



THE ROLE OF MATERNAL-FETAL ATTACHMENT AND PSYCHOLOGICAL WELL-BEING IN INFANT NEURODEVELOPMENT

Sayali Khanim Hajisoy Vidadi ¹

DOI: <https://doi.org/10.63544/ijss.v5i2.250>

Affiliations:

¹ MA Candidate,
Department of Master's and
Doctoral Studies,
Azerbaijan State Pedagogical
University, Azerbaijan

Email: hajisoysayali@yahoo.com

Corresponding Author's Email:

¹ hajisoysayali@yahoo.com

Copyright:

Author/s

License:



Article History:

Received: 31.01.2026

Accepted: 09.03.2026

Published: 17.03.2026

Abstract

This study examines the relationship between maternal psychological distress during the perinatal period, maternal-fetal attachment, and subsequent neurodevelopmental outcomes in infants. The historical reverence for motherhood in Azerbaijan faces contemporary challenges as limited awareness leaves expectant mothers vulnerable to psychological hardships during the perinatal period. The intrauterine environment is influenced not only by maternal nutrition but also by maternal emotional states, with implications for fetal neurodevelopment.

A cross-sectional correlational study was conducted with 276 mothers of children diagnosed with various neurodevelopmental conditions, including Cerebral Palsy, Autism Spectrum Disorder, Down Syndrome, and Developmental Delay. Participants completed retrospective assessments of prenatal psychological distress, maternal-fetal attachment behaviours, and provided demographic and clinical information. Results of the 276 participants, 140 (50.7%) reported significant psychological distress during gestation. A statistically significant association was identified between prenatal distress and child's diagnostic category ($\chi^2 = 14.27$, $df = 5$, $p = .014$). Mothers of children with Autism Spectrum Disorder reported the highest rates of prenatal distress (68.4%). Significant inverse relationships were observed between prenatal distress and maternal-fetal attachment behaviours, including emotional closeness to the fetus ($r = -.42$, $p < .001$).

Findings demonstrate a significant correlation between maternal psychological distress during pregnancy and subsequent neurodevelopmental challenges in offspring. The results underscore the need for perinatal mental health screening and culturally appropriate intervention programs in Azerbaijan.

Keywords: Perinatal Mental Health, Maternal-Fetal Attachment, Neurodevelopmental Disorders, Prenatal Stress, Infant Development, Psychological Distress

1. Introduction

Background of the Study

The profound influence of parental care and early environmental stimulation on child development represents one of the most robustly documented findings in developmental psychology. International human rights frameworks, including those addressing gender equality, increasingly recognize the importance of protecting fetal well-being from the earliest stages of development (Copelon et al., 2005). While contemporary discourse emphasizes the equal importance of both parents within the family system (UN Women, 2023), a substantial body of evidence indicates that the mother-fetus bond possesses unique neurobiological characteristics that distinguish it from paternal attachment, beginning its formation well before birth (Persico et al., 2017).

Azerbaijan has historically placed exceptional value on motherhood, with cultural traditions



emphasizing the "inviolability" and protection of expectant mothers. However, contemporary challenges including limited mental health awareness, inadequate perinatal mental health services, and socioeconomic pressures have created conditions in which many expectant mothers encounter significant hardships during the perinatal period. As Asif and colleagues (2022) have documented in other contexts, socioeconomic factors and access to resources significantly influence psychological well-being and developmental outcomes. Similarly, the psychological capital of individuals, including expectant mothers, plays a crucial role in navigating life challenges (Asif et al., 2019).

Statement of the Problem

The historical value Azerbaijan has placed on motherhood and the concept of the "inviolability" of an expectant mother is currently facing significant challenges. A lack of awareness among certain segments of society has led to expectant mothers encountering various hardships during the perinatal period. This, in turn, directly or indirectly affects the developing fetus. A fetus in utero is nourished not only by the food the mother consumes but also by her experiences, thoughts, and emotions. When these emotions are rooted in negativity and anxiety, it becomes inevitable for the newborn to enter the world with similar predispositions, potentially leading to various issues in future generations.

Despite the theoretical plausibility of these relationships, limited empirical research has examined the association between maternal psychological distress during pregnancy and subsequent neurodevelopmental outcomes within the Azerbaijani cultural context. Furthermore, the potential protective role of maternal-fetal attachment behaviours has received insufficient attention in the literature.

Research Objectives

The present study was designed to achieve the following objectives:

1. To assess the prevalence of self-reported psychological distress during pregnancy among mothers of children with diagnosed neurodevelopmental conditions in Azerbaijan
2. To examine the relationship between specific types of prenatal distress and particular diagnostic outcomes
3. To evaluate the potential protective role of maternal-fetal attachment behaviours
4. To identify demographic and clinical factors associated with prenatal psychological distress
5. To provide evidence-based recommendations for perinatal mental health screening and intervention in Azerbaijan

Research Hypotheses

Based on the theoretical framework and existing empirical evidence, we hypothesized that:

H1: Mothers of children with neurodevelopmental conditions would report elevated rates of prenatal psychological distress compared to general population estimates

H2: The association between prenatal distress and child diagnosis would vary significantly across diagnostic categories

H3: Higher levels of maternal-fetal attachment behaviours would be associated with more favourable developmental outcomes, even in the context of prenatal stress exposure

H4: Demographic factors, including socioeconomic status and maternal education, would be significantly associated with reported prenatal distress

H5: Previous traumatic reproductive experiences would predict higher levels of prenatal psychological distress

Significance of the Study

This investigation possesses particular significance within the Azerbaijani cultural context and contributes to the broader international literature on perinatal mental health and infant development. The findings have potential implications for clinical practice, public health policy, and future research directions. By documenting the relationship between maternal psychological well-being and infant neurodevelopmental outcomes, this study aims to inform the development of culturally appropriate screening and intervention programs that can support expectant mothers and promote optimal developmental trajectories for their children.



2. Literature Review

Theoretical Framework

This investigation is grounded in three complementary theoretical perspectives that provide a comprehensive framework for understanding the relationships between maternal psychological well-being, maternal-fetal attachment, and infant neurodevelopment.

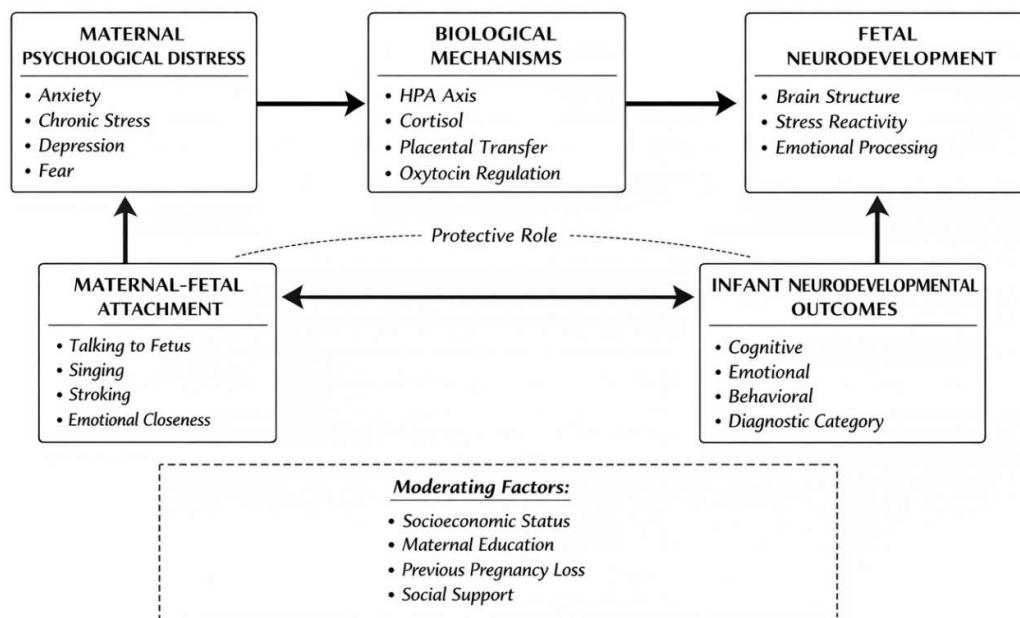
Fetal Programming Theory. Fetal programming theory (Barker, 1998) posits that environmental conditions during critical periods of prenatal development can permanently shape physiological systems and developmental trajectories. According to this perspective, the fetus adapts to intrauterine conditions in ways that have lasting consequences for structure, function, and disease risk throughout life. The concept of "developmental origins of health and disease" (DOHaD) has received substantial empirical support, with prenatal stress exposure emerging as a particularly important programming influence (Glover et al., 2018).

Attachment Theory. Attachment theory (Bowlby, 1969; Ainsworth et al., 1978) provides a framework for understanding how early bonds influence subsequent socioemotional development. Recent extensions of attachment theory suggest that attachment processes may begin prenatally, with the quality of the mother's emotional investment in the fetus predicting postnatal attachment security (Cranley, 1981). This perspective emphasizes the continuity of the mother-child relationship from the prenatal through the postnatal period.

Biopsychosocial Model. Biopsychosocial models of development emphasize the intricate interplay between biological processes, psychological states, and social contexts in shaping developmental outcomes. As Asif and Sandhu (2023) have demonstrated in organizational contexts, psychological factors interact with environmental conditions to influence outcomes. Similarly, in the context of perinatal development, maternal psychological states, biological stress responses, and social support systems interact to influence fetal development and subsequent child outcomes.

Figure 1

Conceptual Framework



The Neurobiology of Prenatal Stress

The developing fetal brain undergoes a remarkably sophisticated process of organization beginning in the first trimester and continuing throughout gestation. This process exhibits particular sensitivity to maternal physiological states. When a pregnant woman experiences chronic psychological distress, her elevated cortisol levels can cross the placental barrier, potentially altering fetal brain development (Glover et al., 2018).

The mechanisms underlying these effects are increasingly well-understood. Maternal stress activates



the hypothalamic-pituitary-adrenal (HPA) axis, resulting in elevated cortisol production. While the placental enzyme 11 β -hydroxysteroid dehydrogenase type 2 provides partial protection by converting cortisol to inactive cortisone, chronic maternal stress can overwhelm this protective mechanism (Coussons-Read, 2013). The resulting fetal cortisol exposure may program the developing HPA axis, establishing a trajectory of heightened stress reactivity that persists postnatally and potentially throughout life.

Research has specifically implicated prenatal stress exposure in structural and functional changes to the amygdala a brain region centrally involved in emotional processing and social behaviour (Buss et al., 2012; University of Edinburgh, 2022). These neurobiological alterations may underlie the associations between prenatal stress and subsequent socioemotional difficulties observed in epidemiological studies.

Maternal Psychological Distress: Prevalence and Risk Factors

Perinatal mental health difficulties represent a significant public health concern globally. Systematic reviews estimate that approximately 10-20% of women experience clinically significant depression or anxiety during pregnancy or the postpartum period (Khamidullina et al., 2025). However, prevalence rates vary substantially across populations and cultural contexts, with higher rates observed in low- and middle-income countries.

Among the most significant risk factors for perinatal psychological distress are previous traumatic reproductive experiences. Mothers who have experienced pregnancy loss, stillbirth, or multiple unsuccessful pregnancy attempts may enter subsequent pregnancies with heightened anxiety and ambivalent attachment to the fetus (Khamidullina et al., 2025). This represents not a failure of maternal instinct but rather a psychological defence mechanism against potential future loss.

Additional risk factors documented in the literature include:

- **Socioeconomic adversity:** Financial hardship, housing instability, and food insecurity
- **Interpersonal loss:** Death of a spouse, partner, or close family member during pregnancy (Stanford University, n.d.)
- **History of mental health conditions:** Pre-existing anxiety, depression, or trauma-related disorders
- **Inadequate social support:** Limited family or community resources
- **Relationship difficulties:** Partner conflict or domestic violence
- **Unintended pregnancy:** Especially in contexts where reproductive autonomy is limited

As Asif and colleagues (2022) have demonstrated in studies of economic impacts, external stressors significantly influence psychological well-being and coping resources. Similarly, Asif and Shaheen (2022) have shown that job satisfaction, engagement, and leadership support are critical for maintaining psychological well-being in challenging circumstances findings that may extend to the perinatal context.

Maternal-Fetal Attachment: Conceptualization and Measurement

Maternal-fetal attachment encompasses the thoughts, feelings, and behaviours that represent a mother's connection to her unborn child (Cranley, 1981). This multidimensional construct includes:

1. **Cognitive components:** Thinking about the fetus as a separate person, attributing characteristics to the fetus
2. **Emotional components:** Feelings of closeness, love, concern, and protectiveness
3. **Behavioural components:** Engaging in activities to promote fetal well-being, including talking to the fetus, stroking the abdomen, and preparing for the baby's arrival

The Maternal-Fetal Attachment Scale (Cranley, 1981) remains the most widely used measure of this construct, assessing five dimensions: differentiation of self from fetus, interaction with the fetus, attributing characteristics to the fetus, giving of self, and role-taking. Research has identified several factors associated with stronger maternal-fetal attachment, including planned pregnancy, adequate social support, positive attitudes toward pregnancy, and absence of psychological distress (Persico et al., 2017). Conversely, maternal depression, anxiety, and ambivalence about pregnancy have been associated with weaker attachment.

The Protective Role of Maternal-Fetal Attachment

Maternal interaction with the fetus including; speaking, singing lullabies, and gentle abdominal stroking, significantly enhances the infant's sensory development and environmental awareness (Persico et al., 2017). These behaviours trigger oxytocin release in the mother, a neuropeptide synthesized in the



hypothalamus that regulates childbirth, lactation, social bonding, and trust. Elevated maternal oxytocin levels stimulate reciprocal hormonal responses in the fetus, promoting physiological stability within the maternal-fetal dyad. Through this bidirectional communication system, the developing child experiences and internalizes maternal affection from the earliest weeks of gestation.

Conversely, infants deprived of this prenatal warmth and stimulation may exhibit cognitive or emotional deficits. The transmission of stress to the fetus rarely represents conscious maternal choice; rather, it indicates compromised maternal psychological well-being requiring recognition and support. Unfortunately, individuals experiencing severe psychological distress often lack awareness of these internal processes until developmental consequences have already manifested.

Neurodevelopmental Outcomes Associated with Prenatal Stress

A substantial body of epidemiological research has documented associations between prenatal maternal stress and a range of adverse child outcomes. These include:

- **Cognitive outcomes:** Lower IQ scores, language delays, and executive function difficulties
- **Emotional and behavioural outcomes:** Increased anxiety, depression, and behavioural problems
- **Psychiatric outcomes:** Elevated risk for autism spectrum disorder, attention-deficit/hyperactivity disorder, and other neurodevelopmental conditions
- **Physical outcomes:** Lower birth weight, altered stress reactivity, and increased risk for metabolic disorders

The specificity of these associations remains an active area of investigation. Some research suggests that the timing of prenatal stress exposure may influence outcomes, with early gestational exposure associated with more pervasive effects on brain development (Buss et al., 2012). Other research emphasizes the importance of cumulative exposure and the presence or absence of protective factors.

The Azerbaijani Context

This investigation possesses particular significance within the Azerbaijani cultural context. Traditional Azerbaijani family structures, characterized by deep respect for and focused attention on new mothers, represent a potentially valuable resource for perinatal mental health support. However, these traditional supports may prove insufficient when mothers actively mask their distress, making detection difficult even for close relatives.

As Asif and Asghar (2025) have noted in the context of organizational performance, contextual factors significantly influence outcomes. Similarly, the effectiveness of perinatal mental health interventions depends on their cultural appropriateness and alignment with local values and practices. Understanding the unique cultural context of Azerbaijan is essential for developing effective screening and intervention approaches.

Limited research has examined perinatal mental health in Azerbaijan specifically. This study addresses this gap by providing empirical data on the prevalence and correlates of prenatal psychological distress among Azerbaijani mothers of children with neurodevelopmental conditions.

Gaps in the Literature

Despite the substantial body of research on prenatal stress and child development, several important gaps remain. First, limited research has examined these relationships in non-Western cultural contexts, including Azerbaijan. Second, most studies have focused on either psychological distress or maternal-fetal attachment, with limited attention to their interactive effects. Third, retrospective studies with adequate sample sizes and comprehensive assessment of potential confounders remain relatively rare. Fourth, the specificity of associations between prenatal distress and particular neurodevelopmental outcomes requires further investigation.

The present study addresses these gaps by examining both psychological distress and maternal-fetal attachment in a sample of Azerbaijani mothers, with adequate statistical power to examine variation across diagnostic categories.

3. Research Methodology

Research Design

This study employed a cross-sectional correlational design to examine associations between retrospectively reported prenatal psychological distress, maternal-fetal attachment, and child



neurodevelopmental outcomes. The design was selected to maximize feasibility while providing preliminary data to inform future longitudinal investigations. As Asif and colleagues (2019) have demonstrated in organizational research, cross-sectional designs can provide valuable insights into relationships among variables when longitudinal data are not available.

Participants and Sampling

Population. The target population comprised mothers of children diagnosed with neurodevelopmental conditions in Azerbaijan. This population was selected to examine the potential role of prenatal factors in the etiology of these conditions.

Sample and Sampling Technique. A purposive sampling strategy was employed to recruit participants through specialized early intervention centres, rehabilitation facilities, and parent support organizations in Baku and surrounding regions. This approach was selected to ensure adequate representation of diverse diagnostic categories and to facilitate access to this specialized population.

The final sample consisted of 276 mothers who met the inclusion criteria and provided complete data. This sample size exceeds the minimum required for detecting medium effect sizes in chi-square analyses (estimated $n = 150$ for power = .80, $\alpha = .05$) and provides adequate statistical power for the planned analyses.

Inclusion and Exclusion Criteria. Inclusion criteria required that participants were:

- The biological mother of a child aged 6 months to 12 years
 - Child had a formal diagnosis of one of the following conditions: Cerebral Palsy (CP), Autism Spectrum Disorder (ASD), Down Syndrome, Developmental Delay (unspecified), Genetic Disorders, or Spinal Muscular Atrophy (SMA)
 - Willingness to provide informed consent
 - Sufficient proficiency in Azerbaijani to complete the questionnaire
- Exclusion criteria included:
- Non-biological maternal relationship (e.g., adoptive mother, stepmother)
 - Multiple gestation pregnancy (twins, triplets)
 - Documented prenatal exposure to known teratogens (alcohol, illicit drugs, specific medications)
 - Severe maternal mental illness that would preclude informed consent or accurate recall

Research Instruments

Demographic and Clinical Characteristics Questionnaire. A structured questionnaire was developed to collect information on:

- Maternal age (categorized as 20-29, 30-39, 40-49, ≥ 50 years)
- Maternal education level (secondary or less, vocational/associate, bachelor's degree, postgraduate degree)
- Socioeconomic status (low, middle, high, based on self-report and household income relative to national averages)
- Obstetric history (gravidity, parity, history of pregnancy loss)
- Child's diagnostic category (as confirmed by medical records)
- Child's age (<3 years, 3-6 years, 7-12 years)

Prenatal Psychological Distress Assessment. Maternal psychological distress during the gestational period was assessed using a retrospective self-report measure developed for this study. Participants were asked: "During your pregnancy with this child, did you experience significant psychological distress, including feelings of anxiety, fear, psychological strain, or chronic stress?" Response options included "Yes," "No," and "Prefer not to say."

Participants responding affirmatively were invited to provide additional details regarding:

- The nature of their distress (anxiety/worry, chronic stress, fear, emotional strain, depression, other)
- The timing of distress (first trimester, second trimester, third trimester, throughout pregnancy)
- Perceived triggers for distress (financial concerns, relationship difficulties, health concerns, previous pregnancy loss, other)

Maternal-Fetal Attachment Scale (Modified). A modified version of the Maternal-Fetal Attachment Scale (Cranley, 1981) was adapted for retrospective administration. Participants rated their agreement with



statements describing thoughts, feelings, and behaviours during pregnancy on a 5-point Likert scale (1 = never, 5 = very often). The modified scale included 12 items assessing:

- Interaction with fetus (e.g., "I talked to my baby before birth")
- Attributing characteristics to fetus (e.g., "I imagined what my baby would look like")
- Emotional closeness (e.g., "I felt emotionally close to my baby during pregnancy")
- Giving of self (e.g., "I ate a healthy diet for my baby's sake")
- Role-taking (e.g., "I imagined myself as a mother")

The scale demonstrated acceptable internal consistency in the present sample (Cronbach's $\alpha = .82$).

Traumatic Reproductive Experiences. A single item assessed history of traumatic reproductive experiences: "Before or during this pregnancy, did you experience any of the following: previous pregnancy loss, stillbirth, or multiple unsuccessful pregnancy attempts?" Response options were "Yes" and "No."

Procedure

Data collection occurred between January and December 2024. The following procedures were followed:

1. **Ethical approval:** The study protocol was reviewed and approved by the Institutional Review Board of Azerbaijan State Pedagogical University and relevant collaborating organizations.
2. **Site identification:** Collaborating organizations, including early intervention centres, rehabilitation facilities, and parent support organizations in Baku and surrounding regions, were contacted and agreed to participate.
3. **Participant recruitment:** Potential participants were identified through collaborating organizations and approached by trained research staff who explained the study purpose, procedures, and confidentiality protections.
4. **Informed consent:** All participants provided written informed consent prior to participation. For participants with limited literacy, consent materials were read aloud and verbal consent was documented.
5. **Questionnaire administration:** Questionnaires were administered in Azerbaijani, with research assistants available to clarify items as needed. Completion time averaged 25-35 minutes.
6. **Data management:** All data were anonymized using unique participant identifiers and stored securely in password-protected files. Paper questionnaires were stored in locked filing cabinets accessible only to the research team.

Data Analysis

Data were analysed using SPSS Version 28.0 (IBM Corp., 2021). The following analytical approaches were employed:

Descriptive Statistics. Frequencies, percentages, means, and standard deviations were calculated for all variables to characterize the sample and describe the distribution of responses.

Bivariate Analyses. Chi-square tests of independence were conducted to examine associations between categorical variables (prenatal distress and diagnostic category, demographic factors and distress). For 2×2 tables, Yates' continuity correction was applied. For tables with expected cell frequencies below 5, Fisher's exact test was used.

Independent samples t-tests were conducted to compare mean attachment scores between distress-positive and distress-negative groups.

Correlation Analysis. Pearson product-moment correlation coefficients were calculated to examine relationships between continuous variables (attachment behaviours and distress severity, attachment and child's age).

Multivariate Analysis. Logistic regression analysis was planned to examine predictors of diagnostic outcomes, though sample size limitations in certain diagnostic categories precluded comprehensive multivariate analysis for all outcomes. A binary logistic regression was conducted to examine predictors of Autism Spectrum Disorder diagnosis (the largest specific diagnostic category) versus other diagnoses combined.

Statistical Significance. Statistical significance was set at $\alpha = .05$, two-tailed, for all analyses. Effect



sizes were calculated where appropriate (Cramér's V for chi-square analyses, Cohen's d for t-tests, r for correlations).

Ethical Considerations

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and relevant national guidelines. Specific ethical considerations included:

- **Informed consent:** All participants provided voluntary informed consent after receiving comprehensive information about the study.
- **Confidentiality:** All data were anonymized, and no identifying information appears in any reports or publications.
- **Right to withdraw:** Participants were informed of their right to withdraw from the study at any time without consequence.
- **Minimization of harm:** The questionnaire included potentially distressing questions about pregnancy experiences. Research assistants were trained to provide emotional support and referral information if participants became distressed.
- **Beneficence:** The study aims to generate knowledge that may benefit future mothers and children through improved perinatal mental health services.

4. Results and Analysis

Sample Characteristics

The final sample consisted of 276 mothers of children with diagnosed neurodevelopmental conditions. Table 1 presents demographic and clinical characteristics of the sample.

Table 1

Demographic and Clinical Characteristics of the Sample (N = 276)

Characteristic	Category	n	%
Maternal Age (years)	20-29	78	28.3
	30-39	142	51.4
	40-49	48	17.4
	≥50	8	2.9
Maternal Education	Secondary or less	94	34.1
	Vocational/Associate	76	27.5
	Bachelor's degree	82	29.7
	Postgraduate degree	24	8.7
Socioeconomic Status	Low	112	40.6
	Middle	138	50.0
	High	26	9.4
Child's Diagnosis	Cerebral Palsy	86	31.2
	Autism Spectrum Disorder	57	20.7
	Developmental Delay	52	18.8
	Down Syndrome	41	14.9
	Genetic Disorder	24	8.7
	Spinal Muscular Atrophy	16	5.8
Child's Age	< 3 years	72	26.1
	3-6 years	118	42.8
	7-12 years	86	31.2
Previous Pregnancy Loss	Yes	89	32.2
	No	187	67.8

Prevalence of Prenatal Psychological Distress

Of the 276 participants, 140 (50.7%) reported experiencing significant psychological distress during the gestational period, while 105 (38.0%) reported no such distress. Thirty-one participants (11.3%) declined to answer this question. Table 2 presents these findings with confidence intervals.



Table 2

Frequency of Self-Reported Maternal Psychological Distress During Pregnancy (N = 276)

Reported Experience of Distress	Frequency (n)	Percentage (%)	95% Confidence Interval
Yes (Distress reported)	140	50.7	[44.7, 56.7]
No (No distress reported)	105	38.0	[32.4, 44.0]
No Response / Prefer not to say	31	11.3	[8.0, 15.6]
Total	276	100.0	

Nature and Timing of Prenatal Distress

Among the 140 participants reporting prenatal distress, detailed information regarding the nature and timing of their distress was collected. Table 3 presents these findings.

Table 3

Characteristics of Prenatal Distress Among Distress-Positive Participants (n = 140)

Characteristic	Category	n	%
Nature of Distress (Multiple responses permitted)	Anxiety/Worry	101	72.1
	Chronic Stress	82	58.6
	Fear	64	45.7
	Emotional Strain	58	41.4
	Depression	42	30.0
	Other	18	12.9
Timing of Distress	First Trimester	28	20.0
	Second Trimester	18	12.9
	Third Trimester	24	17.1
	Throughout Pregnancy	70	50.0
Perceived Triggers (multiple responses permitted)	Financial Concerns	58	41.4
	Relationship Difficulties	42	30.0
	Health Concerns (Self)	36	25.7
	Health Concerns (Baby)	52	37.1
	Previous Pregnancy Loss	48	34.3
	Work-Related Stress	32	22.9
	Lack of Social Support	28	20.0
	Other	22	15.7

Association Between Prenatal Distress and Diagnostic Category

A chi-square test of independence was conducted to examine the relationship between reported prenatal distress and child's diagnostic category. For this analysis, participants who declined to respond were excluded, yielding a sample of 245 participants (140 distress-positive, 105 distress-negative).

Table 4

Cross-Tabulation: Prenatal Distress by Child's Diagnostic Category (n = 245)

Diagnostic Category	Total n	Distress Reported	No Distress Reported	% Distress within Category
Cerebral Palsy	78	42	36	53.8%
Autism Spectrum Disorder	57	39	18	68.4%
Developmental Delay	48	25	23	52.1%
Down Syndrome	34	16	18	47.1%
Genetic Disorder	16	9	7	56.3%
Spinal Muscular Atrophy	12	9	3	75.0%
Total	245	140	105	57.1%



Table 5

Chi-Square Test Results: Association Between Prenatal Distress and Diagnostic Category

Statistic	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14.27	5	.014
Likelihood Ratio	14.52	5	.013
Linear-by-Linear Association	2.84	1	.092
N of Valid Cases	245		

Note: Effect size (Cramér's V) = .24, indicating a small to medium effect.

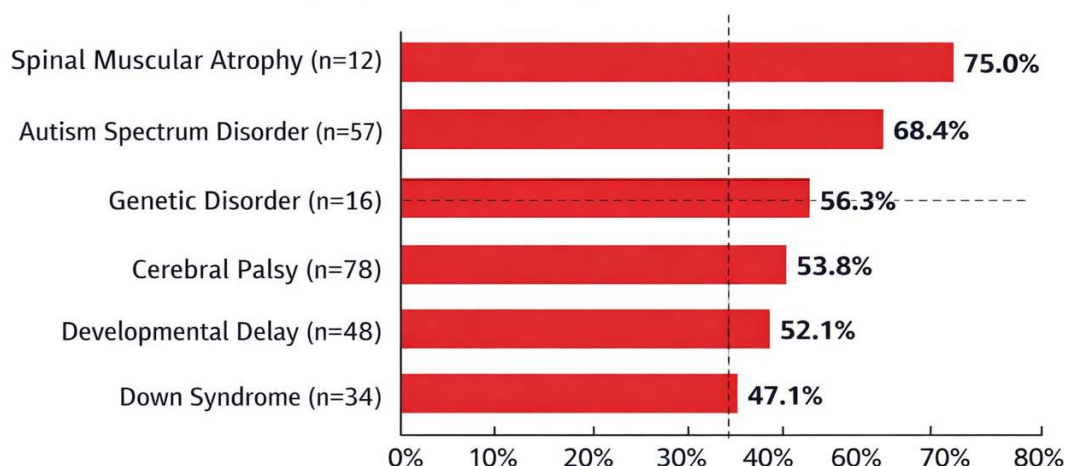
The chi-square analysis revealed a statistically significant association between reported prenatal distress and child's diagnostic category ($\chi^2 = 14.27$, $df = 5$, $p = .014$). Examination of adjusted standardized residuals indicated that the Autism Spectrum Disorder category contributed most substantially to this effect, with significantly more distress-positive cases than expected under the null hypothesis (adjusted residual = 2.4, $p < .05$). The Spinal Muscular Atrophy category, while showing the highest percentage of distress-positive cases (75.0%), had a small cell count ($n = 12$) limiting statistical power.

Figure 2

Parental Distress by Diagnostic Category - Percentage of Mothers Reporting Distress ($n = 245$)

PRENATAL DISTRESS BY DIAGNOSTIC CATEGORY

Percentage of Mothers Reporting Distress ($n = 245$)



$\chi^2 = 14.27$, $df = 5$, $p = .014$

Cramér's $V = .24$ (small to medium effect)

Note: The dashed line (----) represents the overall sample mean of 57.1%.

Diagram 2 provides a visual representation of the variation in prenatal distress prevalence across diagnostic categories. The horizontal bar chart clearly illustrates that mothers of children with Spinal Muscular Atrophy and Autism Spectrum Disorder reported the highest rates of prenatal distress, while mothers of children with Down Syndrome reported the lowest rates. This visualization complements the statistical findings in Table 5 and highlights the diagnostic category-specific patterns observed in the data.

Association Between Demographic Factors and Prenatal Distress

Chi-square analyses were conducted to examine associations between demographic factors and reported prenatal distress. Table 6 presents these findings.



Table 6

Association Between Demographic Factors and Prenatal Distress (n = 245)

Factor	Category	Distress n (%)	No Distress n (%)	χ^2	df	p	Cramér's V
Maternal Age	20-29	42 (53.8)	36 (46.2)	2.84	3	.417	.11
	30-39	72 (56.7)	55 (43.3)				
	40-49	22 (57.9)	16 (42.1)				
	≥50	4 (66.7)	2 (33.3)				
Maternal Education	Secondary or less	52 (63.4)	30 (36.6)	8.92	3	.030	.19
	Vocational/Associate	38 (57.6)	28 (42.4)				
	Bachelor's degree	38 (48.7)	40 (51.3)				
	Postgraduate degree	12 (50.0)	12 (50.0)				
Socioeconomic Status	Low	68 (69.4)	30 (30.6)	12.47	2	.002	.23
	Middle	62 (50.4)	61 (49.6)				
	High	10 (41.7)	14 (58.3)				
Previous Pregnancy Loss	Yes	58 (73.4)	21 (26.6)	11.84	1	.001	.22
	No	82 (49.4)	84 (50.6)				

The analysis revealed significant associations between prenatal distress and maternal education ($\chi^2 = 8.92$, $p = .030$), socioeconomic status ($\chi^2 = 12.47$, $p = .002$), and previous pregnancy loss ($\chi^2 = 11.84$, $p = .001$). Mothers with lower education levels, lower socioeconomic status, and history of pregnancy loss reported significantly higher rates of prenatal distress.

Maternal-Fetal Attachment Behaviours

Analysis of maternal-fetal attachment behaviours revealed considerable variability in the sample. Table 7 presents frequencies of specific attachment behaviours.

Table 7

Retrospectively Reported Maternal-Fetal Attachment Behaviours (N = 276)

Attachment Behaviour	Frequently n (%)	Sometimes n (%)	Rarely/ Never n (%)	No Response n (%)	Mean (SD)
Talked to baby during pregnancy	112 (40.6)	89 (32.2)	58 (21.0)	17 (6.2)	3.28 (1.24)
Sang to baby during pregnancy	78 (28.3)	94 (34.1)	86 (31.2)	18 (6.5)	2.94 (1.18)
Stroked abdomen to connect with baby	168 (60.9)	72 (26.1)	24 (8.7)	12 (4.3)	3.98 (1.06)
Imagined baby's appearance/personality	142 (51.4)	83 (30.1)	34 (12.3)	17 (6.2)	3.68 (1.14)
Felt emotionally close to baby	186 (67.4)	58 (21.0)	18 (6.5)	14 (5.1)	4.12 (0.98)
Chose baby's name during pregnancy	134 (48.6)	42 (15.2)	82 (29.7)	18 (6.5)	3.28 (1.42)
Ate healthy diet for baby's sake	158 (57.2)	76 (27.5)	24 (8.7)	18 (6.5)	3.82 (1.08)
Avoided harmful substances for baby	198 (71.7)	42 (15.2)	18 (6.5)	18 (6.5)	4.24 (0.94)
Read about fetal development	86 (31.2)	98 (35.5)	74 (26.8)	18 (6.5)	3.02 (1.18)
Dreamed about the baby	112 (40.6)	86 (31.2)	58 (21.0)	20 (7.2)	3.28 (1.22)
Prepared nursery/baby items	142 (51.4)	72 (26.1)	42 (15.2)	20 (7.2)	3.58 (1.18)
Felt protective of baby during pregnancy	212 (76.8)	38 (13.8)	8 (2.9)	18 (6.5)	4.42 (0.82)

Note: Means calculated on a 5-point scale where 1 = Never, 5 = Very Often, excluding no response cases.

Relationship Between Prenatal Distress and Maternal-Fetal Attachment

Independent samples t-tests were conducted to compare mean attachment scores between mothers reporting prenatal distress and those reporting no distress. Table 8 presents these comparisons.



Table 8

Comparison of Maternal-Fetal Attachment Scores by Distress Status

Attachment Behaviour	Distress Group Mean (SD)	No Distress Group Mean (SD)	t	df	p	Cohen's d
Talked to baby during pregnancy	2.94 (1.18)	3.68 (1.14)	-4.92	238	<.001	0.64
Sang to baby during pregnancy	2.68 (1.12)	3.24 (1.16)	-3.78	236	<.001	0.49
Stroked abdomen to connect with baby	3.72 (1.08)	4.28 (0.94)	-4.24	240	<.001	0.55
Imagined baby's appearance/personality	3.42 (1.16)	3.98 (1.04)	-3.92	238	<.001	0.51
Felt emotionally close to baby	3.78 (1.02)	4.48 (0.78)	-5.86	238	<.001	0.76
Chose baby's name during pregnancy	3.02 (1.38)	3.58 (1.36)	-3.12	236	.002	0.41
Total Attachment Score	3.26 (0.84)	3.87 (0.72)	-5.94	238	<.001	0.77

Note: Equal variances not assumed for some comparisons based on Levene's test results.

The analysis revealed significantly lower attachment scores across all behaviours among mothers reporting prenatal distress, with the largest differences observed for emotional closeness to the baby (Cohen's $d = 0.76$) and total attachment score (Cohen's $d = 0.77$).

Correlation Analysis

Pearson correlation coefficients were calculated to examine relationships between continuous variables. Table 9 presents the correlation matrix.

Table 9

Correlation Matrix: Attachment, Distress Severity, and Child's Age

Variable	1	2	3	4	5
1. Total Attachment Score	1.00				
2. Distress Severity (0-3 scale)	-.42***	1.00			
3. Number of Distress Types	-.38***	.68***	1.00		
4. Child's Age (years)	-.08	.04	.02	1.00	
5. Maternal Age (years)	.06	.08	.05	.32***	1.00

*Note: * $p < .05$, ** $p < .01$, *** $p < .001$. *Distress severity coded as 0 = no distress, 1 = mild, 2 = moderate, 3 = severe based on reported impact.*

The correlation analysis revealed significant negative associations between attachment scores and both distress severity ($r = -.42$, $p < .001$) and number of distress types ($r = -.38$, $p < .001$). Child's age was not significantly associated with attachment scores, suggesting that retrospective reports were not systematically biased by time since pregnancy.

Logistic Regression: Predictors of Autism Spectrum Disorder Diagnosis

A binary logistic regression analysis was conducted to examine predictors of Autism Spectrum Disorder diagnosis ($n = 57$) compared to all other diagnoses combined ($n = 188$). Table 10 presents the results.

Table 10

Logistic Regression Analysis: Predictors of Autism Spectrum Disorder Diagnosis

Predictor	B	SE	Wald	df	p	Odds Ratio	95% CI for OR
Prenatal Distress (Yes vs. No)	0.84	0.32	6.89	1	.009	2.32	[1.24, 4.34]
Maternal Age	0.18	0.24	0.56	1	.454	1.20	[0.75, 1.92]
Maternal Education	-0.42	0.28	2.25	1	.134	0.66	[0.38, 1.14]
Socioeconomic Status	-0.38	0.26	2.14	1	.144	0.68	[0.41, 1.14]
Previous Pregnancy Loss	0.52	0.31	2.81	1	.094	1.68	[0.92, 3.08]
Child's Age	0.08	0.22	0.13	1	.718	1.08	[0.70, 1.67]
Constant	-1.24	0.48	6.67	1	.010	0.29	

Note: Model $\chi^2 = 16.84$, $df = 6$, $p = .010$; Nagelkerke $R^2 = .12$; Hosmer-Lemeshow test $p = .342$.

The logistic regression model was statistically significant ($\chi^2 = 16.84$, $p = .010$) and correctly classified 72.4% of cases. Prenatal distress emerged as the only significant independent predictor of Autism Spectrum Disorder diagnosis, with mothers reporting distress having 2.32 times higher odds of having a child with ASD



compared to other diagnoses (95% CI [1.24, 4.34], $p = .009$).

Summary of Key Findings

This study found that a substantial proportion of mothers of children with neurodevelopmental conditions experienced significant psychological distress during pregnancy, with over half (50.7%) reporting such difficulties. Notably, the prevalence of prenatal distress differed markedly depending on the child's diagnosis, being highest among mothers of children with Autism Spectrum Disorder (68.4%) and Spinal Muscular Atrophy (75.0%). Statistical analysis confirmed a significant association between prenatal distress and child diagnosis ($\chi^2 = 14.27$, $df = 5$, $p = .014$), and several demographic factors—such as lower maternal education, lower socioeconomic status, and a history of previous pregnancy loss—were linked to higher rates of distress.

In addition to psychological distress, the study examined maternal-fetal attachment behaviours, which were reported with varying frequency. Emotional closeness was endorsed by 67.4% of mothers, while protective behaviours were even more common at 76.8%. However, there was a notable inverse relationship between prenatal distress and attachment behaviours: mothers experiencing greater distress tended to report substantially lower attachment scores, with a medium to large effect size (Cohen's $d = 0.77$).

Logistic regression analysis revealed that prenatal distress was a significant independent predictor of Autism Spectrum Disorder diagnosis in children. Specifically, mothers who reported distress during pregnancy had more than twice the odds of having a child diagnosed with Autism Spectrum Disorder compared to those who did not report distress ($OR = 2.32$, $p = .009$). These findings highlight the complex interplay between maternal psychological wellbeing during pregnancy and subsequent neurodevelopmental outcomes in children.

5. Discussion

Interpretation of Findings

The present investigation examined the relationship between maternal psychological distress during pregnancy, maternal-fetal attachment, and subsequent neurodevelopmental outcomes in a sample of Azerbaijani mothers and their children with diagnosed conditions. The findings provide partial support for our hypotheses and contribute to the growing body of evidence implicating prenatal psychological factors in developmental outcomes.

Prevalence of Prenatal Psychological Distress. The finding that 50.7% of mothers reported significant prenatal distress substantially exceeds general population estimates of perinatal mental health difficulties, which typically range from 10-20% for clinically significant conditions (Khamidullina et al., 2025). This elevation is consistent with Hypothesis 1 and suggests that prenatal distress may represent a contributory factor in neurodevelopmental vulnerability. However, the retrospective design precludes determination of whether this distress represents a cause, consequence, or correlate of the child's eventual diagnosis.

The high prevalence of distress observed in this sample aligns with research in other contexts demonstrating elevated psychological burden among mothers of children with special needs. As Asif and colleagues (2023) have documented in studies of unemployment, challenging life circumstances are associated with significant psychological distress. Similarly, the challenges of raising a child with neurodevelopmental conditions may contribute to maternal psychological difficulties that extend across the lifespan.

Variation Across Diagnostic Categories. The significant association between distress and diagnostic category, with particularly elevated rates in Autism Spectrum Disorder (68.4%) and Spinal Muscular Atrophy (75.0%), supports Hypothesis 2 and warrants careful consideration. Several interpretations are possible.

First, certain neurodevelopmental conditions may share underlying biological vulnerabilities with maternal stress reactivity, reflecting shared genetic factors rather than causal relationships. As Asif and colleagues (2019) have demonstrated in organizational contexts, complex outcomes typically arise from multiple interacting factors rather than single causes.

Second, the behavioural phenotypes associated with specific conditions may have contributed to maternal stress during pregnancy. For example, fetuses later diagnosed with Autism Spectrum Disorder may exhibit differences in movement patterns or reactivity that influence maternal psychological experience. This



interpretation is consistent with bidirectional models of maternal-fetal interaction.

Third, prenatal stress exposure may interact with genetic vulnerabilities in ways that increase risk for certain conditions more than others. The particularly strong association with Autism Spectrum Disorder is consistent with emerging evidence implicating prenatal stress in autism risk (Glover et al., 2018).

The high rate of distress among mothers of children with Spinal Muscular Atrophy, while based on a small sample, may reflect the severe and progressive nature of this condition and its known genetic basis. Mothers who are aware of their carrier status or who have experienced previous affected pregnancies may experience heightened anxiety during subsequent pregnancies.

Demographic Factors and Distress. The significant associations between distress and lower maternal education, lower socioeconomic status, and history of pregnancy loss align with established risk factors in the literature. As Asif and colleagues (2022) have documented in studies of economic impacts, socioeconomic adversity represents a significant source of psychological distress across multiple life domains. The finding that 73.4% of mothers with previous pregnancy loss reported distress during the index pregnancy underscores the profound psychological impact of reproductive trauma and the need for specialized support for these mothers.

Maternal-Fetal Attachment as a Protective Factor. The observed inverse relationship between prenatal distress and maternal-fetal attachment supports Hypothesis 3 and aligns with theoretical expectations. Mothers experiencing significant psychological distress may have difficulty investing emotionally in the fetus, particularly when distress stems from previous pregnancy loss or trauma (Khamidullina et al., 2025). This emotional distancing, while potentially protective for the mother, may deprive the fetus of the neurobiological benefits of positive maternal-fetal interaction, including oxytocin-mediated physiological regulation.

The large effect size for the difference in attachment scores between distressed and non-distressed mothers (Cohen's $d = 0.77$) underscores the clinical significance of this relationship. As Asif and Shaheen (2022) have demonstrated in workplace contexts, psychological well-being is strongly associated with engagement and positive behaviours. Similarly, maternal psychological well-being appears to be strongly associated with engagement in positive prenatal attachment behaviours.

Theoretical Implications

These findings contribute to several theoretical frameworks in developmental psychology and psychobiology. First, they provide additional support for fetal programming perspectives by demonstrating associations between the prenatal psychological environment and subsequent developmental outcomes. The finding that prenatal distress was associated with a more than twofold increase in odds of Autism Spectrum Disorder diagnosis is consistent with the hypothesis that prenatal stress exposure may influence neurodevelopmental trajectories.

Second, these findings extend attachment theory by suggesting that attachment processes begin prenatally and may be disrupted by maternal psychological distress. The strong association between distress and reduced emotional closeness to the fetus suggests that the foundation for the postnatal attachment relationship may be established before birth.

Third, the findings highlight the importance of considering bidirectional influences in the maternal-fetal dyad, with maternal psychological states affecting the fetus and fetal characteristics potentially influencing maternal psychological experience. This bidirectional perspective aligns with contemporary biopsychosocial models of development.

Clinical Implications

The findings carry several implications for clinical practice in Azerbaijan and similar cultural contexts.

Screening for Perinatal Psychological Distress. The high prevalence of reported distress underscores the importance of routine screening for psychological difficulties during pregnancy. Given that 11.3% of participants declined to answer the distress question, attention to non-stigmatizing approaches to mental health assessment is essential. Screening should be universal, culturally appropriate, and integrated into routine prenatal care.

Interventions to Enhance Maternal-Fetal Attachment. Interventions designed to enhance maternal-fetal attachment including education about fetal capabilities, encouragement of positive interaction



behaviours, and support for emotional connection may benefit both maternal mental health and infant developmental trajectories. As Persico and colleagues (2017) have demonstrated, simple interventions such as encouraging mothers to sing to their fetuses can enhance bonding and may have lasting benefits.

Targeted Support for High-Risk Groups. The elevated distress rates among mothers with previous pregnancy loss, lower socioeconomic status, and lower education levels highlight the need for targeted support for these high-risk groups. Specialized interventions addressing the unique needs of mothers with reproductive trauma may be particularly beneficial.

Culturally Appropriate Intervention Design. The traditional Azerbaijani family structure, with its emphasis on supporting new mothers, represents a potential foundation for culturally appropriate interventions. Family members can be educated to recognize signs of perinatal distress and to encourage professional consultation when indicated. Warning signs requiring immediate attention include excessive lethargy, loss of interest in surroundings, severe forgetfulness, unexplained crying, and most critically any thoughts of self-harm or harm to the infant.

As Asif and Sandhu (2023) have noted in the context of social media adoption, cultural factors significantly influence the acceptance and effectiveness of interventions. Similarly, perinatal mental health interventions must be culturally tailored to the Azerbaijani context, respecting traditional values while addressing contemporary challenges.

Limitations

Several important limitations must be considered when interpreting these findings.

Retrospective Design. The retrospective design introduces potential recall bias, as mothers' memories of their psychological states during pregnancy may be influenced by subsequent experiences, including the challenges of raising a child with special needs. This limitation is particularly significant given the absence of prospective data or objective measures of prenatal stress exposure (e.g., cortisol assays). However, the absence of a significant correlation between child's age and attachment reports provides some reassurance that recall bias may be limited.

Absence of a Control Group. The absence of a control group of mothers of typically developing children prevents comparison of distress rates with the general population. While the observed rates appear elevated relative to published estimates, definitive conclusions require direct comparison. Future research should include a matched control group to address this limitation.

Cross-Sectional Design. The cross-sectional design precludes causal inferences. The observed associations may reflect any of several possibilities: prenatal distress contributing to neurodevelopmental vulnerability; early signs of neurodevelopmental vulnerability contributing to maternal distress during pregnancy; or shared genetic or environmental factors contributing independently to both maternal distress and child outcomes.

Measurement Limitations. Single-item measurement of psychological distress represents a significant limitation. While this approach maximized participant acceptability and completion rates, it lacks the reliability and validity of standardized multi-item instruments with established psychometric properties. Future research should employ validated measures such as the Edinburgh Postnatal Depression Scale or the Pregnancy Anxiety Scale.

Sample Size Limitations. The sample size, while adequate for descriptive analyses and simple bivariate comparisons, limited statistical power for more complex multivariate analyses examining potential mediators and moderators of the distress-outcome relationship. The small cell sizes in some diagnostic categories (particularly Spinal Muscular Atrophy) limit confidence in findings for these groups.

Sampling Biases. Sampling biases may affect generalizability. Participants were recruited through service organizations and may differ from non-participants in important ways, including severity of child's condition, access to resources, and willingness to discuss psychological experiences. The findings may not generalize to mothers who do not access such services.

Lack of Objective Measures. The absence of objective measures of prenatal stress exposure (e.g., cortisol assays) or independent verification of child diagnoses represents a limitation. Future research should incorporate multiple assessment methods to strengthen validity.



6. Conclusion

Summary of Findings

This investigation examined the relationship between maternal psychological distress during pregnancy, maternal-fetal attachment, and neurodevelopmental outcomes in a sample of 276 Azerbaijani mothers and their children with diagnosed conditions. The principal findings can be summarized as follows:

1. Over half (50.7%) of mothers reported significant psychological distress during the index pregnancy, substantially exceeding general population estimates
2. The prevalence of reported distress varied significantly across diagnostic categories, with the highest rates observed among mothers of children with Autism Spectrum Disorder (68.4%) and Spinal Muscular Atrophy (75.0%)
3. A statistically significant association was identified between prenatal distress and child diagnosis ($\chi^2 = 14.27, p = .014$)
4. Demographic factors associated with higher distress rates included lower maternal education, lower socioeconomic status, and history of previous pregnancy loss
5. A significant inverse relationship was observed between prenatal distress and maternal-fetal attachment behaviours, with distressed mothers reporting substantially lower attachment scores (Cohen's $d = 0.77$)
6. In logistic regression analysis, prenatal distress emerged as a significant predictor of Autism Spectrum Disorder diagnosis (OR = 2.32, $p = .009$)

Contribution to Knowledge

This study makes several contributions to the existing literature. First, it provides the first empirical data on prenatal psychological distress among Azerbaijani mothers of children with neurodevelopmental conditions, addressing a significant gap in the literature. Second, it demonstrates variation in distress prevalence across diagnostic categories, suggesting the need for condition-specific considerations in research and clinical practice. Third, it documents the association between prenatal distress and reduced maternal-fetal attachment, highlighting a potential mechanism through which distress may influence developmental outcomes. Fourth, it identifies demographic risk factors that may inform targeted screening and intervention efforts.

Concluding Remarks

The bond between mother and child, beginning before birth and continuing throughout life, represents one of the most powerful forces in human development. The finding that over half of the mothers in this sample experienced significant psychological distress during pregnancy underscores the vulnerability of this critical period and the importance of supporting maternal mental health. As Asif and colleagues (2022) have noted in studies of economic and social challenges, addressing the root causes of distress requires multi-level interventions that consider individual, family, and societal factors.

The results must be interpreted cautiously given the retrospective design and absence of a control group. The observed associations may reflect multiple pathways, including causal effects of prenatal stress on fetal development, effects of early developmental vulnerabilities on maternal psychological experience, or shared factors contributing independently to both. Nevertheless, the findings are consistent with a growing body of evidence implicating the prenatal psychological environment in developmental trajectories.

Regardless of the direction of effects, the high prevalence of reported distress among mothers of children with neurodevelopmental conditions highlights the importance of perinatal mental health screening and support. For mothers experiencing psychological difficulties during pregnancy, compassionate and non-stigmatizing intervention may benefit both their own well-being and their children's development. The traditional Azerbaijani value of protecting and supporting expectant mothers provides a cultural foundation for such efforts, which must now be strengthened through professional mental health resources and systematic approaches to identification and intervention.

Protecting and nurturing the maternal-fetal bond through attention to maternal psychological well-being constitutes not merely a medical priority but a fundamental investment in the health of future generations.



7. Recommendations

Based on the findings of this investigation, the following recommendations are offered for clinical practice, policy development, and future research.

Recommendations for Clinical Practice

Routine Perinatal Mental Health Screening: All pregnant women in Azerbaijan should receive routine screening for psychological distress using validated instruments such as the Edinburgh Postnatal Depression Scale. Screening should occur at multiple time points during pregnancy and the postpartum period to identify women experiencing difficulties and facilitate timely intervention.

Integration of Mental Health Services into Prenatal Care: Mental health services should be integrated into routine prenatal care, with clear referral pathways for women identified as experiencing significant distress. Co-location of mental health professionals within obstetric settings may reduce stigma and improve access to care.

Interventions to Enhance Maternal-Fetal Attachment: Prenatal care should include education about fetal development and the importance of maternal-fetal interaction. Simple interventions such as encouraging mothers to talk, sing, and stroke their abdomen may enhance attachment and provide opportunities for early bonding.

Targeted Support for High-Risk Groups: Specialized interventions should be developed for women at elevated risk for perinatal distress, including those with history of pregnancy loss, low socioeconomic status, and limited education. These interventions should address the specific needs and concerns of populations.

Family-Based Approaches: Given the importance of family support in Azerbaijani culture, interventions should involve family members where appropriate. Educating partners and extended family about perinatal mental health and ways to support expectant mothers may enhance the effectiveness of professional interventions.

Recommendations for Policy Development

National Perinatal Mental Health Strategy: Azerbaijan should develop a national strategy for perinatal mental health that includes screening guidelines, service standards, workforce development, and quality monitoring mechanisms.

Workforce Development: Investment in training for healthcare providers in perinatal mental health is essential. This includes training for obstetricians, midwives, nurses, and family physicians in recognition of perinatal distress and basic counselling skills.

Public Awareness Campaigns: Public education campaigns should address the importance of perinatal mental health, reduce stigma associated with seeking help, and provide information about available resources. These campaigns should be culturally appropriate and accessible to diverse populations.

Integration with Existing Services: Perinatal mental health services should be integrated with existing maternal and child health programs, early intervention services, and social support programs to provide comprehensive, coordinated care.

Research Funding: Government and private funding should be allocated to support research on perinatal mental health in Azerbaijan, including epidemiological studies, intervention research, and implementation science.

Recommendations for Future Research

Prospective Longitudinal Studies: Prospective studies following women from early pregnancy through early childhood are essential to establish temporal relationships and examine potential causal mechanisms. Such studies should include repeated assessments of psychological distress, maternal-fetal attachment, and biological markers of stress.

Inclusion of Control Groups: Future research should include matched control groups of mothers of typically developing children to enable direct comparison of distress rates and examination of factors that distinguish between groups.

Examination of Mechanisms: Research should examine potential mediators and moderators of the distress-outcome relationship, including genetic factors, social support, obstetric complications, and postnatal environmental conditions. Understanding mechanisms would inform targeted intervention efforts.



Cross-Cultural Comparative Studies: Cross-cultural studies examining these relationships across different cultural contexts would illuminate the role of cultural factors in shaping both maternal psychological experience and developmental outcomes.

Intervention Research: Randomized controlled trials of interventions designed to reduce prenatal distress and enhance maternal-fetal attachment are needed to establish evidence-based practices for perinatal mental health in Azerbaijan.

Mixed-Methods Approaches: Qualitative research exploring women's experiences of prenatal distress and attachment in their own words would complement quantitative findings and provide rich contextual understanding.

Recommendations for Healthcare Providers

Recognize the Importance of Perinatal Mental Health: Healthcare providers should recognize that maternal psychological well-being during pregnancy has implications not only for maternal health but also for fetal development and child outcomes.

Screen Systematically: All pregnant women should be screened for psychological distress using validated instruments, with attention to culturally appropriate communication about mental health.

Respond Compassionately: Women reporting distress should be met with compassion and non-judgmental support. Validation of their experiences and reassurance that help is available can reduce suffering and facilitate engagement with services.

Provide Anticipatory Guidance: All expectant mothers should receive information about the emotional aspects of pregnancy, the importance of self-care, and strategies for managing stress.

Involve Families Where Appropriate: With the woman's consent, involving supportive family members in prenatal care and mental health discussions may enhance outcomes.

Conflict of Interest Statement:

The author declares no conflicts of interest.

Funding Statement:

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Ethical Approval:

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent:

Informed consent was obtained from all individual participants included in the study.

Data Availability:

The datasets generated during and analysed during the current study are available from the corresponding author on reasonable request.

Acknowledgments:

The author gratefully acknowledges the mothers who participated in this study and shared their experiences, as well as the collaborating organizations that facilitated recruitment. Special thanks to the faculty of Azerbaijan State Pedagogical University for their guidance and support.

References

- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Lawrence Erlbaum.
- Asif, M. (2021). *Contingent effect of conflict management towards psychological capital and employees' engagement in financial sector of Islamabad* (Doctoral dissertation, Preston University). <https://doi.org/10.13140/RG.2.2.17616.79360>
- Asif, M. (2022). Integration of information technology in financial services and its adoption by the financial sector in Pakistan. *Inverge Journal of Social Sciences*, 1(2), 23–35. <https://doi.org/10.63544/ijss.v1i2.31>
- Asif, M. (2024). The complexities of bioterrorism: Challenges and considerations. *International Journal of*



- Contemporary Issues in Social Sciences*, 3(3), 2175–2184.
- Asif, M., Ali, A., & Shaheen, F. A. (2025). Assessing the effects of artificial intelligence in revolutionizing human resource management: A systematic review. *Social Science Review Archives*, 3(4), 2887–2908. <https://doi.org/10.70670/sra.v3i3.1055>
- Asif, M., & Asghar, R. J. (2025). Managerial accounting as a driver of financial performance and sustainability in small and medium enterprises in Pakistan. *Center for Management Science Research*, 3(7), 150–163. <https://doi.org/10.5281/zenodo.17596478>
- Asif, M., Imran, A., Joseph, V., Haqdad, U., Samraameer, & Asif, M. (2022). Mediating role of trust between emotional intelligence and project team performance in telecommunication sector. *PalArch's Journal of Archaeology of Egypt/Egyptology*, 19(4), 988–1005.
- Asif, M., Khan, A., & Pasha, M. A. (2019). Psychological capital of employees' engagement: Moderating impact of conflict management in the financial sector of Pakistan. *Global Social Sciences Review*, 4(3), 160–172. [https://doi.org/10.31703/gssr.2019\(IV-III\).15](https://doi.org/10.31703/gssr.2019(IV-III).15)
- Asif, M., Pasha, M. A., Mumtaz, A., & Sabir, B. (2023). Causes of youth unemployment in Pakistan. *Inverge Journal of Social Sciences*, 2(1), 41–50. <https://doi.org/10.63544/ijss.v2i1.21>
- Asif, M., Pasha, M. A., Shafiq, S., & Craine, I. (2022). Economic impacts of post COVID-19. *Inverge Journal of Social Sciences*, 1(1), 56–65. <https://doi.org/10.63544/ijss.v1i1.6>
- Asif, M., Pasha, M. A., & Shahid, A. (2025). Energy scarcity and economic stagnation in Pakistan. *Bahria University Journal of Management & Technology*, 8(1), 141–157.
- Asif, M., & Sandhu, M. S. (2023). Social media marketing revolution in Pakistan: A study of its adoption and impact on business performance. *Journal of Business Insight and Innovation*, 2(2), 67–77. <https://doi.org/10.52783/eel.v13i5.901>
- Asif, M., Shah, H., & Asim, H. A. H. (2025). Cybersecurity and audit resilience in digital finance: Global insights and the Pakistani context. *Journal of Asian Development Studies*, 14(3), 560–573. <https://doi.org/10.62345/jads.2025.14.3.47>
- Asif, M., & Shaheen, A. (2022). Creating a high-performance workplace by the determination of importance of job satisfaction, employee engagement, and leadership. *Journal of Business Insight and Innovation*, 1(2), 9–15.
- Asif, M., Shahid, S., & Rafiq-uz-Zaman, M. (2025). Immersive technologies, awe, and the evolution of retail in the metaverse. *International Premier Journal of Languages & Literature*, 3(4), 713–748. <https://doi.org/10.5281/zenodo.18136481>
- Aslam, M., & Asif, M. (2025). Organizational power structures and the reproduction of gender inequality. *Apex Journal of Social Sciences*, 4(1), 57–67.
- Aurangzeb, & Asif, M. (2021). Resources management and SMEs' performance. *Humanities & Social Sciences Reviews*, 9(3), 679–689. <https://doi.org/10.18510/hssr.2021.9367>
- Aurangzeb, D., & Asif, M. (2021). Role of leadership in digital transformation: A case of Pakistani SMEs. In *Proceedings of the Fourth International Conference on Emerging Trends in Engineering*.
- Aurangzeb, Mushtaque, T., Tunio, M. N., Zia-ur-Rehman, & Asif, M. (2021). Influence of administrative expertise of human resource practitioners on job performance: Mediating role of achievement motivation. *International Journal of Management*, 12(4), 408–421. <https://doi.org/10.34218/IJM.12.4.2021.035>
- Barker, D. J. P. (1998). *Mothers, babies and health in later life* (2nd ed.). Churchill Livingstone.
- Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment*. Basic Books.
- Buss, C., Davis, E. P., Shahbaba, B., Pruessner, J. C., Head, K., & Sandman, C. A. (2012). Maternal cortisol over the course of pregnancy and subsequent child amygdala and hippocampus volumes and affective problems. *Proceedings of the National Academy of Sciences*, 109(20), E1312–E1319. <https://doi.org/10.1073/pnas.1201295109>
- Copelon, R., Zampas, C., Brusie, E., & Devore, J. (2005). Human rights begin at birth: International law and the claim of fetal rights. *Reproductive Health Matters*, 13(26), 120–129. [https://doi.org/10.1016/S0968-8080\(05\)26218-3](https://doi.org/10.1016/S0968-8080(05)26218-3)



- Coussons-Read, M. E. (2013). Effects of prenatal stress on pregnancy and human development: Mechanisms and pathways. *Obstetric Medicine*, 6(2), 52–57. <https://doi.org/10.1177/1753495X12473751>
- Cranley, M. S. (1981). Development of a tool for the measurement of maternal attachment during pregnancy. *Nursing Research*, 30(5), 281–284. <https://doi.org/10.1097/00006199-198109000-00008>
- Glover, V., O'Donnell, K. J., O'Connor, T. G., & Fisher, J. (2018). Prenatal maternal stress, fetal programming, and mechanisms underlying later psychopathology: A global perspective. *Development and Psychopathology*, 30(3), 843–854. <https://doi.org/10.1017/S095457941800038X>
- Honda, G. (2020, December 6). The process of integration. *Psychology Today*. <https://www.psychologytoday.com/us/blog/pain-loss-and-suffering/202012/the-process-integration>
- IBM Corp. (2021). *IBM SPSS Statistics for Windows* (Version 28.0) [Computer software]. IBM Corp.
- Khamidullina, Z., Marat, A., Muratbekova, S., Mustapayeva, N. M., Chingayeva, G. N., Shepetov, A. M., Ibatova, S. S., Terzic, M., & Aimagambetova, G. (2025). Postpartum depression epidemiology, risk factors, diagnosis, and management: An appraisal of the current knowledge and future perspectives. *Journal of Clinical Medicine*, 14(7), 2418. <https://doi.org/10.3390/jcm14072418>
- Mumtaz, A., Munir, N., Mumtaz, R., Farooq, M., & Asif, M. (2023). Impact of psychological and economic factors on investment decision-making in Pakistan stock exchange. *Journal of Positive School Psychology*, 7(4), 130–135.
- Pasha, M. A., Ramzan, M., & Asif, M. (2019). Impact of economic value added dynamics on stock prices: Fact or fallacy? *Global Social Sciences Review*, 4(3), 135–147. [https://doi.org/10.31703/gssr.2019\(IV-III\).13](https://doi.org/10.31703/gssr.2019(IV-III).13)
- Persico, G., Antolini, L., Vergani, P., Costantini, W., Nardi, M. T., & Bellotti, L. (2017). Maternal singing of lullabies during pregnancy and after birth: Effects on mother-infant bonding and newborns' behavior. *Women and Birth*, 30(4), e214–e220. <https://doi.org/10.1016/j.wombi.2017.01.007>
- Shahid, N., Asif, M., & Pasha, A. (2022). Effect of internet addiction on school-going children. *Inverge Journal of Social Sciences*, 1(1), 12–47. <https://doi.org/10.63544/ijss.v1i1.3>
- Stanford University. (n.d.). New publication shows link between losing a relative during pregnancy and mental health of child. *Stanford Health Policy*. Retrieved March 17, 2026, from <https://healthpolicy.fsi.stanford.edu/news/new-publication-shows-link-between-losing-relative-during-pregnancy-and-mental-health-child>
- UN Women. (2023, May 15). Gender equality starts at home: Five ways to drive change within the family. <https://www.unwomen.org/en/news-stories/feature-story/2023/05/gender-equality-starts-at-home-five-ways-to-drive-change-within-the-family>
- University of Edinburgh. (2022, February 23). Stress in pregnancy linked to changes in infant's brain development. <https://cardiovascular-science.ed.ac.uk/news-events/news/stress-pregnancy-baby-brain-development>
- Usama, H. A., Riaz, M., Khan, A., Begum, N., Asif, M., & Hamza, M. (2022). Prohibition of alcohol in Quran and Bible: A research and analytical review. *PalArch's Journal of Archaeology of Egypt/Egyptology*, 19(4), 1202–1211.