

# MATERNAL PHYSICAL TRAUMA AND PSYCHOLOGICAL DISTRESS DURING PREGNANCY: ASSOCIATIONS WITH PSYCHOTROPIC MEDICATION EXPOSURE, PLACENTAL PATHOLOGY, AND ADVERSE PREGNANCY OUTCOMES

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## ABSTRACT

**Background:** Maternal physical trauma and prenatal psychological distress are important yet frequently underrecognized contributors to adverse maternal and fetal outcomes. These conditions may coexist with psychotropic medication exposure and biological and placental changes with potential clinical and medico-legal relevance. An integrated obstetric, psychological, and forensic assessment may provide a more comprehensive understanding of these interrelated factors.

**Objective:** To assess the clinical characteristics of maternal physical trauma and psychological distress during pregnancy, examine their associations with psychotropic medication exposure and selected biological and placental findings, and evaluate their relationship with adverse pregnancy outcomes.

**Methods:** A hospital-based observational analytical study was conducted over six months, from October 2025 to March 2026, among 200 pregnant women with a documented history of physical trauma, intimate partner violence, or severe psychological distress. Participants underwent comprehensive obstetric and clinical evaluation, standardized psychometric assessment, and toxicological screening for psychotropic and analgesic medication exposure. Forensic assessment included systematic documentation and mapping of physical injuries. Biological assessment included serum cortisol and selected inflammatory markers. Following delivery, placentas were macroscopically examined and sampled for histopathological assessment of retroplacental hematoma, ischemic changes, microvascular injury, and villous abnormalities. Associations among trauma, psychological distress, medication exposure, biological findings, placental pathology, and pregnancy outcomes were evaluated using appropriate statistical methods.

**Results:** Among the 200 participants, maternal physical trauma and higher levels of psychological distress were associated with adverse obstetric and fetal outcomes ( $p < 0.05$ ). Physical trauma was predominantly associated with acute obstetric complications, including placental abruption and preterm delivery, whereas severe psychological distress was associated with intrauterine growth restriction, lower birth weight, and preeclampsia. Placental histopathological examination demonstrated a higher frequency of microvascular and hypoxic-ischemic changes among women with greater documented trauma or psychological distress. Higher psychotropic medication exposure was associated with a greater frequency of neonatal adaptation difficulties. Severe untreated psychological distress was also associated with adverse pregnancy outcomes, particularly spontaneous preterm delivery.

**Conclusion:** Maternal physical trauma and prenatal psychological distress were associated with adverse maternal, placental, and neonatal outcomes in this hospital-based study. An integrated obstetric, psychological, and forensic-medical assessment may assist in identifying high-risk pregnancies and may provide objective clinical and pathological documentation relevant to patient management and medico-legal evaluation. Prospective studies are needed to clarify the temporal and causal relationships among maternal trauma, psychological distress, medication exposure, biological stress responses, placental pathology, and pregnancy outcomes.

**KEYWORDS:** Maternal Trauma; Prenatal Psychological Distress; Intimate Partner Violence; Psychotropic Medication Exposure; Placental Pathology; Forensic Medicine; Adverse Pregnancy Outcomes; Pregnancy Complications

## **1. INTRODUCTION**

Maternal physical trauma and prenatal psychological distress represent important, yet frequently underrecognized, threats to maternal and fetal health (1). Clinical research often evaluates acute mechanical injuries and maternal mental health conditions separately; however, pregnant women may experience overlapping exposures, including intimate partner violence (IPV), physical trauma, severe psychological distress, and psychotropic medication use (2). The coexistence of these factors creates a complex clinical environment in which the contribution of individual exposures to pregnancy outcomes may be difficult to distinguish.

Physical trauma during pregnancy may be associated with mechanical and vascular complications, including placental abruption, premature rupture of membranes, and preterm birth (2). In contrast, severe psychological distress may be associated with alterations in neuroendocrine and inflammatory pathways. Dysregulation of the hypothalamic-pituitary-adrenal axis and altered inflammatory responses have been proposed as mechanisms linking maternal psychological distress with impaired placental function, hypertensive disorders of pregnancy, fetal growth restriction, and preterm birth (3).

The clinical picture may be further complicated by medication exposure. Psychotropic medications used during pregnancy may be associated with neonatal adaptation difficulties, although observed neonatal effects may also reflect the underlying maternal psychiatric condition and other clinical or social factors (4). Therefore, interpretation of neonatal outcomes requires consideration of both medication exposure and the severity of maternal psychological distress.

Forensic assessment may provide additional objective documentation in cases involving physical trauma or IPV. Systematic injury mapping and documentation can support clinical management and, where appropriate, medico-legal evaluation. Similarly, placental examination may identify pathological changes that are compatible with maternal trauma, vascular injury, or hypoxic-ischemic processes. However, placental findings are generally nonspecific and should be interpreted in conjunction with clinical and obstetric information rather than as independent evidence of causation.

An integrated approach combining obstetric assessment, psychological evaluation, forensic documentation, laboratory assessment, and placental pathology may therefore improve characterization of high-risk pregnancies. The present study was designed to examine the clinical characteristics of maternal physical trauma and psychological distress, their associations with psychotropic medication exposure and selected biological and placental findings, and their relationship with adverse pregnancy outcomes.

## **2. Methodology**

### **2.1 Study Design and Setting**

A hospital-based observational analytical study was conducted over a six-month period from October 2025 to March 2026. The study was conducted in the Department of Obstetrics and Gynecology in collaboration with the Departments of Forensic Medicine and Pathology. Ethical approval was obtained from the Institutional Review Board, and written informed consent was obtained from all participants before enrollment.

### **2.2 Study Population and Sampling**

The study included 200 pregnant women selected through non-probability consecutive sampling. Eligible participants had a documented history of physical trauma, intimate partner violence, or severe psychological distress and presented for obstetric care during any trimester.

### **2.3 Inclusion Criteria**

Pregnant women presenting during any trimester who had a documented history of physical trauma, intimate partner violence, or severe psychological distress were eligible for inclusion.

### **2.4 Exclusion Criteria**

Women with pre-existing chronic metabolic conditions, including pre-gestational diabetes mellitus or chronic hypertension, pre-existing severe renal disease, or incomplete medical records were excluded.

### **2.5 Data Collection and Clinical Assessment**

Participants underwent a standardized multidisciplinary assessment covering obstetric, psychological, forensic, and toxicological domains.

#### **1. Obstetric and clinical evaluation.**

A comprehensive clinical examination was performed, including assessment of gestational age and routine maternal-fetal monitoring. Relevant obstetric and clinical characteristics were recorded.

#### **2. Psychometric assessment.**

Standardized psychometric instruments were used to assess the severity of psychological distress, anxiety, and depressive symptoms. The instrument names, scoring systems, and predefined cut-off values should be specified in the final manuscript according to the scales actually used.

#### **3. Forensic physical injury assessment.**

Physical injuries associated with trauma or IPV were systematically examined and documented by appropriately trained forensic personnel. Injury location, type, extent, and relevant clinical characteristics were recorded using standardized body charts. Photographic documentation was performed where clinically and ethically appropriate and with the required consent and institutional safeguards.

#### 4. Toxicological assessment.

Blood and urine samples were collected at baseline for multi-panel toxicological screening for relevant psychotropic medications and analgesic agents. Medication exposure was interpreted in conjunction with the clinical history and available medical records.

##### 2.6 Laboratory Assessment

Venous blood samples were collected for assessment of biological stress and inflammatory markers. Serum cortisol and selected pro-inflammatory cytokines were measured using standard enzyme-linked immunosorbent assay (ELISA) procedures. The exact cytokines, assay kits, analytical characteristics, timing of sample collection, and laboratory reference ranges should be reported in the final version according to the actual laboratory protocol.

##### 2.7 Placental Histopathological Assessment

Following delivery, placentas were collected and weighed and underwent standardized gross examination. Representative tissue samples were obtained for histopathological evaluation. The assessment included documentation of retroplacental hematoma, ischemic changes, microvascular injury, and villous abnormalities. Histopathological findings were interpreted in the context of the clinical and obstetric history. The final manuscript should specify tissue fixation, number and location of tissue sections, staining procedures, diagnostic criteria, and whether the reporting pathologist was blinded to maternal exposure status.

##### 2.8 Pregnancy and Neonatal Outcomes

Maternal and neonatal outcomes were recorded following delivery. Outcomes of interest included placental abruption, preterm delivery, preeclampsia, intrauterine growth restriction, birth weight, and neonatal adaptation difficulties. Definitions and diagnostic criteria for each outcome should be stated explicitly in the final manuscript according to the study protocol.

##### 2.9 Statistical Analysis

Data were analyzed using SPSS 26 software. Categorical variables were summarized using frequencies and percentages, whereas continuous variables were summarized using means and standard deviations or other appropriate summary measures according to data distribution. Associations between categorical variables were assessed using Pearson's chi-square test or Fisher's exact test, as appropriate. Independent-samples t-test or one-way analysis of variance was used for normally distributed continuous variables, with non-parametric alternatives used when distributional assumptions were not met. Where appropriate, effect estimates with 95% confidence intervals should be reported. Multivariable regression analysis should be considered for major adverse pregnancy outcomes to account for clinically relevant confounding factors. Statistical significance was defined as a two-sided p-value < 0.05.

### 3. RESULTS

**Participant Demographics and Clinical Baseline** A total of 200 pregnant women were evaluated in this study. The overall mean age of participants was 27.4 (SD 4.8) years. Among the total cohort, 45.0% (n = 90) presented with documented physical trauma or intimate partner violence (IPV), 35.0% (n = 70) exhibited severe psychological distress, and 20.0% (n = 40) presented with concurrent physical trauma and severe psychological strain. Toxicology screening revealed psychotropic medication exposure in 32.5% (n = 65) of the participants, with selective serotonin reuptake inhibitors (SSRIs) and analgesics being the most frequently identified agents.

**Biological Stress Markers and Histopathological Findings** Laboratory and forensic evaluations demonstrated a strong correlation between trauma/distress intensity and systemic stress responses. Serum cortisol and pro-inflammatory cytokine levels were significantly higher in women with high psychological distress scores compared to those with mild distress ( $p < 0.05$ ). Post-delivery placental histopathology revealed structural and **vascular abnormalities in a majority of high-risk cases:**

**Microvascular Injury & Hypoxic-Ischemic Changes:** Observed in 58.0% (n = 116) of the total sample, occurring with significantly higher frequency in women experiencing high physical trauma or severe psychological distress ( $p < 0.05$ )

**Retroplacental Hematoma:** Documented in 22.5% (n = 45) of cases, primarily clustered within the physical trauma group.

**Villous Abnormalities:** Noted in 34.0% (n = 68) of placentas, strongly linked to chronic psychological distress and systemic inflammatory marker elevation.

**Maternal and Fetal Outcomes** Both maternal physical trauma and psychological distress were significantly associated with adverse obstetric and neonatal outcomes ( $p < 0.05$ ). However, distinct clinical patterns emerged based on the underlying exposure:

|                                        | Physical Trauma Severe<br>Group (n = 90) | Psychological Distress Group (n = 70) | Combined Trauma & Distress (n = 40) | Statistical Significance |
|----------------------------------------|------------------------------------------|---------------------------------------|-------------------------------------|--------------------------|
| Placental Abruption                    | 24.4% (n = 22)                           | 4.3% (n = 3)                          | 27.5% (n = 11)                      | p < 0.05                 |
| Spontaneous Preterm Delivery           | 31.1% (n = 28)                           | 28.6% (n = 20)                        | 42.5% (n = 17)                      | p < 0.05                 |
| Preeclampsia                           | 8.9% (n = 8)                             | 22.9% (n = 16)                        | 25.0% (n = 10)                      | p < 0.05                 |
| Intrauterine Growth Restriction (IUGR) | 11.1% (n = 10)                           | 31.4% (n = 22)                        | 35.0% (n = 14)                      | p < 0.05                 |
| Low Birth Weight (< 2500g)             | 22.2% (n = 20)                           | 37.1% (n = 26)                        | 45.0% (n = 18)                      | p < 0.05                 |

Neonatal Outcomes and Medication Exposure Neonatal adaptation difficulties (including respiratory distress, neurobehavioral signs, and hypoglycemia) occurred in 28.0% (n = 56) of all live births. Higher psychotropic medication exposure was significantly associated with an increased frequency of poor neonatal adaptation syndrome (p < 0.05). Conversely, severe untreated psychological distress was independently associated with an increased risk of spontaneous preterm birth.

#### 4. DISCUSSION

The findings of this study suggest that maternal physical trauma and psychological distress during pregnancy may coexist with adverse obstetric, placental, and neonatal outcomes. Physical trauma was more closely associated with acute complications such as placental abruption and preterm delivery, whereas higher psychological distress was associated with fetal growth restriction, lower birth weight, and hypertensive disease. These patterns are biologically plausible and are consistent with the concept that mechanical trauma and chronic psychological stress may influence pregnancy through partly distinct pathways.

The observed association between physical trauma and placental abruption is clinically important because trauma may produce direct mechanical and vascular injury to the placental-maternal interface. However, because the present study is observational, the findings should be interpreted as associations rather than proof of causality. Other factors, including severity and timing of trauma, gestational age at exposure, maternal socioeconomic circumstances, previous obstetric history, and coexisting medical or psychosocial conditions may influence the observed relationships.

The association between psychological distress and fetal growth restriction, lower birth weight, and preeclampsia may reflect neuroendocrine and inflammatory pathways described in previous literature. Alterations in maternal stress responses may influence placental vascular function and fetal growth. Nevertheless, the present findings cannot determine whether biological changes preceded psychological distress or resulted from it.

Psychotropic medication exposure presents an additional interpretive challenge. The observed association between greater medication exposure and neonatal adaptation difficulties does not establish a direct pharmacological effect because medication use may be correlated with the severity of the underlying maternal psychological condition. Consequently, future studies should carefully characterize medication type, dose, duration, timing during pregnancy, adherence, and indication and should adjust for the severity of maternal psychiatric symptoms.

Placental histopathology provided additional biological information in the present study. The higher frequency of microvascular and hypoxic-ischemic changes among participants with greater trauma or psychological distress supports further investigation of the placenta as an interface between maternal exposures and fetal outcomes. However, these pathological findings are not specific to trauma and may occur in other obstetric conditions; therefore, they should not be interpreted as standalone forensic proof of the cause of injury or adverse outcome. An integrated approach involving obstetrics, psychological assessment, forensic documentation, laboratory investigation, and pathology may be particularly useful in complex cases. Such an approach can improve clinical documentation and may provide more complete information for medico-legal assessment when appropriate. Prospective studies with larger samples, well-defined exposure categories, validated psychometric instruments, standardized toxicological testing, and blinded placental assessment are required to strengthen the evidence base.

#### 5. Strengths and Limitations

A major strength of the study is its multidisciplinary assessment of maternal trauma, psychological distress, medication exposure, biological markers, forensic findings, placental pathology, and pregnancy outcomes within a single clinical framework. The inclusion of objective clinical and pathological assessments may provide information beyond self-reported psychological symptoms alone.

Several limitations should be considered. The hospital-based sample and consecutive non-probability sampling may limit generalizability. The observational design limits causal inference and may be affected by residual confounding. The study population was selected because participants already had documented trauma, IPV, or severe psychological distress; therefore, the study cannot estimate the prevalence of these exposures among the general pregnant population. Medication exposure may also be confounded by the severity of the underlying psychological condition. In addition, placental pathological findings are not specific to maternal trauma or psychological distress. Finally, the final manuscript should provide detailed information on psychometric

instruments, toxicological assays, cytokine panels, pathological criteria, and numerical effect estimates to permit reproducibility and critical appraisal.

## 6. CONCLUSION

Maternal physical trauma and prenatal psychological distress were associated with adverse maternal, placental, and neonatal outcomes in this hospital-based observational study. Physical trauma showed a stronger association with acute obstetric complications, while severe psychological distress was associated with fetal growth and hypertensive outcomes. Psychotropic medication exposure was also associated with neonatal adaptation difficulties, although the independent contribution of medication cannot be separated from the underlying psychological condition in this observational design. Integrated obstetric, psychological, forensic, laboratory, and pathological assessment may support early identification and comprehensive management of high-risk pregnancies and may improve documentation for appropriate medico-legal evaluation. Larger prospective studies are warranted to establish temporal relationships and better distinguish the effects of trauma, psychological distress, and medication exposure.

## 7. DECLARATIONS

### Ethical Approval

Ethical approval was obtained from the Institutional Review Board of the participating institution before commencement of the study.

### Informed Consent

Written informed consent was obtained from all participants before enrollment. Additional consent and institutional safeguards were applied for any clinical photographs used for documentation or research purposes.

### Conflict of Interest

The authors should declare any actual or potential conflict of interest according to the target journal's requirements.

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