

Research Article

Prevalence and Associated Factors of Severe Perineal Tear at Mekelle Public Hospitals, Tigray, Northern Ethiopia: A Seven Years Review

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Abstract

Background: Obstetric anal sphincter injuries (OASIS) from perineal trauma during vaginal delivery are a significant cause of maternal morbidity, especially in low-resource settings. Despite skilled care in hospitals, such injuries still occur. This study investigates the prevalence and associated risk factors of third- and fourth-degree perineal tears at Mekelle Public Hospitals, Tigray, Northern Ethiopia, from July 2016 to June 2023. **Methodology:** A retrospective unmatched case-control study was conducted at Ayder Comprehensive Specialized Hospital and Mekelle General Hospital. All mothers with documented third- or fourth-degree perineal tears during vaginal delivery were included as cases, with three controls selected per case. Data from delivery logbooks and patient charts were extracted using a structured tool. Data were analyzed with EpiData Management version 4.6 and SPSS version 23, employing bivariate and multivariate logistic regression. Statistical significance was determined with a p-value of <0.05, and associations were measured using odds ratios. **Results:** A total of 361 women (88 cases, 273 controls) were included. The seven-year prevalence of severe perineal tears was 0.157% (1.57 per 1,000 vaginal deliveries). Significant risk factors included rural residence (AOR: 5.3, 95% CI: 2.1-13.3), primiparity (AOR: 4.7, 95% CI: 2.2-9.8), gestational age ≥ 40 weeks (AOR: 5.1, 95% CI: 2.5-10.3), birth weight ≥ 3.5 kg (AOR: 2.2, 95% CI: 1.1-4.5), and instrumental delivery (AOR: 5.1, 95% CI: 1.2-15.9). Mediolateral episiotomy was protective (AOR: 0.57, 95% CI: 0.3-0.9). **Conclusion:** Severe perineal tears are associated with identifiable maternal and delivery-related factors. Improved clinical vigilance, timely episiotomy, and skilled delivery practices are essential. Improved documentation and risk assessment strategies are recommended.

Keywords

Perineal Tear, Risk Factors, Obstetric Injuries, Ethiopia

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1. Introduction

Obstetric anal sphincter injuries (OASIS), encompassing third- and fourth-degree perineal tears, are among the most severe forms of birth-related trauma. These injuries carry significant short- and long-term morbidities, including perineal pain, dyspareunia, anal incontinence, and rectovaginal fistula. Despite improvement in maternal care, OASIS continues to be underdiagnosed and underreported, particularly in low-resource settings [1-7].

The Royal College of Obstetricians and Gynecologists (RCOG) classifies perineal tears into four degrees. First- and second-degree tears are considered mild, while third- and fourth-degree tears constitute OASIS. Accurate classification and repair are crucial to preventing long-term complications [3].

While several studies have explored the risk factors for OASIS, including primiparity, instrumental delivery, macrosomia, post-term gestation, and occiput posterior position [8-21] data from northern Ethiopia remain limited. This study aims to fill the gap by analyzing the prevalence and determinants of severe perineal tears in Mekelle public hospitals.

Generally, there are limited data on risk factors for severe-degree perineal tears in our setting. Our study aimed at determining the risk factors for perineal tear among women having vaginal delivery at Mekelle Public Hospitals, Tigray, Ethiopia. The findings will inform policy formulation and clinical practices geared to enhance better management and prevention of obstetric perineal tears.

2. Methods

2.1. Study Design and Setting

A retrospective unmatched case-control study reviewed records from mothers who delivered vaginally at Ayder Comprehensive Specialized Hospital and Mekelle General Hospital between July 1, 2016, and June 30, 2023, to examine the prevalence and risk factors of severe perineal tears. Ayder serves over 8 million people, with approximately 5,000 annual deliveries and facilities for low- and high-risk mothers, three operating rooms, and a neonatal care unit. Mekelle, one of the oldest regional hospitals, averages 400 deliveries per month, staffed by 30 midwives and 6 delivery couches, with rotating residents from Ayder. Both hospitals are crucial for maternal and neonatal health in their regions.

2.2. Study Population

All women who delivered vaginally after 28 weeks of gestation and were diagnosed with third- and fourth-degree perineal tears were considered cases. Controls were women who delivered vaginally on the same day without such injuries.

2.3. Eligibility Criteria

All mothers who delivered vaginally after 28 weeks of gestation and were managed for severe perineal tear at Mekelle public hospitals between July 1, 2016, and June 30, 2023, were included in this study. Charts of mothers with severe perineal tears that had incomplete documentation or were lost were excluded from the study.

2.4. Sample-size and Sampling Techniques

Sample size determination and statistical methods

The sample size was calculated using Epi-Info version 7 STATA for an unmatched case-control study, based on previous research in Ethiopia that identified birth weight of 3.5 kg and above as a risk factor for severe perineal laceration. The calculation assumed an 80% power ($1 - \beta$), an odds ratio of 2.11, 27.5% exposure among controls, a 3:1 control-to-case ratio, and a 95% confidence level. Ultimately, a total of 361 participants were included, consisting of 88 cases and 273 controls. A seven-year record from operating rooms and delivery registration books was reviewed to identify cases of severe perineal tear. Out of 95 medical records, 88 cases were eligible for the study. For each case, three controls who delivered vaginally on the same day as the severe perineal tear occurred and met the inclusion criteria were selected (Figure 1).

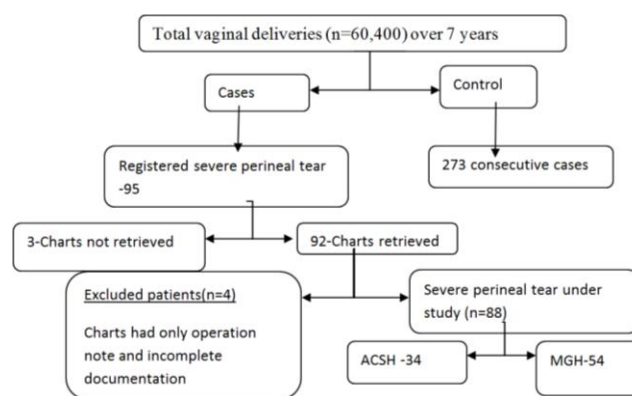


Figure 1. Flow diagram of study participants, Ayder Comprehensive Specialized Hospital and Mekelle General Hospital, Mekelle, Northern Ethiopia, 2016–2023.

2.5. Variables and Measurements

The dependent variable in this study was severe perineal laceration, coded as (yes = 1, no = 0). The independent variables included maternal age, address, religion, length of the second stage of labor, precipitated labor, parity, gestational age, birth weight, instrumental delivery (forceps or vacuum), induction of labor, shoulder dystocia, persistent occiput posterior position, episiotomy, and the qualification of the birth attendant.

Case Definition: A case is defined as a mother who delivered vaginally at or beyond 28 weeks of gestation and experienced a severe perineal tear involving the anal sphincter muscle and anorectal mucosa. In contrast, a control is defined as a mother who delivered vaginally at or beyond 28 weeks of gestation without severe perineal laceration.

The diagnosis of severe perineal tear was made by a senior resident, with confirmation by a gynecologist or obstetrician for final diagnosis and repair, typically performed in the operating room. Data collection involved two Bachelor of Science midwives and two third-year senior residents, with the principal investigator (PI) overseeing the entire process. Variables were extracted using a pretested structured questionnaire and analysed with Epi Data version 4.6, drawing information from patient cards, partographs, delivery logbooks, and operating room logbooks. Data quality was ensured through training and a pilot study.

2.6. Data Analysis

Data was entered into Epi Data Management version 4.6 and exported to SPSS version 23 for analysis. Frequency distribution was used to describe participant characteristics, while comparisons for categorical variables were made using the Chi-square test. Bi-variable logistic regression identified candidate variables, with those significant at $p \leq 0.25$ included in the multivariable analysis. The final model was determined using multivariable binary logistic regression, where variables with $p < 0.05$ were considered significant. Model fit was assessed using the Hosmer-Lemeshow goodness-of-fit test ($p > 0.05$ indicating a good fit), and odds ratios with 95% confidence intervals were reported to measure the strength of association.

2.7. Operational Definitions and Terminologies

- 1) *Severe Perineal Tear/Laceration:* Refers to third and fourth-degree perineal tears.
- 2) *Mekelle Public Hospitals:* Includes Ayder Comprehensive Specialized Hospital and Mekelle General Hospital.
- 3) *Prolonged Second Stage of Labor (SSOL):* Defined as primipara (first-time mothers) having labor lasting 2 hours or more, and multipara (women who have had more than one baby) lasting 1 hour or more.
- 4) *Precipitated Labor:* Delivery occurring within three hours of the onset of regular uterine contractions.
- 5) *Multiparity:* Refers to the delivery of more than one baby.
- 6) *Incomplete Chart:* Charts that contain only an operation note or only a delivery summary.
- 7) *Mediolateral Episiotomy:* A surgical incision made at an angle to the vaginal towards the side to facilitate delivery.

3. Result

Out of the total delivery for the last 7 years in Mekelle Public Hospitals, 60,400 were vaginal deliveries (25,250 at ACSH and 35,150 at MGH). 95 cases of severe degree perineal tears were recorded in the operation registration book over the course of the 7-year study period at the Ayder Comprehensive Specialized Hospital and College of Health Science as well as the Mekelle General Hospital. A total of 88 charts were collected, 34 (38.6%) from ACSH and 54 (61.4%) from Mekelle General Hospital, after excluding mothers who did not meet the inclusion criteria. Three of the remaining seven charts couldn't be located, and four charts had to be removed due to inadequate documentation. Mothers who gave birth vaginally on the day that a severe degree perineal tear was repaired were included as controls.

The prevalence of severe degree perineal tear over a 7 years study in both hospitals was 0.157% (1.57/1000 vaginal deliveries).

Socio-demographic characteristics of participants;

The majority of women were identified in the 17–30 age range in both groups. The mean maternal age of cases and controls was 26.2 ± 5 (SD) years and 26.9 ± 5.6 (SD) years, respectively. The majority of cases, 68 (77.3%), and controls, 245 (89.7%), were urban dwellers from the Tigray region. (Table 1).

Maternal, fetal, and delivery-related characteristics of cases and controls;

Out of 361 participants, 32.4% were nulliparous. About 85 (96.6%) cases and 267 (97.8%) controls had antenatal care, with more than half of the controls having their ANC follow-up at their nearby health center. The pattern of gestational age at delivery: 35 (39.8%) of cases and 175 (64.1%) controls were at 37 to 39 weeks, whereas 45 (51.1%) cases and 58 (21.2%) were delivered at 40–42 weeks. 8 cases had unknown gestational age even from the third trimester.

Labor was initiated with induction in 6 (6.8%) cases and 14 (5.1%) controls. Episiotomy was performed in 110 (30.5%) of the mothers in the study, with a much higher incidence in the control group in 92 (33.7%) patients compared with the severe degree perineal tear group. Instrumental delivery was done in 10 (11.4%) cases and 14 (5.1%) controls. About 40 (45.5%) of cases and 68 (24.9%) of control neonates were between 3.5 and 3.99 kg, whereas 14 (15.9%) cases and 32 (11.7%) control neonates were 4 kilograms and above. Labor was not attended on 9 (10.2%) of cases and 20 (7.3%) controls; from the attended labor most of the cases (83.3%) and controls (85.4%) were attended by midwifery, whereas the rest were attended by Residents. In 61 (69.3%) of the cases and 169 (61.9%) of the controls, labor was at nighttime (Table 2).

The risk factors associated with severe perineal tear;

Both bivariate and multivariate logistic regression analyses revealed that rural dwelling, primiparity, and birth weight of 3.5 kg and above and gestational age of 40 weeks and above were associated with severe perineal tear, whereas mediola-

teral episiotomy on current delivery was associated with reduced risk in severe perineal tear (Table 3).

Table 1. Socio demographic characteristics of women with cases and controls, ACSH and MGH, July 2016- June, 2023.

Variable		Cases (N, %)	Controls (N, %)
Address	Urban	68 (77.3%)	245 (89.7%)
	Rural	20 (22.7%)	28 (10.3%)
Religion	Christian	86 (97.7%)	263 (96.3)
	Muslim	2 (2.3)	10 (3.7%)
Age	17-24	37 (42%)	102 (37.4%)
	25-30	33 (37.5%)	99 (36.3%)
	>30	18 (20.5%)	72 (26.4%)
Institution	ACSH	34 (38.6%)	105 (38.50%)
	MGH	54 (61.4%)	168 (61.50%)

Abbreviations: ACSH: Ayder comprehensive specialized hospital, MGH: Mekelle General hospital.

Table 2. Maternal, fetal and delivery related characteristics of cases and controls, ACSH and MGH, July 2016- June, 2023.

Characteristics		Cases (N, %)	Controls (N, %)
Parity	Primipara	44 (50.0%)	73 (26.7%)
	Multipara	44 (50.0%)	200 (73.3%)
Gestational Age	37-39 Weeks	35 (39.8%)	175 (64.1%)
	≥40 Weeks	45 (51.1%)	58 (21.2%)
	Unknown	8 (9.1%)	40 (14.7%)
ANC	Yes	85 (96.6%)	267 (97.8%)
	No	3 (3.4%)	6 (2.2%)
Place of ANC	ACSH	14 (16.3%)	26 (9.7%)
	MHG	16 (18.6%)	73 (27.2%)
	H/C	50 (58%)	148 (55.2%)
	Private	5 (5.8%)	20 (7.5%)
History of Tear	Yes	8 (9.1%)	0
	No	80 (90.9%)	273 (100%)
Labor initiation	Spontaneous	82 (93.2%)	259 (94.9%)
	Induction	6 (6.8%)	14 (5.1%)
Labor Augmentation	Yes	4 (4.5%)	21 (7.7%)
	No	84 (95.5%)	252 (92.3%)
Precipitated labor	Yes	9 (10.2%)	22 (8.1%)
	No	66 (75%)	224 (82.1%)
	Unknown	13 (14.8%)	27 (14.8%)
Prolonged SSOL	Yes	9 (10.2%)	31 (11.4%)

Characteristics		Cases (N, %)	Controls (N, %)
Episiotomy	No	48 (54.5%)	117 (42.9%)
	Unknown	31 (35.2%)	125 (45.8%)
	Yes	19 (21.6%)	92 (33.7%)
Instrumental delivery	No	69 (78.4%)	181 (66.3%)
	Yes	10 (11.4%)	14 (5.1%)
	No	78 (88.6%)	259 (94.9%)
Type of Instrumental delivery	Forceps	7 (70.0%)	4 (26.7%)
	Vacuum	3 (30%)	11 (73.3%)
	Occipitoanterior	40 (45.5%)	192 (70.3%)
Fetal head position	Occipitoposterior	7 (8.0%)	16 (5.9%)
	Unknown	41 (46.6%)	65 (23.8%)
	Yes	79 (89.8%)	253 (92.7%)
Was labor attended	No	9 (10.2%)	20 (7.3%)
	Resident	13 (16.5%)	36 (14.2%)
Who attended labor	Midwifery	66 (83.5%)	217 (85.4%)
	at night	60 (68.2%)	166 (60.8%)
	day time	24 (27.3%)	104 (38.1%)
Timing of SSOL	Unknown	4 (4.5%)	3 (1.1%)
	2500-3500 gram	34 (38.6%)	173 (63.4%)
	3500-3999 gram	40 (45.5%)	68 (24.9%)
Birth weight	≥4000 gram	14 (15.9%)	32 (11.7%)
	Male	55 (62.5%)	128 (46.9%)
	Female	33 (37.5%)	145 (53.1%)
Neonatal gender	Alive	87 (98.9%)	271 (99.3%)
	Stillbirth	1 (1.1%)	2 (0.7%)
1 st min APGAR	<7	7 (8%)	24 (8.9%)
	≥7	80 (92%)	247 (91.1%)
	<7	4 (4.6%)	14 (5.2%)
5 th min APGAR	≥7	83 (95.4%)	257 (94.8%)

Abbreviations: SSOL-Second stage of labor, APGAR-A-Appearance, P-Pulse rate, G-Grimace, A-Appearance, RR-Respiratory Rate, N, % = number and percentage

Table 3. Bivariate and Multivariate Analysis Results of Maternal, fetal and delivery related characteristics of cases and control, ACSH and MGH, July, 2016- June, 2023.

Characteristics		Cases (N, %)	Controls (N, %)	COR (95%CI)	AOR (95%CI)	P-value
Address	Urban	68 (77.3%)	245 (89.7%)	1	1	
	Rural	20 (22.7%)	28 (10.3%)	2.7 (1.4-5.1)	5.302 (2.118-13.275)	<0.001

Characteristics		Cases (N, %)	Controls (N, %)	COR (95%CI)	AOR (95%CI)	P-value
Place of ANC	ACSH	14 (16.3%)	26 (9.7%)	2.5 (1.06-5.7)	3.270 (0.852-12.551)	0.084
	MHG	16 (18.6%)	73 (27.2%)	1.6 (0.777-3.3)	1.858 (0.606-5.702)	0.279
	H/C	50 (58.1%)	148 (55.2%)	1.9 (0.62-5.75)	0.811 (0.191-3.437)	0.776
Parity	private	6 (7.0%)	21 (7.8%)	1	1	
	Primipara	44 (50.0%)	73 (26.7%)	2.7 (1.67-4.5)	4.7 (2.2-9.8)	<0.001
	Multipara	44 (50.0%)	200 (73.3%)	1	1	
Gestational Age	37-39 wk	35 (39.8%)	175 (64.1%)	1		
	40-42 wk	45 (51.1%)	58 (21.2%)	3.88 (2.3-6.6)	5.1 (2.5-10.3)	<0.001
	Unknown*	8 (9.1%)	40 (14.7%)			
Precipitated labor	yes	12 (13.6%)	19 (7.0%)	2.14 (0.98-4.65)	2.9 (0.98-8.5)	0.053
	No	64 (72.7%)	217 (79.5%)	1	1	
	unknown*	9 (10.2%)	40 (14.7%)			
Episiotomy	yes	19 (21.6%)	92 (33.7%)	0.54 (0.307-0.95)	0.266 (0.109-0.649)	0.004
	No	69 (78.4%)	181 (66.3%)	1	1	
Instrumental delivery	yes	10 (11.4%)	14 (5.8.3%)	2.36 (1.01-5.53)	5.07 (1.2-15.9)	0.024
	No	78 (88.6%)	258 (94.9%)	1	1	
Timing of SSOL	at night	60{68.2%}	166 (60.8%)	1.5 (0.92-2.7)	1.4 (0.67-3.2)	0.35
	day time	24 (27.3%)	104 (38.1%)	1	1	
	Unknown	4 (4.5)	3 (1.1%)			
Birth weight	2500-3499gram	34 (38.6%)	173 (63.4%)	1	1	
	>3499 gram	54 (61.4%)	100 (36.6%)	2.7 (1.68-4.5)	2.23 (1.14-4.5)	0.02
Neonatal gender	Male	55 (62.5%)	128 (46.9%)	1.8 (1.15-3.1)	1.640 (0.82-3.3)	0.16
	female	33 (37.5%)	145 (53.1%)	1	1	

*-Regression was not done for unknown variables

Abbreviations: N, % = number and percentage, COR=crude odd ratio, AOR=adjusted odd ratio; CI=confidence interval

4. Discussion

In this seven-year review, the prevalence of third- and fourth-degree perineal tears was 0.157% which is markedly lower than reports from African countries such as Uganda (6.6%) [5], and developed nations like Germany (1.8%) [22]. This low prevalence may reflect underdiagnosis and underreporting rather than improved obstetric care. Inadequate post-delivery examination and documentation may contribute to the apparent disparity. This calls for systematic perineal evaluation after every vaginal delivery and accurate classification of obstetric anal sphincter injuries (OASIS).

Primiparity was significantly associated with a higher risk of severe perineal tears, consistent with previous literatures [10, 18]. This could be due to decreased elasticity and com-

pliance of the perineal tissue in primiparous women [18]. In contrast, multiparity increase chance of tissue stretching from prior delivery, during injury risk. While our finding aligns with many studies, it contradicts one study Debreworkos, Ethiopia, which did not find parity to be a significant factor [6]. This reinforces the need for heightened clinical vigilance for OASIS among primigravids.

Instrumental delivery, particularly forceps delivery, significantly increased the risk of OASIS, similar to findings from other settings [23-25]. This may be due to the mechanical stretching and trauma associated with forceps application, often used in cases of labor dystocia or fetal distress. The situations inherently carry increased risk for perineal injury. Ensuring strict adherence to prerequisites for instrumental delivery and improving provider training can mitigate this risk. When criteria are not met, cesarean delivery may be a safer alternative.

Gestational age ≥ 40 weeks was associated with 5.1fold increased risk of severe perineal tears. This relationship has been supported by studies showing increased risk of OASIS with advancing gestation [13, 26]. One possible explanation is the tendency for fetal weight to increase with gestational age, placing more pressure on the perineum during delivery. However, a study from cape town reported no such association [27], highlighting the need for local context in clinical decision making. Closer surveillance and timely intervention in post-term pregnancies may reduce OASIS risk.

Fetal weight ≥ 3.5 kg was also associated with increased OASIS risk, consistent with studies from Saudi Arabia [13], Spain [16], and Ethiopia [26]. Larger babies exert more pressure on the perineal tissues, increasing the likelihood of tearing. Interestingly, the cape town study did not find birth weight to be a risk factor [27], possibly due to different birth weight thresholds or lower prevalence of macrosomia. Antenatal estimation of fetal weight may guide decisions regarding the mode of delivery and the use of protective measures like episiotomy.

Rural residence was associated with more than fivefold increased risk of severe perineal tears. This may be related to delayed facility arrival, prolonged labor, or limited access to skilled care. Among rural women with OASIS in this study, a significant proportion had prolonged second stage of labor, which can cause genital tract edema and reduced perineal compliance [20]. These findings emphasize the importance of timely referral and labor monitoring for women from remote areas.

Mediolateral episiotomy was found to have a protective effect against OASIS (AOR 0.57), consistent with findings from Poland by Grażyna Gebuza et al. (2018) [15] and a systematic review by Verghese et al. (2016) on mediolateral episiotomy [28]. At our institutions, mediolateral episiotomy is routinely practiced in selected cases. When appropriately timed and correctly angled, it may reduce perineal trauma in high-risk women. This contrasts with studies from Debre Markos [6] and Uganda [5], where episiotomy was not found to be protective. These differences may reflect variation in episiotomy techniques, angle, or timing.

Our findings in general reaffirms that OASIS is associated with identifiable and largely modifiable risk factors. Primiparity, instrumental delivery, post-term gestation, fetal macrosomia, and rural residence are significant contributors. Proper intrapartum management, appropriate use of mediolateral episiotomy, and improved access to skilled delivery care can help reduce the burden of these injuries.

5. Strength and Limitations of the Study

Strength: Large sample, multi-center data, case control study

Limitations: Retrospective design, incomplete documentation, potential underreporting of cases

6. Conclusion

Primiparous, instrumental delivery, fetal weight ≥ 3.5 kg, mothers from rural areas, and gestational age ≥ 40 weeks were significantly associated with severe perineal tears. Mediolateral episiotomy demonstrated a protective effect. Clinical practices should include risk stratification, skilled birth attendance, and improved documentation.

7. Recommendation

- 1) Train birth attendants in proper perineal support and timely use of episiotomy.
- 2) Monitor high risk labor, especially in rural referrals.
- 3) Improve post-delivery perineal examinations and documentation.

Abbreviations

ACSH	Ayder Comprehensive Specialized Hospital
ANC	Antenatal Care
AOR	Adjusted Odds Ratio
APGAR	Appearance, Pulse, Grimace, Activity, and Respiration
CI	Confidence Interval
COR	Crude Odd Ratio
MGH	Mekelle General Hospital
OASIS	Obstetric Anal Sphincter Injuries
RCOG	Royal College of Obstetricians and Gynecologists
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
SSOL	Second Stage of Labor

Author Contributions

Musie Negasi Gebreslase: Conceptualization, Data curation, Funding acquisition, Investigation, Project administration, Writing – original draft, Writing – review & editing

Birhanu Kassie Reta: Investigation, Validation, Writing – review & editing

Haftom Guesh Girmay: Formal Analysis, Methodology, Software, Supervision

Dawit Negash Abraha: Project administration, Supervision, Validation, Writing – review & editing

Ethical Considerations

The study received ethical approval from the Institutional Review Board (IRB) of Mekelle University, College of Health Sciences, and the ethical approval number is MU-IRB 2051/2023. Data confidentiality and anonymity were strictly maintained.

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Conflicts of Interest

The authors declare no conflicts of interest.

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