IMPACT OF OBSTETRIC FACTORS ON ANAL SPHINCTER THICKNESS: A POSTPARTUM EVALUATION USING TRANSVAGINAL SONOGRAPHY

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Abstract:

Background

Obstetric Anal Sphincter Injuries (OASI) represent considerable postpartum problems that may lead to enduring morbidity, such as fecal incontinence. Notwithstanding advancements in diagnostic imaging, there is a paucity of evidence about the use of transvaginal sonography (TVS) in assessing the anal sphincter complex post-vaginal births. This research seeks to evaluate the influence of obstetric variables on anal sphincter thickness and provide insights for improving delivery methods.

Methodology

A prospective observational research was performed, including 390 postpartum women aged 18 to 36 years who had spontaneous vaginal delivery (SVD) or assisted delivery. The individuals underwent evaluation using TVS within 48 hours postoperatively. The thickness of the anal sphincter was assessed and linked with obstetric variables including parity, length of labor, mode of delivery, and neonatal birth weight. ANOVA and post hoc analysis were used to ascertain statistically significant correlations.

Results

The majority of participants were aged 25-35 years (79.5%), with primigravida constituting 59% of the group. The majority of births occurred within one to two hours of labor (46.2%), with spontaneous vaginal delivery (SVD) being the most prevalent (92.1%). The mean thickness of the anal sphincter decreased considerably with increased parity ($p<0.001$), elevated neonatal birth weight ($p<0.001$), extended labor length ($p<0.05$), and the use of assisted delivery techniques ($p<0.05$). Post hoc study demonstrated statistically significant intergroup differences across all variables, highlighting the adverse effects of certain obstetric events on sphincter integrity.

Conclusion

Transvaginal sonography (TVS) is an invaluable non-invasive instrument for evaluating postpartum anal sphincter damage. This research emphasizes the significant impact of obstetric variables on sphincter thickness and stresses the need of customized delivery procedures to reduce postpartum problems.

Keywords

Anal sphincter complex, obstetric injuries, transvaginal sonography, postpartum complications, parity, labor duration.

Introduction:

Normal Vaginal childbirth leads to pelvic floor stress with direct impact on both the pelvic floor and the anal sphincter complex. (1) The occurrence of Obstetric anal sphincter injuries (OASIs) during vaginal births poses a major risk factor that triggers multiple post birth complications involving fecal incontinence and pelvic floor dysfunction with persistent anal pain. (2) OASIs exist as treatable injuries that clinical staff sometimes miss during postpartum checks because these conditions present significant impacts across physical health and mental health along with social ramifications for treated females. (3) The primary method to detect such injuries relies on clinical examination yet its detection sensitivity proves limited for both overlooked and subclinical traumatic injuries. (4)

The basic functions of continence depend on the internal anal sphincter (IAS) and external anal sphincter (EAS) which form the anal sphincter complex. (5) Any damage to these anatomic structures or their functional integrity following childbirth creates major medical problems for the patient. (6) Accurate and early injuries identification represent the foundation for immediate appropriate treatment measures that minimize potential long-term complications. Although traditional diagnostic methods help professionals make diagnoses. Doctors struggle to view the entire sphincter complex completely through these tools particularly when assessing partial tears or invisible forms of trauma. (4) (7)

An imaging modality known as transvaginal sonography (TVS) demonstrates substantial promise for assessing pelvic floor structures. (8) Through its precise high-resolution imaging techniques TVS allows physicians to precisely see the anal sphincter complex while rendering a thorough evaluation of both complex and surrounding tissues thus proving crucial for sphincter integrity assessments in the postpartum period. (9) TVS shows several advantages as a diagnostic method since it represents a minimally invasive procedure that is easily accessible and patients generally accept it well for routine postpartum examinations. (10) Through TVS exam providers can identify hidden injuries that tend to escape standard clinical assessment. (11)

This research evaluates how transvaginal sonography measures the anal sphincter complex during postpartum assessments after vaginal births. we aim to understand anal sphincter thickness patterns while locating causes of injury among maternal and obstetrics groups. The objective is to assess the characteristics of anal sphincter thickness and identify maternal and obstetric factors associated with injuries. The study uses sonographic data analysis in combination with postpartum medical factors and delivery events to enhance the understanding of anal sphincter trauma in new mothers. This study proves the critical value of introducing TVS as an advanced imaging technique within postpartum care treatment because it helps diagnose anal sphincter injuries promptly which reduces subsequent long-term health complications post childbirth, serves to improve maternal health results and enhance the quality of postnatal life experiences.

Methodology:

This cross-sectional research was performed from 2022 to 2024 at the Department of Obstetrics and Gynecology, SRIHER, Chennai. The research sought to assess the anal sphincter complex by transvaginal sonography (TVS) in women post-vaginal delivery. A total of 390 individuals were scheduled for enrolment. The participants were classified into four categories: women with spontaneous vaginal births (Group I), those who had instrumental vaginal deliveries (Group II), patients with perineal tears (Group III), and symptomatic patients with anal sphincter dysfunction (Group IV).

Eligible participants included women suffering spontaneous vaginal births, with or without episiotomies, those who had aided vaginal deliveries, and those who had first, second, or third-degree perineal lacerations. Women with fourth-degree perineal rips were excluded from the research owing to the severity and complexity of their injuries, necessitating distinct diagnosis and care techniques.

Participants were discovered and recruited throughout their postpartum hospitalization. Following the acquisition of informed permission, demographic information, obstetric history, and delivery particulars were documented using a standardized questionnaire. A transvaginal sonographic assessment of the anal sphincter complex was conducted with a high-resolution transducer, maintaining uniform imaging settings for all subjects. The internal anal sphincter (IAS) and external anal sphincter (EAS) were methodically evaluated for integrity, thickness, and signs of trauma or discontinuity.

The results of TVS were associated with delivery-related factors, including the application of episiotomy, mode of delivery (spontaneous or instrumental), and perineal laceration. Participants exhibiting symptoms, such as fecal incontinence or anal discomfort, were assessed for subclinical or hidden injuries. Data gathering conformed to a rigorously established process by the institutional ethics committee.

The gathered data were recorded and analyzed statistically using SPSS version 21 to ascertain differences and relationships among the groups. Comparative evaluations of sphincter injuries were conducted across the four groups to examine the influence of delivery method and perineal trauma on the anal sphincter complex.

Results:

A total of 390 individuals were included, mostly aged 25-35 years (79.5%), with the remainder spread throughout the age ranges of 18-24 years (17.4%) and above 36 years (3.1%) (Table 1). Primigravida comprised 59% of the individuals, whilst multigravida accounted for 41%. The majority of births occurred during one to two hours of labor (46.2%), followed by those occurring in less than one hour (46.7%), and those exceeding two hours (7.2%). Spontaneous vaginal delivery (SVD) was the primary method of birth (92.1%), whereas a minor percentage had SVD with tools (5.1%) or sustained perineal tears (1%).

The correlation between anal sphincter thickness and parity was examined using ANOVA (Table 2). The average anal sphincter thickness decreased with increasing parity: 1.5238 mm for 0-1.9 mm thickness, 1.5168 mm for 2-2.5 mm, 1.3333 mm for 2.6-3 mm, and 1.2414 mm for >3 mm ($p<0.001$). Correspondingly, significant variations in anal sphincter thickness were identified according to neonatal birth weight, delivery method, and labor time. The average birth weight varied from 3.333 kg in the 0-1.9 mm thickness group to 2.524 kg in the >3 mm group, demonstrating a statistically significant decrease ($p<0.001$).

Post hoc analysis demonstrated intergroup correlations among all variables. The mean differences between groups were statistically significant, especially between the lowest thickness group (0-1.9 mm) and the higher thickness groups (>3 mm), with p-values below 0.05 (Table 3). A similar trend was seen in work length, with significant mean differences between groups of 0-1.9 mm, 2.6-3 mm, and >3 mm ($p<0.05$). Birth weight exhibited notable intergroup disparities; specifically, the mean difference between 0-1.9 mm and >3 mm was 0.8083 ($p<0.001$) (Table 4). Significant variations were seen in the manner of delivery across groups, especially between spontaneous vaginal delivery and instrument-assisted births, with p-values demonstrating great statistical significance (Table 5).

This study's results underscore the influence of obstetric variables on anal sphincter thickness, indicating that increased parity, longer labor duration, and higher birth weights associated with decreased anal sphincter thickness. These findings emphasize the need of refining delivery techniques to mitigate harm to the anal sphincter complex, hence decreasing the likelihood of problems such as fecal incontinence in postpartum women.

Discussion:

This research provides essential insights into the impact of vaginal births on the anal sphincter complex by transvaginal ultrasonography. This research examines a varied group of 390 people, highlighting the influence of obstetric factors, including parity, labor time, delivery technique, and neonatal birth weight, on anal sphincter thickness. Contrasting our results with current literature reveals both parallels and discrepancies, enhancing the comprehension of this important subject.

Our research revealed a statistically significant reduction in anal sphincter thickness correlated with increasing parity ($p<0.001$). This is consistent with He et al. (2021), "who found that vaginal births markedly decrease anal sphincter thickness in comparison to cesarean procedures. He et al. specifically detected decreased thickness in some planes of the external and internal anal sphincters in primiparous women after vaginal birth, corroborating our discovery of increasing thinning with increased parity. Nonetheless, their research focused on three-dimensional ultrasonography, which offers more extensive imaging of the sphincter complex than the transvaginal method employed in our study. This underscores the prospective advantage of using three-dimensional imaging for a more comprehensive examination of sphincter anatomy". (12)

Our study's notable connection between anal sphincter thickness and newborn birth weight aligns with the results of Cattani et al. (2024). "Their investigation revealed abnormalities in the anal sphincter correlated with increased infant birth weights, however the repeatability of fault grading was a hurdle. Our research found that increased newborn birth weights were associated with decreased sphincter thickness, highlighting the mechanical stress imposed by bigger neonates during vaginal delivery. Both results underscore the need for improved obstetric procedures to reduce damage to the anal sphincter". (13)

Our research revealed significant differences in sphincter thickness between spontaneous vaginal deliveries and instrument-assisted births, with the latter linked to increased thinning. The findings align with Hurni et al. (2022), "who emphasized the heightened risk of anal sphincter damage linked to episiotomies and instrumental births. Moreover, Hurni et al. endorsed endovaginal ultrasonography as an effective method for the early detection of sphincter injuries, a suggestion that aligns with our results by proposing the use of regular imaging for postpartum evaluation". (14)

The research conducted by Kido et al. (2023) "reinforces the efficacy of ultrasound imaging in urogynecology and obstetrics. They highlighted the cost-efficiency and non-invasive nature of transperineal ultrasonography, especially for real-time evaluation during labor. Although our research focused on postpartum assessment, the application of transperineal ultrasonography for intrapartum surveillance may facilitate the identification of individuals at risk for anal sphincter injury prior to birth". (15)

The study highlights the impact of vaginal deliveries on anal sphincter integrity, emphasizing the role of obstetric variables such as labor duration, delivery method, and neonatal birth weight. Incorporating findings from Tanwar et al. (2023), "who demonstrated the utility of 2D Transperineal Ultrasound (TPU) in detecting occult Obstetric Anal Sphincter Injuries (OASI), enriches the discussion. Tanwar et al. found a significant incidence of OASI (45.5%) among low-risk primigravida and identified risk factors like lower baseline sphincter thickness, prolonged labor, and episiotomy parameters. Their study supports the feasibility of TPU as a non-invasive alternative to Endoanal Ultrasound, which has limited clinical application. Aligning with our findings, Tanwar et al. also reported reduced pelvic floor muscle strength and sphincter tone in women with OASI. Adopting TPU for postpartum evaluations could enhance early detection and guide targeted pelvic floor rehabilitation, especially in resource-constrained settings, improving outcomes for affected women". (16)

Ultimately, the repeatability of measures in our research is favorable when compared to Cattani et al. (2024), "who documented exceptional intrarater reliability for ultrasound-based evaluations of the anal sphincter. This highlights the dependability of ultrasound imaging in assessing sphincter integrity. Our results underscore the need of enhancing ultrasonography methods to better identify minor anomalies, since Cattani et al. identified difficulties in assessing the severity of sphincter damage". (13)

Our work corroborates previous research, demonstrating the considerable influence of obstetric factors on the anal sphincter complex and the importance of ultrasound imaging in evaluating postpartum sphincter integrity. Discrepancies in imaging methods and study designs throughout research underscore the need for uniformity in ultrasound procedures. Future study should investigate the use of modern imaging techniques, including three-dimensional and endovaginal ultrasound, to augment diagnostic precision and increase therapeutic outcomes for postpartum women.

Recommendations

This study suggests including transvaginal sonography (TVS) in routine postpartum evaluations for women at high risk of Obstetric Anal Sphincter Injuries (OASI), especially after prolonged labor, instrumental delivery, episiotomies, or macrosomic babies. TVS may identify sphincter damage early, allowing pelvic floor therapy and avoiding fecal incontinence or pelvic organ prolapse.

To guarantee clinical acceptance and consistency, healthcare practitioners must be trained in transvaginal sonography performance and interpretation. Using sonographic data with clinical evaluations helps improve OASI diagnosis. Public health campaigns could also educate women about postpartum pelvic floor health and non-invasive diagnostic methods like TVS.

Future study should examine the long-term effects of sonographically diagnosed sphincter injuries and their care, as well as the cost-effectiveness of TVS as a regular screening method.

Limitations

This research contains flaws. The small sample size may limit the generalizability of the results. This single-center research may not adequately represent variability in practice and results across varied healthcare institutions.

Transvaginal sonography detected sphincter damage, however its diagnostic accuracy compared to endoanal ultrasonography was not assessed. This hinders TVS's gold standard status. These shortcomings should be addressed by bigger, multicenter cohorts and diagnostic tool comparisons in future investigations.

Conclusion:

The transvaginal sonographic examination of the anal sphincter complex after vaginal births reveals how obstetric factors affect mother pelvic floor health. Long labor, instrumental interventions, episiotomies, and macrosomic newborns increase the incidence of undetected Obstetric Anal Sphincter Injuries during vaginal births. Sometimes clinically subtle, these injuries may lead to pelvic floor dysfunction and fecal incontinence if left untreated. The usefulness of non-invasive diagnostic methods like transvaginal sonography for early sphincter problems is shown by this research. Transvaginal sonography is a potential postpartum evaluation method because to its accessibility, practicality, and patient comfort. Routine sonographic screening for high-risk postpartum women may detect injuries early, enable appropriate care, and minimize long-term morbidity. Sonographic-based pelvic floor therapy may enhance quality of life for afflicted women.

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Conflict of Interest:

The authors declare that there are no conflicts of interest.

ETHICS LETTER

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01.02.2023

To
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REF: CSP-MED/22/AUG/79/119
SUB: Transvaginal ultrasonographic evaluation of anal sphincter complex following vaginal delivery.

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Thank you for submitting the clarifications. The Institutional Ethics Committee (for Medical PG Students), SRIHER (DU) approves the project.

You are advised to be familiar with ICMR guidelines on Biomedical Research in human beings and also to adhere to the Principles of good clinical practice.

- **You are required to inform the IEC when the study initiated and**
- **Submit the final report on the completion of study to the Committee for Students Proposals, SRIHER (DU).**

Yours Sincerely,

(Member Secretary)
Note: Please quote IEC Reference number in all future communication
Copy to Guide: Dr. K.S. Rajeswari

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Table 1: Distribution Of Study Participants

Variable	Category	Frequency	Percent	Valid Percent	Cumulative Percent
Age	18 - 24 YEARS	68	17.4	17.4	17.4
	25 - 35 YEARS	310	79.5	79.5	96.9
	> 36 YEARS	12	3.1	3.1	100
	Total	**390**	**100**	**100**	**100**
Parity	PRIMIGRAVIDA	230	59	59	59
	MULTIGRAVIDA	160	41	41	100
	Total	**390**	**100**	**100**	**100**
Duration of Labor (Hours)	< 1 HOUR	182	46.7	46.7	46.7
	1 - 2 HOURS	180	46.2	46.2	92.8
	> 2 HOURS	28	7.2	7.2	100
	Total	**390**	**100**	**100**	**100**
Mode of Delivery	SVD	359	92.1	92.1	92.1
	SVD-instrument	20	5.1	5.1	97.2
	Patients with perineal tears	4	1	1	98.2
	Symptomatic patients	7	1.8	1.8	100
	Total	**390**	**100**	**100**	**100**
Birth Weight	0 - 2.5 Kg	51	13.1	13.1	13.1
	2.6 - 3 Kg	154	39.5	39.5	52.6
	3.1 - 4 Kg	185	47.4	47.4	100
	Total	**390**	**100**	**100**	**100**

Anal Sphincter Thickness	0 - 1.9 MM	42	10.8	10.8	10.8
	2 - 2.5 MM	149	38.2	38.2	49
	2.6 - 3 MM	141	36.2	36.2	85.1
	> 3 MM	58	14.9	14.9	100
	Total	**390**	**100**	**100**	**100**
Gestational Age	LATE PRETERM	21	5.4	5.4	5.4
	TERM	369	94.6	94.6	100
	Total	**390**	**100**	**100**	**100**

Table 2 : ANOVA Test Showing Association Of Anal Sphincter Thickness With Parity, Duration Of Labour, Baby Birth Weight, Mode Of Delivery.

Dependent Variable	ANAL SPLINTER THICK	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		P value
						Lower Bound	Upper Bound	
parity	0 - 1.9 MM	42	1.5238	.50549	.07800	1.3663	1.6813	0.00
	2 - 2.5 MM	149	1.5168	.50140	.04108	1.4356	1.5980	
	2.6 - 3 MM	141	1.3333	.47309	.03984	1.2546	1.4121	
	> 3 MM	58	1.2414	.43166	.05668	1.1279	1.3549	
	Total	390	1.4103	.49251	.02494	1.3612	1.4593	
BABY BIRTH WEIGHT	0 - 1.9 MM	42	3.33310	.313194	.048327	3.23550	3.43069	0.00
	2 - 2.5 MM	149	3.05856	.260884	.021372	3.01632	3.10079	
	2.6 - 3 MM	141	2.90408	.320941	.027028	2.85064	2.95751	
	> 3 MM	58	2.52483	.329200	.043226	2.43827	2.61139	
	Total	390	2.95290	.370476	.018760	2.91601	2.98978	
MODE OF DELIVERY	0 - 1.9 MM	42	1.60	.989	.153	1.29	1.90	0.00
	2 - 2.5 MM	149	1.14	.507	.042	1.06	1.22	
	2.6 - 3 MM	141	1.02	.145	.012	1.00	1.05	
	> 3 MM	58	1.00	0.000	0.000	1.00	1.00	
	Total	390	1.13	.489	.025	1.08	1.17	
BIRTH WEIGHT	0 - 1.9 MM	42	2.8095	.39744	.06133	2.6857	2.9334	0.00
	2 - 2.5 MM	149	2.5705	.57251	.04690	2.4778	2.6632	
	2.6 - 3 MM	141	2.2908	.66051	.05562	2.1808	2.4008	
	> 3 MM	58	1.5517	.59743	.07845	1.3946	1.7088	
	Total	390	2.3436	.69880	.03539	2.2740	2.4132	

Table 3: Post Hoc Tests Showing Intergroup Associations Of Anal Sphincter Thickness With Parity And Duration Of Labor

Dependent Variable	(I) Anal Sphincter Thickness	(J) Anal Sphincter Thickness	Mean Difference (I-J)	Std. Error	P-Value	95% Confidence Interval (Lower Bound)	95% Confidence Interval (Upper Bound)
Parity							
	0 - 1.9 MM	2 - 2.5 MM	0.00703	0.08419	0.93	-0.1585	0.1726
	0 - 1.9 MM	2.6 - 3 MM	0.19048*	0.08471	0.02	0.0239	0.357
	0 - 1.9 MM	> 3 MM	0.28243*	0.09764	0	0.0905	0.4744
	2 - 2.5 MM	0 - 1.9 MM	-0.007	0.08419	0.93	-0.1726	0.1585
	2 - 2.5 MM	2.6 - 3 MM	0.18345*	0.05662	0	0.0721	0.2948
	2 - 2.5 MM	> 3 MM	0.27540*	0.07458	0	0.1288	0.422
	2.6 - 3 MM	0 - 1.9 MM	-0.19048*	0.08471	0.02	-0.357	-0.0239
	2.6 - 3 MM	2 - 2.5 MM	-0.18345*	0.05662	0	-0.2948	-0.0721
	2.6 - 3 MM	> 3 MM	0.09195	0.07517	0.22	-0.0558	0.2398
	> 3 MM	0 - 1.9 MM	-0.28243*	0.09764	0	-0.4744	-0.0905
	> 3 MM	2 - 2.5 MM	-0.27540*	0.07458	0	-0.422	-0.1288
	> 3 MM	2.6 - 3 MM	-0.092	0.07517	0.22	-0.2398	0.0558
Duration of Labour							
	0 - 1.9 MM	2 - 2.5 MM	0.91067*	0.12722	0	0.6605	1.1608
	0 - 1.9 MM	2.6 - 3 MM	1.01368*	0.12801	0	0.762	1.2654
	0 - 1.9 MM	> 3 MM	1.37110*	0.14754	0	1.081	1.6612

	2 - 2.5 MM	0 - 1.9 MM	-0.91067*	0.12722	0	-1.1608	-0.6605
	2 - 2.5 MM	2.6 - 3 MM	0.103	0.08556	0.229	-0.0652	0.2712
	2 - 2.5 MM	> 3 MM	0.46043*	0.1127	0	0.2388	0.682
	2.6 - 3 MM	0 - 1.9 MM	-1.01368*	0.12801	0	-1.2654	-0.762
	2.6 - 3 MM	2 - 2.5 MM	-0.103	0.08556	0.229	-0.2712	0.0652
	2.6 - 3 MM	> 3 MM	0.35742*	0.1136	0.002	0.1341	0.5808
	> 3 MM	0 - 1.9 MM	-1.37110*	0.14754	0	-1.6612	-1.081
	> 3 MM	2 - 2.5 MM	-0.46043*	0.1127	0	-0.682	-0.2388
	> 3 MM	2.6 - 3 MM	-0.35742*	0.1136	0.002	-0.5808	-0.1341

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Table 4: Post Hoc Tests Showing Inter Group Association of anal sphincter thickness with baby birth weight in the patients among the four groups.

Dependent Variable	(I) ANALSPLINTER THICK	(J) ANALSPLINTER THICK	Mean Difference (I-J)	Std. Error	P - Value	95% Confidence Interval	
						Lower Bound	Upper Bound
BABY BIRTH WEIGHT	0 - 1.9 MM	2 - 2.5 MM	.274538*	0.052375	0	0.17156	0.37751
		2.6 - 3 MM	.429017*	0.0527	0	0.3254	0.53263
		> 3 MM	.808268*	0.060741	0	0.68884	0.92769
	2 - 2.5 MM	0 - 1.9 MM	-.274538*	0.052375	0	-0.37751	-0.17156
		2.6 - 3 MM	.154479*	0.035222	0	0.08523	0.22373
		> 3 MM	.533729*	0.046398	0	0.4425	0.62495
	2.6 - 3 MM	0 - 1.9 MM	-.429017*	0.0527	0	-0.53263	-0.3254
		2 - 2.5 MM	-.154479*	0.035222	0	-0.22373	-0.08523
		> 3 MM	.379250*	0.046766	0	0.2873	0.4712
	> 3 MM	0 - 1.9 MM	-.808268*	0.060741	0	-0.92769	-0.68884
		2 - 2.5 MM	-.533729*	0.046398	0	-0.62495	-0.4425
		2.6 - 3 MM	-.379250*	0.046766	0	-0.4712	-0.2873

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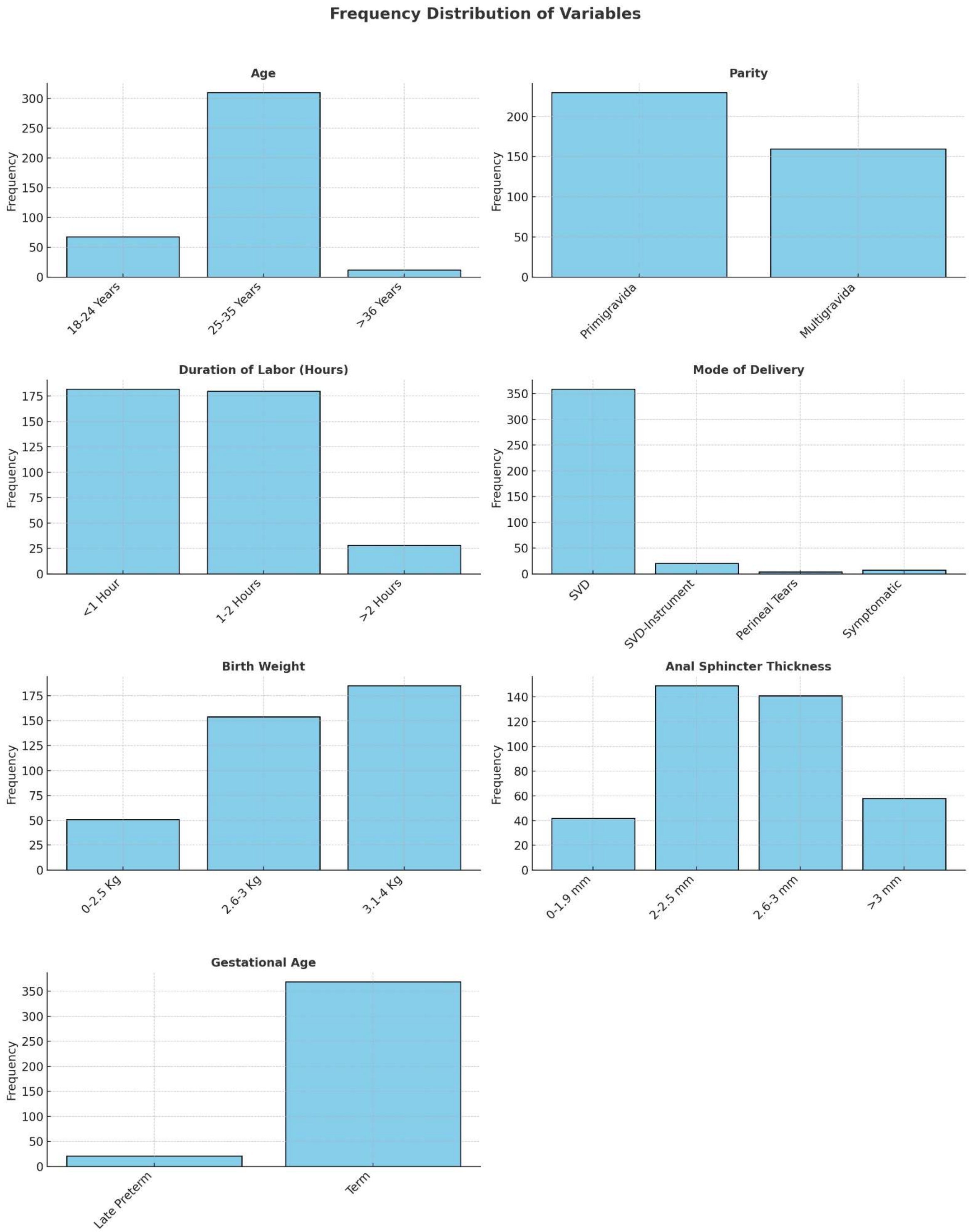
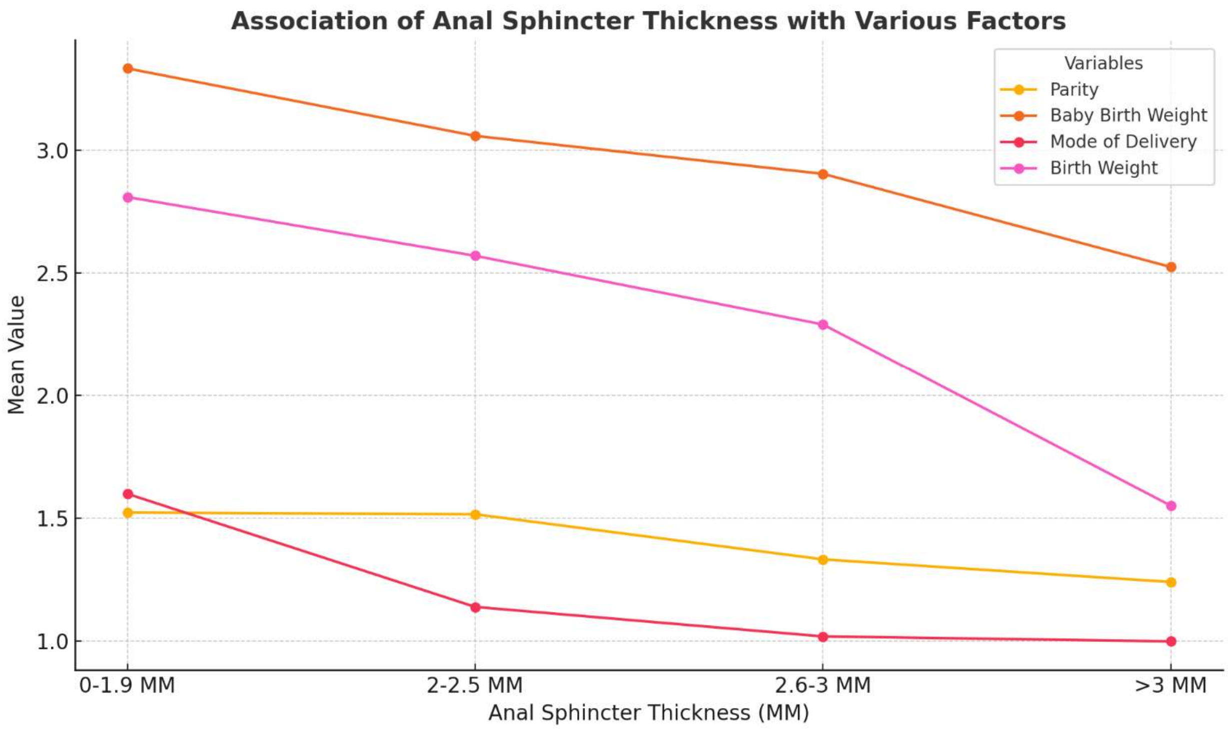
Table 5 :Post Hoc Tests Showing Inter Group Association of Anal sphincter thickness with mode of delivery in the study population.

Dependent Variable	(I) ANALSPLINTER_ THICK	(J) ANALSPLINTER_ THICK	Mean Difference (I-J)	Std. Error	P value	95% Confidence Interval	
						Lower Bound	Upper Bound
MODEOFDELIVERY	0 - 1.9 MM	2 - 2.5 MM	.454*	0.08	0	0.3	0.61
		2.6 - 3 MM	.574*	0.081	0	0.42	0.73
		> 3 MM	.595*	0.093	0	0.41	0.78
	2 - 2.5 MM	0 - 1.9 MM	-.454*	0.08	0	-0.61	-0.3
		2.6 - 3 MM	.120*	0.054	0.027	0.01	0.23
		> 3 MM	.141*	0.071	0.048	0	0.28
	2.6 - 3 MM	0 - 1.9 MM	-.574*	0.081	0	-0.73	-0.42
		2 - 2.5 MM	-.120*	0.054	0.027	-0.23	-0.01
		> 3 MM	0.021	0.072	0.766	-0.12	0.16
	> 3 MM	0 - 1.9 MM	-.595*	0.093	0	-0.78	-0.41
		2 - 2.5 MM	-.141*	0.071	0.048	-0.28	0
		2.6 - 3 MM	-0.021	0.072	0.766	-0.16	0.12

Graph A:


Frequency Distribution of Variables
Age
Frequency
0
50
100
150
200
250
300
18-24 Years
25-35 Years
>36 Years
Parity
Frequency
0
50
100
150
200
Primigravida
Multigravida
Duration of Labor (Hours)
Frequency
0
25
50
75
100
125
150
175
<1 Hour
1-2 Hours
>2 Hours
Mode of Delivery
Frequency
0
50
100
150
200
250
300
350
SVD
SVD-Instrument
Perineal Tears
Symptomatic
Birth Weight
Frequency
0
25
50
75
100
125
150
175
0-2.5 Kg
2.6-3 Kg
3.1-4 Kg
Anal Sphincter Thickness
Frequency
0
20
40
60
80
100
120
140
0-1.9 mm
2-2.5 mm
2.6-3 mm
>3 mm
Gestational Age
Frequency
0
50
100
150
200
250
300
350
Late Preterm
Term

Graph B:


Association of Anal Sphincter Thickness with Various Factors
Variables
Parity
Baby Birth Weight
Mode of Delivery
Birth Weight
Mean Value
3.0
2.5
2.0
1.5
1.0
0-1.9 MM
2-2.5 MM
2.6-3 MM
>3 MM
Anal Sphincter Thickness (MM)

References

1. *John O.L. DeLancey, Masteling M, Pipitone F, LaCross J, Mastrovito S, Ashton-Miller JA. Pelvic floor injury during vaginal birth is life-altering and preventable: what can we do about it? American Journal of Obstetrics and Gynecology. 2024 Jan 1;.*

2. ***Keriakos R, Gopinath D. Obstetric anal sphincter injuries. Journal of Acute Disease. 2015 Oct;4(4):259–65.***

3. ***Globerman D, Ramirez AC, Larouche M, Pascali D, Dufour S, Giroux M. Guideline No. 457: Obstetrical Anal Sphincter Injuries (OASIS) Part I: Prevention, Recognition, and Immediate Management. Journal of Obstetrics and Gynaecology Canada. 2024 Nov;102719.***

4. ***Spinelli A, Laurenti V, Carrano FM, Gonzalez-Díaz E, Borycka-Kiciak K. Diagnosis and Treatment of Obstetric Anal Sphincter Injuries: New Evidence and Perspectives. J Clin Med. 2021 Jul 23;10(15):3261. doi: 10.3390/jcm10153261. .*** **s.l. : PMID: 34362045; PMCID: PMC8347477.**

5. ***Internal Anal Sphincter - an overview | ScienceDirect Topics [Internet]. Sciencedirect.com. 2012. Available from: https://www.sciencedirect.com/topics/medicine-and-dentistry/internal-anal-sphincter.***

6. ***Ramar CN, Vadakekut ES, Grimes WR. Perineal Lacerations. [Updated 2024 Aug 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK559068/.***

7. ***Hickman LC, Propst K. Accurate diagnosis and repair of obstetric anal sphincter injuries: why and how. Am J Obstet Gynecol. 2020 Jun;222(6):580.e1-580.e5. doi: 10.1016/j.ajog.2020.02.044. Epub 2020 Mar 3. PMID: 32142829.***

8. —.

9. ***Abdool Z, Sultan AH, Thakar R. Ultrasound imaging of the anal sphincter complex: a review. Br J Radiol. 2012 Jul;85(1015):865-75. doi: 10.1259/bjr/27314678. Epub 2012 Feb 28. PMID: 22374273; PMCID: PMC3474057.***

10. ***Nahlawi S, Gari N. Sonography Transvaginal Assessment, Protocols, and Interpretation. [Updated 2022 Sep 16]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK572084/.***

11. ***Karena ZV, Mehta AD. Sonography Female Pelvic Pathology Assessment, Protocols, and Interpretation. [Updated 2023 Aug 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. .*** **s.l. : https://www.ncbi.nlm.nih.gov/books/NBK585034/.**

12. ***He N, Shi L. The effect of vaginal delivery and Caesarean section on the anal Sphincter complex of Primipara based on optimized three-dimensional ultrasound image and nuclear***

regression Reconstruction Algorithm. Pakistan Journal of Medical Sciences. . s.l. : 2021;37(6):1641.

13. *Cattani L, Packet B, Samešova A, Williams H, Van Schoubroeck D, Deprest J. Three-Dimensional Transperineal Ultrasound Assessment of the Anal Sphincter Immediately After Vaginal Birth: An Exploratory Study. Journal of Ultrasound in Medicine. 2024 Jun 12.*

14. *Hurni Y, Maes E, Avau F, Becu L, Buljubasic M, Danon A, Paquier L, Garofalo G, Albert V, Pastijn A. Immediate postpartum assessment of the anal sphincter by endovaginal ultrasound: An experimental study. International Urogynecology Journal.* . s.l. : 2022 Jun;33(6):1639-47.

15. *Kido K, Barbera A, Nagasaka K. The role of transperineal ultrasonography for perinatal management: A review. Journal of Obstetrics and Gynaecology Research. 2023 Jul;49(7):1700-9.*

16. *TANWAR S, JAIN S, RAJARAM S, TANDON A, GUPTA B, KALRA K. Detection of Occult Anal Sphincter Injuries in Primipara by 2D Transperineal Ultrasound and its Clinical Association: A Cohort Study. Journal of Clinical & Diagnostic Research. 2023 Jun 1;17(6).*