villani F, Cosmi E, Lunardon Z, Granci M, Panizza C, Mazzucato B, et al. Antenatal Anovaginal Distance, a Potential Indicator of Perineal Damage during Pregnancy. Healthcare . 2024 Oct 15;12(20):2044–4.

19. Huber M, Larsson C, Lehmann J, Strigård K, Lindam A, Katarina Tunón. Sonographic postpartum anal sphincter defects and the association with pelvic floor pain and dyspareunia. Acta Obstetricia et Gynecologica Scandinavica. 2023 Jun 23;102(10):1290–7.

20. Głoćko P, Janczak S, Nowosielska-Ogórek A, Patora W, Wielgoszewska O, Kozłowski M, et al. Perspective on Perinatal Birth Canal Injuries: An Analysis of Risk Factors, Injury Mechanisms, Treatment Methods, and Patients' Quality of Life: A Literature Review. Journal of Clinical Medicine. 2025 May 20;14 (10):3583.

21. Birene B, Ferreira A, Raimond E, Graesslin O, Ishaque U, Gabriel R. Impact of screening for large-for-gestational-age fetuses on maternal and neonatal outcomes: a prospective observational study. Journal of perinatal medicine. 2024;53(3):367–75.

22. Ali M, Migisha R, Ngonzi J, Muhumuza J, Mayanja R, Jolly Joe Lapat, et al. Risk Factors for Obstetric Anal Sphincter Injuries among Women Delivering at a Tertiary Hospital in Southwestern Uganda. Obstetrics and Gynecology International. 2020 May 14;2020:6035974.

23. Dagne Addisu, Betelihem Fentahun. Risk factors associated with severe perineal tear at Public Hospitals in Bahir Dar town, Northwest Ethiopia. SAGE Open Medicine. 2024 Jan 1;12.

24. Lodge F, Haith-Cooper M. The effect of maternal position at birth on perineal trauma: A systematic review. British Journal of Midwifery. 2016 Mar 2;24(3):172–80.

25. O'Connor E, Monga D, Mylonas G, Constable L. Birthing position and its influence on perineal trauma in primiparous women. Journal of paediatrics and child health. 2019 mar;55(s1):125–5.

26. Angarita AM, Berghella V. Evidence-based Labor Management: Third stage of labor (Part 5). American Journal of Obstetrics & Gynecology MFM. 2022 May;100661.

27. Waldenström U, Ekéus C. Risk of obstetric anal sphincter injury increases with maternal age irrespective of parity: a population-based register study. BMC Pregnancy and Childbirth. 2017 Sep 15;17(1).

28. Eze CU, Abonyi LC, Njoku J, Okorie U, Owonifari O. Correlation of ultrasonographic estimated fetal weight with actual birth weight in a tertiary hospital in Lagos, Nigeria. African Health Sciences. 2016 Jan 18;15(4):1112