

# Prevalence and risk factors of obstetric anal sphincter injuries: analyses of eight thousand vaginal deliveries

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## Abstract

**Introduction:** Obstetric anal sphincter injuries (OASIS) following vaginal childbirth are a major cause of fecal incontinence which can have tremendous impact on women's quality of life. Unfortunately, these are often missed at the time of delivery. Recognition of potential risk factors may help increase awareness and detection rate of OASIS in routine obstetric practice. The objective of this study was to determine the prevalence of OASIS and associated risk factors in women undergoing vaginal childbirth. **Materials and Methods:** This was a retrospective chart review of 8,475 women undergoing vaginal delivery at Department of Obstetrics and Gynecology, Siriraj Hospital during 2010 and 2012. Inclusion criteria were singleton, cephalic presentation, gestational age  $\geq$  20 weeks, live births, no history of cesarean section and complete medical record. OASIS was defined as third- and fourth-degree perineal tears. Women's baseline characteristics and factors potentially associated with OASIS were recorded. Chi-square and Student T-tests were used to demonstrate the correlation between OASIS and non-OASIS groups. Univariate and multiple logistic regression analyses were performed to determine significant predictors of OASIS. **Observations and Results:** Overall prevalence of OASIS was 5.4%. With two-step analyses, birth weight over 3,500 g was confirmed as the strongest predictor for OASIS (OR 6.26; 95% CI 3.79–10.32). Other risk factors included occiput posterior position (OR 5.54), instrumental delivery (OR 3.54), primiparity (OR 3.22), prolonged second stage of labor (OR 2.23), and short stature (OR 1.8) respectively. **Conclusion:** Preventive strategies and proper management during intrapartum and postpartum period are essential for all women at risk in order to avoid anal sphincter injuries.

**Keywords:** obstetric anal sphincter injuries (OASIS); odds ratio; prevalence, risk factor; vaginal delivery.

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## INTRODUCTION

It was estimated that approximately 70% of women had experienced some degree of perineal trauma following vaginal childbirth<sup>1</sup>, of which obstetric anal sphincter

injuries (OASIS) seemed to be the major concern. Reported incidence of OASIS varies from one study to another depending on different obstetric practice and predisposing factors. With routine episiotomy, OASIS can be diagnosed in 0.5-5% of vaginal deliveries in centers where mediolateral episiotomy is practiced<sup>2</sup> and up to 19% among those with midline episiotomy<sup>3</sup>. The incidence also varies in women with different risk factors which include primiparity, labor induction, prolonged second stage of labor, persistent occiput posterior position, shoulder dystocia, birth weight over 4 kg, operative vaginal delivery, and epidural analgesia<sup>4</sup>. Sphincter tears are often missed at the time of delivery. These unrecognized and sustained injuries are the most common cause of fecal urgency and incontinence in women with the prevalence of 4-6% within one year after

vaginal delivery<sup>5</sup>. Fecal incontinence and associated symptoms, such as perineal pain and dyspareunia, can have tremendous effects on women's physical and psychosexual health and occasionally lead to medico-legal issues<sup>6</sup>. Preventive strategies and proper management are essential in order to improve patient outcomes. To achieve this goal, many hands-on workshops have been provided worldwide to help increase awareness of OASIS risk factors and recognition of anal sphincter injuries, as well as improve surgical skills for high standard repair among obstetricians and related healthcare personnel. As one of the training centers in Obstetrics and Gynecology with more than 3,000 vaginal deliveries per year, our institution has become involved in the national policy on maternal healthcare. We are deeply concerned with the problems of OASIS and its impact on women's quality of life. Primary, secondary, and tertiary preventive measures have been investigated and carried out. For the first two steps of prevention, we aimed to boost awareness and detection rate of anal sphincter injuries among our attending staff and trainees. As a result, this retrospective study was conducted with the objective of determining the prevalence of OASIS and their associated predisposing factors in the routine obstetric practice. In the meantime we have partially incorporated the hands-on perineal workshop into our training protocol, planning to fully implement this as one of the tertiary preventive schemes for OASIS in the near future.

## MATERIALS AND METHODS

With the Institutional Ethics Committee approval, the retrospective chart review of women undergoing vaginal delivery at the Department of Obstetrics and Gynecology, Siriraj Hospital between 2011 and 2013 was performed. Only cases with singleton, cephalic presentation, gestational age of 20 weeks or more, live births, no previous history of cesarean section and complete medical record were included. Obstetric anal sphincter injuries (OASIS) were defined according to the Royal College of Obstetricians and Gynaecologists (RCOG) classification of perineal trauma<sup>3</sup> as the third- and fourth-degree tears of which injuries involved the anal sphincter complex<sup>4</sup>. Women's baseline characteristics such as age, weight, height and calculated body mass index (BMI) were recorded. Factors which were potentially associated with an increased risk of OASIS including parity, birth weight, head position, duration of second stage of labor, instrumental delivery, episiotomy status, and use of epidural analgesia were taken into account.

## STATISTICAL ANALYSIS

All statistical analyses were performed using the Statistical Packages for the Social Sciences version 18 for

Windows (PASW statistic18). Continuous variables were presented as mean  $\pm$  standard deviation whereas categorical data were expressed in terms of number and percentage. Independent-samples T-test and Pearson chi-square test were used to demonstrate the correlation between OASIS and non-OASIS groups with the p-value of less than 0.05 being considered as an indicator for statistical significance. Univariate analysis was performed in order to determine significant predictors for anal sphincter injuries. Prior to calculation continuous variables such as age, height, BMI, parity, birth weight, and duration of second stage of labor were transformed into categorical subsets as generally used in obstetric research. BMI was categorized as normal, overweight, and obesity according to the Institute of Medicine (IOM) recommendations<sup>7</sup>. The second stage of labor was considered to be prolonged when exceeding 1 hour in multiparas and 2 hours in nulliparas with regard to obstetric definitions<sup>8</sup>. Instrumental delivery comprised forceps and vacuum assisted, with the latter being the most preferable method of choice. Although episiotomy has been widely practiced in our institution, there was no information regarding its type (midline or mediolateral) in the data source. Finally, adjusted odds ratios with 95% confidence intervals were calculated using multiple logistic regression analysis in order to adjust for potential confounders and to highlight the risk factors which were independently associated with OASIS.

## OBSERVATIONS AND RESULTS

Medical records of 8,475 women undergoing vaginal delivery at the Department of Obstetrics and Gynecology, Siriraj Hospital between 2011 and 2013 were reviewed. Obstetric anal sphincter injuries (OASIS) occurred in 454 cases, yielding a prevalence of 5.4%. Information regarding women's baseline characteristics was displayed in Table 1. Overall, the mean age was  $26.42 \pm 6.20$  years, the average weight was  $65.79 \pm 10.7$  kg, the average height was  $158.41 \pm 5.90$  cm, and the mean BMI was  $26.21 \pm 3.92$  kg/m<sup>2</sup>. Although there were statistical differences when comparing data among those with and without OASIS, no clinical significance was found. The correlation between OASIS and non-OASIS groups in terms of various predisposing factors was demonstrated in Table 2. All except epidural analgesia were significantly correlated with sphincter trauma. With univariate analysis, seven variables including high BMI (overweight and obesity), primiparity, birth weight above 3,500 g, prolonged second stage of labor, occiput posterior position, episiotomy, and instrumental delivery were identified as significant predictors for anal sphincter injuries (Table 3). Among these, occiput posterior position carried the highest, up to 7 times, risk (OR 6.9;

95% CI 4.35–10.93;  $p < 0.001$ ) whereas episiotomy had the lowest risk (OR 1.62; 95% CI 1.08–2.45;  $p = 0.02$ ). Noticeably, short stature seemed to increase risk of OASIS; however, there was no statistical significance ( $p = 0.065$ ). To adjust for possible confounding factors, all variables were integrated into multiple logistic regression analysis. Table 4 clearly demonstrated different outcomes between univariate and multiple logistic regression analyses. There was a dramatic increment in odds ratio in two groups including primiparity (OR 3.22; 95% CI 2.52–4.11;  $p < 0.001$ ) and birth weight over 3,500 g (OR 6.26; 95% CI 3.79–10.32;  $p < 0.001$ ). Other predisposing factors, with significant but slightly declining odds ratio, were prolonged second stage of labor (OR 2.23; 95% CI 1.48–3.37;  $p < 0.001$ ), occiput posterior position (OR 5.54; 95% CI 3.34–9.20;  $p < 0.001$ ), and instrumental delivery (OR 3.54; 95% CI 2.59–4.84;  $p < 0.001$ ). High BMI and episiotomy were no longer considered as independent predictors for OASIS. Surprisingly, short stature turned out to be another important risk factor for anal sphincter tears with an adjusted odds ratio of 1.8 (95% CI 1.2 – 2.8;  $p = 0.005$ ).

## DISCUSSION

The overall prevalence of obstetric anal sphincter injuries among women undergoing vaginal delivery at the Department of Obstetrics and Gynecology, Siriraj Hospital between 2011 and 2013 was 5.4% which seemed to be consistent with the results from many studies. However, this finding could be considered as under-detection. Often, anal sphincter injuries cannot be recognized at the time of delivery especially those with partial tears. Being aware of OASIS predisposing factors can potentially increase the detection rate among women at risk. Results from our study regarding OASIS risk factors were in harmony with those from previous trials. Predictors which were independently associated with anal sphincter injuries ( $p < 0.001$ ) included birth weight over 3,500 g (6.2-fold), occiput posterior position (5.5-fold), operative vaginal delivery (3.5-fold), primiparity (3.2-fold), prolonged second stage of labor (2.2-fold), and short stature (1.8-fold) respectively. Although high BMI and episiotomy seemed to have some impact on OASIS during univariate analysis, no statistical significance was found when calculated using multiple logistic regression model. Due to differences in skeletal structure between Mongoloid and Caucasian, we decided to evaluate height separately from BMI. The height of less than 150 centimeters was considered as short stature. With the two-step analyses, we eventually discovered that short stature was also a significant predictor for sphincter damage. Our finding was comparable to a previous report from Srinagarind Hospital with a slight difference in the cut-off

point used to define short stature<sup>9</sup>. Information regarding the role of episiotomy has been inconclusive. Episiotomy was recognized by a number of studies as the risk factor strongly correlated with OASIS. The risk was reported to be as high as 18-fold in a study by DiPiazza *et al*<sup>10</sup>. On the contrary, protective effect with mediolateral episiotomy was determined by several authors<sup>11-12</sup>. According to the RCOG guidelines, episiotomy should only be performed when indicated and a mediolateral episiotomy is preferable with careful attention to the angle cut away from midline<sup>4</sup>. Although current evidence does not support the routine use of episiotomy, both midline and mediolateral episiotomy have been widely practiced in our institution. The rate of episiotomy among our study population was as high as 91.5% (7,757 out of 8,475) which was far from the ideal rate of 10% recommended by the World Health Organization<sup>13</sup>. Despite this extraordinary prevalence of episiotomy, our study failed to demonstrate any significant correlation between episiotomy and sphincter injuries. Perhaps, the protective effect of mediolateral episiotomy was responsible for this unexpected outcome. Second stage longer than 1 hour was often used by most literatures to define prolonged second stage of labor for both nulliparas and multiparas. With this definition, prolonged second stage of labor was found to carry as high as 4 times risk for anal sphincter injuries<sup>4</sup>. Interestingly, when strictly defined and differentiated according to the obstetric definitions as in this study (1 hour for multiparas and 2 hours for nulliparas), the risk was greatly reduced to only 2.2-fold. Primiparity has long been established by many researchers to be an independent risk factor for OASIS. The same conclusion was met in our study as primiparity incurred a 3-fold risk for sphincter tears. The possible explanation is that the perineal tissues of nulliparous women are unable to adapt to the stretching force of labor and become easily disrupted during vaginal childbirth. Similar to primiparity and prolonged second stage of labor, occiput posterior position was also significantly associated with sphincter trauma (OR 5.54). As vacuum extraction was the most popular method performed for operative vaginal delivery in our institution, both vacuum and forceps assisted deliveries were grouped together as instrumental delivery. Our findings were consistent with the results from numerous studies<sup>10,14</sup>. Instrumental delivery, especially vacuum extraction, was considered as an important predisposing factor for sphincter damage (OR 3.54). Macrosomia, defined as birth weight over 4 kilograms, was proven by many trials to have a major impact on OASIS. However, macrosomia was not common among our study population. As a result, we preferred a birth weight of more than 3,500 g to be the cut-off point for analysis purposes. Based on multiple

logistic regression analysis, birth weight over 3,500 g was confirmed as the strongest predictor (OR 6.26) for anal sphincter injuries in our study. Though some authors were able to identify the association between epidural analgesia and sphincter trauma, results from our study were

contradictory. Regarding information from statistical analyses, epidural analgesia did not seem to increase risk of OASIS among our study group (OR 0.74; 95% CI 0.30 – 1.86; p = 0.524). This could be due to an inadequate sample size for data analysis.

**Table 1:** Women’s baseline characteristics

	Overall (n = 8,475)	OASIS (n = 454)	Non-OASIS (n = 8,021)	P-value
Age(y)	26.42 ± 6.20	27.21 ± 6.08	26.37 ± 6.20	0.005
Weight(kg)	65.79 ± 10.69	64.88 ± 9.51	65.84 ± 10.75	0.063
Height(cm)	158.41 ± 5.90	157.60 ± 5.60	158.45 ± 5.91	0.003
BMI(kg/m <sup>2</sup> )	26.21 ± 3.92	26.12 ± 3.52	26.21 ± 3.94	0.612

Data are presented as mean + standard deviation.

**Table 2:** Correlation between OASIS and non-OASIS regarding predisposing factors

	OASIS (N = 454)	Non-OASIS (N = 8,021)	P-value
Parity	1.31 ± 0.63	1.63 ± 0.80	< 0.001
Birth weight (g)	3,123.28 ± 410.03	2,962.30 ± 445.66	< 0.001
Second stage of labor (min)	46.20 ± 35.95	26.87 ± 23.35	< 0.001
Occiput posterior position	26 (5.7)	70 (0.9)	< 0.001
Episiotomy	429 (94.5)	7,328 (91.4)	0.020
Instrumental delivery	80 (17.6)	278 (3.5)	< 0.001
Epidural analgesia	6 (1.3)	69 (0.9)	0.307

Data are presented as mean ± standard deviation or n (%)

**Table 3:** Multiple logistic regression of OASIS predisposing factors

	Univariate analysis		Multiple logistic regression	
	Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Maternal age ≥ 35 y	1.08 (0.78–1.49)	0.648	1.02 (0.71–1.45)	0.932
Short stature (<150 cm)	1.46 (0.98–2.19)	0.065	1.84 (1.20–2.81)	0.005
<b>BMI (kg/m<sup>2</sup>)</b>				
Overweight (25–29.9)	1.27 (1.04–1.56)	0.024	1.15 (0.93–1.43)	0.162
Obesity (≥ 30)	0.93 (0.69–1.26)		0.88 (0.64–1.20)	
Primiparity	2.82 (2.26–3.51)	< 0.001	3.22 (2.52–4.11)	< 0.001
<b>Birth weight</b>				
2,500–3,500 g	2.44 (1.58–3.78)	< 0.001	2.59 (1.66–4.03)	< 0.001
≥ 3,500 g	4.81 (2.98–7.76)	< 0.001	6.26 (3.79–10.32)	< 0.001
Prolonged second stage	4.0 (2.84–5.65)	< 0.001	2.23 (1.48–3.37)	< 0.001
Occiput posterior position	6.9 (4.35–10.93)	< 0.001	5.54 (3.34–9.20)	< 0.001
Episiotomy	1.62 (1.08–2.45)	0.020	0.85 (0.55–1.30)	0.446
Instrumental delivery	5.96 (4.55–7.80)	< 0.001	3.54 (2.59–4.84)	< 0.001
Epidural analgesia	1.54 (0.67–3.57)	0.307	0.74 (0.30–1.86)	0.524

**CONCLUSION**

Six independent risk factors of anal sphincter injuries following vaginal childbirth have now been established. Among these, birth weight over 3,500 g carries the highest risk. Most of our data are consistent with findings from previous literatures. However, short stature is another risk factor which should be taken into consideration. All women at risk especially those with multiple predisposing factors should receive special attention during intrapartum and immediate postpartum period in order to avoid any unfavorable outcomes. Obstetricians and related healthcare personnel should

foresee the possibility of sphincter trauma in individuals at risk. Informative counseling should be given whenever operative vaginal delivery is indicated. Early decision making for cesarean delivery may be considered in case of persistent occiput posterior position and a tendency of prolonged labor. Finally, thorough examination of perineal wound after vaginal delivery is mandatory for early detection and effective primary repair of obstetric anal sphincter injuries. Although there are some limitations regarding the nature of retrospective study, our research has possessed the advantage of having large study population in a single center with variety in patient

characteristics. We hope that the results from this study will be clinically implemented in our routine obstetric practice to help improve the quality of women's healthcare.

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### REFERENCES

1. Kettle C, Tohill S (2011) Perineal Care. *Clin Evid* 04:1401.
2. Sultan AH, Kamm MA, Hudson CN, Bartram CI (1994) Third degree obstetric anal sphincter tears: risk factors and outcome of primary repair. *BMJ* 308:887-891.
3. Fenner DE, Genberg B, Brahma P, Marek L, DeLancey JO (2003) Fecal and urinary incontinence after vaginal delivery with anal sphincter disruption in an obstetric unit in the United States. *Am J Obstet Gynecol* 189:1543-1550.
4. Royal College of Obstetricians and Gynaecologists (RCOG) (2007) The management of third- and fourth-degree perineal tears. Royal College of Obstetricians and Gynaecologists (RCOG), London.
5. MacArthur C, Bick DE, Keighley MRB (1997) Faecal incontinence after childbirth. *Br J Obstet Gynaecol* 104:46-50.
6. Sultan AH. Obstetric perineal injury and anal incontinence (1999) *Clin Risk* 5:193-196.
7. Committee on Obstetric Practice (2013) Obesity in pregnancy. *ACOG Comm Opin* 549:1-5.
8. Abnormal Labor. In: Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Rouse DJ, Spong CY (eds). *Williams Obstetrics*, 23rd edn. New York, McGraw-Hill Companies, pp 489-464.
9. Sooklim R, Thinkhamrop J, Lumbiganon P, *et al* (2007) The outcomes of midline versus medio-lateral episiotomy. *Reprod Health* 4(10):1-5. doi:10.1186/1742-4755-4-10
10. DiPiazza D, Richter HE, Chapman V *et al* (2006) Risk factors for anal sphincter tear in multiparas. *Obstet Gynecol* 107(6):1233-1237.
11. Helwig JT, Thorp JM, Jr, Bowes WA, Jr (1993) Does midline episiotomy increase the risk of third- and fourth-degree lacerations in operative vaginal deliveries? *Obstet Gynecol* 82(2):276-279.
12. Coats PM, Chan KK, Wilkins M, Beard RJ (1980) A comparison between midline and mediolateral episiotomies. *Br J Obstet Gynaecol* 87(5):408-412.
13. World Health Organization maternal and newborn health/safe motherhood unit (1996) Care in normal birth: a practical guide. Report of a Technical Working Group Doc. No. WHO/FRH/MSM/96.24:29.
14. Patterson D, Hundley AF. Perineal Lacerations in Teen Deliveries. *Female Pelvic Medicine and Reconstructive Surgery* 2010; 16(6):345-48.

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