International Journal of
Mental Health Promotion

Tech Science Press

http://doi.org/10.32604/ijmhp.2026.078835

ARTICLE

Indirect Pathways from Early Adversity to Postpartum Depression after Assisted Reproduction: Attachment, Maternal Self-Efficacy, and Financial Strain

Verónica García-Tribaldos[1] and Laura Lacomba-Trejo[2,*]

[1]Faculty of Psychology and Speech Therapy, Universitat de València, València, Spain
[2]Department of Developmental and Educational Psychology, Faculty of Psychology and Speech Therapy, Universitat de València, València, Spain
*Corresponding Author: Laura Lacomba-Trejo. Email: laura.lacomba@uv.es

Received: 08 January 2026; Accepted: 01 June 2026; Published: 23 June 2026

ABSTRACT: Backgrounds: Adverse childhood experiences (ACEs) can increase the likelihood of developing insecure attachment patterns, which in turn may heighten economic concerns and couple dissatisfaction—both generally and particularly in the context of assisted reproduction treatments (ART). These processes together elevate the risk of postpartum depression (PPD). **Methods**: This study examined psychosocial and relational predictors of PPD in a sample of 149 Spanish women up to 12 months postpartum following ART. (8.1% = artificial insemination with a sperm donor; 12.1% = artificial insemination without a sperm donor; 67.1% = *in vitro* fertilization; 20.8% = intracytoplasmic sperm injection; 12.8% = egg donation; 22.1% = frozen-thawed embryo transfer). Predictors included subdomains of ACEs (abuse and household dysfunction), maternal self-efficacy, romantic attachment (anxiety/avoidance), couple satisfaction (*ad hoc* item, 0–10), and financial concerns (*ad hoc* item, 0–10). **Results:** Hierarchical regression analyses showed that economic worry and low maternal self-efficacy accounted for 29% of the variance in PPD in the final step. Mediation models revealed that attachment anxiety partially mediated the association between childhood abuse and PPD. (β = 0.018, 95% CI [0.0002, 0.0396]), whereas avoidance did not emerge as a significant pathway. There was a lack of association between family dysfunction and attachment dimensions, which should be interpreted cautiously due to the subscale's limited reliability in this sample. Furthermore, maternal self-efficacy partially mediated the link between financial concerns and PPD (β = 0.096, 95% CI [0.0003, 0.2533]), indicating that economic strain increases depressive symptoms partly by undermining maternal confidence. **Conclusion:** For women conceiving through ART, the relevance of maternal self-efficacy and socioeconomic stress are highlighted as key targets for prevention and intervention. The role of attachment anxiety is, as well, underscored as a mechanism linking early adversity to PPD.

KEYWORDS: Postpartum depression; assisted reproduction; adverse childhood experiences; maternal self-efficacy; romantic attachment; couple satisfaction; financial concerns

1 Introduction

Pregnancy is a potentially stressful life event, with maternal self-reported stress reaching 36.1% [1]. This is particularly true for women who conceive through assisted reproduction treatments (ART), procedures that provide pathways to parenthood for individuals and couples facing infertility, as well as for single parents and members of the LGBTQ+ community [2,3]. ART use has increased worldwide in parallel with delayed parenthood and broader recognition of diverse family configurations [4]. In Spain, ART accounts for an estimated 11% of all births [5], placing the country among those with the highest utilization

rates in Europe. While ART expands access to parenthood, it is also associated with significant emotional and psychological challenges [6–8]. Beyond the medical and emotional burden, ART procedures often entail substantial economic strain. Women may need to be absent from work for repeated medical visits, sometimes accompanied by fears of job instability or loss. In Spain, although public funding covers ART in many regions, access is restricted by eligibility criteria such as age limits and number of attempts, and in some autonomous communities, patients must assume extra costs (e.g., donor gametes). Many couples also turn directly to private clinics, where the entire treatment is self-financed, often at considerable cost [9].

Importantly, these objective expenses are often accompanied by subjective financial concerns, as women may experience persistent worry about the affordability of treatment and the long-term economic implications of parenting after ART [10]. Lower socioeconomic resources are well established as risk factors for both physical and mental health problems [11], partly because they limit access to protective "buffer" resources such as healthy environments, leisure opportunities, or social participation. However, subjective financial concerns are not equivalent to objective income levels. Indeed, recent studies suggest that perceived financial strain may be a stronger predictor of mental health outcomes, including depression, than objective economic status itself [12]. These stressors help explain why women conceiving through ART may be especially vulnerable to mental health difficulties in the perinatal period [13].

Postpartum depression (PPD) is the most prevalent psychological disorder in the perinatal period [14]. According to the DSM-5-TR [15], the condition is conceptualized as a specifier of major depressive episodes rather than a separate disorder. It is labelled "major depressive episode with peripartum onset", given that up to 50% of cases begin before delivery. While the diagnostic window is restricted to symptom onset during pregnancy or within the first four weeks after birth, clinical and research practice often extends the definition of PPD to the entire first year after childbirth [16].

The prevalence of PPD has been estimated between 10% and 19% [14,17–20]. Specifically, for the target population of this research—those conceiving through ART-, several studies have reported an 5.9–7% prevalence [21,22]. However, rates may be underestimated due to stigma (e.g., social judgment of depressive symptoms during a time expected to be joyful) and the masking of depressive symptoms as normal postpartum changes such as sleep or appetite alterations [20]. PPD has wide-ranging consequences for mothers, partners, and infants. For mothers, it can impair cognitive functioning, increase vulnerability to comorbid mental health problems, and compromise parenting capacity. At the couple level, it is linked to lower relationship satisfaction, while for infants it can interfere with bonding and attachment, raising the risk of later developmental and emotional difficulties [14,19]. The aetiology of PPD is multifactorial, involving genetic, biological, psychological, social, and economic influences [14,20]. Within this framework, several psychosocial risk factors have been highlighted, including adverse childhood experiences (ACEs), insecure romantic attachment, low couple satisfaction, reduced maternal self-efficacy, and financial strain [23].

ACEs refer to stressful or potentially traumatic events occurring before the age of 18, including abuse and household dysfunction [24,25]. Between 50% and 66% of the general population report at least one ACE, although only a smaller proportion experience four or more, a threshold consistently linked to critical health risks [26,27]. The cumulative effect of ACEs is conceptualized in Felitti's pyramid shaped model, whereby early adversity disrupts emotional, cognitive, and social development, fosters maladaptive coping, and increases vulnerability to later health problems, including depression [24,28]. A dose–response relationship has been documented: the more ACEs accumulated, the greater the risk of internalizing disorders such as anxiety and depression, as well as PPD [18].

ACEs not only increase general vulnerability to psychopathology but also play a crucial role in shaping attachment patterns. According to attachment theory [29], early relationships with primary

caregivers form the basis of internal working models of the self and others, which guide expectations in later relationships. Insecure attachment styles—anxious, avoidant, or disorganized—are more likely to emerge in the context of adverse or inconsistent caregiving [30,31]. These insecure patterns reflect difficulties in seeking or accepting support, heightened emotional reactivity, and poorer emotion regulation. Empirical studies show that insecure attachment is associated with greater psychological distress, including anxiety and depression [32,33], and that the co-occurrence of multiple ACEs further increases the likelihood of trauma-related disorders [26]. In the perinatal context, insecure attachment is identified as a significant risk factor for PPD, partly because it is associated with lower couple satisfaction and complicates maternal adjustment during the transition to parenthood [34]. Moreover, lower maternal self-efficacy has consistently been linked to increased risk of postpartum depressive symptoms; insecure attachment may undermine efficacy by amplifying negative affect and reducing confidence in caregiving [35].

ACEs and the insecure attachment styles they often foster can have enduring effects on relational and parental functioning in adulthood. In the context of ART, these vulnerabilities may be particularly pronounced. Women with a history of ACEs are likely to develop insecure romantic attachment patterns, which are consistently linked to lower couple satisfaction and greater relational conflict during the perinatal transition [36,37]. Marital dissatisfaction, in turn, is a well-established predictor of mental health problems for both partners [38]. The demanding nature of ART—prolonged medical procedures, repeated cycles of uncertainty, and financial sacrifices—can further exacerbate relationship strain, amplifying the impact of insecure attachment. At the individual level, insecure attachment may also undermine maternal self-efficacy by reducing confidence in managing caregiving demands and heightening negative emotional responses in stressful situations [39].

The concept of self-efficacy, introduced by Bandura [40], refers to individuals' beliefs in their own ability to successfully perform a given task. According to Social Learning Theory, behaviours are not acquired solely through direct associations between events, but through the conscious processing of information provided by the environment. Maternal self-efficacy specifically refers to mothers' beliefs about their capacity to successfully manage parenting tasks [41]. It encompasses perceived competence in childrearing, confidence in handling challenging situations, and the ability to effectively manage daily caregiving demands [42]. During the perinatal and postpartum stages, maternal self-efficacy plays a crucial role in promoting both physical and psychological adjustment [43,44]. Higher levels of maternal self-efficacy are associated with more positive parenting behaviours, greater adaptability to the demands of motherhood, and lower risk of developing PPD [45].

These pathways can be understood within an ecological framework [46], in which postpartum depression results from the interaction of influences across multiple levels. Distal factors, such as adverse childhood experiences, shape internal relational processes (e.g., attachment), whereas proximal contextual stressors, such as financial concerns, impact current psychological resources (e.g., maternal self-efficacy), jointly contributing to postpartum mental health outcomes.

Taken together, prior research underscores the importance of examining how early adversity, attachment, and perceived efficacy intersect with relational and socioeconomic factors to shape women's psychological adjustment in the postpartum period. However, few studies have simultaneously considered these variables in women conceiving through ART, despite this group facing unique medical, emotional, and financial stressors that may heighten vulnerability to PPD. By integrating ACEs, romantic attachment, couple satisfaction, maternal self-efficacy, and economic concerns within a single framework, the present study aims to clarify pathways of risk and protection in this population.

Accordingly, the objective of this study was to examine psychosocial and relational predictors of PPD in women who conceived through ART, with particular focus on the role of ACEs, romantic attachment, couple satisfaction, maternal self-efficacy, and financial concerns. In this sense, (H1) higher levels of both dimensions of ACEs (childhood abuse and household dysfunction), insecure romantic attachment (anxiety and avoidance), lower couple satisfaction, lower maternal self-efficacy, and greater financial concerns will be associated with increased PPD. (H2) We expect to find that ACEs will predict higher levels of PPD through greater insecure attachment. (H3) We expect to find that higher financial concerns will predict higher levels of PPD through lower maternal self-efficacy, indicating an indirect pathway in addition to a direct effect of financial concerns on PPD.

2 Methods

2.1 Participants

The study sample was composed of 149 women between 26 and 49 years of age (M = 37.45, SD = 3.75). Eligibility criteria included: (a) being older than 18 years; (b) having given birth within the past 12 months; (c) having conceived the most recent pregnancy through an assisted reproduction technique; (d) ability to read and provide written informed consent; (e) having a partner; and (f) being able to complete all questionnaires. A power analysis was conducted using G*Power 3.1 to estimate the required sample size for multiple regression analyses. Assuming a medium effect size (f^2 = 0.15), an alpha level of 0.05, a power of 0.80, and six predictors, the required sample size was estimated at N = 98. The final sample (N = 149) exceeded this requirement. Only complete responses were included in the analyses; therefore, cases with missing data were excluded using listwise deletion.

On average, participants had been in their current relationship for 11.50 years (SD = 5.24). Most participants identified as heterosexual (95.52%) and were either married or in a stable relationship (93.04%). Regarding family structure, 78.5% reported that their partner was the other parental figure of their child. For the majority, the pregnancy in the last year was their first (71.1%), while for the majority, this was their second pregnancy overall (58.1%; M = 2.60; SD = 0.90). Although various assisted reproductive technologies could have been used, most turned to *in vitro* fertilization (67.1%), with infertility most frequently attributed to female factors (41.6%), followed by male factors (16.8%) or combined causes (14.8%). Further descriptive statistics are presented in Table 1.

2.2 Variables and Instruments

Postpartum depression (PPD). Symptoms of PPD were assessed with the Edinburgh Postnatal Depression Scale (EPDS) [47], using the validated Spanish version [48]. The EPDS is a 10-item self-report questionnaire with four Likert-type response options that vary across items. A total score ≥10 indicates a probable case of PPD [49]. The original version demonstrated good internal consistency (α = 0.79) [50], with similar reliability in the Spanish validation (α = 0.80) [51]. In the present study, Cronbach's alpha was α = 0.88.

Adverse Childhood Experiences (ACEs). Childhood adversity was assessed with the Adverse Childhood Experiences Questionnaire (ACEQ) [24], Spanish adaptation by Nevárez & Ochoa-Meza [52]. This 10-item self-report instrument uses dichotomous (yes/no) responses to evaluate exposure before age 18 to physical, sexual, and emotional abuse or neglect, as well as household dysfunction, including parental substance abuse, mental illness, or incarceration. The questionnaire comprises two subscales: childhood abuse (items 1, 2, 4, 5, 7; e.g., "Did people in your family often insult, humiliate, or threaten you physically?") and household dysfunction (items 3, 6, 8, 9, 10; e.g., "Did a member of your household go to prison?"). Scores

are summed into a total ACE index, with ≥4 indicating significant exposure [53]. Subscale scores were computed as the sum of endorsed dichotomous items (0 = no, 1 = yes); therefore, the mean values reported represent the average number of adverse experiences endorsed within each subscale. Reported internal consistency is $\alpha = 0.70$ in the original [54] and $\alpha = 0.68$ in the Spanish version, with $\alpha = 0.80$ for abuse and $\alpha = 0.61$ for dysfunction [52]. In the present study, reliability was $\alpha = 0.61$ (abuse), $\alpha = 0.40$ (dysfunction).

Table 1: Descriptive analyses of the main variables under study.

Type of Variable	Variable	Category	*N* (%)
Sociodemographic and clinical variables	Sexual Orientation	Heterosexual	139 (93.3%)
		Homosexual (Gay, Lesbian)	4 (2.7%)
		Bisexual	6 (4.0%)
	Marital Status	Single	9 (6%)
		Married or in a relationship	136 (91.3%)
		Separated or divorced	4 (2.7%)
	Family Structure	Single parent	7 (4.7%)
		My partner is the parental figure of my child.	117 (78.5%)
		Same-sex parent	7 (4.7%)
		Extended	14 (9.4%)
		Other	4 (2.7%)
	Pregnancy number in your obstetric history (referring to the last one)	2	25 (58.1%)
		3	13 (30.2%)
		4	3 (7.0%)
		5	1 (2.3%)
		6	1 (2.3%)
	ART	Artificial Insemination with a Sperm Donor	12 (8.1%)
		Artificial Insemination without a Sperm Donor	18 (12.1%)
		In Vitro Fertilization	100 (67.1%)
		Intracytoplasmic Sperm Injection	31 (20.8%)
		Egg Donation	19 (12.8%)
		Frozen-Thawed Embryo Transfer	33 (22.1%)
	Derivation Factors to ART	Female Factors	62 (41.6%)
		Male Factors	25 (16.8%)
		Combined Factors	22 (14.8%)
		Single-parent family or member of the LGTBQ+ community	11 (7.4%)
		Unexplained factors	39 (26.2%)
			M (SD)
Psychological variables	Postpartum Depression		9.32 (5.48)
	Economic Concern		5.40 (2.59)
	Child Abuse		0.60 (0.97)
	Family Disfunction		0.84 (0.92)
	Anxiety		25.68 (12.28)
	Avoidance		19.68 (10.15)
	Couple Satisfaction		8.18 (1.87)
	Maternal Self-Efficacy		69.62 (8.91)

Note: M = mean; *SD* = standard deviation; ART = assisted reproduction treatments.

Romantic attachment. Attachment was measured with the Experiences in Close Relationships–Revised, short Spanish version (ECR-R) [55,56]. The 18 self-administered items are rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree) referring to relationships in the past 12 months, or generally if no partner was present. Two subscales are obtained: anxiety (9 items, e.g., "I worry about not measuring up to my partner's expectations") and avoidance (9 items, 7 reverse-coded, e.g., "I talk things over with my partner"). Higher scores indicate greater attachment insecurity. Internal consistency has been reported as $\alpha \approx 0.81$ in the original, and $\alpha = 0.80$ (anxiety) and $\alpha = 0.86$ (avoidance) in the Spanish adaptation. In this study, reliability was $\alpha = 0.86$ for both dimensions.

Maternal Self-Efficacy. Was measured with the Perceived Maternal Parenting Self-Efficacy (PMP S-E) [57], This 20-item self-administered questionnaire with four Likert-type response options (1 = strongly disagree, 4 = strongly agree) refers to the mother's perception of her own ability in those situations which involve the interaction with her baby. This questionnaire comprises four subscales: evoking behaviours (items 9, 10, 11, 12, 13, 14, 15; e.g., "I am good at soothing my baby when he/she becomes upset"); care taking procedures (items 5, 6, 7, 17, 18, 19, 20; e.g., "I believe that my baby responds well to me"); reading and managing emotional cues (items 2, 4, 8; e.g., "I can make my baby calm when he/she has been crying") and reading and managing bodily cues (items 1, 3, 16; e.g., "I can tell when my baby is sick"). Scores are summed into a total PMP index, which was the measure used in the present study. Reported internal consistency is $\alpha = 0.91$ in the original [57] and $\alpha = 0.98$ in the Spanish version [58]. In this study, reliability was $\alpha = 0.94$ (evoking behaviours); $\alpha = 0.88$ (care taking); $\alpha = 0.73$ (emotional cues), $\alpha = 0.75$ (bodily cues), and $\alpha = 0.95$ for the total index.

Couple satisfaction. Was assessed with an ad hoc single-item Likert question (1 = "Very dissatisfied" to 10 = "Very satisfied"): "Indicate your level of satisfaction with your couple relationship."

Economic concerns. Were measured with an ad hoc single-item Likert question (1 = "I am not usually concerned" to 10 = "I worry about it every day"): "How often do you feel concerned about your financial situation."

2.3 Procedure and Analysis

After providing informed consent and confirming eligibility criteria, participants completed the questionnaire via *LimeSurvey* (Universitat de València). Participation was voluntary, with no direct personal benefit expected, and participants were informed that the study assessed risk and protective factors for PPD.

Recruitment was conducted through social media, particularly Instagram, by contacting healthcare professionals working in pregnancy and postpartum care. These professionals shared the study information and survey link on their profiles, which were mostly followed by women interested in perinatal topics. Accessing the link, participants could provide informed consent and complete the survey.

Data collection took place between 7 and 17 February 2025, following approval by the Ethics Committee of the Universitat de València (reference: 2024-PSILOG-3773873). Completion time ranged from 10 to 15 min. Although no adverse effects were anticipated, given the sensitive nature of the questions, the survey included information about support resources (e.g., El Parto es Nuestro [elpartoesnuestro.es], MARES [sociedadmarce.org], and the Spanish Association of Perinatal Psychology [asociacionpsicologiaperinatal.es]). In addition, participants were informed about the possibility of attending a workshop organized by the research team should they require further support.

Statistical analyses were conducted using IBM SPSS Statistics (version 28, IBM Corp., Armonk, NY, USA). Prior to conducting the analyses, statistical assumptions were examined. Normality was assessed using skewness and kurtosis indices, which were within acceptable ranges. Additionally, the data were

screened for outliers, and no influential cases were identified. First, descriptive analyses were performed for the main study variables. Subsequently, hierarchical regression analyses were conducted to examine predictors of postpartum depression. In addition, mediation models were assessed using Hayes' [59] PROCESS macro (Model 4). to explore indirect effects. Statistical significance was set at $p < 0.05$.

3 Results

To test the study hypotheses, we adopted a stepwise analytical strategy. First, we conduct bivariate correlations to examine initial associations among all study variables (H1). Second, we performed HRMs to identify the unique contribution of each predictor to postpartum depression while controlling for shared variance among variables (H1). Finally, mediation analyses were conducted to test the hypothesized indirect effects, specifically whether ACEs were associated with postpartum depression through attachment anxiety (H2), and whether financial concerns were associated with postpartum depression through maternal self-efficacy (H3).

Importantly, we performed mediation analyses regardless of the presence of significant direct effects, as indirect effects may emerge even when direct associations are not statistically significant.

3.1 Descriptive Analysis

Firstly, PPD showed elevated scores, with 43.04% of the sample being at risk of presenting clinically significant symptoms by surpassing the established cut-off point [48]. Participants reported low average levels of significant ACEs, with 10% of the women at risk, having experienced four or more ACEs. Insecure attachment and financial concerns reflect moderate scores. High scores were found for partner satisfaction and maternal self-efficacy (Table 1).

3.2 Correlational Analysis

PPD was significantly and linearly associated with higher ACEs (abuse and family dysfunction), greater attachment anxiety and avoidance, and higher economic concerns. Conversely, significant negative associations were found with maternal self-efficacy and couple satisfaction. Further information can be found in Table 2. Given the low internal consistency observed for the ACE household dysfunction subscale ($\alpha = 0.40$), results involving this variable should be interpreted with caution.

Table 2: Correlational analyses of the main variables under study.

Variables	1	2	3	4	5	6	7	8
Postpartum Depression	1							
Economic concerns	0.31***	1						
Child Abuse	0.24**	0.07	1					
Family Dysfunction	0.10	0.02	0.45***	1				
Anxiety	0.36***	0.21*	0.21*	−0.02	1			
Avoidance	0.35***	0.08	0.15	0.01	0.54***	1		
Couple Satisfaction	−0.32***	−0.07	−0.16*	−0.04	−0.47***	−0.67***	1	
Maternal Self-Efficacy	−0.36***	−0.24**	−0.04	−0.07	−0.06	−0.04	−0.05	1

Note: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; 1 = Postpartum Depression; 2 = Economic concerns; 3 = Child Abuse; 4 = Family Dysfunction; 5 = Anxiety; 6 = Avoidance; 7 = Couple Satisfaction; 8 = Maternal Self-Efficacy.

3.3 Hierarchical Regressions

A five-step hierarchical regression analysis was conducted to examine predictors of PPD. In the first step, economic concerns significantly predicted higher depressive symptoms, explaining 11% of the variance.

In the second step, the inclusion of ACE subscales (abuse and family dysfunction) produced a small and non-significant increment in explained variance. At step three, the addition of attachment dimensions increased the explained variance by 11.5%, with attachment anxiety emerging as a significant positive predictor, while avoidance did not reach significance. In step four, we added couple satisfaction, but this variable did not significantly improve the model. Finally, in step five, maternal self-efficacy was entered and explained an additional 8% of the variance. The final model accounted for approximately 29% of the variance in PPD. In this model, economic concerns (β = 0.18, p = 0.040) and lower maternal self-efficacy (β = −0.33, p < 0.001) were the only significant predictors. There was no multicollinearity among the independent variables due to VIF values ranged from 1.08 to 2.08, below the commonly accepted threshold of 5. Specific VIF values for each regression step are presented in Table 3.

Table 3: Hierarchical regression model of PPD in women undergoing assisted reproduction.

Predictor	Postpartum Depression									
	R^2	R^2_{adj}	ΔR^2	ΔF	F	Sig.	β	Sig.	t	VIF
Step 1	0.10	0.09	0.10	11.29	11.29	0.001				
Economic Concern							0.18*	0.04	2.08	1.11
Step 2	0.14	0.12	0.05	2.88	5.82	0.001				
Child Abuse							0.14	0.14	1.49	1.33
Family Dysfunction							0.00	0.98	0.02	1.28
Step 3	0.25	0.21	0.11	7.15	6.77	<0.001				
Anxiety							0.14	0.18	1.36	1.56
Avoidance							0.13	0.27	1.11	2.08
Step 4	0.25	0.21	0.01	0.66	5.73	<0.001				
Couple Satisfaction							−0.14	0.21	−1.28	1.91
Step 5	0.34	0.29	0.08	12.70	7.30	<0.001				
Maternal Self-Efficacy							−0.30**	<0.001	−3.56	1.08
Durbin-Watson		1.90								

Note: R^2 = coefficient of determination; R^2_{adj} = R^2 adjusted; ΔR^2 = Change on R^2; ΔF = Change on F; F = F statistic; Sig. = Significance levels; β = Regression Coefficient; VIF = Variance Inflation Factor; t = t value; *p < 0.05; **p < 0.01.

3.4 Mediation Models

First, analyses examined whether attachment dimensions mediated the association between ACEs (abuse and family dysfunction) and PPD. For abuse-related ACEs, results showed a direct effect on PPD (β = 1.16, p = 0.021). Moreover, abuse predicted higher attachment anxiety (β = 2.64, p = 0.025), and anxiety was positively associated with PPD (β = 0.15, p = 0.001). The indirect effect of abuse on depression through anxiety was significant (β = 0.018, 95% CI [0.0002, 0.0396]), suggesting partial mediation, indicating that both direct and indirect pathways were relevant.

In contrast, although abuse predicted higher avoidance (β = 2.05, p = 0.041), and avoidance was positively associated with PPD (β = 0.17, p = 0.001), the model with attachment avoidance as mediator showed no significant indirect effect (β = 0.34, 95% CI [−0.021, 0.846]).

For family dysfunction, results suggested a direct positive association with PPD (β = 0.38, p = 0.046). However, neither anxiety (β = −4.28, p = 0.732) nor avoidance (β = −0.39, p = 0.970) emerged as significant mediators, reflecting that its contribution to depressive outcomes might not be explained by attachment pathways. These results are illustrated in Fig. 1.

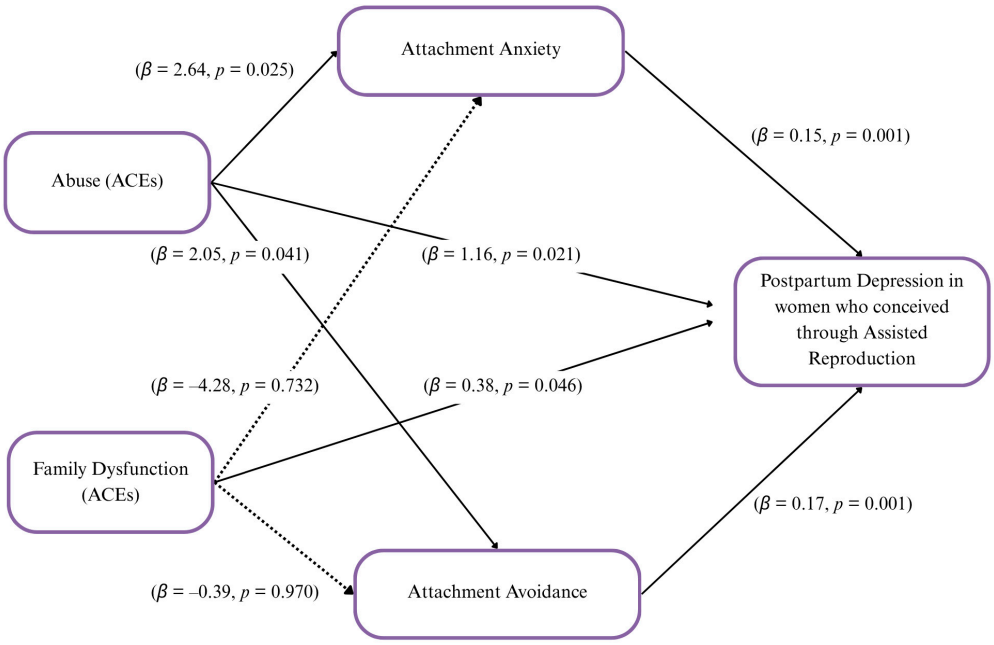

Figure 1: Mediation Models: ACEs, Attachment, and Postpartum Depression in Assisted Reproduction Treatment sample. Note. This figure provides a schematic summary of the mediation analyses conducted. We tested separate models for each ACE dimension (childhood abuse and household dysfunction) and attachment dimension (anxiety and avoidance). The figure is intended to facilitate the visualization of the tested pathways and does not represent a single integrated model.

Second, analyses examined whether maternal self-efficacy mediated the association between financial concerns and PPD. Results indicated a significant direct positive effect on PPD ($\beta = 0.57$, $p = 0.002$). Moreover, the analysis suggested an indirect effect of financial concerns on PPD through maternal self-efficacy. Specifically, higher economic worries were associated with lower maternal self-efficacy ($\beta = -0.59$, $p = 0.054$, trend level), and lower maternal self-efficacy was in turn linked to greater PPD symptoms ($\beta = -0.96$, $p = 0.004$). The indirect effect was statistically significant ($\beta = 0.096$, 95% CI [0.0003, 0.2533]), indicating that both direct and indirect pathways were relevant (Fig. 2). Although partial mediation might be suggested, the trend-level significance must be considered.

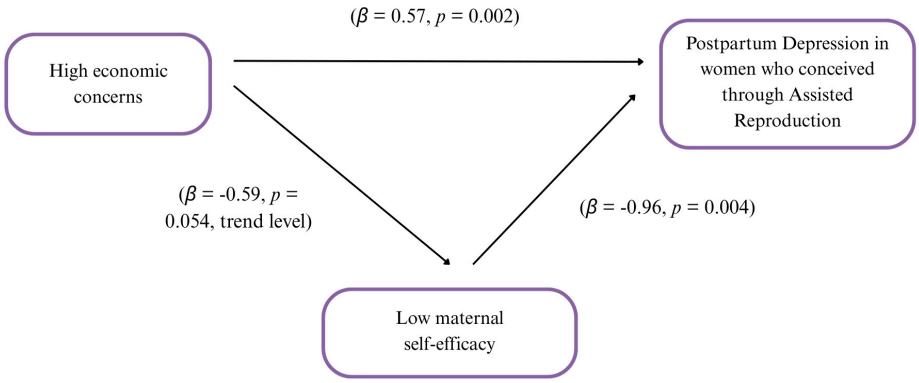

Figure 2: Mediation Models: financial concerns, maternal self-efficacy, and Postpartum Depression in Assisted Reproduction Treatment sample.

4 Discussion

The main objective of this study was to examine the predictors of PPD in women who conceived through ART, focusing on the role of ACEs, romantic attachment, couple satisfaction, maternal self-efficacy, and financial concerns. First hypothesis (H1) proposed that higher levels of ACEs, insecure romantic attachment (anxiety and avoidance), lower couple satisfaction, lower maternal self-efficacy, and greater financial concerns would be associated with increased PPD. We conducted a study with almost 150 Spanish women in the postpartum period after undergoing ART, and our findings showed that in line with H1, several variables were associated with PPD at the bivariate level. However, in the regression models, only lower maternal self-efficacy and greater financial concerns emerged as significant unique predictors. This pattern suggests that some variables may share variance or operate through indirect pathways rather than exerting direct effects. On the other hand, the effects of attachment dimensions, including the significant contribution of attachment anxiety observed at step three of the regression analysis, were attenuated once we introduced maternal self-efficacy. These findings contrast with previous literature highlighting the long-term effects of ACEs and attachment on mental health, as well as the protective role of couple satisfaction against PPD in the context of ART [60–62].

In the context of ART, maternal self-efficacy and financial concerns may be particularly salient due to the prolonged emotional, physical, and economic investment associated with fertility treatments. For many women, motherhood represents a highly valued and long-awaited goal, often central to identity, which may increase the psychological impact of perceived competence in the maternal role. In addition, prior reproductive difficulties (e.g., infertility or unsuccessful treatment attempts) may contribute to a more fragile sense of bodily trust and competence, increasing sensitivity to challenges during the postpartum period [63].

ART also involves a combination of high medical control and persistent uncertainty. After childbirth, the shift from a structured, medically supervised process to caregiving demands may place greater emphasis on personal competence, highlighting the role of maternal self-efficacy. At the same time, financial concerns may reflect not only current strain but also the cumulative costs of treatment. Furthermore, women may experience emotional dissonance between the expectation of happiness after a long-awaited pregnancy and the presence of emotional problems [64], which may intensify self-criticism.

Finally, women undergoing ART often constitute a relatively homogeneous and highly involved group, which may reduce variability in distal risk factors while increasing the relative influence of proximal, situational variables. This may help explain why maternal self-efficacy and financial concerns emerged as stronger predictors of postpartum depression than more distal variables in this population.

Contrary to expectations [65,66], ACEs did not emerge as direct predictors in the regression models. However, mediation analyses revealed that abuse-related ACEs were indirectly associated with PPD through attachment anxiety as outlined in H2. An explanation for the lack of significant effects of ACEs (H1) may relate to limitations in their measurement. Although participants reported relatively low levels of ACEs, a substantial proportion of the sample presented elevated depressive symptoms, suggesting a possible mismatch between measured adversity and psychological outcomes. The ACEQ [24] although adapted for cross-cultural use by the World Health Organization, is conceptually rooted in earlier frameworks developed in North American contexts and primarily captures more overt forms of adversity, such as physical abuse or household dysfunction. However, it may be less sensitive to more subtle, chronic, or culturally specific forms of adversity that could be particularly relevant in other contexts.

For instance, forms of psychological or gender-based violence, including coercive control or indirect exposure to violence within the family, may not be fully captured by traditional ACEs measures. Similarly,

contemporary conceptualizations of adversity have expanded to include a broader range of experiences, such as chronic stress, socioeconomic instability, or relational trauma, which may not be adequately reflected in standard ACEs instruments [67]. As a result, the low variability observed in ACEs in the present sample may partly reflect measurement limitations rather than a true absence of early adversity. These considerations highlight the need to critically examine the cultural and conceptual adequacy of ACEs measures and suggest that future research should incorporate more comprehensive and context-sensitive assessments of early adversity. Another relevant consideration is that different types of ACEs may have distinct effects on postpartum outcomes, which may not be fully captured when using cumulative or composite ACE scores. Experiences of sexual abuse have been consistently linked to greater vulnerability in mental health and to difficulties related to bodily autonomy, trust, and exposure in medical [68]. This may be especially relevant in the context of ART, where women are subjected to repeated medical procedures involving bodily exposure and physical intervention. For individuals with a history of abuse, these experiences may reactivate feelings of vulnerability or loss of control, potentially increasing psychological distress. Subsequent studies should therefore consider examining ACE subtypes separately to better understand their differential impact on postpartum mental health, particularly in populations undergoing medicalized reproductive processes.

Furthermore, the lack of significant effects for ACEs and couple satisfaction mightbe partly explained by the relatively low variability observed in these measures in our sample, which may have limited statistical power to detect effects, as well as by the characteristics of women undergoing ART. Interestingly, most participants reported high levels of couple satisfaction despite the presence of elevated depressive symptoms. This apparent discrepancy could reflect the cohesion often generated by the shared experience of ART. However, ART can also represent a significant emotional and relational challenge, and the extent to which couples emerge strengthened or strained by this process likely depends on the individual and dyadic coping strategies they employ. While some couples may experience greater unity and resilience, others may struggle with heightened stress or conflict [9]. Exploring these variations in coping and adaptation would be an important avenue for future investigations to clarify how the ART experience shapes relational functioning and, in turn, maternal mental health outcomes.

In addition, we assessed couple satisfaction using a single direct item, which may have limited sensitivity to detect variability and might be more susceptible to social desirability bias. In the context of ART—where the couple relationship is often perceived as central to the reproductive project—participants could be more likely to report high levels of satisfaction, potentially leading to inflated scores and reduced variability.

Further explanation might be that these constructs capture different dimensions: while relationship satisfaction reflects the quality of the couple's bond, PPD assesses individual psychological distress. It is therefore possible for women to report high satisfaction with their partner while simultaneously experiencing depressive symptoms, especially in the context of ART, where shared challenges may strengthen cohesion independently of individual vulnerability [34,69]. Also, recent evidence indicates that depression level fluctuates across the ART process, with an increase following treatment initiation, suggesting that emotional adjustment is strongly influenced by treatment-related factors rather than solely by pre-existing vulnerabilities [13]. Given the significance of the time factor in women who have conceived through ART, it is necessary to monitor this factor in future research. Finally, it could also be explained by evidence suggesting that the medication to which women are exposed during fertility treatments could predispose them more strongly to depressive symptoms than usual conditions, or even by the influence of hormonal changes during fertility treatments and the postpartum period [70], which may contribute to depressive outcomes independently of relational quality.

We hypothesized (H2) that ACEs would predict higher levels of PPD through greater insecure attachment. This hypothesis was partially supported, as abuse-related ACEs were indirectly associated with PPD via attachment anxiety, in addition to a direct effect. Women who had experienced abuse reported higher attachment anxiety, which in turn was linked to a greater risk of PPD. This suggests that abuse could shape internal working models characterized by heightened fear of rejection and excessive need for reassurance, thereby increasing vulnerability to postpartum depressive symptoms. In contrast, although abuse was also related to higher attachment avoidance, this pathway did not significantly predict PPD, consistent with the notion that emotional distancing strategies mightbe less directly linked to PPD [71,72]. One possible explanation is that attachment anxiety, characterized by hyperactivation of the attachment system and heightened emotional reactivity, may be more closely associated with depressive symptomatology, whereas avoidant strategies, which involve emotional suppression and distancing, may not directly translate into increased depressive symptoms in the postpartum period [73].

Regarding family dysfunction, no mediating effects were observed through attachment, suggesting that its impact could operate through mechanisms other than relational ones, such as chronic stress exposure, environmental instability, or alterations in emotional regulation systems [74]. While interpersonal trauma such as abuse might exert its effects through relational schemas and attachment-related processes, broader family dysfunction may reflect chronic stress exposure or environmental instability that impacts mental health through more direct or non-relational mechanisms. In this sense, while abuse impacts both attachment processes and depressive outcomes, family dysfunction potentially increases risk primarily through direct pathways [75].

An additional consideration concerns the assessment of attachment. In the present study, we operationalized attachment as romantic attachment, which may capture relationship-specific dynamics rather than broader or context-independent attachment representations. In the postpartum period, and particularly in the context of ART, other forms of attachment—such as caregiving-related or maternal attachment representations—could be more directly relevant to psychological adjustment [76]. Future research should consider incorporating multi-method approaches and attachment measures specifically tailored to the perinatal context.

Our third hypothesis (H3) proposed that higher financial concerns would predict greater PPD both directly and indirectly through lower maternal self-efficacy. This hypothesis was partially confirmed. Results indicated a significant indirect effect, as financial concerns were linked to lower maternal self-efficacy, which in turn predicted higher PPD symptoms, although the association between concerns and self-efficacy was only marginally significant. Because of only trend-level significance, partial mediation results are preliminary, in need of replication. At the same time, financial concerns exerted a robust direct effect on PPD, suggesting that economic strain influences maternal mental health both through diminished self-efficacy and through more immediate pathways. One possible explanation lies in the distinction between objective economic resources and subjective economic worries: women may have sufficient resources yet still perceive high financial strain, or conversely, limited resources but fewer perceived worries [12]. In the context of ART, financial concerns might extend beyond childcare costs to include the substantial expenses of fertility treatments, amplifying their impact on maternal well-being. In this regard, economic resources may facilitate access to instrumental, informational, and social supports (e.g., childcare, healthcare, or professional guidance), which would enhance women's perceived competence in managing caregiving demands [77]. Conversely, financial strain could potentially restrict access to these resources, thereby undermining maternal self-efficacy and increasing vulnerability to psychological distress. These findings underscore the central role of financial strain in the postpartum period, suggest maternal self-efficacy as a

potential partial explanatory mechanism and point to the importance of considering both objective and perceived economic stress in further investigations.

Despite the contributions of this study, some limitations should be acknowledged. First, although the sample size was sufficient for the planned analyses, it remains relatively small. Recruiting participants for such research is particularly challenging, as it requires women to reflect on painful past experiences while being in a vulnerable and time-limited period such as the postpartum stage. Thus, even with a modest number of participants, the data obtained could be considered meaningful. Furthermore, the sample consisted exclusively of cisgender women, and no transgender or gender-diverse individuals participated. This limits the generalizability of the findings to all people who may experience pregnancy and postpartum, upcoming research should aim to include more diverse gender identities. In addition, the sample was non-probabilistic and recruited online through associations and high-reach social media profiles, which might have introduced selection bias. For instance, women with higher postpartum psychological distress could have contacted perinatal-focused online communities, leading to an overrepresentation of individuals with a significant presence of postpartum depression symptoms (approximately 43% in the sample). Furthermore, we did not examine differences in PPD prevalence across demographic or clinical subgroups. Conversely, individuals with fewer economic or educational resources may have been less likely to access or complete the survey, inducing a possible underrepresentation of more vulnerable populations. Additionally, the low levels of ACE exposure observed in the sample suggest a highly skewed distribution, which may have reduced variability and affected the stability of both regression and mediation estimates. Therefore, these findings should be cautiously interpreted ¡. Finally, online data collection also presents inherent challenges: although incomplete responses were removed, no formal validity checks (e.g., infrequency scales or algorithms to detect careless responding) were employed, which would have allowed us to better identify and exclude inadequate response patterns. Nevertheless, this approach provided access to a larger number of participants.

Additional limitation concerns the instruments used. We assessed ccouple satisfaction and financial concerns with a single Likert-type item rather than with validated multi-item scales, which may have limited measurement precision. The use of single-item *ad hoc* measures for couple satisfaction and financial concerns might have reduced reliability and content validity, limiting the ability to capture the multidimensional nature of these constructs. Future studies should address this issue by including standardized and psychometrically robust measures. Although no formal validation analyses were conducted, the observed pattern of associations provides preliminary support for the criterion-related validity of these measures. Specifically, couple satisfaction was negatively associated with PPD and insecure attachment dimensions, whereas financial concerns were positively associated with PPD and negatively associated with maternal self-efficacy, in line with theoretical expectations. However, these findings should be considered as indirect evidence, and subsequent studies should employ validated multi-item instruments to ensure a more robust assessment of these constructs.

Additionally, the internal consistency of the ACE subscales was limited, particularly for the household dysfunction subscale, which could have impacted regression and mediation estimates by attenuating associations and biasing effects toward zero. Even though lower reliability is sometimes expected in ACE measures due to the heterogeneous nature of adverse experiences, this heterogeneity does not eliminate the need for adequate reliability when interpreting subscale-specific effects. Therefore, results involving the household dysfunction subscale should be interpreted with caution, and the absence of significant associations should not be considered evidence of no relationship.

Another limitation concerns the study design. Given its cross-sectional nature, we cannot establish causal relationships. Further research is needed to address these questions using longitudinal designs that can better capture trajectories of risk and resilience. Longitudinal designs are warranted to examine temporal sequences and confirm the mediational pathways proposed. In addition, the use of retrospective measures such as the ACEs questionnaire may involve recall bias. However, prior evidence suggests that such measures can still provide reliable information [25]. Future studies should also consider including partner reports, when applicable, as well as additional variables that could shape outcomes, such as obstetric violence, dyadic coping, resilience, family functioning, or social support, among others.

Finally, several methodological issues should be considered. All measures relied on self-report, which may be affected by social desirability or subjective perceptions, particularly regarding sensitive topics such as couple satisfaction. The sample was composed exclusively of Spanish women who conceived through ART, potentially limiting the generalizability of the findings to other cultural or clinical contexts, or to women who conceived spontaneously. Moreover, no data were collected on important clinical variables such as prior psychiatric history, perinatal complications, or professional support received, all of which might moderate depressive outcomes. Similarly, aspects related to the ART process itself, such as the type and number of treatment attempts or whether care was received in public or private healthcare, were not assessed, but could influence both the financial and psychological burden associated with treatment. Furthermore, the study did not account for the specific timing within the postpartum period at which participants were assessed. Participants were evaluated at different points in the postpartum period, possibly introducing variability in the severity of depressive symptoms, given that PPD can fluctuate across time. In addition, no potential confounding variables (e.g., age, relationship duration, or reproductive history) were included in the mediation analyses. Although this approach allowed for a more parsimonious model given the sample size, it may have influenced the observed associations. Future research should examine these relationships while controlling for relevant covariates.

Added to the above, although VIF were within acceptable limits, the moderate-to-high correlation between attachment anxiety and avoidance suggests potential multicollinearity, which may obscure the unique contribution of each dimension. Lastly, although the present analyses were conducted using the PROCESS macro, which estimates indirect effects through observed variables, this approach does not account for measurement error. A structural equation modelling (SEM) approach would allow the inclusion of latent constructs and a more precise estimation of paths; however, the available sample size (N = 149) was below the recommended threshold for stable SEM estimation. Future studies with larger samples should evaluate the proposed model using latent-variable analyses.

Despite its limitations, this study has important implications for women in the postpartum period following ART. ART processes can be highly demanding, often extending over years, creating substantial financial strain on families who face uncertainty without the guarantee of achieving a desired pregnancy. Identifying modifiable factors such as maternal self-efficacy that could help prevent PPD is therefore highly relevant for the design of psychological interventions to accompany pregnancy and postpartum after ART. Our findings highlight those proximal factors at the time of childbirth—maternal self-efficacy and financial concerns—carry greater weight than more distal variables such as ACEs, attachment, or couple satisfaction. Moreover, maternal self-efficacy partly explained the effect of financial concerns on PPD, underscoring the role of psychological resources in translating stress into vulnerability.

Given that financial concerns may affect maternal mental health with repercussions for the infant and the family system, policies should consider strengthening public resources dedicated to ART and revising inclusion and exclusion criteria that currently push many women into private treatment. Some countries,

such as France, already subsidize oocyte cryopreservation through public healthcare, aiming to mitigate the difficulties associated with delayed motherhood. Considering the economic precarity in countries such as Spain, where the cost of living makes family planning increasingly difficult, such policies could help reduce inequalities in reproductive health.

Finally, it would be advisable to include psychological factors such as ACEs in standard assessment protocols during ART. As abuse was linked to greater attachment anxiety and higher risk of PPD, these women may benefit from careful screening and closer follow-up throughout pregnancy and postpartum. Moreover, ART involves not only medical but also psychological and economic challenges; therefore, incorporating psychological counselling and financial support into fertility clinics could represent a key preventive measure. As women with fewer educational and economic resources might be underrepresented in ART and perinatal care, these findings also call for policies that ensure equitable access to both fertility treatments and psychological support.

Conclusions

Overall, the results point to a differentiated role of the variables examined. Maternal self-efficacy and financial concerns emerged as the most relevant predictors of PPD in the regression models, showing the strongest effects once all variables were considered simultaneously. In contrast, other variables did not retain unique predictive value. However, mediation analyses indicated that abuse-related ACEs were linked to PPD indirectly through attachment anxiety, suggesting that early relational experiences may influence vulnerability through attachment-related pathways. Family dysfunction appeared to operate more directly, and avoidant attachment did not significantly mediate risk.

Regarding the hypotheses, H1 was partially supported, as only maternal self-efficacy and financial concerns remained significant predictors. H2 was supported for childhood abuse, but not for household dysfunction, although this result should be interpreted cautiously due to the limited reliability of that subscale. H3 was also partially supported, as the indirect effect through maternal self-efficacy reached only trend-level significance.

At a broader level, these findings suggest that proximal and potentially modifiable factors during the postpartum period could play a more prominent role in PPD than more distal vulnerabilities, although the latter may still exert indirect effects. Clinically, identifying women with low self-efficacy, financial strain, or histories of adversity during the ART process might probably help guide targeted support. However, these conclusions are bounded by the characteristics of the sample—Spanish women who conceived through ART and were assessed at different postpartum stages—and should be further examined across different contexts and treatment conditions.

Acknowledgement: We are deeply grateful to all the women who generously participated in this study during their postpartum period. Despite the emotional difficulty of addressing such sensitive topics, they chose to contribute their time and experiences altruistically, with the aim of helping other women and families in similar situations.

Funding Statement: The authors received no specific funding for this study.

Author Contributions: The authors confirm contribution to the paper as follows: conceptualization, Verónica García-Tribaldos and Laura Lacomba-Trejo; methodology, Laura Lacomba-Trejo; software, Laura Lacomba-Trejo; validation, Verónica García-Tribaldos and Laura Lacomba-Trejo; formal analysis, Laura Lacomba-Trejo; investigation, Laura Lacomba-Trejo; resources, Laura Lacomba-Trejo; data curation and sample collection, Verónica García-Tribaldos; writing—original draft preparation, Verónica García-Tribaldos and Laura Lacomba-Trejo; writing—review and editing, Laura Lacomba-Trejo; visualization, Laura Lacomba-Trejo; supervision, Laura Lacomba-Trejo; project administration, Laura Lacomba-Trejo. All authors reviewed and approved the final version of the manuscript.

Availability of Data and Materials: The data that support the findings of this study are available from the Corresponding Author, Laura Lacomba-Trejo, upon reasonable request.

Ethics Approval: The study involved human participants and was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of the Universitat de València (reference: 2024-PSILOG-3773873). All participants provided informed consent prior to participation.

Conflicts of Interest: Laura Lacomba-Trejo declares that, although they serve as a Guest Editor for a different Special Issue of the journal, this role did not influence the editorial or peer review process of the present manuscript. The review process was conducted independently and in accordance with the journal's standard procedures to ensure objectivity and transparency.

References

1. Kingston D, Heaman M, Fell D, Dzakpasu S, Chalmers B. Factors associated with perceived stress and stressful life events in pregnant women: findings from the Canadian maternity experiences survey. Matern Child Health J. 2012;16(1):158–68. [CrossRef].
2. Jain M, Singh M. Assisted reproductive technology (ART) techniques. St. Petersburg, FL, USA: StatPearls; 2023.
3. Raja NS, Russell CB, Moravek MB. Assisted reproductive technology: considerations for the nonheterosexual population and single parents. Fertil Steril. 2022;118(1):47–53. [CrossRef].
4. Newman AM. Mixing and matching: sperm donor selection for interracial lesbian couples. Med Anthropol. 2019;38(8):710–24. [CrossRef].
5. Sociedad Española de Fertilidad (SEF) . Registro nacional de actividad 2021. Registro SEF: informe estadístico de técnicas de reproducción asistida 2021. Madrid, Spain: Sociedad Española de Fertilidad (SEF); 2022. [cited 2025 Sep 20]. Available from: https://www.registrosef.com/public/docs/sef2021_IAFIV.pdf.
6. Geisler M, Meaney S, Waterstone J, O'Donoghue K. Stress and the impact on the outcome of medically assisted reproduction. Eur J Obstet Gynecol Reprod Biol. 2020;248:187–92. [CrossRef].
7. Lakatos E, Szigeti JF, Ujma PP, Sexty R, Balog P. Anxiety and depression among infertile women: a cross-sectional survey from Hungary. BMC Women's Health. 2017;17(1):48. [CrossRef].
8. Vitale SG, La Rosa VL, Rapisarda AMC, Laganà AS. Psychology of infertility and assisted reproductive treatment: the Italian situation. J Psychosom Obstet Gynecol. 2017;38(1):1–3. [CrossRef].
9. Santamaría-Gutiez R, Martínez-Corredor S, González-Sala F, Lacomba-Trejo L. Relevance of positive dyadic coping for couples undergoing assisted reproduction treatments: a systematic review. J Marital Family Therapy. 2025;51(2):e70016. [CrossRef].
10. Gupta A, Lu E, Thayer Z. The influence of assisted reproductive technologies-related stressors and social support on perceived stress and depression. BMC Women's Health. 2024;24(1):431. [CrossRef].
11. Kivimäki M, Batty GD, Pentti J, Shipley MJ, Sipilä PN, Nyberg ST, et al. Association between socioeconomic status and the development of mental and physical health conditions in adulthood: a multi-cohort study. Lancet Public Health. 2020;5(3):e140–9. [CrossRef].
12. McBride M, Martin CA, Teece L, Irizar P, Batson M, Lagrata S, et al. Investigating the impact of financial concerns on symptoms of depression in UK healthcare workers: data from the UK-REACH nationwide cohort study. BJPsych Open. 2023;9(4):e124. [CrossRef].
13. Sonne H, Egsgaard S, Munk-Olsen T, Cesta CE, Schmidt L, Bliddal M. Depression and anxiety among women going through medically assisted reproduction: a register-based cohort study. Hum Reprod. 2026;41(5):786–94. [CrossRef].
14. Zhang GR, Li PS, Jia YB. Relationship between family cohesion/adaptability and postpartum depressive symptoms: a single-center retrospective study. World J Psychiatry. 2023;13(2):50–9. [CrossRef].
15. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. Diagnostic and statistical manual of mental disorders 2022. Washington, DC, USA: American Psychiatric Association; 2022. [CrossRef].
16. Rodríguez Muñoz MDLF. Psicología perinatal: teoría y práctica. 1st ed. Madrid, Spain: Ediciones Pirámide; 2019. (In Spanish).

17. Armer JS, Oh W, Davis MT, Issa M, Sexton MB, Muzik M. Post-traumatic change and resilience after childhood maltreatment: impacts on maternal mental health over the postpartum period. J Affect Disord. 2024;361:1–9. [CrossRef].
18. Ayers S, Bond R, Bertullies S, Wijma K. The aetiology of post-traumatic stress following childbirth: a meta-analysis and theoretical framework. Psychol Med. 2016;46(6):1121–34. [CrossRef].
19. Brummelte S, Galea LAM. Depression during pregnancy and postpartum: contribution of stress and ovarian hormones. Prog Neuro Psychopharmacol Biol Psychiatry. 2010;34(5):766–76. [CrossRef].
20. Marcus SM. Depression during pregnancy: rates, risks and consequences. J Popul Ther Clin Pharmacol. 2009;16:15–22.
21. Si S, Zhao G, Song G, Liu J. Assisted reproductive technologies and postpartum depressive symptoms: a meta-analysis. J Affect Disord. 2024;356:300–6. [CrossRef].
22. Egsgaard S, Bliddal M, Jølving LR, Liu X, Sonne H, Munk-Olsen T. The association between medically assisted reproduction and postpartum depression: a register-based cohort study. BJOG. 2025;132(7):991–9. [CrossRef].
23. Vogel L, Löchner J, Opitz A, Ehring T, Lux U, Liel C, et al. Shadows of the past–Hierarchical regression analyses on the role of childhood maltreatment experiences for postpartum depression. J Affect Disord. 2025;371:82–90. [CrossRef].
24. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. Am J Prev Med. 1998;14(4):245–58. [CrossRef].
25. Lacomba-Trejo L, Quezada-Gaibor K, Gomis-Pomares A, Prado-Gascó V, Villanueva L. Adverse childhood experiences and coping strategies: do they make a difference in psychopathic traits and altruism for young adults? Curr Psychol. 2024;43(39):30926–36. [CrossRef].
26. Finch K, Lawrence D, Williams MO, Thompson AR, Hartwright C. Relationships between adverse childhood experiences, attachment, resilience, psychological distress and trauma among forensic mental health populations. J Forensic Psychiatry Psychol. 2024;35(5):660–84. [CrossRef].
27. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, Giles WH. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the adverse childhood experiences study. JAMA. 2001;286(24):3089. [CrossRef].
28. Gomis-Pomares A, Lacomba-Trejo L, Villanueva L. Using avoidant emotion-focused coping and being a woman with adverse childhood experiences as the worst-case scenario for internalising problems. J Child Adolesc Trauma. 2025;18(2):319–29. [CrossRef].
29. Bowlby J. Attachment and loss: Volume 2. Sepaeration: anxiety and anger. Vol. 95. New York, NY, USA: Basic Books; 1973. p. 1–429.
30. Ainsworth MDS, Blehar MC, Waters E, Wall S. Patterns of attachment: a psychological study of the strange situation. Mahwah, NJ, USA: Lawrence Erlbaum Associates, Inc.; 1978.
31. Grady MD, Levenson JS, Bolder T. Linking adverse childhood effects and attachment: a theory of etiology for sexual offending. Trauma Violence Abuse. 2017;18(4):433–44. [CrossRef].
32. Bifulco A, Mahon J, Kwon JH, Moran PM, Jacobs C. The Vulnerable Attachment Style Questionnaire (VASQ): an interview-based measure of attachment styles that predict depressive disorder. Psychol Med. 2003;33(6):1099–110. [CrossRef].
33. Bifulco A, Kwon J, Jacobs C, Moran PM, Bunn A, Beer N. Adult attachment style as mediator between childhood neglect/abuse and adult depression and anxiety. Soc Psychiatry Psychiatr Epidemiol. 2006;41(10):796–805. [CrossRef].
34. Mahdavishahri R, Gutierrez D. Relationship satisfaction, attachment, and perinatal depression in women of color: a quantitative investigation. Behav Sci. 2024;14(12):1142. [CrossRef].
35. Brazeau N, Reisz S, Jacobvitz D, George C. Understanding the connection between attachment trauma and maternal self-efficacy in depressed mothers. Infant Ment Health J. 2018;39(1):30–43. [CrossRef].
36. Feeney JA. Adult romantic attachment: developments in the study of couple relationships. In: Cassidy J, Shaver PR, editors. Handbook of attachment: theory, research, and clinical applications. 2nd ed. New York, NY, USA: The Guilford Press; 2008. p. 456–81.

37. Simpson JA, Rholes WS. Adult attachment, stress, and romantic relationships. Curr Opin Psychol. 2017;13:19–24. [CrossRef].
38. Freitas MC, Pinto TM, Conde A. Maternal gatekeeping and paternal self-efficacy and mental health: the mediation of dyadic adjustment. Acta Psychol. 2025;259:105362. [CrossRef].
39. Jones TL, Prinz RJ. Potential roles of parental self-efficacy in parent and child adjustment: a review. Clin Psychol Rev. 2005;25(3):341–63. [CrossRef].
40. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Adv Behav Res Ther. 1978;1(4):139–61. [CrossRef].
41. Schuengel C, Oosterman M. Parenting self-efficacy. Vol. 3. London, UK: Routledge; 2019. [CrossRef].
42. Bandura A. Self-efficacy: the exercise of control. 1st ed. New York, NY, USA: W.H. Freeman & Co; 1997.
43. Salonen AH, Kaunonen M, Åstedt-Kurki P, Järvenpää AL, Isoaho H, Tarkka MT. Parenting self-efficacy after childbirth. J Adv Nurs. 2009;65(11):2324–36. [CrossRef].
44. Zaman A, Fadlalmola HA, Ibrahem SE, Ismail FH, Abedelwahed HH, Ali AM, et al. The role of antenatal education on maternal self-efficacy, fear of childbirth, and birth outcomes: a systematic review and meta-analysis. Eur J Midwifery. 2025;9:13. [CrossRef].
45. Przybyła-Basista H, Michalska N, Januszek M. The role of chronic fatigue in the relationship between maternal self-efficacy, social support, and depressive symptoms in mothers of crying infants. Midwifery. 2025;142:104297. [CrossRef].
46. Bronfenbrenner U. The ecology of human development: experiments by nature and design. Cambridge, MA, USA: Harvard University Press; 1979. [CrossRef].
47. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh postnatal depression scale. Br J Psychiatry. 1987;150(6):782–6. [CrossRef].
48. Garcia-Esteve L, Ascaso C, Ojuel J, Navarro P. Validation of the Edinburgh postnatal depression scale (EPDS) in Spanish mothers. J Affect Disord. 2003;75(1):71–6. [CrossRef].
49. Hernández-Martínez A, Martínez-Vázquez S, Rodríguez-Almagro J, Khan KS, Delgado-Rodríguez M, Martínez-Galiano JM. Validation of perinatal post-traumatic stress disorder questionnaire for Spanish women during the postpartum period. Sci Rep. 2021;11:5567. [CrossRef].
50. Kheirabadi GR, Maracy MR, Akbaripour S, Masaeli N. Psychometric properties and diagnostic accuracy of the edinburgh postnatal depression scale in a sample of iranian women. Iran J Med Sci. 2012;37:32.
51. Vázquez MB, Pereira B, Míguez MC. Psychometric properties of the Spanish version of the pregnancy related anxiety questionnaire (PRAQ). Span J Psychol. 2018;21:E64. [CrossRef].
52. Nevárez B, Ochoa Meza G. Adaptación del Cuestionario de Experiencias Adversas en la infancia en muestras mexicanas. Psic Y Sal. 2022;32(2):203–14. [CrossRef].
53. Alhowaymel FM, Kalmakis KA, Chiodo LM, Kent NM, Almuneef M. Adverse childhood experiences and chronic diseases: identifying a cut-point for ACE scores. Int J Environ Res Public Health. 2023;20(2):1651. [CrossRef].
54. Oláh B, Fekete Z, Kuritárné Szabó I, Kovács-Tóth B. Validity and reliability of the 10-Item Adverse Childhood Experiences Questionnaire (ACE-10) among adolescents in the child welfare system. Front Public Health. 2023;11:1258798. [CrossRef].
55. Fraley RC, Waller NG, Brennan KA. An item response theory analysis of self-report measures of adult attachment. J Pers Soc Psychol. 2000;78(2):350–65. [CrossRef].
56. Fernández Fuertes AA, Orgaz Baz B, Fuertes Martín JA, Carcedo González RJ. La evaluación del apego romántico en adolescentes españoles: validación de la versión reducida del Experiences in Close Relationships-Revised (ECR-R). Anales de Psicología. 2011;27:827–33.
57. Barnes CR, Adamson-Macedo EN. Perceived Maternal Parenting Self-Efficacy (PMP S-E) tool: development and validation with mothers of hospitalized preterm neonates. J Adv Nurs. 2007;60(5):550–60. [CrossRef].
58. Vargas-Porras C, Roa-Díaz ZM, Barnes C, Adamson-Macedo EN, Ferré-Grau C, De Molina-Fernández MI. Psychometric properties of the Spanish version of the perceived maternal parenting self-efficacy (PMP S-E) tool for primiparous women. Matern Child Health J. 2020;24(5):537–45. [CrossRef].
59. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: a regression-based approach. 2nd ed. New York, NY, USA: Guilford Press; 2018.

60. Rahim M. Developmental trauma disorder: an attachment-based perspective. Clin Child Psychol Psychiatry. 2014;19(4):548–60. [CrossRef].
61. Ångerud K, Annerbäck EM, Tydén T, Boddeti S, Kristiansson P. Adverse childhood experiences and depressive symptomatology among pregnant women. Acta Obstet Gynecol Scand. 2018;97(6):701–8. [CrossRef].
62. Bright K, Dube L, Hayden KA, Gordon JL. Effectiveness of psychological interventions on mental health, quality of life and relationship satisfaction for individuals and/or couples undergoing fertility treatment: a systematic review and meta-analysis protocol. BMJ Open. 2020;10(7):e036030. [CrossRef].
63. Shaw MK. Exploring the multiplicity of embodied agency in Colombian assisted reproduction. Body Soc. 2021;27(4):55–80. [CrossRef].
64. Martín-Sánchez MB, Bretón-López J, Suso-Ribera C. Evolution of maternal ambivalence: long-term stability, suppression, and the need for targeted support. Clin Exp Obstet Gynecol. 2026;53(2):46910. [CrossRef].
65. Hu N, Luo J, Xiang W, Yang G, Huang T, Guan L, et al. The relationship between postpartum negative life events and postpartum depression: a moderated mediation model of neuroticism and psychological flexibility. BMC Psychiatry. 2024;24(1):147. [CrossRef].
66. Garthus-Niegel S, Horsch A, Handtke E, von Soest T, Ayers S, Weidner K, et al. The impact of postpartum posttraumatic stress and depression symptoms on couples' relationship satisfaction: a population-based prospective study. Front Psychol. 2018;9:1728. [CrossRef].
67. Finkelhor D. Trends in adverse childhood experiences (ACEs) in the United States. Child Abuse Negl. 2020;108:104641. [CrossRef].
68. Bastón R, Quintanilla L, Chimpén-López CA, López-González MA, Cantero-García M. Parental adverse childhood experiences and sexually abused adolescents: exploring the intergenerational relationship. Child Youth Serv Rev. 2025;179:108645. [CrossRef].
69. Ruan JM, Wu LJ. Postpartum depression and partner support during the period of lactation: correlation research and its influencing factors. World J Psychiatry. 2024;14(1):119–27. [CrossRef].
70. Lez-Rodrı'guez AG, Cobo J, Soria V, Usall J, Garcia-Rizo C, Bioque M, et al. Women undergoing hormonal treatments for infertility: a systematic review on psychopathology and newly diagnosed mood and psychotic disorders. Front Psychiatry. 2020;11:479. [CrossRef].
71. Molmen Lichter M, Peled Y, Levy S, Wiznitzer A, Krissi H, Handelzalts JE. The associations between insecure attachment, rooming-in, and postpartum depression: a 2 months' longitudinal study. Infant Ment Health J. 2021;42(1):74–86. [CrossRef].
72. Bianciardi E, Vito C, Betrò S, De Stefano A, Siracusano A, Niolu C. The anxious aspects of insecure attachment styles are associated with depression either in pregnancy or in the postpartum period. Ann Gen Psychiatry. 2020;19(1):51. [CrossRef].
73. Altamura M, Leccisotti I, De Masi L, Gallone F, Ficarella L, Severo M, et al. Coping as a mediator between attachment and depressive symptomatology either in pregnancy or in the early postpartum period: a structural equation modelling approach. Brain Sci. 2023;13(7):1002. [CrossRef].
74. Lin HC, School HM, Poulin R, Hatfield K, Kolluru P, Kolluru R, et al. Emotion regulation buffers the effects of childhood adversity on depression, anxiety, and stress in college students. J Coll Stud Ment Health. 2026;40(1):79–99. [CrossRef].
75. Shen G, Huang J, Fang J, Zhen Y, Tang J, Wu L, et al. The mediating role of family functioning between childhood adversity and adult health-related risk behaviors: a moderated mediation analysis of generational gap in Chinese migrant workers. Popul Health Metr. 2025;23(1):17. [CrossRef].
76. Huang Y, Nie S, Yang P, Pei Y, Dong M, Cui N, et al. Exploring the developmental changes in and the relationship between maternal-offspring attachment and depression in perinatal women: a longitudinal study. J Affect Disord. 2026;399:121118. [CrossRef].
77. Beach Copeland D, Harbaugh BL. Early maternal-efficacy and competence in first-time, low-income mothers. Compr Child Adolesc Nurs. 2017;40(1):6–28. [CrossRef].