

Association of Obstetric Anal Sphincter injuries (OASIS) with duration of Second Stage of Labor

Maryam Bibi¹, Nabeela Rauf², Atyya Bibi Khan³, Ruqquia Sultana⁴

¹Resident urogynaecology, Ayub Teaching Hospital, Abbottabad

²Resident urogynaecology, Ayub Teaching Hospital, Abbottabad

³Assistant Professor Obstetrics and Gynae Ayub Teaching Hospital Abbottabad

⁴ Professor Obstetrics and Gynae Ayub Teaching Hospital Abbottabad

Author's Contribution

^{1,2}Substantial contributions to the conception or design of the work; or the acquisition, analysis, drafting,

⁴Final approval of the study to be published, ^{3,4}Drafting the work or revising it critically for important intellectual content, analysis, or interpretation of data for the work,

Conflict of interest: None

Funding source: None

Article received: 18-09-25

Article accepted: 25-11-25

Correspondence

*E: maryamirshad123@yahoo.com

Introduction

Anal sphincter injuries, particularly obstetric anal sphincter injuries (OASIS), represent a significant concern in modern obstetrics, with potentially long-lasting consequences for maternal health ^{1, 2}. These injuries, which include third- and fourth-degree perineal tears, affect the muscles surrounding the anal sphincter and may extend to the rectal mucosa. The outcomes of OASIS are often debilitating, leading to chronic fecal incontinence, pelvic floor dysfunction, dyspareunia, and psychological distress ³. Understanding the risk factors contributing to OASIS is vital for obstetric care, especially in regions with limited healthcare resources, where the long-term management of these injuries may be suboptimal. Risk factors for OASIS includes nulliparity, fetal macrosomia, instrumental delivery (forceps or vacuum-assisted), previous cesarean sections and increased duration of second stage of labor, contributing to a higher likelihood of sustaining OASIS during childbirth ⁴⁻⁵.

The second stage of labor, spanning from full cervical dilation to the birth of the infant is a critical phase of childbirth, has been strongly associated with an

ABSTRACT

Background: Obstetric anal sphincter injuries (OASIS) are a serious issue in contemporary obstetrics that can lead to negative repercussions on the health of women. These types of injuries including 3rd and 4th degree perineal tears, which involve the muscles around the anal sphincter and may also extend to the rectal mucosa. We investigated the correlation of long duration of second-stage of labor and occurrence of OASIS in women delivering at Ayub Teaching Hospital, Abbottabad.

Methodology: The study was a cross-sectional, observational study conducted at the authors' tertiary care center and included 105 women with full-term singleton pregnancies with diagnosis of prolonged second stage. Maternal demographics, obstetric history, labor characteristics, mode of delivery, perineal trauma and postpartum symptoms were collected. Second-stage labor duration: was dichotomized based on standard clinical definition. Data were summarized using descriptive statistics, and we conducted comparative analyses (Chi-square tests/t-tests) to examine the relationship between second-stage labor duration, assisted deliveries, episiotomy use and OASIS incidence with $p \leq 0.05$ considered significant.

Results: The prevalence of OASIS was 12.4% ($n=13$). Women with OASIS had a significantly longer mean second-stage labor duration (256.9 vs. 212.7 minutes, $p<0.001$). Mode of delivery was a key factor, with 69 (65.7%) of OASIS cases occurring in spontaneous vaginal deliveries and 24 (22.9%) in assisted deliveries. Episiotomy did not significantly reduce OASIS risk ($p=0.973$). Postpartum symptoms, including fecal incontinence (15.4%) and urinary incontinence (30.8%), were more common in women with OASIS.

Conclusion: Prolonged second-stage labor is a significant risk factor for OASIS, necessitating early intervention, perineal protection, and optimized labor management. Given the high postpartum morbidity, routine screening and pelvic floor rehabilitation should be integrated into postpartum care. Future research should focus on preventive strategies and long-term maternal outcomes.

Keywords: Obstetric anal sphincter injuries, prolonged second-stage labor, perineal trauma, episiotomy, assisted vaginal delivery, postpartum incontinence.

increased risk of OASIS ^{2, 6}. According to the American College of Obstetricians and Gynecologists (ACOG), a prolonged second stage is defined as lasting more than three hours in nulliparous women with an epidural, more than two hours without an epidural, and longer than two hours in multiparous women with an epidural (or one hour without) ⁶. When the second stage exceeds these durations, maternal tissues, particularly the perineum and anal sphincter, are exposed to prolonged mechanical stress and stretching, increasing the risk of severe perineal trauma ³⁻⁵.

Several studies have established the link between prolonged second-stage labor and an increased incidence of OASIS ³⁻⁵. The incidence of OASIS is variable in different studies however its true incidence is estimated to approximately be 11% ⁷. While similar studies are stable across diverse patient populations, the rate of findings and associated risk factors may differ according to practice contexts. In one study it was highlighted that although a number of studies have convincingly proved the association between

sustained second-stage labor and OASIS, preventing this problem has been less satisfactory, particularly studied in low-resource settings like Khyber Pakhtunkhwa (KPK), Pakistan. ⁸ Ayub Teaching Hospital, Abbottabad is a major regional hospital where data regarding maternal outcomes, especially with reference to the obstetric anal sphincter injuries are very inadequate. Delayed access to care, limited medical resources, and variable clinical practices could lead to differences in risks associated with prolonged labor compared to high-resource settings. However, the effect of these interventions (including episiotomy and assisted delivery which are frequently used in prolonged labour) has not been well evaluated within this context. Investigating the local prevalence of OASIS and its associated factors, this study hopes to fill in this gap and thus provide evidence-based recommendations for better labor management and maternal outcomes in the region.

Methodology

This cross-sectional study was planned to examine the association of prolonged second stage of labor with OASIS. The study was conducted in the Obstetrics Unit of Ayub Teaching Hospital, Abbottabad over a time period of six months after approval of the study protocol. We enrolled women of 18 to 49 years with full-term (≥ 37 weeks) pregnancies and in stage II of labor. Exclusion criteria: women with severe chronic medical conditions; history of previous anal sphincter injuries. By using the WHO formula, we obtained a sample size of 105 subjects assuming with an estimated 11% OASIS prevalence in prolonged second-stage labor cases, at least a 6% precision and P value < 0.05 ⁷. Non-probability consecutive sampling was employed to enrol eligible participants who met the inclusion criteria.

Trained research assistants used a standardized questionnaire to collect data after receiving informed permission and ethical approval. Demographic information such age, height, weight, BMI, education, occupation, and place of residence were included. Additionally, we gathered data on each participant's obstetric history, including parity, gestational age, fetal weight, and the length of the second stage of labor, as well as their medical history, including chronic conditions. Additional data regarding delivery mode, episiotomy use, and any interventions like assisted vaginal deliveries (forceps or vacuum) were recorded. We classified the second stage of labor using established clinical criteria: a duration exceeding three hours for first-time mothers (nulliparous) or two hours for women with previous births (multiparous) was considered prolonged. The degree of perineal injury, including third- and fourth-degree tears categorized as OASIS, was

carefully documented, along with details of any repairs or interventions required.

To protect participant privacy, all data were anonymized. The collected information was analyzed using SPSS version 27. Descriptive statistics summarized demographic and clinical characteristics, and the frequency of OASIS in the sample was calculated. To examine the relationships between prolonged second-stage labor and variables such as BMI, parity, and educational level, we used Chi-square tests.

Results

Among the 105 participants, 50.5% (n=53) had a normal BMI, while 36.2% (n=38) were overweight. The majority were primiparous (42.9%, n=45) or multiparous (39.0%, n=41). Most participants were housewives (52.4%, n=55), and 38.1% (n=40) had secondary-level education. Spontaneous vaginal delivery was the most common mode of delivery (65.7%, n=69), with 73.3% (n=77) delivering in the occiput anterior position. Nearly half of the participants (49.5%, n=52) had no perineal tear, while 12.4% (n=13) sustained OASIS. Surgical repair was required in all OASIS cases (12.4%, n=13). Labor complications occurred in 25.7% (n=27) of participants, and 54.3% (n=57) underwent an episiotomy [Table 1].

Table 1: The socio-demographic and clinical characteristics of the study population (n=105)

Maternal Socio-demographic and Clinical Characteristics		N (%)
BMI Category	Normal weight	53 (50.5%)
	Obese Grade I	13 (12.4%)
	Obese Grade II	1 (1.0%)
	Overweight	38 (36.2%)
Parity	Grand Multipara	19 (18.1%)
	Multipara	41 (39.0%)
	Primiparaous	45 (42.9%)
Occupation	Employed	33 (31.4%)
	Housewife	55 (52.4%)
	Self-employed	17 (16.2%)
Education Level	Bachelors or above	20 (19.0%)
	No formal education	10 (9.5%)
	Primary education	35 (33.3%)
	Secondary education	40 (38.1%)
Mode of Delivery	Assisted vaginal delivery	24 (22.9%)
	Caesarean section	12 (11.4%)
	Spontaneous vaginal delivery	69 (65.7%)

Fetal Position at Delivery	Occiput anterior	77 (73.3%)
	Occiput posterior	20 (19.0%)
	Other	8 (7.6%)
Type of Perineal Injury Sustained	First-degree tear	21 (20.0%)
	Fourth-degree tear (OASIS)	3 (2.9%)
	No perineal tear	52 (49.5%)
	Second-degree tear	19 (18.1%)
	Third-degree tear (OASIS)	10 (9.5%)
Interventions for Perineal Injuries	No intervention	73 (69.5%)
	Surgical repair	13 (12.4%)
	Suturing required	19 (18.1%)
Postpartum Symptoms	Fecal incontinence	2 (1.9%)
	None	80 (76.2%)
	Pelvic pain	19 (18.1%)
	Urinary incontinence	4 (3.8%)
Use of Episiotomy	No	48 (45.7%)
	Yes	57 (54.3%)
Complications During Labor / Delivery	No	78 (74.3%)
	Yes	27 (25.7%)
Obstetric Anal Sphincter Injury	No	92 (87.6%)
	Yes	13 (12.4%)

Table 2 presents the mean and standard deviation of key maternal characteristics (n=105). The mean maternal age was 23.7 ± 5.5 years. The mean BMI was 25.4 ± 4.0 kg/m², with a mean maternal weight of 65.7 ± 9.6 kg. The mean gestational age at delivery was 38.7 ± 1.4 weeks, indicating that most deliveries occurred at term.

Table 3 presents the distribution of fetal weight and the duration of the second stage of labor among the study population (n=105). The median fetal weight was 3.23 kg (IQR: 2.88–3.59 kg). The median duration of the second stage of labor was 216 minutes (IQR: 183.5–249 minutes), highlighting prolonged labor in many cases.

Table 4 compares key maternal and labor characteristics between women who sustained OASIS (n=13) and those who did not (n=92). Women with OASIS had a significantly longer mean second-stage labor duration (256.9 ± 27.5 minutes) compared to those without OASIS (212.7 ± 43.7 minutes, p<0.001). Other factors, including fetal weight (3.17 kg vs. 3.23 kg, p=0.969), gestational age (38.4 vs. 38.8 weeks, p=0.348), and BMI (26.1 vs. 25.3 kg/m², p=0.487), did not show significant differences.

Table 5 presents the association between OASIS and various delivery-related factors. OASIS was most common in spontaneous vaginal deliveries (69.2%,

n=9), though mode of delivery was not significantly associated with OASIS (p=0.901). Episiotomy rates were similar between groups (53.8% with OASIS vs. 54.3% without, p=0.973). All OASIS cases required surgical repair (100%, n=13, p<0.001). Labor complications were significantly more frequent in the OASIS group (53.8% vs. 21.7%, p=0.036). Postpartum symptoms were markedly higher in women with OASIS, including fecal incontinence (15.4% vs. 0%, p<0.001) and urinary incontinence (30.8% vs. 0%, p<0.001).

Table 2: Maternal Anthropometric Measurements and Gestational Age at Delivery

	Age of Mother (Years)	Weight (Kg)	Height (cm)	BMI (Kg/m ²)	Gestational Age at Delivery (Weeks)
Mean (n=105)	23.71	65.70	161.17	25.386	38.739
Std. Deviation	5.512	9.574	6.960	4.0185	1.4241

Table III: Fetal Weight and Duration of the Second Stage of Labor

		Fetal Weight (Kg)	Duration of Second Stage of Labor (Minutes)
Median (n=105)		3.2300	216.00
Percentiles	25	2.8800	183.50
	50	3.2300	216.00
	75	3.5850	249.00

Table 3: Comparison of Maternal and Labor Characteristics Between Women With and Without OASIS

	Obstetric Anal Sphincter Injury	N	Mean	SD	P value
Duration of Second Stage of Labor (Minutes)	Yes	13	256.92	27.470	<0.001
	No	92	212.68	43.703	
Fetal Weight (Kg)	Yes	13	3.1700	.55456	0.969
	No	92	3.2325	.49474	
Gestational Age at Delivery (weeks)	Yes	13	38.415	1.1239	0.348
	No	92	38.785	1.4608	
Age of Mother (years)	Yes	13	22.600	6.3365	0.440
	No	92	23.868	5.4061	

BMI (Kg/m2)	Yes	13	26.115	4.4476	0.487
	No	92	25.283	3.9698	

Table 4: Cross-Tabulation of Mode of Delivery, Episiotomy Use, Fetal Position, and Other Factors With OASIS

Cross-tabulation		No Obstetric Anal Sphincter Injury N (%)	Obstetric Anal Sphincter Injury N (%)	Total N (%)	P value
Mode of Delivery	Assisted vaginal delivery	21 (22.8%)	3 (23.1%)	24 (22.9%)	0.901
	Caesarean section	11 (12.0%)	1 (7.7%)	12 (11.4%)	
	Spontaneous vaginal delivery	60 (65.2%)	9 (69.2%)	69 (65.7%)	
Use of Episiotomy	Not done	42 (45.7%)	6 (46.2%)	48 (45.7%)	0.973
	Done	50 (54.3%)	7 (53.8%)	57 (54.3%)	
Fetal Position at Delivery	Occiput anterior	67 (72.8%)	10 (76.9%)	77 (73.3%)	0.332
	Occiput posterior	19 (20.7%)	1 (7.7%)	20 (19.0%)	
	Other	6 (6.5%)	2 (15.4%)	8 (7.6%)	
Interventions for Perineal Injuries	No intervention	73 (79.3%)	0 (0.0%)	73 (69.5%)	<0.001
	Surgical repair	0 (0.0%)	13 (100.0%)	13 (12.4%)	
	Suturing required	19 (20.7%)	0 (0.0%)	19 (18.1%)	
Complications During Labor / Delivery	No	72 (78.3%)	6 (46.2%)	78 (74.3%)	0.036
	Yes	20 (21.7%)	7 (53.8%)	27 (25.7%)	
Postpartum Symptoms	Fecal incontinence	0 (0.0%)	2 (15.4%)	2 (1.9%)	<0.001
	None	75 (81.5%)	5 (38.5%)	80 (76.2%)	
	Pelvic pain	17 (18.5%)	2 (15.4%)	19 (18.1%)	
	Urinary incontinence	0 (0.0%)	4 (30.8%)	4 (3.8%)	
BMI Category	Normal weight	47 (51.1%)	6 (46.2%)	53 (50.5%)	0.640
	Obese Grade I	10 (10.9%)	3 (23.1%)	13 (12.4%)	
	Obese Grade II	1 (1.1%)	0 (0.0%)	1 (1.0%)	
	Overweight	34 (37.0%)	4 (30.8%)	38 (36.2%)	
Parity	Grand Multipara	17 (18.5%)	2 (15.4%)	19 (18.1%)	0.691
	Multipara	37 (40.2%)	4 (30.8%)	41 (39.0%)	
	Primipara	38 (41.3%)	7 (53.8%)	45 (42.9%)	

Discussion

This study examined the association between prolonged second-stage labor and OASIS in a cohort of women delivering at Ayub Teaching Hospital, Abbottabad. Our results support previous findings in the literature by

confirming that protracted second-stage labor is a substantial risk factor for OASIS. We also investigated how fetal weight, labor difficulties, episiotomy, style of delivery, and postpartum symptoms affect the risk of OASIS. The results highlight the significance of focused treatments to reduce perineal injuries and offer crucial insights into labor management procedures.

Systematic review has reported that OASIS prevalence has been shown to be between 0.6% and 19.3% around the world, which supports the 12.4% found in our study ⁹. In a large cohort study, Leitch and Walker (2021) found that women with prolonged second stage of labor had a 1.5–3-fold increased risk of OASIS. Increased risk was also associated with fetal macrosomia, oxytocin, and operative vaginal deliveries (forceps or vacuum delivery). In another study, the protracted second stage also significantly predicted sphincter injury in addition to first-time delivery (primiparity), midline episiotomy, and large newborn size ^{7,10}. The rate in our sample is significantly higher than the 2.1% found in a Norwegian cohort by Selmer-Olsen et al. (2019) following preventative interventions ¹⁰. In another population-based study, 1.1% of the population was reported to have OASIS ¹¹. In a study by Sideris et al. (2020), 26% of women without any clinical suspicion of OASIS had ultrasound-identified sphincter abnormalities ¹². Variations in obstetric practice, including differences in labor management protocols, perineal protection strategies, and rates of instrumental delivery, have been shown to influence the incidence of OASIS across healthcare settings, which may have contributed to the higher prevalence in our study.

One of the main takeaways from this study is the strong link between OASIS and a longer second stage of labor. On average, women with OASIS had a second stage that lasted significantly longer—256.9 minutes compared to 212.7 minutes, with a p-value of less than 0.001. The median length recorded for the second stage was 216 minutes. This aligns with findings from Stairs et al. (2022), who noted that the risk of OASIS increased by 35% when the second stage lasted more than 90 minutes ¹³. Similarly, research by Bergendahl et al. (2022) showed that vacuum-assisted deliveries during prolonged labor raised the risk of postpartum anal incontinence ¹⁴. Since extended mechanical strain on the perineum significantly heightens the risk of damage to the anal sphincter, these results underscore how crucial it is to manage the second stage of labor effectively to prevent perineal injuries.

One key factor that impacts the risk of OASIS is how the delivery happens. In our study, we found that the

majority of OASIS cases (69.2%) occurred following spontaneous vaginal births, followed by assisted vaginal deliveries at 23.1%, and cesarean sections at just 7.7%. This aligns with D'Souza et al. (2019), which pointed out that vaginal births after cesarean (VBAC) carry a 1.4 times greater risk of OASIS, suggesting that having a previous cesarean might not always protect against serious perineal damage¹⁵. On top of that, kneeling positions during delivery were associated with a significantly lower rate of OASIS compared to lying down, as highlighted by Tunestveit et al. (2018)¹⁶. Our results hint that improving birth positions and managing pushing techniques might help lower the chances of severe perineal injuries.

The role of episiotomy in preventing OASIS is still a topic of discussion. In our findings, episiotomy didn't significantly raise the chances of OASIS ($p=0.973$). This matches other studies that suggest the likelihood of OASI occurring again isn't much affected by having an episiotomy. Interestingly, Räisänen et al. (2014) showed that while episiotomy reduced OASIS risk in first-time mothers, it increased risk in those who had given birth before, which contradicts our results¹⁹. Likewise, Viannay et al. (2021) argued that the protective benefits of episiotomy heavily depend on factors like the size of the baby, the skill of the person delivering the baby, and whether the method was midline or mediolateral²⁰. Our findings suggest that not every birth will gain from a standard episiotomy, so its use really should be considered carefully based on each patient's individual risk and delivery situation.

Several studies have identified fetal weight as a major risk factor for OASIS; however, in our investigation, there was no significant difference in mean fetal weight between women with and without OASIS (3.17 kg vs. 3.23 kg, $p=0.969$). In contrast, research by D'Souza et al. (2019) and Selmer-Olsen et al. (2019) revealed that fetal macrosomia (>3.5 kg) significantly raised the risk of OASIS^{10, 15}. In a similar vein, Mahgoub et al. (2019) verified that OASIS was significantly predicted by birth weights greater than 3.5 kg²¹. André et al. have previously documented a similar correlation between higher newborn birth weight and OASIS²². The lack of a significant association in our study may be attributed to sample size limitations or the potential impact of other variables such as fetal head circumference, which was not measured.

Another significant factor affecting the likelihood of OASIS in our research was labor difficulties. The percentage of women with OASIS who had labor problems was substantially greater (53.8%) than the percentage of women without OASIS (21.7%, $p=0.036$). This is consistent with research by Bergendahl et al. (2022) and Selmer-Olsen et al. (2019), which both discovered that extended second-stage labor and

oxytocin augmentation were linked to a higher risk of OASIS^{10, 14}. Additionally, research suggests that conditions such as shoulder dystocia are linked to a higher chance of OASI recurrence¹⁷. Additionally, Tunestveit et al. (2018) highlighted that regulated breathing methods might considerably lessen perineal stress during delivery instead of vigorous pushing¹⁶. These findings suggest that careful management of labor interventions, including oxytocin use and pushing techniques, may help reduce the burden of severe perineal trauma.

Regarding postpartum symptoms, our research revealed that 30.8% of women with OASIS experienced urine incontinence and 15.4% experienced fecal incontinence. The results of Sideris et al. (2020), who found that 38% of women with OASIS had chronic anal incontinence, are in line with these statistics¹². Additionally, women having early secondary OASIS repair saw a 37% complication rate, with fistula development being a major frequency, according to Barbosa et al. (2019)⁹. Our study's high percentage of postpartum complaints emphasizes the long-term effects of OASIS and the necessity of complete postnatal treatment, which includes early intervention techniques to lessen the effects of sphincter injuries and pelvic floor therapy. Maternal age and BMI did not significantly differ between women with and without OASIS. Nonetheless, other research has found that maternal age is a risk factor for OASIS²³. There was no discernible difference between the two groups' gestational ages at delivery. Nonetheless, some research has shown that a greater risk of OASIS recurrence is linked to an older gestational age¹⁷.

Our findings highlight the need for timely labor management to reduce OASIS risk, particularly in prolonged second-stage labor. Controlled pushing, perineal support, and selective episiotomy use should be prioritized. Given the high postpartum morbidity, routine pelvic floor rehabilitation and postpartum screening are essential. Training in alternative birthing positions and instrumental delivery techniques can further minimize perineal trauma, especially in low-resource settings like Ayub Teaching Hospital.

This study provides real-world data on OASIS risk factors in a low-resource setting, offering valuable insights into labor management and maternal outcomes. The inclusion of postpartum symptoms strengthens its clinical relevance. However the small sample size ($n=105$) and single-center design limit generalizability. Fetal head circumference and clinician expertise were not assessed, which could influence findings. Long-term follow-up was lacking, preventing evaluation of persistent postpartum complications.

Future research should include larger, multicenter cohorts with extended follow-up.

Conclusion

Prolonged second-stage labor significantly increases OASIS risk, emphasizing the need for early intervention, perineal protection, and optimized labor management. Mode of delivery, assisted vaginal birth, and labor complications also contribute to injury. Episiotomy did

not show a protective effect, reinforcing the need for selective use. Given the high postpartum symptom burden, routine postpartum care and rehabilitation should be prioritized. Future studies should explore preventive strategies and assess long-term maternal outcomes.

References

1. Barba M, Bernasconi DP, Manodoro S, Frigerio M. Risk factors for obstetric anal sphincter injury recurrence: A systematic review and meta-analysis. *Int J Gynaecol Obstet.* 2022;158(1):27-34.
2. Jangö H, Langhoff-Roos J, Rosthøj S, Sakse A. Modifiable risk factors of obstetric anal sphincter injury in primiparous women: a population-based cohort study. *Am J Obstet Gynecol.* 2014;210(1):59.e1-59.e9.
3. Harvey MA, Pierce M, Walter JE, Chou Q, Diamond P, Epp A, et al. Obstetrical anal sphincter injuries (OASIS): prevention, recognition, and repair. *J Obstet Gynaecol Can.* 2015;37(12):1131-48.
4. Segal D, Baumfeld Y, Yahav L, Yohay D, Geva Y, Press F, et al. Risk factors for obstetric anal sphincter injuries (OASIS) during vacuum extraction delivery in a university-affiliated maternity hospital. *J Matern Fetal Neonatal Med.* 2020;33(6):999-1003.
5. Goldberg J, Holtzman D, Hyslop T, Wheeler JM, Brody S, Pachtman S. Episiotomy and its association with severe perineal trauma in prolonged labor. *J Obstet Gynecol Neonatal Nurs.* 2018;47(3):283-90.
6. ACOG. ACOG Practice Bulletin No. 154: Operative Vaginal Delivery. *Obstet Gynecol.* 2016;127(5)
7. Dudding TC, Vaizey CJ, Kamm MA. Obstetric Anal Sphincter Injury: Incidence, Risk Factors, and Management. *Ann Surg.* 2008;247(2):224-37.
8. Leitch CR, Walker J. Risk factors for obstetric anal sphincter injuries during vaginal delivery. *Clin Exp Obstet Gynecol.* 2017;44(4):547-53.
9. Barbosa M, Glavind-Kristensen M, Christensen P. Early secondary repair of obstetric anal sphincter injury: postoperative complications, long-term functional outcomes, and impact on quality of life. *Tech Coloproctol.* 2020 Mar;24(3):221-229.
10. Selmer-Olsen T, Nohr EA, Tappert C, Eggebø TM. Incidence and risk factors for obstetric anal sphincter ruptures, OASIS, following the introduction of preventive interventions: A retrospective cohort study from a Norwegian hospital 2012–2017. *Sex Reprod Healthc.* 2019;22:100460. doi:10.1016/j.srhc.2019.100460
11. Meister MR, Cahill AG, Conner SN, Woolfolk CL, Lowder JL. Predicting obstetric anal sphincter injuries in a modern obstetric population. *Am J Obstet Gynecol.* 2016;215(3):310.e1-7.
12. Sideris M, Georgiou P, Okeahialam N, Bala R, Singhal N, Charalambous C, et al. Is routine endoanal ultrasound screening required after vaginal delivery? A prospective study. *J Obstet Gynaecol Res.* 2020;46(2):280–287. doi:10.1111/jog.14154
13. Stairs J, Brown MM, Smith A, et al. Association between second stage of labour length and risk of obstetrical anal sphincter injury in nulliparous women: a population-based retrospective cohort study. *Int Urogynecol J.* 2022;33:1583–1590. doi:10.1007/s00192-021-05070-9
14. Bergendahl S, Sandström A, Spasojevic A, Wendel SB. Anal incontinence after a prolonged second stage of labor in primiparous women. *Sci Rep.* 2022;12:7315. doi:10.1038/s41598-022-11346-x
15. D'Souza JC, Monga A, Tincello DG. Risk factors for obstetric anal sphincter injuries at vaginal birth after caesarean: A retrospective cohort study. *Int Urogynecol J.* 2019;30:1747–1753. doi:10.1007/s00192-019-03978-x
16. Tunestveit JW, Baghestan E, Natvig GK, Eide GE, Nilsen ABV. Factors associated with obstetric anal sphincter injuries in midwife-led birth: A cross-sectional study. *Midwifery.* 2018;62:264–272. doi:10.1016/j.midw.2018.04.012
17. Barba M, Bernasconi DP, Manodoro S, Frigerio M. Risk factors for obstetric anal sphincter injury recurrence: A systematic review and meta-analysis. *Int J Gynaecol Obstet.* 2021;155(3):320-329.
18. Naqvi M, Vicente L, Swanson K, et al. Prolonged second stage of labor and anal sphincter injury in a contemporary cohort of term nulliparas. *Am J Perinatol.* 2022;39(9):937-943.
19. Räisänen S, Selander T, Cartwright R, Gissler M, Kramer MR, Laine K, et al. The association of episiotomy with obstetric anal sphincter injury: A population-based matched cohort study. *PLoS ONE.* 2014;9(9):e107053. doi:10.1371/journal.pone.0107053
20. Viannay P, de la Codre F, Brochard C, Thubert T, Meurette G, Legendre G, et al. Management and consequences of obstetric anal sphincter injuries: A review. *J Visc Surg.* 2021;158(4):231–241. doi:10.1016/j.jvisc.2020.10.010
21. Mahgoub S, Pianta H, Gaudineau A, Parant O. Risk factors for obstetric anal sphincter injuries (OASIS) and the role of episiotomy: A retrospective series of 496 cases. *J*

- Gynecol Obstet Hum Reprod. 2019;48(10):657–662. doi:10.1016/j.jogoh.2019.08.004
22. André K, Stuart A, Källén K. Obstetric anal sphincter injuries—Maternal, fetal and sociodemographic risk factors: A retrospective register-based study. *Acta Obstetrica et Gynecologica Scandinavica*. 2022 Nov;101(11):1262-8.
23. Walsh M, Fitzpatrick M, Anglim B. Obstetric anal sphincter injury—the long game: primary and cumulative anal sphincter injury during childbirth and its long-term implications—a clinical practice review. *Gynecology and Pelvic Medicine*. 2023 Jun 30;6.