

Childhood Trauma, Antenatal Depression, and Neutrophil-to-Lymphocyte Ratio in High-Risk Pregnant Women: A Brazilian Cross-Sectional Study

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Abstract

Purpose

To investigate associations between childhood trauma, antenatal depression (AD), and inflammation in high-risk pregnant women at a university hospital in southern Brazil.

Methods

Analytical cross-sectional study conducted at Complex Hospital of Clinics of the Federal University of Paraná (CHC/UFPR) from July 2024 to September 2025. Pregnant women aged ≥ 18 years with gestational age ≥ 13 weeks were included. Patients who were illiterate, had not completed primary education, or were not fluent in Portuguese were not considered. AD and anxiety were assessed using the Mini International Neuropsychiatric Interview Plus (M.I.N.I. Plus), childhood trauma via the Childhood Trauma Questionnaire (CTQ), and inflammatory profile by the neutrophil-to-lymphocyte ratio (NLR).

Results

A total of 212 pregnant women were included. The prevalence of AD was 14.6% of the sample. Anxiety occurred in 16.5% and was associated with AD ($p < .001$; OR = 14.8). Women with AD had lower rates of marital partnership ($p = 0.003$), education ($p = 0.006$), household income ($p = 0.002$), partner satisfaction ($p = 0.002$), a higher history of suicide attempts ($p = 0.02$), and were in their third trimester ($p = 0.006$). High childhood trauma prevalence was observed, with emphasis on emotional abuse (46.2%), emotional neglect (38.6%) and sexual abuse (25.9%), but no significant association was found between childhood trauma and AD, nor between NLR and AD. Altered NLR occurred in 47.6% of participants, with no significant group difference ($p = 0.7$). A moderate correlation between childhood sexual abuse and inflammation was found in women with AD ($r = 0.445$; $p = 0.038$).

Conclusions

Anxious pregnant women were 14.8 times more likely to develop AD. No association was found between childhood trauma and AD, nor between AD and NLR. A moderate correlation between childhood sexual abuse and NLR was observed among women with depression, suggesting early trauma may influence the inflammatory profile in AD.

Highlights

- Anxiety during pregnancy strongly predicted AD, with affected women 14.8 times more likely to be diagnosed.

- Childhood sexual abuse was moderately linked to higher inflammation in pregnant women with depression.
- Many pregnant women with depression were not receiving mental health treatment, revealing a care gap.
- Low-cost inflammatory markers such as NLR may help identify at-risk pregnant women in resource-limited settings.

Introduction

Pregnancy and the postpartum period are phases of the highest psychiatric disorder incidence in the female life cycle, with depression as the most prevalent (Soares and Zitek 2008; Arrais et al. 2018; Hulubă et al. 2025). Antenatal depression (AD) is characterized as a depressive episode occurring during pregnancy, and symptoms may include anhedonia, changes in weight and/or appetite, sleep and psychomotor disturbances, feelings of worthlessness or guilt, and even frequent thoughts of death or suicidal ideation, for at least two weeks (American Psychiatric Association [APA], 2014). In Brazil, AD prevalence is estimated between 15 and 25% (Lovisi et al. 2005; Pereira and Lovisi 2008; Thiengo et al. 2012; Begnini et al. 2021), and risk factors include psychiatric history, socioeconomic vulnerability, unplanned pregnancy, lack of social support, and history of childhood trauma (Thiengo et al. 2012; Nunes and Phipps 2013; Silva et al. 2016; Arrais et al. 2018; Wang et al. 2021; Silva et al. 2022). The hypothalamic-pituitary-adrenal (HPA) axis plays a key role in the development of depression (Chrousos and Gold 1992; Kammerer et al. 2006; Osborne et al. 2020). Childhood trauma drives persistent HPA hyperactivity, leading to constant cortisol release and impaired negative feedback through glucocorticoid receptor desensitization (Kaess et al. 2018; Zefferino et al. 2021). During pregnancy, HPA dysfunction linked to childhood trauma intensifies innate immune activation, causing elevated pro-inflammatory cytokines (Amsterdam et al. 2002; Miller et al. 2002; Cole et al. 2010). Pregnant women with a history of childhood trauma tend to present more depressive symptoms and higher inflammatory markers, which are associated with adverse neonatal outcomes and perinatal depression (Walsh et al. 2016; Finy and Christian 2018; Mitchell et al. 2018; McCormack et al. 2021; Bianciardi et al. 2021; Bublitz et al. 2022; Kleih et al. 2022; 2024). Accessible markers such as the neutrophil-to-lymphocyte ratio (NLR) are particularly relevant in resource-limited settings (Slavich and Sacher 2019; Bublitz et al. 2022; Zhang et al. 2023). Despite growing international interest, findings remain controversial with heterogeneous results. A critical gap persists in studies from low- and middle-income countries, where populations face greater social adversities. This study aims to investigate the relationship between childhood trauma history, depressive symptoms, and systemic inflammation measured by NLR in pregnant women.

Materials and Methods

Design and procedures

This was a cross-sectional analytical study conducted at the prenatal outpatient clinics of the Maternity Unit of the Complex Hospital of Clinics of the Federal University of Paraná (CHC/UFPR) between July 2024 and September 2025. This study was approved by the Ethics Committee of the CHC/UFPR on 18 July 2024, decision No. 6.957.171. The authors did not receive funding from any organization for the submitted work. Participants were approached during routine prenatal visits, received detailed information about the study, and provided written informed consent in accordance with Resolution No. 466/12 (Brasil 2012).

Eligible participants were pregnant women aged 18 years or older, with a gestational age ≥ 13 weeks, receiving prenatal care at the study site. Patients who were illiterate, had not completed primary education, or were not fluent in Portuguese were not considered. Participants completed assessments in a private setting, including sociodemographic questionnaires, a structured neuropsychiatric interview, and self-report instruments.

Measured variables

Sociodemographic questionnaire

A semi-structured instrument collected data on sociodemographic, obstetric, clinical, and psychiatric variables, based on the 11th revisions of the International Classification of Diseases-11 (ICD-11; World Health Organization [WHO], 2019), including treatment history, suicide attempts, and exposure to violence, allowing identification of risk factors for AD.

Edinburgh Postnatal Depression Scale

The Edinburgh Postnatal Depression Scale (EPDS; Cox et al. 1987), validated in Brazil (Santos et al. 2007), is a 10-item self-report measure (score range: 0–30) assessing depressive symptoms over the past week. A cutoff score ≥ 10 was adopted (sensitivity 82.6%, specificity 65.4%, Cronbach's $\alpha = 0.87$) (Santos et al. 2007).

Beck Depression Inventory

The Beck Depression Inventory (BDI; Beck et al. 1961), validated in Brazil (Cunha 2001), is a 21-item self-report scale assessing the severity of depressive symptoms (0–63), classified as minimal (0–9), mild–moderate (10–18), moderate–severe (19–29), and severe (30–63). It shows good psychometric properties (sensitivity 70%, specificity 87%, Cronbach's $\alpha = 0.92$) and is suitable for perinatal use. A cutoff ≥ 10 was used to classify AD.

Beck Anxiety Inventory

The Beck Anxiety Inventory (BAI; Beck et al. 1961), validated in Brazil (Cunha 2001), is a 21-item self-report scale (0–63) assessing anxiety symptoms, categorized as minimal (0–10), mild (11–19), moderate (20–30), or severe (31–63). It demonstrates adequate validity (sensitivity 74%, specificity 71%, Cronbach's alpha = 0.86) (Cunha 2001; Osório et al. 2011). Scores ≥ 11 indicated clinically relevant anxiety symptoms.

Childhood Trauma Questionnaire

Childhood trauma was assessed using the Childhood Trauma Questionnaire (CTQ; Bernstein et al. 2003; Bernstein and Fink 1998), in its Portuguese validated version (Grassi-Oliveira et al. 2006), a 28-item retrospective self-report measure evaluating five sub-types of maltreatment: emotional, physical, and sexual abuse, as well as emotional and physical neglect. Items are rated on a 5-point Likert scale ranging from 1 ("never true") to 5 ("always true"). The CTQ demonstrates strong psychometric properties, including good internal consistency (Cronbach's alpha = 0.66 to 0.92) and approximately 80% sensitivity and specificity. Standardized cutoff scores defined by the instrument manual classify exposure levels as none to minimal, low to moderate, moderate to severe, or severe to extreme (Bernstein et al. 2003; Brodsky et al. 2010). In this study, we assessed trauma occurring between childhood and adolescence. Established cutoff points were applied to identify low-to-severe maltreatment (emotional abuse ≥ 12 ; physical abuse ≥ 9 ; sexual abuse ≥ 8 ; emotional neglect ≥ 14 ; and physical neglect ≥ 9), and a dichotomous variable was created (0 = no experiences; 1 = presence of low-to-severe experiences). According to Brazilian legislation (Brasil 1990), childhood is defined as the period up to 12 years old, while adolescence extends from 12 to 18 years old.

Mini International Neuropsychiatric Interview

Psychiatric diagnoses, including major depressive disorder (MDD) and generalized anxiety disorder (GAD), were assessed using the Mini International Neuropsychiatric Interview (MINI Plus; Sheehan et al. 1998), using the Brazilian Portuguese validated version (Amorim 2000), a structured diagnostic interview based on Diagnostic and Statistical Manual of Mental Disorders criteria (DSM IV; APA, 1994). It is brief, reliable, and suitable for clinical and research settings, with satisfactory validity indicators.

Inflammatory marker

Systemic inflammation was assessed using the NLR, a low-cost biomarker of systemic inflammation, calculated from routine blood counts obtained during the second (T2) and third trimesters (T3). In non-pregnant adults, values < 0.7 may indicate immunosuppression, 1.0–2.0 are considered normal, 2.0–3.0 indicate increased risk of inflammatory or clinical conditions, and > 3.0 suggest significant inflammatory processes (Godoi et al. 2020; Zahorec 2021). As supported by the reviewed literature, altered NLR values vary by trimester during pregnancy: ≥ 2.6 (T1), ≥ 4.0 (T2), and ≥ 3.5 (T3) (Hershko Klement et al. 2018).

Statistical analysis

Data analysis

Data were analyzed using R software (R Core Team 4.4.2 2024). Descriptive statistics included frequencies, means, medians, standard deviations, and quartiles. Normality was assessed using the Kolmogorov–Smirnov test. The Mann–Whitney U test was used for continuous variables, while categorical variables were analyzed using Fisher’s exact test or Pearson’s chi-square test. Spearman’s correlation was used to assess associations between inflammation and childhood trauma in women with AD. Binary logistic regression was performed to estimate odds ratios (OR) and 95% confidence intervals for factors associated with AD. Statistical significance was set at $p < 0.05$ for all analyses.

Results

Two hundred and twelve pregnant women participated in this investigation. The sample consisted mostly of self-declared white women (58.5%), the average age of the participants was 29.6 years (SD = 6.39; 18–44 years), and with a family income of up to 31,6 USD/day (59%; median: 24.2; IQR: 16.8–34.7). The average gestational age at the time of data collection was 29.8 weeks (Median: 32; IQR: 24–36). The majority reported not having planned the current pregnancy (68.4%), despite the desire to become pregnant in the future (85.3%). A history of pregnancy loss was reported by 26.4% of participants. Most of the sample reported having their own income (61.4%), followed by a considerable portion of women without their own income at the time of the interview (38.2%). All were residents of the city of Curitiba or the city's Metropolitan Region, with the majority also being native to the state of Paraná (66.5%).

Ten percent of the sample reported a history of sexual violence, 5.2% physical violence, and 6.6% both types. A prior psychiatric diagnosis was reported by 28.3% of participants, while 24.1% held a current diagnosis during pregnancy. Suicide attempts were reported by 15.1% of the sample, and psychiatric hospitalization had occurred in 4.2% of cases. Most of the sample (74.1%) had no psychiatric diagnosis during pregnancy. Only 7% were receiving psychological follow-up, and 16.5% used psychiatric medications, primarily sertraline hydrochloride (47.3%) and fluoxetine hydrochloride (28.9%).

The BDI results ($n = 206$) classified 25% of the sample as mild-to-moderate, 8.5% as moderate-to-severe, and 5.2% as severe depressive symptoms. The EPDS ($n = 198$) identified 28.8% scoring at or above the cutoff of 10 points. The M.I.N.I. Plus MDD module ($n = 201$) diagnosed major depressive disorder in 14.6% of participants. The GAD module ($n = 198$) identified 16.5% meeting criteria for generalized anxiety disorder. The BAI ($n = 200$) classified anxiety symptoms as mild in 18.9% of the sample, moderate in 11.8%, and severe in 4.7%.

The CTQ results were stratified by severity level for each subtype of childhood trauma investigated among 188 participants. Emotional abuse was absent in 42.4% of participants, classified as low in 25%, moderate in 12.7%, and severe in 8.5%. Sexual abuse was absent in 62.7%, with 9.9% at low levels, 7.5% at moderate levels, and 8.5% at severe levels. Physical abuse was absent in 65.1%, with low levels in 13.7%, moderate in 3.3%, and severe in 6.6%. Emotional neglect was absent in exactly half of the sample

(50%), while 22.6% presented low levels, 8.5% moderate levels, and 7.5% severe levels. Physical neglect was absent in 56.6%, with low levels in 15.1%, moderate in 9.4%, and severe in 7.5%. Across all dimensions, approximately 11.3% of participants had missing data. Nearly half of the sample reported some type of childhood adversity, with emotional abuse (46.2%) and emotional neglect (38.6%) being the most prevalent, followed by sexual abuse (25.9%) and physical abuse (23.6%).

As described in Table 1, when compared to women without AD, depressed pregnant women exhibited lower rates of marital partnerships ($p = 0.003$), lower educational attainment ($p = 0.006$), a very poor or poor level of relationship satisfaction ($p = 0.002$), a lack of personal income ($p = 0.02$), lower household income ($p = 0.002$), a higher number of living children ($p = 0.02$), a higher history of suicide attempts ($p = 0.02$), and a higher prevalence in the third trimester of pregnancy ($p = 0.006$). When comparing the groups, there was no statistically significant difference regarding the variables of age ($p = 0.35$), parity ($p = 0.55$), race ($p = 0.36$), reproductive planning ($p = 0.70$), presence of living children ($p = 0.27$), history of pregnancy loss ($p = 0.39$), history of violence ($p = 0.30$), previous psychiatric diagnosis ($p = 0.17$), and current psychiatric diagnosis ($p = 0.09$). Among the patients who reported experiencing sexual or combined sexual and physical abuse, it was observed that in all cases, the first episode occurred during childhood and adolescence. Of these, 90.6% were committed by family members or individuals close to the victim's social circle, and 86.2% occurred chronically, taking place in two or more episodes throughout this period.

Table 1
Comparison of sociodemographic characteristics between patients with and without AD

Variable	Total <i>n</i> (%)	With AD <i>n</i> (%)	Without AD <i>n</i> (%)	<i>p</i>-value
Marital status (<i>n</i> = 212)				0.003
Marital relationship	164 (77.4)	22 (10.8)	134 (66.5)	
Without marital relationship	48 (22.6)	17 (8.5)	84 (41.8)	
Education (<i>n</i> = 212)				0.006
Up to 12 years	152 (71.7)	21 (9.9)	124 (58.5)	
More than 12 years	60 (28.3)	10 (4.5)	46 (21.6)	
Employment (<i>n</i> = 211)				0.02
With own income	130 (61.4)	19 (9.5)	102 (51)	
Without own income	81 (38.2)	12 (6)	66 (33)	
Household income (<i>n</i> = 201)				0.002
Up to 31,6 USD/day	125 (59)	17 (8.5)	109 (54.2)	
31,6 to 52,7 USD/day	55 (25.9)	13 (6.7)	41 (20.4)	
52,7 USD/day or more	21 (9.9)	1 (0.5)	20 (10)	
Relationship satisfaction (<i>n</i> = 211)				0.002
Very poor or poor	5 (2.4)	2 (0.8)	3 (1.3)	
Fair	11 (5.2)	3 (1.4)	8 (3.7)	
Good or very good	177 (83.5)	21 (9.9)	146 (69.1)	
N/A	18 (8.5)	5 (2.3)	12 (5.6)	
Living children (<i>n</i> = 212)				0.02
None	83 (39.1)	9 (4.2)	68 (32)	
One	74 (34.9)	14 (6.6)	59 (27.8)	
Two	31 (14.6)	6 (2.8)	23 (10.8)	
Three or more	24 (11.4)	2 (0.9)	20 (9.4)	
Gestational trimester (<i>n</i> = 212)				0.006
<i>Note.</i> % = relative frequency; <i>n</i> = number of observed elements; <i>p</i> -value = level of statistical significance.				

Variable	Total <i>n</i> (%)	With AD <i>n</i> (%)	Without AD <i>n</i> (%)	<i>p</i> -value
Second trimester	58 (27.3)	7 (3.5)	48 (24.1)	
Third trimester	154 (72.7)	24 (12)	120 (60.3)	
History of suicide attempts (<i>n</i> = 209)				0.02
Yes	32 (15.1)	9 (4.3)	21 (10)	
No	177 (83.5)	22 (10.5)	148 (70.8)	
Note. % = relative frequency; <i>n</i> = number of observed elements; <i>p</i> -value = level of statistical significance.				

The majority of the sample (97.6%) were high-risk prenatal patients, and most (85.8%) reported having some comorbidity during the gestational period, as described in Table 2. Pharmacological treatment, in addition to multivitamins and standard supplementation for pregnancy, occurred in 66.5% of the cases. Previous obstetric and neonatal complications occurred in 66.5% of the cases. Regarding the inflammatory profile, it was possible to access the NLR in the electronic medical records of 147 pregnant women. Of these, 47.6% presented values above the mean for the period. NRL values ≥ 4 in the second trimester and ≥ 3.5 in the third trimester of pregnancy were considered elevated. Patients whose medical records described infections from any other causes during the investigated period had their values disregarded from the analysis of this variable. The statistical analysis employed found no significance when comparing the quantitative values and the presence or absence of AD ($p = 0.7$).

Table 2
Comparison of clinical profile between patients with and without AD

Variable	Total <i>n</i> (%)	With AD <i>n</i> (%)	Without AD <i>n</i> (%)	<i>p</i> -value
Inflammation measured by NLR (<i>n</i> = 147)	68 (49)	10 (7.1)	58 (41)	0.7
Psychoactive substances (<i>n</i> = 200)	8 (4)	1 (0.5)	7 (3.5)	0.8
Smoking (<i>n</i> = 200)	17 (8.5)	4 (2)	13 (6.5)	0.4
Overweight (<i>n</i> = 198)	104 (53)	17 (8.6)	87 (44)	0.8
Obesity (<i>n</i> = 198)	80 (40)	14 (7.1)	66 (33)	0.6
Gestational hypertension (<i>n</i> = 200)	68 (32.2)	8 (4)	56 (28)	0.4
Gestational diabetes (<i>n</i> = 200)	56 (28)	12 (6)	44 (22)	0.2
GAD (<i>n</i> = 201)	35 (17.4)	19 (9.6)	16 (8.1)	< 0.001
BAI (<i>n</i> = 200)	75 (37.5)	22 (11.3)	53 (26.9)	< 0.001
<i>Note.</i> BAI = Beck Anxiety Inventory; GAD = Generalized Anxiety Disorder module of the Mini International Neuropsychiatric Interview; <i>n</i> = number of observed elements; NLR = neutrophil-to-lymphocyte ratio; <i>p</i> -value = level of statistical significance.				

Table 3 presents the analysis of the association between AD and anxiety symptomatology, estimated using Pearson's chi-square test, Fisher's exact test, and odds ratio calculation. It describes the frequencies of anxiety symptoms among pregnant women with and without an AD diagnosis, as well as the corresponding statistical significance values and confidence intervals.

Table 3
Association between AD and anxiety symptoms

Variable	MDD <i>n</i> (%)	<i>p</i> -value*	OR	95% CI Lower	95% CI Upper
GAD (<i>n</i> = 201)	19 (9.6)	< 0.001	14.8	6.2	37.2
BAI (<i>n</i> = 200)		< 0.001			
Mild	14 (7.2)		6.5	2.6	17.4
Moderate	6 (3.1)		3.8	1.1	12
Severe	2 (1)		3.0	0.4	14.7
Note. BAI = Beck Anxiety Inventory; CI = confidence interval; GAD = Generalized Anxiety Disorder module of the Mini International Neuropsychiatric Interview; MDD = Major Depressive Disorder module of the Mini International Neuropsychiatric Interview; <i>n</i> = number of observed elements; OR = Odds Ratio; <i>p</i> -value = level of statistical significance.					
* Pearson's Chi-square test					

The prevalence of childhood trauma dimensions were compared between 31 women with AD and 157 without AD. No statistically significant differences were found between groups regarding emotional abuse ($p = 0.531$), sexual abuse ($p = 0.26$), physical abuse ($p = 0.07$), emotional neglect ($p = 0.08$), or physical neglect ($p = 0.59$).

Table 4
Spearman's correlation between NLR and history of childhood trauma in depressed pregnant women ($n = 31$)

Variable	1. NLR	2. Emotional Abuse	3. Sexual Abuse	4. Physical Abuse	5. Physical Neglect
1. NLR	—				
2. Emotional abuse	-0.044	—			
3. Sexual abuse	0.445*	0.515*	—		
4. Physical abuse	0.204	0.575*	0.428*	—	
5. Physical neglect	0.002	0.619**	0.642**	0.404*	—
6. Emotional neglect	0.158	0.578*	0.661**	0.529*	0.705**
Note. Values expressed by Spearman Correlation Coefficient. * = moderate correlation ($p < 0.05$); ** = strong correlation ($p < 0.01$); NLR = neutrophil-to-lymphocyte ratio.					

Discussion and Conclusions

This was the first Brazilian study to investigate inflammation in pregnant women with depression and a history of childhood trauma, expanding the limited national scientific production on trauma and AD. This study provided a detailed overview of the prevalence of AD among women receiving care in a high-risk prenatal setting in Southern Brazil, reinforcing the importance of screening for childhood and adolescent trauma, particularly sexual abuse, during the antenatal period. Trauma-informed care, periodic mental health screening, and appropriate treatments are of utmost importance during the perinatal period, given their profound impact on maternal and infant health.

The prevalence of AD in this study (14.6%) is consistent with estimates reported in Brazil and other developing countries, ranging from 15% to 25% (Pereira and Lovisi 2008; Brasil 2020; Albuquerque and Rollemberg 2021; Begnini et al. 2021; Wang et al. 2021; Zejnullahu et al. 2021; Bauer et al. 2022; Mitchell et al. 2023). Systematic reviews indicate that AD is highly prevalent in low- and middle-income settings, affecting up to one in four women (Mitchell et al. 2023), with regional estimates in South America around 21.7%, compared to 14.85% in high-income countries (Wang et al. 2021). However, prevalence varies widely across countries, even within similar economic strata. Sociodemographic and psychosocial risk factors include low education, lack of stable partnerships, limited social support, financial difficulties, substance use, and exposure to violence or chronic stress (Wang et al. 2021; Mitchell et al. 2023). Additionally, underdiagnosis remains a concern, with up to 82% of affected women not receiving a proper diagnosis or treatment (Dagher et al. 2021; Bauer et al. 2022).

In this sample, a higher frequency of AD was observed among women without partners or in unsatisfactory relationships, as well as among those with lower educational levels and prior suicide attempts, reinforcing the role of psychosocial vulnerability and previous psychopathology (Zaconeta et al. 2013; Silva et al. 2017; Guintivano et al. 2018; Araújo et al. 2019; Vaezi et al. 2019; Santana et al. 2022; Yu et al. 2024; Grillo et al. 2024). The prevalence of GAD (16.5%) was similar to that of AD and aligned with previous estimates ranging from 15% to 26% (Bayrampour et al. 2015; Martini et al. 2015; Silva et al. 2017; Sinesi et al. 2019). Anxiety symptoms tend to increase across pregnancy, particularly in the third trimester, influenced by neurobiological changes involving the HPA axis, placental hormones, neurotransmitters, and stress responsivity (Gilles et al. 2018; Zhang et al. 2018; Fawcett et al. 2019; Mikołajków and Małyszczak 2022). Accordingly, higher AD frequency was observed in later gestational stages (Okagbue et al. 2019; Felix and Ceolim 2023; Cetolin et al. 2024).

A strong association between anxiety and depressive symptoms was identified, with anxious women presenting a 14.8-fold increased likelihood of depressive symptoms. This finding aligns with evidence of high comorbidity between anxiety and depression, which is associated with greater severity and chronicity (Olfson et al. 1997; Wittchen et al. 2000; Brown et al. 2001; Lamers et al. 2011; Prenoveau et al. 2013; Jacobson and Newman 2017; Groen et al. 2020). Despite this, only a minority of participants were receiving psychological (7%) or pharmacological (16.5%) treatment, reinforcing concerns about underdiagnosis and inadequate care (Josefsson et al. 2007; Bauer et al. 2022). Methodological differences between screening tools and structured interviews may partially explain variability in prevalence estimates, with instruments such as the EPDS showing higher sensitivity, while structured

interviews (e.g., M.I.N.I. Plus) yield more conservative diagnostic rates (Matthey et al. 2013; Thombs and Ziegelstein 2014; Chorwe-Sungani and Chipps 2017; Levis et al. 2020).

A high prevalence of childhood trauma was observed, with almost half of the participants reporting some form of violence, particularly emotional abuse (46.2%) and emotional neglect (38.6%). Rates of physical and sexual abuse were higher when assessed through standardized instruments such as the CTQ compared to direct questioning, highlighting potential underreporting in interviews (Stoltenborgh et al. 2013, 2015; Pinto and Maia 2013; Baldwin et al. 2019). Most violence was intrafamilial (90.6%) and chronic (86.2%), consistent with previous literature (Vieira et al. 2017; Costa et al. 2019; Rocha and Ferreira 2019; Ferraz et al. 2021). Although no significant differences were found between AD and childhood trauma subtypes, the high prevalence supports its role as a long-term risk factor for mental disorders (Felitti et al. 1998; Danese et al. 2009; Slavich and Sacher 2019; United Nations Children's Fund [UNICEF]; 2024; Camargo Júnior et al. 2024; Cerqueira and Bueno 2025). Our findings showed significant correlations between childhood adversity types in AD patients, with abuse and neglect dimensions co-occurring. Finkelhor et al. (2007) found polyvictimization highly predictive of emotional trauma. Socioeconomic factors influence concurrent violence types (Oliveira et al. 2014; Said and Costa Junior 2018). Childhood maltreatment increases revictimization risk across life stages (Walker et al. 2019), with sexual abuse doubling to tripling adult revictimization likelihood (Van Bruggen et al. 2006; Walker et al. 2019; Walker and Warmser-Nanney 2023). Each maltreatment type raises victimization risk regardless of violence type (Stroem et al. 2019; Fereidooni et al. 2023).

Regarding inflammation measured by NLR, 49% of patients who had their blood tests evaluated presented elevated NLR values; however, no significant association was found between NLR and depressive symptoms. While some studies report associations between inflammatory markers and depression (Simpson et al. 2016; Walsh et al. 2016; Kleih et al. 2022, 2024), findings remain inconsistent (Mitchell et al. 2018; Bianciardi et al. 2021; McCormack et al. 2021). In cases of association, studies suggested that this relationship may be influenced by the high body mass index values observed in the patients evaluated, reinforcing the already well-established relationship between obesity and inflammation (Bodnar et al. 2005; Wit et al. 2022; Steptoe and Frank 2023). Despite the high prevalence of overweight (53%) and obesity (40%) in this sample, the potential relationships between these variables were not explored as they fall outside the proposed scope.

This study observed a moderate correlation between elevated NLR in depressed pregnant women with a history of childhood sexual abuse. Bublitz et al. (2022) showed that a history of childhood sexual abuse was a significant predictor of NLR change during gestation, although the association between depression and NLR did not reach statistical significance. The findings partially agreed with Zhang et al. (2023), who associated NLR with depression only in the second trimester. The sample had 72.7% of pregnant women in the third trimester, a pro-inflammatory period, which may have influenced the results. The relationship is multifactorial, mediated by HPA axis alterations (Danese et al. 2009; Kaess et al. 2018) and trimester-specific inflammatory profiles (Mor and Cardenas 2010).

Some limitations should be considered in this research, including high-risk clinical sample, missing laboratory data (33.9%), reliance on retrospective self-report measures, and potential instrument-related biases. The nonspecific nature of NLR, susceptible to infections, stress, anemia, and obesity, and the absence of analysis of specific cytokines such as IL-6, CRP, and TNF- α , which would be more sensitive to inflammatory reactivity associated with early stress and depression. Additionally, the cross-sectional study design, the predominance of participants in the third trimester, and the use of general-population instruments for anxiety and depression assessment (BAI and BDI) may have influenced results.

In conclusion, the prevalence of AD in this high-risk prenatal sample was 14.6%. Pregnant women with anxiety were significantly more likely to meet criteria for AD. Compared with non-depressed participants, women with AD were more likely to report lower educational attainment, lower household income, lack of personal income, poorer relationship satisfaction, a history of suicide attempts, and to be in the third trimester of pregnancy. Adverse childhood experiences were highly prevalent, particularly emotional abuse, emotional neglect, and sexual abuse. Although no significant associations were found between AD and either childhood trauma or NLR levels, a moderate correlation was observed between childhood sexual abuse and NLR among women with AD. These findings suggest that early-life sexual trauma may be associated with inflammatory processes in a subgroup of pregnant women with depression, warranting further investigation in larger longitudinal studies.

Declarations

Author Contribution

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by G.M.P, L.R.N., R. M.N and S.C.Z.R. The first draft of the manuscript was written by G.M.P. and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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