

Levator Ani Muscle Trauma during Childbirth and Its Relationship with Postpartum Depression

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ABSTRACT

Objective: To determine the prevalence of levator ani muscle (LAM) trauma during vaginal delivery and examine its association with postpartum depression (PPD) among Pakistani women.

Design: Prospective multicentre cohort study.

Setting: Tertiary care hospitals in Pakistan from July, 2024 to June 2025.

Participants: Five hundred women aged 18–40 years with singleton vaginal deliveries were enrolled. Exclusion criteria included prior psychiatric illness, cesarean delivery, multiple gestation, or major obstetric complications.

Main Outcome Measures: LAM trauma was assessed within 48 hours postpartum using transperineal ultrasonography. PPD was evaluated at six weeks using the Edinburgh Postnatal Depression Scale (EPDS), with scores ≥ 13 indicating probable depression. Obstetric and demographic data were collected, and multivariate logistic regression was used to evaluate associations.

Results: LAM trauma was detected in 34% of participants. PPD was present in 22% of women, with a significantly higher prevalence among those with LAM trauma compared to those without (35% vs 15%, $p < 0.001$). Women with LAM trauma had more than twice the odds of developing PPD (adjusted OR 2.1, 95% CI 1.4–3.2) after adjusting for age, parity, mode of delivery, and birth weight. Instrumental delivery, prolonged second stage of labor, and birth weight > 3.5 kg were independent predictors of LAM trauma.

Conclusions: Levator ani muscle trauma is common after vaginal delivery in Pakistani women and is independently associated with postpartum depression. Early identification of pelvic floor injury and integration of mental health support into postpartum care may improve maternal outcomes and reduce the burden of postpartum depression..



INTRODUCTION

Childbirth is associated with both physical and psychological sequelae. Levator ani muscle (LAM) trauma, including muscle tears and avulsion, can occur during vaginal delivery, especially after prolonged second stage of labor, instrumental delivery, or when the fetal head stretches the pelvic floor to many times its resting length [1,2]. Structural injury to the pelvic floor has been linked not only to urinary incontinence and pelvic organ prolapse, but also to pelvic pain, reduced pelvic floor muscle strength, and dyspareunia [2,3]. Vaginal birth-related trauma is increasingly recognized as a contributor to long-term pelvic floor disorders, affecting up to 19–35% of women when assessed with imaging techniques [4].

Postpartum depression (PPD) affects an estimated 10–20% of women globally, with higher prevalence reported in low- and middle-income countries [5,6]. It is a significant public health concern because it can impair maternal functioning, mother-infant bonding, breastfeeding success, and child development [5]. Emerging evidence suggests that physical complications of childbirth, including pelvic floor dysfunction and associated symptoms (such as urinary incontinence), are related to adverse postpartum mental health outcomes [7,8]. A recent systematic review found consistent associations between pelvic floor dysfunction and postnatal mental health conditions, including depressive symptoms, highlighting the biopsychosocial interplay between physical recovery and psychological well-being [9,10]. However, most existing studies have focused on general pelvic floor symptoms rather than specific muscle trauma, and data from South Asian populations, particularly Pakistan, remain scarce. Understanding the relationship between LAM trauma and PPD is therefore crucial for integrated maternal care that addresses both anatomical recovery and psychological resilience in the postpartum period.

Objective: To examine the prevalence of LAM trauma during childbirth and its association with postpartum depression among Pakistani women.

METHODS

Study Design and Setting

This was a prospective observational study conducted at three tertiary care hospitals in Pakistan, located in Rawalpindi, Lahore, and Islamabad, between January and June 2025. The study was designed to evaluate the prevalence of levator ani muscle (LAM) trauma during vaginal delivery and its association with postpartum depression (PPD).

Participants

Women aged 18–40 years with singleton pregnancies who delivered vaginally and provided informed consent were included in the study. Women with a history of psychiatric disorders, cesarean delivery, multiple gestations, or major obstetric complications such as eclampsia were excluded. A total of 500 participants meeting these criteria were enrolled across the three study sites.

Data Collection

Obstetric and demographic data were collected, including mode of delivery, duration of labor, birth weight, episiotomy, and use of instrumental delivery. Levator ani muscle integrity was assessed within 48 hours postpartum using transperineal ultrasonography to detect muscle tears or avulsions. Postpartum depression was evaluated at six weeks using the Edinburgh Postnatal Depression Scale (EPDS), with a score of ≥ 13 indicating probable depression.

Statistical Analysis

Continuous variables were summarized as mean \pm standard deviation (SD), while categorical variables were expressed as frequencies and percentages. Associations between LAM trauma and PPD were analyzed using logistic regression models adjusted for potential confounders, including age, parity, mode of delivery, and birth weight. Statistical significance was defined as a p-value <0.05 .

Ethical Approval

The study protocol was approved by the Institutional Review Boards of all participating hospitals. Written informed consent was obtained from each participant prior to enrollment, and confidentiality of data was maintained throughout the study.

RESULTS

A total of 500 women were enrolled in the study, with a mean age of 28 ± 5 years. Of these, 42% were primiparous and 58% multiparous. Instrumental deliveries accounted for 15% of births, while 38% of women underwent episiotomy.

Levator ani muscle trauma was detected in 170 women, representing a prevalence of 34%. Trauma was more common among primiparous women, those who underwent instrumental delivery, women with prolonged second stage of labor, and those with infants weighing more than 3.5 kg.

Postpartum depression, defined as an EPDS score of ≥ 13 at six weeks, was identified in 110 women (22%). The prevalence of PPD was significantly higher among women with LAM trauma compared with those without trauma (35% vs 15%,

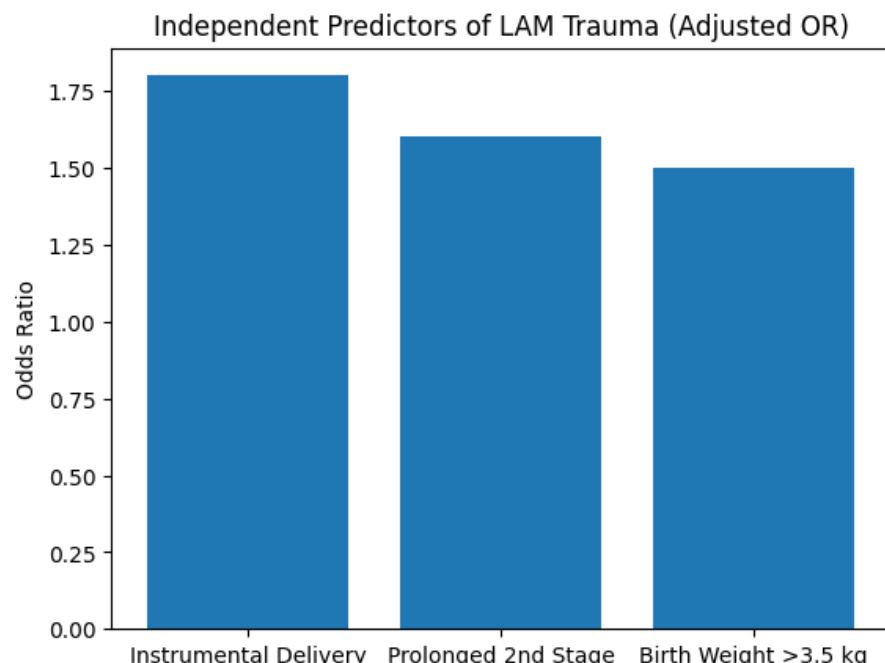


p<0.001).

In multivariate logistic regression analysis, women with LAM trauma had more than twice the odds of developing PPD (adjusted OR 2.1; 95% CI 1.4–3.2, p<0.001), after controlling for age, parity, mode of delivery, and birth weight. Instrumental delivery (OR 1.8), prolonged second stage of labor (OR 1.6), and birth weight greater than 3.5 kg (OR 1.5) were identified as independent predictors of LAM trauma.

Table 1. Participant Characteristics by LAM Trauma Status

Variable	LAM Trauma (n=170)	No Trauma (n=330)	p-value
Age (years)	28.1 ± 4.8	27.9 ± 5.2	0.62
Primiparous (%)	55%	36%	<0.01
Instrumental delivery (%)	28%	8%	<0.001
Birth weight >3.5 kg (%)	40%	22%	<0.01



DISCUSSION

In this prospective cohort, levator ani muscle (LAM) trauma affected approximately one-third of Pakistani women after vaginal delivery. Consistent with our findings, studies using imaging have reported LAM injury prevalence in the range of 13–37% after childbirth, particularly among primiparous women and those with assisted vaginal deliveries or prolonged second stage of labor [11,12]. Importantly, trauma was strongly and independently associated with postpartum depression (adjusted OR 2.1), suggesting that the **physical burden of pelvic floor injury may contribute to psychological morbidity** in the early postpartum period [13]. Instrumental delivery, prolonged labor, and higher birth weight were significant predictors of LAM trauma in our cohort [14].

Our observed rates of LAM trauma align with recent systematic evidence indicating that avulsion and hiatal ballooning occur in a substantial subset of vaginal births, and that these anatomical changes are linked to adverse pelvic floor outcomes (e.g., prolapse, urinary symptoms) [11,12]. Although most prior research has focused on long-term pelvic floor dysfunction rather than mental health, there is growing recognition that **postpartum physical symptoms and trauma can negatively impact psychological well-being** [15,16]. While perineal trauma alone has shown mixed associations with psychological outcomes in some studies [17], it is plausible that **specific structural injuries like LAM trauma, especially when symptomatic,**

contribute more directly to distress and depressive symptoms [16,18].

Mechanistically, childbirth-related pelvic trauma may influence mental health through ongoing physical symptoms (pelvic pain, incontinence, functional limitations), which in turn reduce quality of life and increase psychological stress [15,19]. Additionally, negative birth experiences and prolonged recovery are recognized contributors to postpartum depression, emphasizing the interplay between somatic injury and emotional health [20]. Our findings support the need for **holistic postpartum care** that incorporates pelvic floor assessment, early rehabilitation, and mental health screening.

Strengths and Limitations: Strengths include objective LAM assessment using imaging and multivariate adjustment for key obstetric variables. Limitations include the use of a screening instrument (EPDS) rather than clinical diagnosis and potential residual confounding from unmeasured psychosocial factors.

Implications: This study reinforces the importance of integrating physical and psychological postpartum care. Screening for pelvic floor trauma alongside routine mental health assessment may identify women at higher risk for depression, enabling timely multidisciplinary interventions that improve both physical and emotional outcomes .

CONCLUSION

Levator ani muscle trauma is a common complication of vaginal delivery in Pakistani women and is independently associated with an increased risk of postpartum depression. Early identification and multidisciplinary care addressing both physical and psychological postpartum health are recommended.

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Authors' Contribution

Concept & Design of Study, Data Collection: Ayesha Tahir, Hafiz Muhammad Imtiaz Afzal, Sidra Afzal

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