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ORIGINAL ARTICLE

Racial/Ethnic Impact on Obstetric Anal Sphincter Injuries: A Multicentric Retrospective Study

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Abstract

Introduction and Hypothesis Obstetric anal sphincter injuries (OASIs), third- and fourth-degree lacerations, represent a severe obstetric complication. Previous studies reported a higher incidence of OASIs in Asian women in non-Asian countries. This study was aimed at establishing a different OASIs prevalence among the racial/ethnic groups in Southern European centers.

Methods A multicenter retrospective study that included pregnant women who had vaginal singleton delivery between January 2019 and September 2022 in two Italian University hospitals, Naples and Novara, was conducted. We excluded cesarean sections, nonvertex presentation, preterm delivery, multiple pregnancies, congenital malformations, or stillbirths. Statistical analysis with an independent association of ethnicity to the risk of OASIs using clinical characteristics-adjusted multivariate logistic regression was performed.

Results A total of 3,049 pregnant women were included. 2.33% (71 patients) had an OASI. The median age was 31 years (IQR 7.00) and median gestational age was 39 weeks (IQR 1.40). Mean birth weight was 3,300 g (IQR 580.00). 1' and 5' Apgar scores were 9 and 9. The univariate logistic regression was not statistically significant. Multivariate logistic regression model adjusted for baseline clinical characteristics showed an OR 2.540 (p value 0.01) for OASIs in Asian women. Primiparous and secondiparous were protective factors for OASIs with OR 0.224 (p value < 0.001) and OR 0.209 (p value 0.01).

Conclusions Our results confirm racial/ethnic disparities regarding OASIs, with an elevated risk for Asian women in Southern Europe. Prevention strategies and obstetric care in developed countries should be modulated to offset the risk of OASIs in this population. Additional research is needed to explain the specific mechanisms of these disparities.

Keywords Delivery · Maternal origin · Obstetric anal sphincter injury · Perineal laceration · Asian · Ethnicity

.Introduction

In recent years, evidence-based labor and delivery management have advanced and improved fetal and maternal outcomes [1–4]. Obstetric anal sphincter injuries (OASIs) remain severe complications that dramatically impact women's quality of life [5], as they involve laceration of vaginal and perianal muscles up to the anal mucosa and sphincters [6]. It is known that third- and fourth-degree lacerations show different degrees of severity and variable long-term implications [7, 8]. A third-degree laceration includes the perineal muscles and the anal sphincter, whereas a fourth-degree laceration involves the anal sphincters as well as the anal mucosa [7, 8]. OASIs can significantly contribute to short-term morbidity and long-term complications ranging from perineal pain, sexual dysfunction up to pelvic floor disorders, including anal incontinence. An incidence of OASIs

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of 4.4% has been reported [9], with a severe burden of psychological, physical, and social implications [10]. Based on different conditions and populations, incidents of OASIs vary notably between regions: the reported incidences are between 1.7% and 10.2%. An incidence of 1.7% was reported in some Asian countries, whereas in Norway, it accounted for 4.1%, 10.2% in the USA, and 3.5% in Australia [11–14]. Demographic and obstetric factors, along with intrapartum care, have been found to be linked to a higher risk of severe perineal lacerations [15–17]. Variables such as nulliparity, persistent occiput posterior position, midline episiotomy, older maternal age, and instrumental delivery emerged as risk factors [15–17]. Further, ethnic/racial disparity is recognized as an independent risk factor for OASIs [18], as shown in several studies exploring the influence of racial and ethnic disparities on OASIs [18, 19]. Interestingly, although an increased rate of OASIs in Asian ethnicity has been reported in high-income countries [11, 20–26], this finding has not been confirmed in Asian women living in an Asian country [11–13]. Ethnic differences with regard to OASIs in countries such as Australia, Canada, Norway, or the USA suggest that considerations other than racial or genetic profile should be considered [11, 20–26]. Examples include differences in maternity care practices, such as labor and delivery management (episiotomies or preventive measures such as perineal support at the time of delivery) [27, 28]. All these considerations represent the critical issue of understanding the racial disparities and tailoring adequate preventive strategies.

Our multicentric retrospective study explored the incidence of severe third- and fourth-degree perineal lacerations among different races and ethnicities in a southern European nation (Italy) and in two geographically different centers. Our primary objective was to assess the role of maternal ethnicity as a risk factor for OASIs in Italy. As secondary outcomes, we analyzed the impact of other potential risk factors on the incidence of OASIs.

Materials and Methods

A multicentric retrospective study was conducted within the Gynecology and Obstetrics Unit of the University of Campania "Luigi Vanvitelli", Naples, and the Gynecology and Obstetrics Unit of the University Hospital Maggiore della Carità, Novara. The database of these two university centers (including comprehensive maternal and neonatal information) on vaginal deliveries performed from January 2019 to September 2022 was used for data collection. Bias due to the retrospective nature of this study was mitigated by physician data collection after delivery. For each pregnant woman the following obstetric and clinical information were available on the database: maternal age, pre-pregnancy BMI, smoking, parity, previous abortion, gestational age at delivery, episiotomy, birth weight, and Apgar scores 1' and 5'. Inclusion criteria were term pregnant woman undergoing a vaginal delivery with a vertex presentation, thus excluding all cesarean sections, nonvertex presentation, preterm delivery, pregnancies affected by malformations or stillbirth, and multiple pregnancies.

Institutional Review Board approval was obtained prior to the initiation of this retrospective study with the following protocol number 0011344/i.

The women enrolled were divided on the basis of the following race/ethnic groups: Blacks (African Americans, Africans), Asian (South Asia, Southeast Asia, Central Asia, Pacific Islanders), Latinas, Middle Easterners, and whites. The degree of laceration at the time of delivery (third- or fourth-degree) was always assessed by physicians using the standard criteria: third-degree lacerations involve the anal sphincter or its capsule, and fourth-degree lacerations extend into the rectal mucosa. In these two centers the episiotomy is not routinely carried out, but is at the discretion of the birth attendant if indicated. All episiotomies performed are mediolateral.

Two physicians (R.M. and L.T) performed data collection. Continuous variables were reported as either the means and standard deviation or median and interquartile ranges (IQRs) according to their distribution, as assessed by the Shapiro–Wilk normality test. Categorical variables were reported as percentages. Differences in clinical characteristics between patients with presence or absence of severe lacerations were tested by *t* test or Wilcoxon test (according to their distribution) and Pearson's Chi-squared test or Fisher's exact test for continuous and categorical variables respectively. To measure the linear association between continuous variables Pearson's correlation coefficient was used if variables had a normal distribution; otherwise, Spearman's correlation coefficient was calculated. To assess the probability of severe lacerations a logistic regression model was performed using the ethnicity class variable as predictor. To adjust for clinical variables, the estimates obtained in the univariate logistic regression models were used and a multivariate logistic regression model was performed using as covariates the baseline clinical characteristics significant at 5% in univariate analysis. Odds ratios (ORs) and 95% confidence intervals were used to measure the effects of ethnicity group on severe laceration event probability. For methodological details on the logistic regression model, the reader can refer to Wang et al. [29]. Statistical tests with p values smaller than 0.05 were considered statistically significant. All the statistical analyses were performed using R Studio Statistical software, version 4.1.3. For the sample size calculation, we refer to Okeahialam et al. [9], who reported an incidence of OASIs of 4.4%. The incidence of OASIs in our population was estimated at around 2.2%; using a power of 80% and an alpha of 0.05, we estimated a sample size of 653 deliveries.

Results

We included 3,049 pregnant patients with singleton vaginal deliveries during the period from January 2019 to September 2022. Regarding race and ethnicity, our population was categorized into the following subgroups: 79.4% white, 10.8% Asian, 3.9% Black, 3.3% Latina, and 2.6% Middle Eastern origin (Table 1). There were 71 cases of OASIs (2.33%), mainly among Caucasian and Asian groups (78.9% and 18.3% respectively, Table 1). Latina and Middle Eastern ethnicity had an OASIs rate of 1,4%, while Black reported no lacerations (Table 1). The median maternal age was 31 years (IQR 7.00) with a median gestational age at delivery of 39.7 weeks (IQR 1.4), and pre-pregnancy BMI was 23.92 kg/m^2 (IQR 6.00) (Table 2). Smoking habit has been recorded in 7.3% of our population. 51.0% were nulliparous, and 75.9% had no previous abortion (Table 2). Rate of episiotomy was 13.5%, equally distributed among groups. The median birth weight was 3,300 g (IQR 580.00). Apgar scores at 1 and 5 min showed a median of 9 (Table 2). The parity (p value < 0.001) and birth weight (p value 0.02) showed a statistically significant association with the occurrence of severe lacerations (Table 3). Univariate logistic regression model on OASIs did not evidence statistical significance (Table 4). To adjust for clinical variables, the multivariate logistic regression model and odds ratio (OR) was performed on the results of the univariate logistic regression models (Table S1) [29], and evidenced an increased risk of OASIs, with an OR of 2.23 for Asian ethnicity (95% CI 1.14–4.07, p value 0.01, Table 5). Previous deliveries confer a protective effect for OASIs, with ORs of 0.25 and 0.24 and a p value of < 0.001 and 0.03 respectively for the primiparous and secondiparous (Table 5). The birth weight had an OR of 1.001 (p value < 0.001) (Table 5).

Table 1 Ethnicity distribution by obstetric anal sphincter injuries

Ethnicity	Severe laceration		
	No, $N=2,978$[a]	Yes, $N=71$[a]	Overall, $N=3,049$[a]
White	2,366.0 (79.4)	56.0 (78.9)	2,422.0 (79.4)
Asian	316.0 (10.6)	13.0 (18.3)	329.0 (10.8)
Black	120.0 (4.0)	0.0 (0.0)	120.0 (3.9)
Latina	99.0 (3.3)	1.0 (1.4)	100.0 (3.3)
Middle Eastern origin	77.0 (2.6)	1.0 (1.4)	78.0 (2.6)

[a]Frequency (%)

Table 2 Baseline clinical characteristics of patients by severe laceration event

Characteristic	Severe laceration		
	No, $N=2,978$[a]	Yes, $N=71$[a]	Overall, $N=3,049$[a]
Age	31.00 (8.00)	31.00 (6.00)	31.00 (7.00)
BMI pre-pregnancy	23.97 (6.00)	23.46 (5.35)	23.92 (6.00)
Smoke			
No	2,759.0 (92.6%)	67.0 (94.4%)	2,826.0 (92.7%)
Yes	219.0 (7.4%)	4.0 (5.6%)	223.0 (7.3%)
Parity			
0	1,498.0 (50.3%)	56.0 (78.9%)	1,554.0 (51.0%)
1	1,049.0 (35.2%)	11.0 (15.5%)	1,060.0 (34.8%)
2	298.0 (10.0%)	3.0 (4.2%)	301.0 (9.9%)
≥ 3	132.0 (4.4%)	1.0 (1.4%)	133.0 (4.4%)
Number of abortions			
0	2,252.0 (75.7%)	58.0 (81.7%)	2,310.0 (75.9%)
1	543.0 (18.3%)	10.0 (14.1%)	553.0 (18.2%)
2	139.0 (4.7%)	2.0 (2.8%)	141.0 (4.6%)
≥ 3	40.0 (1.3%)	1.0 (1.4%)	41.0 (1.3%)
Gestational age	39.70 (1.40)	39.90 (2.00)	39.70 (1.40)
Mediolateral episiotomy			
No	2,577.0 (86.5%)	60.0 (84.5%)	2,637.0 (86.5%)
Yes	401.0 (13.5%)	11.0 (15.5%)	412.0 (13.5%)
Birth weight	3,290.00 (580.00)	3,430.00 (530.00)	3,300.00 (580.00)
Apgar 1 min	9.00 (1.00)	9.00 (1.00)	9.00 (1.00)
Apgar 2 min	9.00 (1.00)	9.00 (0.50)	9.00 (1.00)

[a]Median (IQR) or frequency (%)

Table 3 Association between baseline clinical characteristics of patients and severe laceration event

Characteristic	Severe laceration		*p* value*
	No, *N* = 2,978[a]	Yes, *N* = 71[a]	
Age	31.00 (8.00)	31.00 (6.00)	0.64
BMI pre-pregnancy	23.97 (6.00)	23.46 (5.35)	0.79
Smoke			0.82
No	2,759.0 (92.6%)	67.0 (94.4%)	
Yes	219.0 (7.4%)	4.0 (5.6%)	
Parity			0.00
0	1,498.0 (50.3%)	56.0 (78.9%)	
1	1,049.0 (35.2%)	11.0 (15.5%)	
2	298.0 (10.0%)	3.0 (4.2%)	
≥ 3	132.0 (4.4%)	1.0 (1.4%)	
Number of abortions			0.70
0	2,252.0 (75.7%)	58.0 (81.7%)	
1	543.0 (18.3%)	10.0 (14.1%)	
2	139.0 (4.7%)	2.0 (2.8%)	
≥ 3	40.0 (1.3%)	1.0 (1.4%)	
Gestational age	39.70 (1.40)	39.90 (2.00)	0.06
Mediolateral episiotomy			0.60
No	2,577.0 (86.5%)	60.0 (84.5%)	
Yes	401.0 (13.5%)	11.0 (15.5%)	
Birth weight	3,290.00 (580.00)	3,430.00 (530.00)	0.02
Apgar 1 min	9.00 (1.00)	9.00 (1.00)	0.58
Apgar 2 min	9.00 (1.00)	9.00 (0.50)	0.96

*Fisher's exact test; Wilcoxon rank sum test

[a]Median (IQR) or frequency (%)

Table 4 Univariate logistic regression model on severe vaginal lacerations

Ethnicity	OR	95% CI	*p* value
White	—	—	
Asian	1.738	0.901, 3.114	0.08
Black	0.000	0.000, 3,263.484	0.98
Latina	0.427	0.024, 1.970	0.40
Middle Eastern origin	0.549	0.031, 2.545	0.55

OR odds ratio, *CI* confidence interval

Discussion

This multicentric retrospective study explored the incidence of severe perineal lacerations after vaginal delivery in different racial and ethnic groups, in two Italian University Hospitals. Our findings showed an increased risk of severe perineal lacerations for Asian women compared with other racial/ethnic groups, suggesting a specific racial/ethnic susceptibility. Other studies have shown different risks for OASIs among women of different racial and ethnic groups. Hopkins et al., in 2004, reported a different perineal laceration risk among different ethnicities [24]. The following year, Guendelman et al. confirmed this evidence [22]. Western Australia's research reported the same Asian trend [23, 26]. Differences in perineal laceration among racial categories were also reported in the US population [21, 25]. In addition, Sørbye et al. noted an increased risk for Sub-Saharan African origin [11]. In Europe, Baghestan et al. reported African or Asian birth to be a risk factor for sphincter lacerations in the Medical Birth Registry of Norway [20]. Our results support a recent meta-analysis that noted increased obstetric anal sphincter lacerations among Asian in non-Asian countries [19].

Table 5 Multivariate logistic regression model on severe laceration event. Odds ratio (OR) estimates adjusted for baseline clinical characteristics significant at 5% in univariate analysis

Characteristic	OR	95% CI	*p* value
Ethnicity			
White	—	—	
Asian	2.236	1.146, 4.070	0.01
Black	0.000	0.000, 1,501.376	0.98
Latina	0.500	0.028, 2.341	0.50
Middle Eastern origin	0.621	0.035, 2.952	0.64
Parity			
0	—	—	
1	0.251	0.123, 0.467	< 0.001
2	0.240	0.058, 0.664	0.03
≥ 3	0.182	0.010, 0.866	0.10
Birth weight	1.001	1.000, 1.001	< 0.001

CI confidence interval

The occurrence of OASIs is probably related to a complex interplay between anatomical factors, genetic factors, and other modifiable factors related to clinical practice [30]. Regarding anatomical characteristics, perineal length does not correlate with the higher risk of perineal laceration [31, 32]. Additionally, our findings and previous literature suggest that mediolateral episiotomy might not be protective against OASIs [31, 32]. Genetic susceptibility to familial aggregation of OASIs was demonstrated [33]. Obstetric care disparities include different use of episiotomies, labor management, and operative delivery and may explain these differences [34, 35], along with language barriers, cultural differences, and different labor management in developed countries [30, 36].

In order to reduce the incidence of OASIs all these elements should support physicians in elaborating obstetric care strategies. Preventive strategies should include patient education, detailed monitoring of labor progress, and careful decision-making on instrumental delivery [37]. As suggested by different guidelines, perineum protection

measures, such as warm compresses and controlled delivery of the fetal head, are recommended to minimize perineal trauma in the second stage of labor [8]. Antenatal counseling must be offered to the mother with specific ethnic predisposition on delivery choices and the potential risks involved [6].

Prospective studies should evaluate the impact of such comprehensive care strategies on reducing the incidence of severe perineal lacerations and improving maternal outcomes in this population group. At least parity, demographic characteristics, birth weight, and their impact on OASIs were analyzed as secondary outcomes. In agreement with the literature, this secondary analysis demonstrated that pluriparous previous deliveries (primipara and secondipara) represent a protective factor for OASIs [37, 38].

This study examined ethnicity and OASIs to our knowledge for the first time in a southern European population. As reported by a recent meta-analysis, the literature had several studies from different high-income countries but needed more European data [19].

Our study presents strengths and limitations. Positively, it is a multicentric study with data collected from two Italian university hospitals of two different regions with different socio-economic status, thus representing an "average" value of the country. Further, delivery protocols and episiotomy procedure (mediolateral) were comparable in these two university hospitals, as they followed national guidelines. Finally, delivery and ethnicity data were not self-reported but collected by physicians.

Various limitations, however, impact our results, with the retrospective nature of the study design being the major one. Data on operative delivery, use of analgesia, duration of the first and second stages of labor, and occiput-posterior position are lacking. These well-established OASI risk factors include operative vaginal deliveries, especially those performed by forceps and vacuum extraction. Operative vaginal deliveries have been identified in numerous studies as being strongly associated with OASIs. At the same time, the occiput-posterior position has been associated with a high risk rate for severe perineal lacerations. The absence of these variables affected the accuracy of our findings. Finally, we were unable to analyze important variables (which may strongly impact the occurrence of severe perineal lacerations in different ethnicities) such as cultural attitudes and language barriers, as these are not routinely collected. With those being absent we cannot generalize our findings.

Conclusion

This study confirmed a racial/ethnic disparity in obstetric anal sphincter lacerations in high-income countries. Obstetric care should include proper risk management of the delivery of specific populations. Further studies are needed to understand the precise mechanisms of these disparities.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s00192-024-05966-2.

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Data Availability The data that support the findings of this study are available from the corresponding author, [LT], upon reasonable request.

Declarations

Ethics Approval Ethics approval (protocol number 0011344/I of 17 April 2024) was obtained from the Ethics Committee of Campania 2, Naples, Italy.

Consent to Participate Written informed consent was obtained from all individual participants included in the study.

Conflicts of Interest None.

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