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The impact of childhood maltreatment on paternal antenatal bonding: the mediating role of antenatal depression

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Abstract

Background As fathers become more involved in pregnancy and early parenting, more research attention has been given to their emotional connection with their unborn child. The transition to fatherhood is a critical developmental phase involving psychological and relational changes that shape paternal identity and bonding with the fetus. However, the factors influencing prenatal father–infant bonding remain unclear. This study examines whether emotional abuse and neglect experienced in childhood impact paternal bonding during pregnancy, and whether antenatal depressive symptoms mediate this relationship.

Methods A total of 276 expectant fathers completed self-report questionnaires to assess childhood maltreatment (using the Childhood Trauma Questionnaire, CTQ), depressive symptoms (using the Edinburgh Postnatal Depression Scale, EPDS) and paternal antenatal attachment (using the Paternal Antenatal Attachment Scale, PAAS). Correlational analyses and structural equation modelling (SEM) were used to examine direct and indirect associations between these variables.

Results Emotional abuse ($\tau = 0.22$, $p < .001$) and emotional neglect ($\tau = 0.19$, $p < .001$) were both positively associated with antenatal depressive symptoms. Depressive symptoms were negatively related to two dimensions of paternal antenatal attachment - attachment quality ($\tau = -0.20$, $p < .001$) and intensity of concern ($\tau = -0.12$, $p = .046$). SEM analyses supported a mediation model in which depressive symptoms partially accounted for the link between childhood maltreatment and paternal antenatal attachment. Models including depressive symptoms as a mediator provided a better fit (Model 2 A: RMSEA = 0.04, CFI = 0.99, TLI = 0.97; Model 2 N: RMSEA = 0.07, CFI = 0.96, TLI = 0.89) than direct-only models (Model 1 A: RMSEA = 0.17, CFI = 0.74, TLI = 0.33; Model 1 N: RMSEA = 0.14, CFI = 0.83, TLI = 0.56).

Conclusions The findings suggest that emotional neglect and abuse during childhood may hinder expectant fathers' emotional bonding with their unborn child by making them more vulnerable to antenatal depression. Emotional

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neglect, in particular, emerged as a significant risk factor. These results emphasise the importance of screening expectant fathers for early adversity and depressive symptoms, in order to support paternal engagement and infant well-being.

Keywords Paternal antenatal bonding, Pregnancy, Fathers, Perinatal depression, Childhood maltreatment

Introduction

The transition to parenthood is a complex developmental process that begins well before the birth of a child. During pregnancy, expectant parents begin to construct emotional representations of their unborn baby, laying the foundations for the emerging parent–child relationship. While perinatal research has historically focused on mothers, recent studies underscore that fathers, too, develop early emotional bonds with the fetus [1, 2].

On the one hand, parental–fetal attachment has been defined as "the emotional tie or bond which normally develops between the pregnant parents and their unborn child" [3] (p. 359). On the other hand, parent-infant bonding is understood as an affective state of the parent toward the child, focused on the child's safety and wellbeing [4]. Although the terms attachment and bonding are sometimes used interchangeably, they refer to distinct yet complementary processes within the parent–child relationship [5]. While attachment traditionally describes the infant's behavioral and emotional orientation toward the primary caregiver [6], bonding refers to the parent's internal emotional experience toward the child. Bonding involves the parent's feelings of closeness, affection, and emotional investment, even in the absence of physical interaction, and plays a crucial role in shaping early relational dynamics. The concept of parental-infant bonding has been extended to include bonding with the fetus, encompassing the emotional and cognitive representations of the unborn child [7]. Studies on fathers also support this view, describing paternal bonding both after birth [8] and during pregnancy [9].

For this reason, in the present study, we use the term parental-fetus bonding to refer specifically to the parent's emotional connection with the unborn child, as experienced during pregnancy. This bond encompasses a wide range of thoughts, feelings, and behaviors that reflect the parent's investment in and concern for the fetus. Research indicates that expectant mothers and fathers share remarkably similar cognitive, emotional, and imaginative representations of the unborn child, despite their different physiological experiences of pregnancy [10, 11].

This similarity would suggest that both parents warrant equal scientific attention. However, despite this, the majority of research on antenatal bonding has focused on mothers, with the paternal experience often considered secondary or deferred until after birth [12, 13]. This bias may stem from the traditional view that fathers form a bond only once the child is born, in part due to their lack of direct bodily involvement in gestation and the hormonal changes that shape maternal-fetal bonding [14]. However, recent evidence challenges this perspective, showing that many expectant fathers engage in an active psychological process of adaptation to parenthood that can begin as early as the first trimester [1, 15, 16].

Research on paternal antenatal bonding has produced mixed findings. Some studies suggest that the absence of direct physiological experiences during pregnancy, coupled with the lack of tangible signs of the fetus, may delay the formation of an emotional connection between fathers and their unborn child [17]. Conversely, longitudinal studies have shown that paternal antenatal bonding tends to strengthen over the course of pregnancy, following a developmental trajectory similar to that of mothers [11, 18]. In fact, maternal and paternal bonding have been found to correlate from the prenatal period through to two years postpartum [18], suggesting a shared relational trajectory.

While this trajectory appears robust, individual variation in paternal bonding is significant and influenced by multiple psychosocial factors. Higher levels of psychological well-being, perceived social support, and relationship satisfaction have all been linked to stronger paternal antenatal bonding [8, 11, 19, 20]. In contrast, unplanned pregnancies and obstetric complications have been associated with diminished engagement and lower bonding scores in expectant fathers [1, 2, 21]. These findings underscore the role of current interpersonal and contextual stressors in shaping paternal representations of the unborn child.

While these situational variables play a role, they represent only part of the picture. A growing body of literature highlights the need to consider how earlier relational experiences, especially adverse ones, may resurface during this period.

Transition to parenthood often reactivates unresolved emotional conflicts, making individuals more vulnerable to psychological distress and depressive symptoms, especially those with a history of childhood abuse or neglect [22]. Despite limited research, emerging findings suggest that paternal Adverse Childhood Experiences (ACEs), especially emotional neglect and abuse, may have profound consequences on adult mental health and parent-infant bonding, particularly in the perinatal period [23, 24]. Emotional neglect and abuse, unlike physical harm, often occur in the context of chronic relational disruption, such as a lack of parental responsiveness, validation,

or safety in early parent-infant bonding relationships. While the negative impact of maternal ACEs on prenatal perinatal depression and bonding has been widely documented, research on their effects in expectant fathers remains limited [25].

This research gap likely reflects the historically maternal-centric focus of perinatal psychology and enduring stereotypes minimizing fathers' emotional involvement. However, increasing attention to paternal perinatal mental health highlights the need to examine how unresolved ACEs may affect men's developing parental identity and bonding capacities, acknowledging that different forms of childhood maltreatment confer distinct risks [26, 27].

Several studies suggest that emotional abuse and neglect may be particularly damaging because they affect the child's emerging sense of self and others, undermining trust, emotional regulation, and expectations of relationships [28–30]. In the context of impending parenthood, these internalized models may re-emerge and interfere with the father's ability to envision a safe and loving relationship with his child, especially during the emotionally vulnerable transition to fatherhood [31, 32].

Emotional abuse and emotional neglect, although both classified as emotional maltreatment, represent distinct developmental negative experiences with divergent psychological consequences [33, 34]. Emotional abuse involves active forms of harm, such as verbal humiliation, rejection, or intimidation, often leading to heightened affective dysregulation and interpersonal sensitivity [35]. Emotional neglect, in contrast, reflects a failure to provide emotional attunement, validation, and responsiveness, and is more commonly associated with difficulties in emotional awareness [36].

These distinct profiles appear to differentially impact psychological functioning in the perinatal period. Emotional abuse may predispose individuals, including expectant fathers, to more overt affective symptoms such as irritability, guilt, and depressive symptoms, whereas emotional neglect may increase vulnerability to disengagement and reduced capacity to form affective bonds [23, 37]. Preliminary findings suggest that in men, emotional neglect in particular may undermine prenatal bonding by weakening empathic engagement with the unborn child and diminishing the psychological salience of the pregnancy [25].

Among expectant mothers, emotional neglect has been found to exert a stronger negative impact on prenatal bonding than other types of childhood adversity [23, 38].

One mechanism that may link early adversity to impaired bonding is the increased risk of perinatal depressive symptoms. Exposure to childhood maltreatment has been associated with higher rates of depression during the perinatal period [37], which can in turn compromise a parent's ability to emotionally engage with their unborn child. Although perinatal depression in men remains under-recognized, it is increasingly acknowledged as a significant barrier to paternal involvement and prenatal bonding [39].

In parallel, increasing evidence underscores that men, much like women, are susceptible to psychological difficulties in the perinatal period, including clinically significant depressive symptoms [40–42]. Several studies have found that paternal perinatal depression is linked to reduced quality of father-infant bonding [43–45]. Notably, paternal perinatal depression tends to follow a different course compared to maternal perinatal depression, often characterized by a longer duration, slower remission, and distinct symptomatology - such as increased irritability, aggression, anhedonia, self-blame, worries, substance use, and risk-taking behaviors [46–49].

Although paternal mental health in the perinatal period is increasingly recognized, no study has yet explored how different forms of childhood maltreatment (e.g., emotional abuse vs. neglect) may distinctly affect paternal antenatal bonding or whether depression mediates these effects. Filling this gap is essential to understanding men's emotional vulnerability during pregnancy and identifying fathers at higher risk during the transition to parenthood.

Therefore, the present study aimed to investigate the differential impact of childhood emotional abuse and emotional neglect on the development of paternal antenatal bonding. In addition, it examined the role of antenatal depressive symptoms in shaping this relationship. By clarifying these associations, the study contributes to a better understanding of paternal vulnerability during the transition to fatherhood and supports the development of more tailored early interventions.

Methods

Procedure and ethical aspects

The data collection was preceded by the completion and signing of informed consent forms, which briefly explained the study's objectives and specified that individual information and responses provided were anonymous and confidential. This research does not involve any participants under the age of 18.

The assessment battery comprised various areas: socio-demographic information, pregnancy-related information, depressive symptoms, childhood trauma experiences, and parental-fetus bonding.

All the procedures in this study were conducted according to the 2024 Declaration of Helsinki. The protocol was approved by the Bioethics Committee at the University of Palermo (167/2023) and the Ethics Committee at the Civico - Di Cristina – Benfratelli, Hospital of Palermo (142/2022).

Sample

The sample of this study consists of 278 Italian fathers (Mean age = 36.5; SD = 5.6), recruited through various methods: during prenatal obstetrical check-ups, within birth centers and local health services, by disseminating the survey link through formal and informal parenting support networks, and by posting flyers in hospitals, private clinics, and health centers for pregnancy. All measures were administered individually, using electronic devices (telephone, tablet), both in person at the Hospital of Palermo "Civico - Di Cristina – Benfratelli" and online.

The participants in the study are Italian fathers and predominantly reside in Palermo (45%), Messina (11%), Lecce (32%), and Bari (12%). To be eligible, participants had to meet two criteria: they were at least 18 years old and spoke fluent Italian. The distribution of educational qualifications was as follows: junior high school or lower, 9%; high school diploma, 41%; bachelor's or master's degree, 27%; and postgraduate degree, 23%.

Measures

The Paternal Antenatal Attachment Scale (PAAS) [50, 51] : PAAS is a questionnaire designed to assess prenatal attachment. The scale consists of 19 items and uses a 5-point Likert scale to evaluate the father's feelings towards the child along two dimensions: the quality of attachment (PAAS-QA) and the intensity of concern (PAAS-IC). The *Quality of Attachment* dimension reflects the emotional tone of the paternal experience, such as feelings of affection, joy, or ambivalence toward the fetus. The *Intensity of Concern* dimension captures the extent of the father's cognitive and emotional involvement, including the frequency of thoughts and daydreams about the fetus [51]. Higher total scores indicate greater levels of paternal antenatal bonding. The scale has demonstrated good psychometric properties [52, 53].

Table 1 Descriptive statistics and correlations between variables

Variable	EPDS	CTQ_EA	CTQ_EN	PAAS_QA	PAAS_IP
Mean (sd)	4 (4)	6.3 (2.8)	8.5 (4.2)	22.4 (3.6)	33.1 (2.8)
2	0.220 (p <.001)	—			
3	0.192 (p <.001)	0.464 (p <.001)	—		
4	−0.203 (p <.001)	−0.205 (p <.001)	−0.307 (p <.001)	—	
5	−0.12 (p =.046)	−0.173 (p <.001)	−0.221 (p <.001)	0.415 (p <.001)	—

Table 1– Caption. Table 1 shows the descriptive analyses of the variables of interest and the results of correlation analyses. *AbbreviationsEPDS* Edinburgh Postnatal Depression Scale, *CTQ-A* Childhood traumatic questionnaire – Abuse, *CTQ-N* Childhood traumatic questionnaire – Neglect, *PAAS-QA* Paternal Antenatal Attachment - Quality of Attachment, *PAAS-IC* Paternal Antenatal Attachment - Intensity of Concern, *sd* standard deviation.

Edinburgh Postnatal Depression Scale (EPDS) [54, 55]: The EPDS is a self-report questionnaire designed to assess depressive symptoms and emotional well-being over the past week. It comprises 10 items, each rated on a 4-point Likert scale ranging from 0 to 3. Item 10 is particularly important, as it evaluates the risk of suicidal ideation. Higher total scores indicate greater emotional distress, with a possible range from 0 to 30. Scores between 0 and 8 suggest no risk, 9–11 indicate moderate risk, and 12–30 indicate high risk. For this study, we used the validated Italian version developed by Benvenuti et al. [54], which demonstrated good psychometric properties (Cronbach's alpha = 0.809).

Childhood Trauma Questionnaire—Short Form (CTQ–SF) [56]: The CTQ–SF is a 28-item self-report questionnaire designed to assess experiences of childhood trauma. Each item is rated on a 5-point Likert scale, ranging from 1 (never true) to 5 (very often true). The instrument includes five clinical subscales: Physical Abuse, Emotional Abuse, Sexual Abuse, Physical Neglect, and Emotional Neglect. For the present study, we used the validated Italian version translated by Sacchi and colleagues [57]. All subscales demonstrated excellent internal consistency, with Cronbach's alpha coefficients greater than 0.87. For the purposes of this study we used the CTQ-Emotional Abuse score, and the CTQ-Emotional Neglect score.

Data analysis

A summary description of the variables included in the study is provided in Table 1. For each of the variables of interest, we checked for outliers using Grubb's test. We adopted the criteria of asymmetry < 2 and kurtosis < 7 to identify deviations from normality [58] and found that all variables were normal except for childhood trauma dimensions (CTQ_EmotionalAbuse, CTQ_EmotionalNeglect), which showed marked levels of asymmetry and kurtosis. To assess the potential effect of confounding factors, we tested the association between the variables of interest and variables related to age, educational level (expressed in years of schooling), gestational time point (expressed in pregnancy trimester) and place of data collection (i.e., the specific site where recruitment occurred), using Kendall's Tau correlation and Kruskal-Wallis test (p <.05). We then included age, gestational timepoint and place of data collection as covariates in subsequent analyses, as reported below, as these variables were found to be associated with some of the variables of interest (see below).

Kendall's Tau correlations (p <.05) were used as a preliminary measure to identify simple associations between perinatal depressive symptoms measured with the EPDS and each of the childhood trauma dimensions measured with the CTQ_EmotionalAbuse and

CTQ_EmotionalNeglect indices, providing information on the strength and direction of these connections. Similarly, using Kendall's Tau correlation (p <.05), we investigated the possible association between the perinatal depressive symptoms (EPDS) and paternal antenatal bonding in terms of quality (PAAS-QA) and intensity of concern (PAAS-IC). Finally, using Kendall's Tau correlation again (p <.05), we tested the association between the childhood trauma dimensions (CTQ_EmotionalAbuse and CTQ_EmotionalNeglect) and paternal antenatal bonding indices (PAAS-QA and PAAS-IC). All correlations were corrected for multiple comparisons using the false discovery rate procedure (Benjamini-Hochberg method) [59].

As a next step, a Structural Equation Modeling (SEM) approach was used to ascertain the potential relationships between the variables, specifically assessing the impact of childhood traumatic experiences and depressive symptoms on paternal antenatal bonding. The SEM analysis was conducted using the R software, through the lavaan package (https://lavaan.ugent.be – doi: https://doi.org/10.18637/jss.v048.i02). Using SEM, we compared two different models. In the first model, we examined the direct effects of childhood experiences of maltreatment (separately CTQ_EmotionalAbuse or CTQ_EmotionalNeglect) together with depressive symptoms (measured with EDPS) in directly influencing paternal antenatal bonding (measured with PAAS_QA and PAAS_IC). The second model included, in addition to the above, the direct effect of CTQ on EPDS. The addition of this relationship allowed us to test a more complex model, hypothesizing that EPDS functions as a mediating variable in the relationship between childhood traumatic experiences and paternal antenatal bonding. These models were tested separately for abuse conditions (Models 1 A and 2 A, respectively) and for neglect conditions (Models 1 N and 2 N, respectively). We tested the abuse and neglect dimensions in two parallel and identically specified SEMs, rather than in a single combined model, to ensure model parsimony and interpretability. This analytic strategy allowed us to examine each form of maltreatment as a primary predictor of paternal bonding through depressive symptoms, without introducing suppression effects due to their shared variance.

In detail, the relationships hypothesized in Model 1 A are as follows: Paternal Antenatal Attachment (in terms of Quality of Attachment and Intensity of Concern) is directly influenced by Childhood Emotional Abuse as well as by Perinatal Depressive Symptoms; In Model 2 A, we added to these hypothesized relationships the relationship the assumption that Childhood Emotional Abuse influences Perinatal Depressive Symptoms. Similarly, in Model 1 N, we hypothesized that Paternal Antenatal Attachment is directly influenced by Childhood Emotional Neglect as well as by Perinatal Depressive Symptoms, while in Model 2 N, we added the relationship indicating that Childhood Emotional Neglect influences Perinatal Depressive Symptoms. For a graphical representation of the models, see Fig. 1.

In all models, the variables CTQ_EmotionalAbuse and CTQ_EmotionalNeglect were regressed for the covariates of the data collection site, while the variable EDPS was regressed for the variable age, given the evidence of association between these variables; all the variables were finally regressed for gestational time given the strong impact of that variable on bonding. The models were fitted to the data using the Maximum Likelihood Robust estimation method. The goodness-of-fit indicators used include: Root mean square error of approximation (RMSEA), Comparative Fit Index (CFI), Akaike Information Criterion (AIC), Tucker-Lewis Index (TLI). Values of CFI and TLI above 0.90 (and preferably > 0.95) indicate good model fit, RMSEA values below 0.08 (and ideally < 0.05) reflect acceptable approximation error, while lower AIC values denote better model parsimony and comparative fit.

Results

The analyses exploring the potential impact of confounding factors revealed an effect of age on EDPS (τ=−0.13, p =.004), an effect of the data collection site on the CTQ_EmotionalAbuse and CTQ_EmotionalNeglect variables (H(3) = 7.5, p =.047 and H(3) = 33.6, p <.001, respectively), and an effect of pregnancy trimester on the PAAS_IC (H(2) = 15.17, p <.001) Correlation analyses between childhood trauma conditions and depressive symptoms showed a positive association between depressive symptoms and measures of abuse and neglect (see Table 1). Depressive symptom scores were negatively associated with paternal prenatal attachment scores (Table 1). Finally, childhood trauma conditions were associated with measures of paternal prenatal attachment, considering both attachment quality attachment and the intensity of concern (Table 1).

SEM analyses showed a better fit to the data for both models that included the relationship between EPDS and CTQ (Models 2 A and 2 N) compared to models that did not include this relationship. In particular, for the emotional abuse dimension, Model 1 A (RMSEA = 0.17, CFI = 0.74, TLI = 0.33, AIC = 4642.23) showed poor fit and limited parsimony, indicating that the direct-only model did not adequately represent the data. In contrast, Model 2 A (RMSEA = 0.04, CFI = 0.99, TLI = 0.97, AIC = 4598.92) exhibited an excellent fit, with all indicators meeting or exceeding conventional cutoffs (CFI/TLI > 0.95, RMSEA < 0.05, SRMR = 0.03), suggesting that the inclusion of depressive symptoms as a mediator substantially improved model performance and stability.

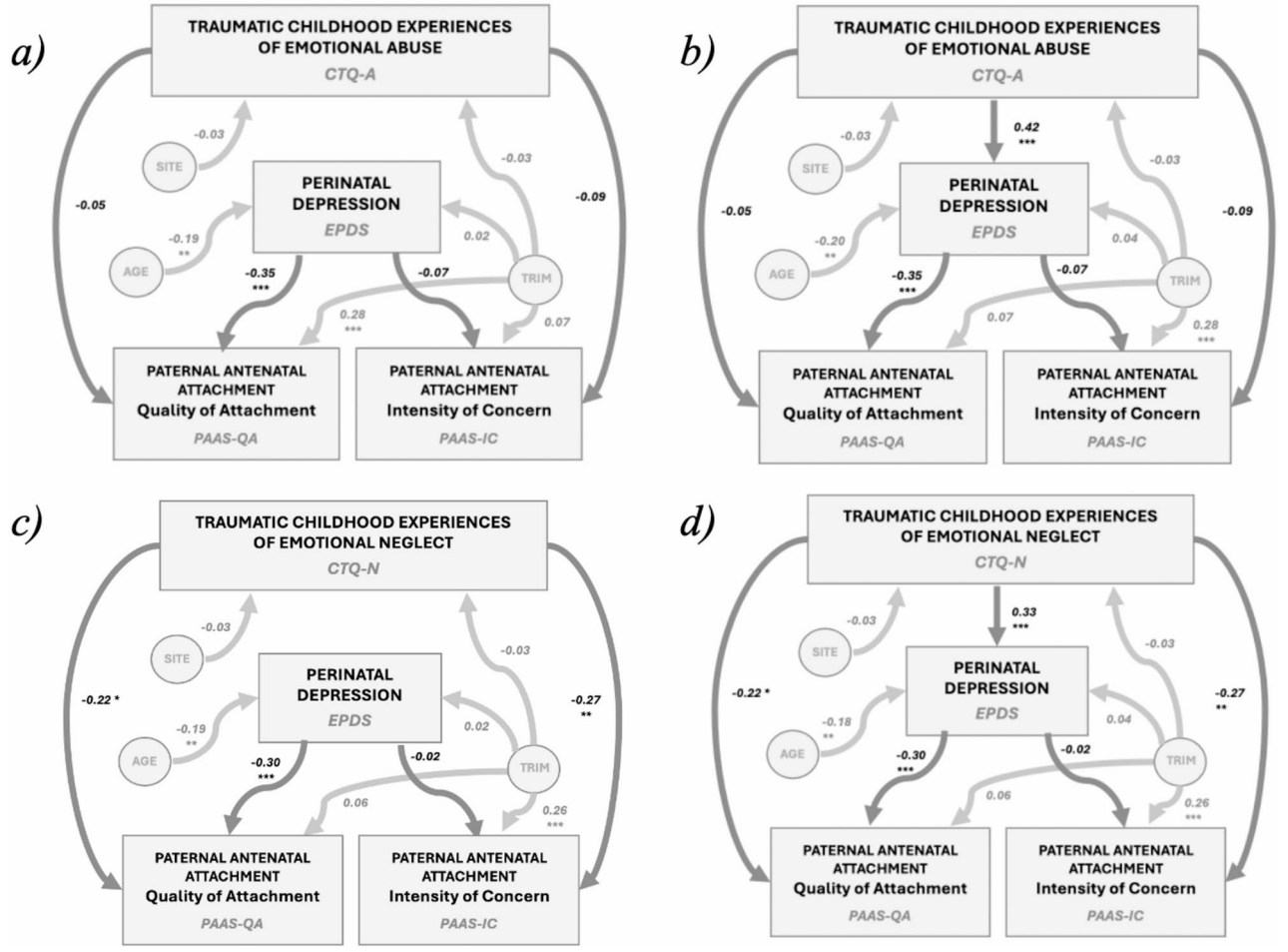

Fig. 1 Structural equation model with standardized path coefficients shown on each arrow 1**a**) The relationships hypothesized in model 1 A in which Paternal Antenatal Attachment (in terms of Quality of Attachment and Intensity of Concern) is directly influenced by Childhood Abuse as well as by Perinatal Depressive Symptoms. 1**b**) The relationships hypothesized in model 2 A in which also Childhood Abuse influences Perinatal Depressive Symptoms. 1**c**) The relationships hypothesized in model 1 N in which Paternal Antenatal Attachment (in terms of Quality of Attachment and Intensity of Concern) is directly influenced by Childhood Neglect as well as by Perinatal Depressive Symptoms. 1 **d**) The relationships hypothesized in model 2 N in which also Childhood Neglect influences Perinatal Depressive Symptoms. Covariates are represented by circles. * $p < .05$; ** $p < .01$; *** $p < .001$

Similarly, for the neglect dimension, Model 1 N (RMSEA = 0.14, CFI = 0.83, TLI = 0.56, AIC = 4784.86) demonstrated an unsatisfactory fit, whereas Model 2 N (RMSEA = 0.07, CFI = 0.96, TLI = 0.89, AIC = 4760.34) showed a good overall fit, with indices within acceptable thresholds and a notable reduction in AIC. Although the improvement from Model 1 N to Model 2 N was less pronounced than in the abuse models, it still indicated that including the mediating path between childhood neglect and depressive symptoms resulted in a more coherent representation of the data.

Discussion

The present study aimed to investigate the impact of adverse childhood experiences (ACEs), specifically emotional abuse and emotional neglect, on the development of paternal antenatal bonding. Specifically, the study pursued a twofold objective: first, to investigate how distinct forms of ACEs may differentially influence paternal antenatal bonding; and second, to examine the role of antenatal depressive symptoms in shaping this relationship;

Our analysis focused on two key dimensions of paternal antenatal bonding, proposed by the Paternal Antenatal Attachment Scale (PAAS): attachment quality and intensity of concern [51]. We hypothesized that these dimensions might be differentially affected by both early experiences of maltreatment and current depressive symptoms.

Our findings confirmed the relationship between childhood maltreatment and reduced levels of paternal antenatal bonding. Specifically, both abuse and neglect were linked to lower scores in both attachment quality and intensity of concern scales. These results corroborate the findings of recent studies that have indicated a correlation between lower levels of prenatal bonding in fathers exposed to early emotional neglect [25]. The results also

align with broader research findings that suggest maltreatment can impact maternal bonding to their unborn children [23, 60, 61]. Moreover, adults with a history of childhood trauma often face complex challenges in the transition to parenthood. Specifically, women who experienced emotional neglect in childhood may have greater difficulty establishing secure and healthy relationships [62]. This relationship is already evident in antenatal parental-fetus bonding, considering both the quality of attachment and the intensity of concern.

In our sample, childhood maltreatment was also associated with increased perinatal depressive symptoms in fathers. Again, both abuse and neglect contributed similarly to the risk of depressive symptomatology. The present findings corroborate earlier research linking early adverse experiences to increased vulnerability to maternal depression during the perinatal period [37], suggesting that this relationship may also be present in the paternal population. The findings of the present study also suggest that fathers who were experiencing symptoms of perinatal depression demonstrated lower levels of antenatal parental-fetus bonding, both in terms of attachment quality and intensity of concern. The present result further confirms recent evidence on the relationship between perinatal depressive symptoms and antenatal bonding in fathers [39], suggesting, even in the paternal population, a potential underlying mechanism linking perinatal depressive symptoms and antenatal bonding, as previously documented in mothers [23, 63, 64].

Our correlation analyses suggest a high degree of interconnectedness among the dimensions under consideration. On the one hand, there is a clear association between exposure to conditions of abuse and neglect in childhood and both perinatal depressive symptomatology and parental-fetus bonding. On the other hand, parental-fetus bonding has been demonstrated to be associated with the presence of depressive symptomatology. The evidence of this close interconnection supports the methodological framework of our study, which aimed to investigate the directionality of these relationships through structural equation modeling (SEM). The models that were implemented compared two potential relationships among the variables. Firstly, they examined the potential direct impact of maltreatment and depressive symptoms on fathers' antenatal bonding. Secondly, they investigated the possibility that depressive symptoms might serve as a mediator between maltreatment and paternal antenatal bonding.

Comparing SEM models suggests that models including the relationship between maltreatment and depressive symptoms better fit the data than models not including it. This better fit was observed in models that included both abuse and neglect dimensions, indicating that the connection between these factors and negative symptoms is significant and essential for accurate modeling.

These results validate the idea that childhood maltreatment and perinatal depressive symptoms affect paternal antenatal bonding. Models that tested the direct effect of these dimensions showed a fair fit to the data. Regression coefficients in these models showed that maltreatment and depressive symptoms significantly impact prenatal attachment quality (PAAS_QA) and the intensity of concern (PAAS_IC). However, comparing these models with models that also tested the role of childhood maltreatment in modulating current depressive symptoms revealed that the latter models better fit the data. In other words, while maltreatment and depressive symptoms have direct and independent effects on paternal antenatal bonding, the indirect effect of maltreatment through influencing depressive symptoms must also be considered.

Overall, these results demonstrate that experiences of abuse and neglect directly and indirectly predict paternal antenatal bonding. However, our investigations suggest a relatively higher incidence of neglect than abuse. This difference was more evident in SEM models, in which the regression coefficients revealed that neglect dimensions have a relatively stronger effect on paternal antenatal bonding than abuse dimensions.

The negative associations between childhood maltreatment and paternal antenatal bonding suggest that early neglect experiences may impair fathers' ability to form strong emotional bonds with their unborn child. The weaker associations with abuse may indicate that neglect has a more pronounced impact on attachment processes, potentially due to its chronic nature disrupting relational skills, emotional growth, and trust in others. These results are consistent with attachment theory, which posits that early caregiving experiences shape later relational capacities [65].

When considering specific forms of maltreatment, both abuse and neglect were associated with increased depressive symptoms and reduced bonding. However, emotional neglect emerged as the strongest predictor of both diminished attachment quality and lower levels of concern for the fetus. This finding aligns with dimensional models of adversity [66], which emphasize the particularly detrimental impact of deprivation-based experiences, such as neglect, on socio-emotional development. Recent studies further support this view, indicating that affective forms of maltreatment, like emotional neglect, exert a pervasive impact on internal working models and the capacity to form secure relationships [38, 67].

Importantly, the best-fitting models (i.e., those including the indirect effect of maltreatment through depressive symptoms) identified depressive symptoms as a

potential mediator between childhood maltreatment and paternal antenatal bonding, thereby supporting our second hypothesis. These results suggest that early adverse experiences may increase the risk of prenatal bonding difficulties indirectly, through elevated emotional distress during the perinatal period. This finding is in line with previous research showing that perinatal depression impairs the development of early parent–child emotional connections, including among fathers [25, 39], and that childhood trauma heightens vulnerability to perinatal depression [22], which in turn undermines paternal bonding [43].

This study makes a new contribution to the literature by highlighting how specific types of early adversity, especially neglect, can shape paternal emotional availability and bonding during pregnancy.

Due to the cross-sectional design of the study, the current findings should be considered exploratory and primarily hypothesis-generating. The identified associations cannot establish causality, but rather highlight potential pathways that warrant further investigation in longitudinal studies. Future studies employing prospective designs are essential for clarifying the directionality and underlying mechanisms of these relationships.

In conclusion, our findings underscore the importance of considering both developmental history and current emotional well-being in understanding early fatherhood. These insights hold important implications for research and clinical interventions aimed at promoting healthy paternal involvement from the earliest stages of parenthood.

Strengths and limitations

A key strength of this study lies in its contribution to an underexplored area of research: the clinical consequences of childhood abuse and neglect, specifically in expectant fathers. While prior studies have predominantly focused on the general outcomes of maltreatment, few have differentiated between the effects of specific types of abuse and neglect. Our study addresses this gap by examining how distinct forms of early adversity relate to depressive symptoms and the quality of paternal–fetal attachment. Notably, the focus on fathers represents an additional strength, as this population has been largely overlooked in research on childhood trauma and perinatal adaptation.

Despite these strengths, several limitations should be acknowledged. First, reliance on self-report measures may introduce biases related to social desirability and retrospective recall. Second, the cross-sectional nature of the study precludes any inference about the temporal or causal direction of the observed associations. Consequently, it is impossible to determine whether depressive symptoms preceded or followed difficulties in prenatal bonding. Furthermore, it should be acknowledged that current depressive symptoms may have biased participants' retrospective reports of their childhood experiences. Third, the sample may not be fully representative of the broader population, potentially limiting the generalizability of the findings to fathers from diverse socioeconomic or cultural backgrounds. Finally, as reported in the introduction, depressive symptoms in men may manifest differently compared to women, often including irritability, aggression, substance use, and risk-taking behaviors. Consequently, a limitation of this study is the use of the Edinburgh Postnatal Depression Scale (EPDS) to assess depressive symptoms in fathers, as this tool was originally developed and validated for maternal populations and may not fully capture the male-specific expression of depressive symptomatology.

Future research would benefit from longitudinal designs to track how paternal antenatal bonding develops into caregiving behaviors and influences long-term parent–child relationships. Additionally, incorporating mixed-methods approaches could offer deeper insight into the subjective experiences of expectant fathers with histories of childhood trauma, enriching our understanding of their emotional and relational development during the transition to parenthood. Finally, while the current study focused specifically on emotional abuse and emotional neglect—given their central role in shaping relational functioning—future research should adopt a more comprehensive approach, examining the distinct and combined effects of all CTQ subscales. Such analyses could provide a more nuanced understanding of how different forms of childhood adversity interact to influence paternal mental health and bonding processes.

Conclusions

This study contributes to the growing body of research on paternal perinatal mental health by demonstrating that early adverse relational experiences - specifically emotional abuse and emotional neglect - may negatively impact the development of paternal antenatal bonding. Our findings suggest that such experiences can influence expectant fathers' emotional connection with the fetus both directly and indirectly, via increased vulnerability to perinatal depressive symptoms.

Among the two forms of childhood maltreatment examined, emotional neglect emerged as a particularly significant predictor of diminished bonding quality, highlighting the pervasive and enduring impact of deprivation-based adversities on relational functioning. Moreover, depressive symptoms were found to mediate the relationship between early maltreatment and antenatal bonding, emphasizing the role of current emotional distress as a critical mechanism in the intergenerational transmission of emotional vulnerability.

These results underscore the importance of routinely assessing childhood maltreatment histories and perinatal depressive symptoms in fathers, not only as a means of identifying individuals at risk, but also to inform early, targeted interventions aimed at fostering emotional engagement and supporting the developing father–child relationship from pregnancy onward. Addressing paternal mental health and relational history within perinatal care settings may ultimately promote better outcomes for both parents and children, and contribute to a more inclusive, preventative model of family mental health.

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Authors' contributions
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Data availability
The data that support the findings of this study are available from the corresponding author, M.R.I., upon reasonable request.

Declarations

Ethics approval and consent to participate
The protocol was approved by the Bioethics Committee at the University of Palermo (167/2023) and the Ethics Committee at the Civico - Di Cristina – Benfratelli" Hospital of Palermo (142/2022). The study was conducted in accordance with the principles of the 2024 Declaration of Helsinki. Informed consent to participate was obtained from all participants.

Consent for publication
Not Applicable.

Competing interests
The authors declare no competing interests.

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