Determinants of Immediate Postpartum Anxiety and Its Association With Postpartum Depression:

A Case-Control Study Nested in a Cohort

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Abstract

Objective: To assess determinants of immediate postpartum anxiety (IPPA) and its association with postpartum depression (PPD).

Methods: We conducted an analysis of the Interaction Gene Environment in Postpartum Depression cohort, which is a prospective, multicenter, French cohort including 3,310 women enrolled between November 2011 and June 2016. Women completed the Hospital Anxiety and Depression Scale-Anxiety (HAD-A) at the maternity department between the second and fifth days following childbirth. IPPA was defined by HAD-A score >7, while HAD-A score >10 defined moderate to severe IPPA. Risk factors were collected. PPD was assessed prospectively at 2 months and 1 year postpartum.

Results: The prevalence of IPPA in this population was 24%, and 7.4% for severe anxiety. Factors independently associated with IPPA were found. Among women with IPPA, 31.2% developed PPD, compared to 16.9% of those without anxiety (adjusted odds ratio [aOR] = 2.0; [95% CI, 1.6–2.5]). The association was stronger for early-onset PPD (aOR = 2.2 [1.7–3.0]) than for late-onset PPD (aOR = 1.8 [1.3–2.4]), even after adjusting on sociodemographic characteristics and history of major depressive episode before or during pregnancy. The higher the intensity of IPPA was, the higher the prevalence of PPD was.

Conclusion: IPPA has specific determinants and is associated, according to its intensity, with early- and late-onset PPD. Identifying (1) women at risk of anxiety, and thus eligible for dedicated support during pregnancy, and (2) women exhibiting anxiety during their maternity stay represent two targets to prevent the onset of PPD.

J Clin Psychiatry 2025;86(4):25m15830

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The prevalence of self-reported anxiety worldwide during pregnancy has been reported to range from 18.2% in the first trimester to 24.6% in the third trimester.[1] In the 6 months following childbirth, the prevalence of anxiety symptoms remains around 15%.[1] It is well established that anxiety is more common in low- to middle-income countries than in high-income countries.[1] A recent meta-analysis showed that 1 woman in 5 in the perinatal period living in low- to middle-income countries had generalized anxiety disorder.[2] There appears to be a continuum throughout the perinatal period: women who experience anxiety during pregnancy often continue to experience it in the postpartum period.[2] Perinatal anxiety symptoms are more common than anxiety disorders, although they can be part of them.[1] The co-occurrence of both anxious and depressive symptoms is also frequently observed during the perinatal period.[3,4] Perinatal depression is more frequently associated with anxious features than nonperinatal major depressive episode (MDE).

Only 2 studies have explored anxiety in the days immediately following childbirth at the maternity department.[3,5] Limited data are thus available on anxiety in the immediate postpartum period. Nonetheless, it is crucial for health care professionals to gain a deeper understanding of its prevalence, associated factors, and potential association with PPD.

Several studies have identified sociodemographic factors associated with perinatal anxiety. These include factors such as young age, low social support, lower

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Clinical Points

- Immediate postpartum anxiety has been largely overlooked in research, despite its high prevalence and potential link to postpartum depression. Our study addresses this gap by examining its prevalence, risk factors, and consequences in a large prospective cohort.
- Screening for anxiety between days 2 and 5 after childbirth can help identify women at risk for early or late-onset postpartum depression. This early detection opens a window for preventive intervention.

levels of education, and unemployment.[6–9] Additionally, personal or family history of psychiatric disorders, particularly during the perinatal period, have been established as a risk factor for perinatal anxiety.[7,8,10] Negative life events, including childhood trauma and stressful life events during pregnancy and adulthood, have also been linked to perinatal anxiety.[11–15] Lastly, obstetric events such as a negative prior childbirth experience, obstetric complications, emergency consultations during pregnancy, and neonatal complications have been shown to be associated with perinatal anxiety.[14,16–18] To our knowledge, only 1 previous study has examined the risk factors of immediate postpartum anxiety (IPPA), using a cohort of 256 participants[19]—highlighting the need for further large-scale research in this area.

In addition to its high prevalence, perinatal anxiety can have negative consequences on both the mother and child independently of the perinatal depression. First, babies born from anxious mothers tend to exhibit more inhibited behavior, experience poorer psychomotor development,[20] and demonstrate weaker skills.[21] Second, anxious mothers report poorer quality of child's attachment,[22,23] and they are also less likely to initiate[24] and sustain breastfeeding.[25] Third, anxiety symptoms can negatively impact the quality of the couple's relationship.[26] Fourth, anxiety can become chronic or even intensify in the late postpartum period.[27] Notably, anxiety assessed in the immediate postpartum period has been identified as a major risk factor for anxiety at 4 and 8 weeks postpartum.[5] Finally, and this is the focus of the present study, women who experience antenatal anxiety are at risk of developing postpartum depression (PPD).[2,28–32] Furthermore, anxious mothers are more prone to experiencing suicidal thoughts.[32] No study to date has explored the association between IPPA and subsequent PPD.

The objectives of this study were (1) to measure the prevalence of IPPA, using a Hospital Anxiety and Depression Scale-Anxiety (HAD-A) score >7 to define anxiety and >10 to define moderate to severe anxiety; (2) to identify its risk factors; and, finally, (3) to assess the risk of developing PPD at 2 months and 1 year postpartum among women who experience IPPA.

METHODS

Participants

The IGEDEPP cohort consisted of 3,310 European adult women who gave birth in 8 maternity departments of the Assistance Publique des Hôpitaux de Paris (AP-HP), Paris metropolitan area, France, spanning from November 1, 2011, to June 30, 2016. Inclusion criteria required participants to be over 18 years old, French-speaking, and covered by health insurance (only 1.0% of French pregnant women are not covered by health insurance).[33] Exclusion criteria encompassed preterm deliveries occurring before 32 weeks of gestation, intellectual disability, or a diagnosis of schizophrenia according to *DSM-IV-TR* criteria.

The enrolled participants underwent 3 interviews with a clinician (psychologist or psychiatrist): the first interview took place face-to-face, at the maternity department, occurring between the second and fifth days following childbirth, while the second and third interviews occurred via telephone at 8 weeks and 1 year postpartum. These 3 time points were selected to capture key phases of postpartum adjustment. The immediate postpartum period (D2–D5) provides insight into acute psychic responses after childbirth. The 2-month follow-up corresponds to the well-established peak period for early-onset PPD, while the 1-year mark allows detection of late-onset depressive episodes. This timing is consistent with previous research.[34] Detailed methodological information about the IGEDEPP cohort and a comprehensive description of the study's participants have been documented in previous publications.[34–36]

The research protocol was registered at ClinicalTrials.gov (identifier: NCT01648816), and the informed consent procedures received approval from the French ethics committee (Île de France I) and the Commission Nationale de l'Informatique et des Libertés.

Measures

Women were interviewed 3 times by trained psychiatrists or psychologists. These clinicians utilized semistructured Diagnostic Interview for Genetic Studies (DIGS) interviews, which were designed in accordance with the international *DSM* criteria.[37] During these interviews, the clinicians also gathered information concerning the participants' psychiatric history, stressful events during childhood or pregnancy, and specifically obstetric events.

Assessment of Anxiety in Immediate Postpartum Period

Anxiety was assessed using the HAD-A between the second and fifth day postpartum.[38] In terms of timing, 29.2% of women were assessed on day 1, 10.7% on day 2, and 30.1% between days 3 and 5. The HAD-A is a 7-

item self-report questionnaire specifically designed for assessing anxiety in nonpsychiatric inpatients.[39] It has received validation and widespread usage in various clinical and research settings globally,[40] in particular, in the perinatal period.[41–43] The HAD-A is scored ranging from 0 to 21. In our study, we employed 2 anxiety thresholds: >7 to denote the presence of anxiety and >10 to indicate moderate to severe anxiety, according to the Haute Autorité de Santé (HAS) guidelines.

Sociodemographic Data and Childhood Trauma, Assessed in the Immediate Postpartum Period

In this study, sociodemographic data, such as age, the level of education, employment status, and marital status, were collected for each woman.

Childhood trauma was assessed using the Childhood Trauma Questionnaire (CTQ),[44,45] a 28-item self-administered tool covering 5 types of trauma: emotional, physical, and sexual abuse, as well as emotional and physical neglect. Cut-off thresholds were applied according to Paquette et al.[45]: scores >10 for physical or sexual abuse, >13 for physical neglect, and >15 for emotional abuse or neglect. This validated scoring method has been used in previous publications from our group.[36]

Stressful Life Events During Pregnancy, Assessed in the Immediate Postpartum Period

Stressful life events during pregnancy were assessed using the Paykel Life Events Scale,[46] a 64-item questionnaire. Participants rated the subjective impact of each event; events were considered stressful if rated as having a "marked" or "severe" negative impact (ie, impact score of 1 or 2). This operationalization is based on established guidelines and has been applied in our prior analyses.[35]

Obstetric Events During Pregnancy and Obstetric History, Assessed in the Immediate Postpartum Period

Obstetric events and data related to the childbirth experience were collected.

The impact of all these obstetric events was categorized as stressful when women reported a negative impact rated as "significant to severe."

Lifetime Psychiatric History, Assessed in the Immediate Postpartum Period

The DIGS was employed to assess lifetime psychiatric history of women,[37,47] according to *DSM-5* criteria.[48] This included past diagnoses of major depressive disorder, anxiety disorders, eating disorders, substance use disorders, and suicide attempts. Each diagnosis was coded as a binary variable (present vs absent).

In addition, family psychiatric history was also investigated using the Family Informant Schedule and Criteria[49] and similarly coded as a binary.

PPD Evaluation at 2 Months and 1 Year

PPD was assessed using the "depression" section of the DIGS according to *DSM-5* criteria, administered at both 2 months and 1 year postpartum.

According to the *DSM-5*,[48] a diagnosis of MDE requires the presence of at least 5 of the following 9 symptoms during the same 2-week period, representing a change from previous functioning: (1) depressed mood, (2) markedly diminished interest or pleasure, (3) significant weight loss or gain, (4) insomnia or hypersomnia, (5) psychomotor agitation or retardation, (6) fatigue or loss of energy, (7) feelings of worthlessness or excessive guilt, (8) diminished ability to think or concentrate, and (9) recurrent thoughts of death or suicidal ideation. At least 1 symptom must be either depressed mood or anhedonia. Additionally, the symptoms must cause clinically significant distress or impairment (Criterion B), not be attributable to a substance or medical condition (Criterion C), and not be better explained by bereavement or another disorder (Criterion D).

The diagnosis was binary: presence or absence of PPD. The prevalence of early- and late-onset PPD was assessed in women experiencing IPPA as well as in control women.

For all women in the cohort, PPD was assessed at 8 weeks postpartum and at 1 year. The aim was to diagnose early-onset PPD and late-onset PPD (ie, beginning between 2 and 12 months postpartum). The two forms of PPD were considered mutually exclusive.

Statistical Analyses

Our study employs a nested case-control design within the IGEDEPP prospective cohort. Women who scored >7 on the HAD-A between the second and fifth day after childbirth were identified as cases of the "anxious group," and those with a HAD-A score ≤7 were considered controls of the "control group." These groups were drawn from the same initial population and followed with identical protocols, minimizing selection bias and ensuring comparable follow-up conditions. In addition to this primary comparison, we conducted a sensitivity analysis focusing on women with moderate to severe IPPA defined by a HAD-A score >10. This secondary analysis aimed to assess if moderate to severe IPPA (HAD-A >10) was more strongly associated with PPD compared to control group.

The 3 objectives of our study were as follows. (1) The prevalence of IPPA was calculated with its 95% confidence interval. (2) To identify risk factors associated with IPPA, we conducted univariate logistic regressions for each of the following variables, selected based on prior

literature identifying them as potential risk factors: age, marital status, education level, employment status, history of MDE, history of anxiety disorders, suicide attempts, eating disorders, substance use disorders, family history of psychiatric disorders, childhood trauma (CTQ), stressful life events (Paykel scale), cesarean section, emergency consultations during pregnancy, pregnancy hospitalization, neonatal complications, and assisted reproductive technology (ART). Variables with $P < .2$ in the univariate analyses, along with sociodemographic variables, were included in a multivariate backward stepwise logistic regression model. This approach aimed to minimize the Akaike information criterion. The final model presents *P* values, adjusted odds ratios (aORs), and 95% CIs. (3) To assess the association between IPPA and PPD, logistic regressions were performed using the binary outcome of PPD at 2 months and 1 year postpartum. Analyses were conducted using bivariate and multivariate models, adjusted first for sociodemographic variables (age, marital status, education level, and employment status), and then further adjusted for the same sociodemographic variables in addition to lifetime history of MDE. All statistical analyses were performed with R, version 3.6.1.

RESULTS

Prevalence of Anxiety at the Maternity Department

At the maternity department, within the IGEDEPP cohort comprising 3,310 women, 24.0% (95% CI, 22.5–25.4) had an HAD-A score exceeding 7, representing a prevalence of 24% (95% CI, 22.5–25.4) of IPPA.

Risks Factors for IPPA

Several sociodemographic factors were associated with IPPA. Being aged from 18 to 25 years was associated with a 1.51-fold increase in the likelihood of IPPA (95% CI, 1.13–2.0). Having a low level of education and being unemployed were both associated with IPPA, with aORs of 1.8 (95% CI, 1.4–2.3) and 1.6 (95% CI, 1.2–2.1), respectively. Conversely, marital status did not show significant associations (Table 1).

Experiencing any type of childhood trauma was significantly associated with IPPA at the maternity department with an aOR of 2.1 [1.6–2.7]. Specifically, emotional neglect (aOR 2.0 [1.5–2.8]), emotional abuse (aOR 2.5 [1.7–3.7]), and physical abuse (aOR 1.9 [1.1–3.1]) were significantly associated with IPPA, whereas there was no statistically significant association observed for physical neglect and sexual abuse (Table 1).

Stressful life events during pregnancy were also associated with IPPA. Women who experienced at least 1 stressful life event during pregnancy, according to the Paykel scale, had a nearly 2-fold increased risk (aOR of 1.9 [1.6–2.3]) (Table 1).

Obstetric events contributed as well. Undergoing ART (aOR 0.7 [0.5–1.0]), having a concurrent chronic physical condition (aOR 1.3 [1.1–1.7]), and primiparity (aOR 0.8 [0.7–1.0]) were all significantly associated with IPPA in the days following delivery. Furthermore, having had an emergency consultation during pregnancy (aOR 1.6 [1.3–1.8]) and being hospitalized during pregnancy (aOR1.7 [1.3–2.1]), particularly for threatened preterm labor (aOR 0.6 [0.4–1.0]) or hypertension (aOR 2.7 [1.3–5.3]), exhibited a strong and statistically significant association with IPPA. Having given birth by cesarean section and experiencing neonatal complications were significantly associated with IPPA, with aORs of 1.6 [1.3–1.9] and 1.6 [1.2–2.0], respectively (Table 2).

Personal and family psychiatric history appeared to be important risk factors. Having personal psychiatric history was associated with IPPA (aOR 2.4 [2.0–2.8]). Specifically, having experienced a MDE increased the risk of IPPA by 2.1 [1.8–2.4], and having had any anxiety disorder raised the risk of IPPA by 2.3 [1.9–2.7]. A prior history of suicide attempts (aOR 1.8 [1.2–2.7]) and eating disorders (aOR 1.5 [1.1–2.2]) were also significantly associated with IPPA. Additionally, experiencing any substance use disorder was strongly associated with IPPA (aOR 1.7 [1.3–2.2]), particularly in cases of tobacco dependence and alcohol use disorder. Family psychiatric history was highly significantly associated with IPPA, with an aOR of 1.5 [1.2–1.8]. Family mood and anxiety disorders were notably and highly significantly associated, with aORs of 1.4 [1.2–1.6] and 1.5 [1.3–1.9], respectively (Table 1).

To further investigate potential combined effects between key predictors, we included an interaction term between childhood trauma and history of MDE in the multivariate model. The interaction term was not statistically significant (OR = 0.9; 95% CI, 0.5–1.5), suggesting no multiplicative effect between these 2 factors. This supports the robustness of their independent associations with IPPA.

Multivariable Regression Analyses

Some of the variables with $P < .05$ in the bivariate analysis were included in the model. In the multivariable analysis, IPPA was found to be independently positively associated with personal history of any anxiety disorder (aOR 1.8 [1.5–2.2]), personal history of MDE (aOR 1.7 [1.4–2.0]), stressful event with negative impact during pregnancy (aOR 1.7 [1.5–2.1]), childhood trauma (aOR 1.7 [1.3–2.2]), cesarean section delivery (aOR 1.6 [1.3–1.9]), newborn-related events (aOR 1.5 [1.1–2.0]), emergency consultation during pregnancy (aOR 1.4, [1.2–1.7]), personal history of

Table 1.

Bivariate Association Between Immediate Postpartum Anxiety (HAD-A >7) and Sociodemographic Data, Childhood Stressful Life Events, Stressful Events During Pregnancy, Obstetrical Events, Delivery Events, and Personal and Family Psychiatric History, Compared to Controls (HAD-A ≤7)

	Immediate postpartum anxiety (HAD-A>7) (N = 793) N (%)	Controls (N = 2,510) N (%)	Immediate postpartum anxiety vs controls	
			OR (95% CI)[a]	*P*[a]
Sociodemographic data				
Age				
<25 y	77	167	1.51 (1.13–2.00)	.004
25–40 y	678	2,220	1 (ref)	Ref
>40 y	38	123	1.01 (0.69–1.46)	.952
Marital status: single	28 (3.5)	75 (3.0)	1.2 (0.8–1.8)	.444
Education level: primary or high school	91 (11.5)	170 (6.8)	1.8 (1.4–2.3)	<.001
Unemployed	72 (9.1)	150 (6.0)	1.6 (1.2–2.1)	.003
Childhood stressful life events (CTQ, N above threshold)			OR (95% CI)[a]	*P*[a]
Emotional abuse	44 (5.6)	56 (2.3)	2.5 (1.7–3.7)	<.001
Physical abuse	28 (3.6)	43 (1.7)	1.9 (1.1–3.1)	.013
Sexual abuse	30 (3.9)	56 (2.3)	1.6 (1.0–2.5)	.061
Emotional neglect	78 (10.0)	118 (4.8)	2.0 (1.5–2.8)	<.001
Physical neglect	8 (1.0)	18 (0.7)	1.2 (0.5–2.7)	.728
Any trauma	118 (15.1)	180 (7.3)	2.1 (1.6–2.7)	<.001
Stressful events during pregnancy				
At least 1 stressful event with negative impact during pregnancy (Paykel scale)	475 (59.9)	1,103 (43.9)	1.9 (1.6–2.3)	<.001
Obstetrical events before and during pregnancy				
Infertility	86 (10.9)	313 (12.5)	0.9 (0.7–1.1)	.332
Assisted reproductive technology	49 (6.2)	218 (8.7)	0.7 (0.5–1.0)	.048
Physical concomitant chronic disease	130 (16.4)	321 (12.8)	1.3 (1.1–1.7)	.013
Primiparity	429 (54.1)	1,467 (58.4)	0.8 (0.7–1.0)	.027
Multiple pregnancy	21 (2.7)	84 (3.3)	0.8 (0.5–1.3)	.423
Emergency consultation during pregnancy	449 (56.7)	1,143 (45.5)	1.6 (1.3–1.8)	<.001
Hospitalization during pregnancy	145 (18.3)	293 (11.7)	1.7 (1.3–2.1)	<.001
Threatened preterm labor	37 (25.5)	101 (34.5)	0.6 (0.4–1.0)	.046
Hypertension during pregnancy	19 (13.1)	18 (6.1)	2.7 (1.3–5.3)	.005
Gestational diabetes	19 (13.1)	40 (13.7)	1.1 (0.6–2.0)	.811
Venous thromboembolic event	3 (2.1)	4 (1.4)	1.6 (0.3–7.3)	.571
Delivery events				
Cesarean section delivery	251 (31.7)	566 (22.5)	1.6 (1.3–1.9)	<.001
No obstetrical analgesia despite intention	155 (92.8)	361 (88.7)	1.6 (0.8–3.1)	.166
Newborn-related events (prematurity, low weight for gestational age, NICU)	100 (12.6)	210 (8.4)	1.6 (1.2–2.0)	<.001
Early maternal postpartum events (hemorrhage, ICU)	50 (6.3)	130 (5.2)	1.3 (0.9–1.8)	.191
Personal psychiatric history				
Any psychiatric disease	509 (64.2)	1,073 (42.7)	2.4 (2.0–2.8)	<.001
Major depressive episode	384 (48.4)	780 (31.1)	2.1 (1.8–2.4)	<.001
Suicide attempt	37 (4.7)	61 (2.4)	1.8 (1.2–2.7)	.008
Any anxiety disorder	207 (26.1)	338 (13.5)	2.3 (1.9–2.7)	<.001
Any eating disorder	43 (5.4)	94 (3.7)	1.5 (1.1–2.2)	.025
Any substance use disorder	97 (12.2)	182 (7.3)	1.7 (1.3–2.2)	<.001
Tobacco dependence	84 (10.6)	151 (6.0)	1.7 (1.3–2.3)	<.001
Alcohol use disorder	10 (1.3)	10 (0.4)	3.0 (1.2–7.4)	.015
Cannabis use disorder	17 (2.1)	37 (1.5)	1.3 (0.7–2.4)	.323
Family psychiatric history				
Any psychiatric disorder	563 (71.0)	1,577 (62.8)	1.5 (1.2–1.8)	<.001
Mood disorder	432 (54.5)	1,191 (47.5)	1.4 (1.2–1.6)	<.001
Anxiety disorder	211 (26.6)	484 (19.3)	1.5 (1.3–1.9)	<.001
Schizophrenia	17 (2.1)	30 (1.2)	1.9 (1.0–3.5)	.036
Alcohol dependence or abuse	143 (18.0)	357 (14.2)	1.3 (1.0–1.6)	.029
Other substance use disorder	182 (23.0)	465 (18.5)	1.3 (1.1–1.6)	.007

[a]Boldface indicates statistical significance.
[b]Adjusted for age, marital status, education level, and employment.
Abbreviations: aOR = adjusted odds ratio, CTQ = Childhood Trauma Questionnaire, HAD-A = Hospital Anxiety and Depression Scale-Anxiety, ICU = intensive care unit, MDE = major depressive episode, NICU = newborn intensive care unit.

Table 2.
Multivariable Models for Immediate Postpartum Anxiety (HAD-A > 7)

	Immediate postpartum anxiety vs controls	
	aOR (95% CI)[a]	*P*[a]
Personal history of any anxiety disorder	1.8 (1.5–2.2)	<.001
Personal history of MDE	1.7 (1.4–2.0)	<.001
Stressor event with negative impact during pregnancy (Paykel)	1.7 (1.5–2.1)	<.001
Childhood trauma (CTQ)	1.7 (1.3–2.2)	<.001
Cesarean section delivery	1.6 (1.3–1.9)	<.001
Newborn-related events (preterm, small for gestational age, NICU)	1.5 (1.1–2.0)	.008
Emergency consultation during pregnancy	1.4 (1.2–1.7)	<.001
Personal history of tobacco dependence	1.4 (1.1–1.9)	.022
Hospitalization during pregnancy	1.3 (1.0–1.7)	.020
Education level: primary or high school	0.7 (0.2–0.8)	.004
Assisted reproductive technology	0.6 (0.4–0.8)	.001

[a]Boldface indicates statistical significance.
Abbreviations: aOR = adjusted odds ratio, CTQ = Childhood Trauma Questionnaire, HAD-A = Hospital Anxiety and Depression Scale-Anxiety, MDE = major depressive episode, NICU = newborn intensive care unit.

tobacco dependence (aOR 1.4, [1.1–1.9]), and hospitalization during pregnancy (aOR 1.3, [1.0–1.7]) and negatively associated with a low education level (aOR 0.7, [0.2–0.8]) and ART (aOR 0.6, [0.4–0.8]) (Table 2).

PPD Prevalence at 2 Months and 1 Year Postpartum in Controls and Women With IPPA

We first examined the association between the presence of IPPA (HAD-A >7) and the onset of PPD compared to women without anxiety for the primary analysis.

Due to the attrition rate, the PPD status was unavailable for 847 women in our sample (with no notable differences in the characteristics of women lost to follow-up[35]). Among those with a known PPD status, 31.2% of the women who presented IPPA had a PPD (either during early or late onset), while 16.8% of the women without anxiety did (aOR 2.2 [1.8–2.8]). This association was notably strong for early-onset PPD (aOR 2.5 [1.9–3.2]); it was also significant for late-onset PPD (aOR 2.0 [1.5–2.6]). When adjusting for sociodemographic covariates, women with IPPA were still 2.2 times more likely to have PPD [1.8–2.7], with aORs of 2.4 for early-onset PPD [1.9–3.2] and 1.9 for late-onset PPD [1.4–2.6]. Furthermore, when adjusting for history of MDE (before and during pregnancy), the aOR for PPD remained similar 2.0 [1.6–2.5], with aORs of 2.2 [1.7–3.0] for early-onset PPD and 1.8 [1.3–2.4] for late-onset PPD (Figure 1).

Sensitivity Analyses

At the maternity department, within the IGEDEPP cohort, 7.4% (95% CI, 6.5–8.3) recorded an HAD-A score above 10, corresponding to moderate to severe anxiety.

Our sensitivity analyses focused on the threshold for moderate to severe IPPA (HAD-A>10) and revealed consistent findings (Supplementary Table 1). Consequently, in the final model, moderate to severe IPPA exhibited independent associations with personal history of anxiety disorder (aOR 2.0 [1.5–2.7]), personal history of MDE (aOR 2.5 [1.9–3.3]), stressful event with negative impact during pregnancy (aOR 1.7 [1.3–2.2]), childhood trauma (aOR 1.6 [1.1–2.3]), cesarean section delivery (aOR 1.5 [1.1–2.0]), newborn-related events (aOR 1.7 [1.2–2.6]), emergency consultation during pregnancy (aOR 1.8, [1.4–2.4]), and low education level (aOR 0.6 [0.4–0.8]) (Supplementary Table 2).

We then conducted a sensitivity analysis restricted to women with moderate to severe IPPA (HAD-A >10) versus women without anxiety, in order to explore whether symptom intensity influenced the strength of this association. Women experiencing moderate to severe IPPA were 2.9 more likely to have presented PPD. Notably, this association was particularly strong for early-onset PPD (aOR 3.6 [2.4–5.2]) and also significant for late-onset PPD (aOR 2.2 [1.4–3.4]). Even after adjusting for sociodemographics factors and subsequently for a history of MDE, the aOR remained similar (Supplementary Table 3).

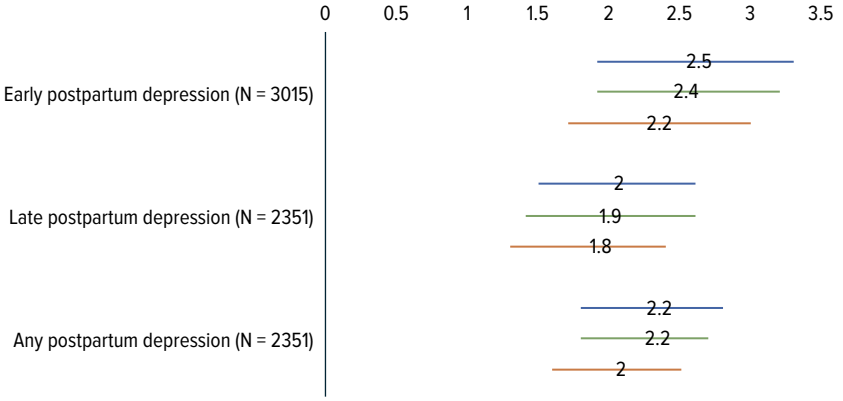
DISCUSSION

Main Findings

In our cohort of 3,310 women, we found a prevalence of IPPA at 24% (95% CI, 22.5–25.4). We analyzed the characteristics of these women and showed that they were significantly more susceptible to developing PPD, both in the early-onset and late-onset forms. Prior to our

Figure 1.

Forest Plot Showing the Association Between Immediate Postpartum Anxiety and Postpartum Depression Among Women Assessed at 1 Year Postpartum (Reported Odds Ratios and 95% CIs Correspond to 3 Models)



In blue: bivariate model

In green: multivariate model adjusted for sociodemographic characteristics

In orange: multivariate model adjusted for sociodemographic characteristics and history of major depressive episode

study, only 2 studies had investigated the prevalence of IPPA. These studies reported prevalence of 17%[3] and 22.3%.[5] Although our results are in the same order of magnitude, the slightly higher prevalence observed in our cohort may be explained by differences in assessment tools used (HAD-A vs State-Trait Anxiety Inventory), geographical differences (France vs Croatia and Canada), and variances in the type of maternity hospital involved in the Canadian study (our population was recruited from university maternity hospitals with a higher incidence of obstetric complication).[35] Furthermore, the Croatian study was conducted at a single center.

Factors associated with anxiety in the immediate postpartum period included women's psychiatric history (particularly MDE and anxiety disorders), as well as experiences of traumatic and stressful events during both childhood and pregnancy, including specific obstetric events. Prior research has identified an association between childhood trauma and both antenatal and postnatal anxiety at 6 months, 1 year, and 2 years.[11,50,51] Stressful life events during pregnancy have previously been recognized as risk factors of perinatal anxiety in the literature.[15] Notably, they may also increase the risk of obstetric complications, such as premature delivery, and pre-eclampsia,[52] which, in turn, can further elevate the level of anxiety during the perinatal period.[53,54] In our study, having given birth by cesarean section, having had an emergency consultation, having had neonatal complications, or being hospitalized during pregnancy emerged as independent risk factors for anxiety in the immediate postpartum period. These factors have not consistently been reported in previous studies. For example, the association between cesarean delivery and anxiety, as well as the association between neonatal birth complications and anxiety, were not observed.[16] In our study, we observed that ART emerged as a significant protective factor for anxiety in the immediate postpartum period, even in our most comprehensive model. The existing literature presents conflicting findings on this topic,[55] but recent studies show that women who went through ART are less likely to have psychological issues in the postpartum period.[56–58] Finally, a personal history of psychiatric disorder was identified as a contributing factor to perinatal anxiety in our study. It is well established that a history of depression or anxiety prior to pregnancy is associated with an increased risk of postnatal anxiety.[7,59] History of suicide attempts, eating disorders, or substance use disorders, particularly alcohol use disorders, did not persist in the final model. This lack of association should be interpreted with caution. While such psychiatric histories are clinically important, their predictive value for IPPA may be lower than that of more proximal and situational factors, such as perinatal complications or psychosocial stressors. Moreover, the limited prevalence of these conditions in our cohort may have reduced the statistical power to detect a significant effect. Clinically, this suggests that IPPA may reflect a distinct psychological vulnerability profile, characterized by heightened sensitivity to perinatal events and some psychosocial factors that are often reactivated during the perinatal period. To date, no study has explored the association between a previous suicide attempt and

perinatal anxiety. A pre-pregnancy history of eating disorder was not previously identified as a risk factor for postpartum anxiety[60]; while substance use disorder, except alcohol use disorder, prior to pregnancy was associated with an increased risk of postpartum anxiety.[61] Our study is the first to investigate family history as a potential risk factor for IPPA.

Furthermore, we conducted a sensitivity analysis to assess the risk factors for immediate moderate to severe postpartum anxiety (HAD>10). We observed that the risk factors for moderate to severe anxiety were consistent with those for overall IPPA, except for tobacco dependence and hospitalization during pregnancy. This result reinforces the validity of our model and underscores the reliability of the factors associated with the IPPA.

In our study, IPPA emerged as a risk factor for future depression during the first year postpartum, with a 2.2-fold increase in risk; particularly for both early-onset PPD (aOR 2.5) and late-onset PPD (aOR 2). Other studies have reported that antenatal anxiety increased the risk of early-onset PPD by 2.2 to 3.5 in the months following childbirth.[2,29,32] Importantly, our study is the first original study, with a large-scale population, to investigate the association between IPPA and late-onset PPD.

We found IPPA predicted both early-onset PPD and late-onset PPD, even after adjusting for sociodemographic characteristics and for personal history of MDE. The strength of this association exhibited a slight reduction from the bivariate to the multivariate analysis, suggesting that IPPA independently increases the risk of PPD by 2, irrespective of sociodemographic characteristics, and history of MDE. In the same way, *Heron & al.* demonstrated that antenatal anxiety predicted the development of PPD at 8 weeks and 8 months, even after controlling antenatal depression.[2] Furthermore, IPPA more strongly predicted early-onset PPD than late-onset PPD. This observation can be attributed to a continuum between anxiety in the immediate postpartum period and early-onset PPD. Additionally, we observed that moderate to severe IPPA was exhibited a stronger association with PPD than overall IPPA. Interestingly, this difference appeared much more pronounced for early-onset PPD than for late-onset PPD. Anxiety symptoms, such as worry and guilt, are more prevalent in PPD than depressive symptoms like anhedonia and sadness,[62] indicating that anxiety could be a prodromal symptom of PPD. Moreover, symptoms occurring in immediate postpartum period tend to persist and may even intensify during the postpartum period[3] or progressing to PPD. This supports the value of systematic screening in maternity wards to detect women at risk before depressive symptoms fully emerge. This interpretation is consistent with the 2021 French Enquête Nationale Périnatale, which found that around 80% of women with PPD also report anxiety symptoms.[63] Although our DIGS-based diagnostic interviews focused on *DSM-5* depressive criteria, the association between early anxiety and later depression highlights the potential prodromal role of anxiety. This study represents the first attempt to investigate the prognosis value of anxiety in the immediate postpartum period, and further studies will be necessary to validate and confirm our findings.

Strengths and Limitations

Our study presents several methodological advantages. First, the IGEDEPP cohort, to our knowledge, is among the largest, to date, to have examined both risk factors for IPPA and its association with PPD in the year following childbirth. Additionally, the diagnoses of PPD were reliable, made by a trained clinician, using *DSM-5* criteria. Similarly, the assessment of anxiety relied on the HAD-A scale, a validated instrument for this purpose, and the utilization of 2 distinct thresholds provided robustness to our findings. The data collected in our study were exhaustive and precise.

However, certain limitations must be acknowledged. We did not have access to the reasons why women refused to take part in our study, potentially introducing inclusion bias. Most of the women enrolled in the study had a high socioeconomic status, were in a relationship, and had attained a high level of education and not entirely representative of the broader French population, leading to potential external validity bias. Our data were collected between 2011 and 2016, before the COVID-19 pandemic, which has since been shown to significantly impact mental health. Although this limits the direct generalizability of our findings to the current postpandemic context, our study provides a valuable prepandemic reference point. Moreover, women with IPPA could also be experiencing anxiety disorders during the antenatal period, which could confound the specific association between IPPA and PPD. Indeed, antenatal anxiety was not specifically measured in our study, and existing literature supports a strong continuity between antenatal and postnatal anxiety.[2,62] As such, it is possible that the symptoms captured during the immediate postpartum period reflect, in some cases, a persistence of pre-existing symptoms rather than a new onset. While this limitation may impact the etiological interpretation of IPPA, it does not diminish its clinical significance. Detecting anxiety symptoms at the maternity ward, regardless of their onset, remains crucial for identifying women at risk for PPD and guiding early preventive interventions. In the same way, another inherent confounding bias during the immediate postpartum period should be considered: 39% of women experience postpartum blues,[64] and one of its primary symptoms is anxiety.[65] It is plausible that the anxiety symptoms we investigated in the immediate postpartum period may overlap with those associated with a

postpartum blues. However, the baby blues itself, when severe, is a risk factor for PPD, rendering the identification of perinatal anxiety, despite its nonspecific nature, remains clinically relevant.

Finally, it is worth noting that this study is an observational study with a nested case-control design, so our findings highlight associations rather than causal relationships.

Interpretations

Only 2 studies have focused on IPPA, but our study is the first to investigate the determinants of IPPA comprehensively, drawing from a large cohort of patients. Moreover, the determinants identified in our study are similar to those of postpartum anxiety (measured between 1.5 months and 1 year postpartum) already identified in the literature. Our study is the first to establish a connection between IPPA, according to its intensity, and the risk of developing PPD, additionally enhancing the available data in the literature regarding the link between antenatal anxiety and PPD. Taken together, these findings suggest that the immediate postpartum period constitutes a window of heightened vulnerability, where anxiety symptoms may serve as an early signal for broader perinatal mental health risks. Systematic screening in maternity wards could therefore help identify psychological fragilities and perinatal complications before the onset of full-blown PPD.

CONCLUSION

IPPA is a frequent condition, affecting approximately 1 in 4 women in our cohort. It is associated with a specific vulnerability profile, including a history of psychiatric disorders, childhood trauma, and stressful or adverse obstetric events. Beyond its prevalence, IPPA emerged as a significant early clinical marker for PPD: women with IPPA had a 2-fold increased risk of developing PPD, in both its early- and late-onset forms. These findings highlight the importance of recognizing and addressing anxiety symptoms shortly after childbirth as part of a broader strategy to prevent postpartum mood disorders.

Beyond identifying at-risk women, our findings support the systematic implementation of anxiety screening tools in maternity wards during the early postpartum period. The HAD-A, which demonstrated good feasibility in our study, may be administered before discharge, even though it is not specifically designed for the perinatal period. This tool could be integrated into collaborative care pathways involving midwives, obstetricians, and mental health professionals to ensure timely identification, referral, and support for vulnerable mothers during this critical transition period. Perinatal psychiatry consultations should be offered in all maternity wards to ensure appropriate follow-up for these women.

Article Information

Published Online: October 15, 2025. https://doi.org/10.4088/JCP.25m15830

Submitted: February 16, 2025; accepted June 20, 2025.

To Cite: Arnal M, Ngameni EG, Tebeka S, et al. Determinants of immediate postpartum anxiety and its association with postpartum depression: a case-control study nested in a cohort. *J Clin Psychiatry* 2025;86(4):25m15830.

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Author Contributions: Arnal drafted the initial manuscript and approved the final manuscript as submitted. Tebeka carried out the initial analyses, revised the manuscript, and approved the final manuscript as submitted. Dubertret designed the study, revised the manuscript, and approved the final manuscript as submitted. Ngameni revised the manuscript and approved the final manuscript as submitted.

Acknowledgments: The authors thank all of the clinicians involved in this study, especially Cindy Parent, Julie Guillon, Jeanne Colombe, Cecile Bourneuf, Celine Hebbache, Madhavi-Julie Guiot, Laura Couppa, and Marie Lebars, who recruited and followed the participants. They also thank all of the women who participated in the study.

Relevant Financial Relationships: None.

Funding/Support: The study was funded by a grant from the Programme Hospitalier de Recherche Clinique - PHRC 2010 (French Ministry of Health). The study was sponsored by Assistance Publique – Hôpitaux de Paris (Délégation à la Recherche Clinique et à l'Innovation).

Role of the Funders: The funders had no role in the analysis or interpretation of data, the writing of the manuscript, or the decision to submit for publication.

Ethics, Consent, and Permissions: The research protocol (ClinicalTrials.gov identifier: NCT01648816), including informed consent procedures, was approved by the French Ethics committee (Ile de France I) and Data Protection and Freedom of Information Commissions.

Supplementary Material: Available at Psychiatrist.com.

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The Journal of Clinical Psychiatry

Supplementary Material

Article Title: Determinants of Immediate Postpartum Anxiety and Its Association With Postpartum Depression: A Case-Control Study Nested in a Cohort

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DOI Number: 10.4088/JCP.25m15830

LIST OF SUPPLEMENTARY MATERIAL FOR THE ARTICLE

DISCLAIMER

Supplementary Table 1: Association between moderate to severe immediate postpartum anxiety (HAD-A>10) and sociodemographic data, childhood stressful life events, stressful events during pregnancy, obstetrical events, delivery events, personal and family psychiatric history

	Moderate to severe immediate postpartum anxiety (HAD-A>10) (N=246)	Controls (N=3057)	Immediate postpartum anxiety vs Controls	
	N (%)	N (%)	OR (95%CI)	P
Age (years)				
<25	26 (10.6)	218 (7.1)	**1.6 (1.0-2.4)**	**0.031**
between 25 and 40	200 (81.3)	2698 (88.3)	**1 (ref)**	**Ref**
>40	20 (8.1)	141 (4.6)	**1.9 (1.1-3.1)**	**0.009**
Marital status: single	10 (4.1)	93 (3.0)	1.4 (0.7-2.6)	0.376
Education level : Primary or high school	34 (13.8)	227 (7.4)	**2.0 (1.4-2.9)**	**<0.001**
Unemployed	21 (8.5)	201 (6.6)	1.3 (0.8-2.1)	0.239
Childhood stressful life events (CTQ, N above threshold)			aOR (95%CI)	P
- Emotional abuse	11 (4.6)	89 (3.0)	1.5 (0.8-2.9)	0.225
- Physical abuse	7 (2.9)	64 (2.1)	1.2 (0.5-2.6)	0.689
- Sexual abuse	15 (6.2)	71 (2.4)	**2.4 (1.3-4.2)**	**<0.001**
- Emotional neglect	29 (12.0)	167 (5.5)	**2.1 (1.4-3.2)**	**<0.001**
- Physical neglect	4 (1.7)	22 (0.7)	1.8 (0.6-5.4)	0.288
- Any trauma	45 (18.7)	253 (8.4)	**2.3 (1.6-3.2)**	**<0.001**
Stressful events during pregnancy				
At least one stressful event with negative impact during **pregnancy (Paykel scale)**	156 (63.4)	1422 (46.5)	2.0 (1.5-2.6)	**<0.001**
Obstetrical events before and during pregnancy				
Infertility	25 (10.2)	374 (12.2)	0.8 (0.5-1.2)	0.257
Assisted reproductive technology	17 (6.9)	250 (8.2)	0.8 (0.5-1.3)	0.387
Physical concomitant chronic disease	48 (19.5)	403 (13.2)	**1.6 (1.1-2.2)**	**0.009**
Primiparity	127 (51.6)	1769 (57.9)	0.8 (0.6-1.0)	0.082
Multiple pregnancy	6 (2.4)	99 (3.2)	0.7 (0.3-1.7)	0.476
Emergency consultation during pregnancy	157 (63.8)	1435 (47.0)	**2.0 (1.5-2.6)**	**<0.001**
Hospitalization during pregnancy	54 (22.0)	384 (12.6)	**1.9 (1.4-2.6)**	**<0.001**
Threatened preterm labor	12 (22.2)	126 (32.8)	0.6 (0.3-1.1)	0.090
Hypertension during pregnancy	7 (13.0)	30 (7.8)	2.1 (0.9-5.2)	0.105
Gestational diabetes	9 (16.7)	50 (13.0)	1.6 (0.7-3.4)	0.283
Venous thromboembolic event	1 (1.9)	6 (1.6)	1.0 (0.1-9.3)	0.981
Delivery events				
C-section delivery	82 (33.3)	735 (24.0)	**1.5 (1.1-2.0)**	**0.004**
No obstetrical analgesia despite intention	54 (94.7)	462 (89.4)	2.0 (0.6-6.7)	0.248
Newborn related events (preterm, small for gestational age, NICU)	40 (16.3)	270 (8.8)	**1.9 (1.4-2.8)**	**<0.001**
Early maternal postpartum events (hemorrhage, ICU)	14 (5.7)	166 (5.4)	1.0 (0.6-1.8)	0.87
Personal psychiatric history				
Any psychiatric disease	190 (77.2)	1392 (45.5)	**4.0 (2.9-5.4)**	**<0.001**
Major depressive episode	151 (61.4)	1013 (33.1)	**3.2 (2.4-4.2)**	**<0.001**
Suicide attempt	13 (5.3)	85 (2.8)	1.7 (0.9-3.2)	0.077
Any anxiety disorder	83 (33.7)	462 (15.1)	**2.9 (2.2-3.8)**	**<0.001**
Any eating disorder	17 (6.9)	120 (3.9)	**1.9 (1.1-3.2)**	**0.016**
Any substance use disorder	31 (12.6)	248 (8.1)	**1.5 (1.0-2.3)**	**0.042**
Tobacco dependence	29 (11.8)	206 (6.7)	**1.7 (1.1-2.6)**	**0.011**
Alcohol use disorder	4 (1.6)	16 (0.5)	3.0 (1.0-9.3)	0.051
Cannabis use disorder	5 (2.0)	49 (1.6)	1.2 (0.5-3.0)	0.761
Family psychiatric history				
Any psychiatric disorder	181 (73.6)	1959 (64.1)	**1.6 (1.2-2.2)**	**<0.001**
Mood disorder	144 (58.5)	1479 (48.4)	**1.6 (1.2-2.0)**	**<0.001**
Anxiety disorder	83 (33.7)	612 (20.0)	**2.1 (1.6-2.8)**	**<0.001**
Schizophrenia	3 (1.2)	44 (1.4)	0.9 (0.3-3.0)	0.879
Alcohol dependence or abuse	45 (18.3)	455 (14.9)	1.2 (0.9-1.7)	0.241
Other substance use disorder	49 (19.9)	598 (19.6)	1.0 (0.7-1.4)	0.888

Abbreviations: CTQ, Childhood Trauma Questionnaire; PPD: Postpartum Depression; ICU, Intensive care unit; NICU, newborn Intensive Care Unit; PPD, postpartum depression ; aOR: OR adjusted for age, marital status, education level and employment

Supplementary Table 2: Multivariable models for moderate to severe immediate postpartum anxiety (HAD-A>10)

	Moderate to severe immediate postpartum anxiety vs Controls	
	aOR (95%CI)	*P*
Personal history of any anxiety disorder	**2.0 (1.5-2.7)**	**<0.001**
Personal history of MDE	**2.5 (1.9-3.3)**	**<0.001**
Stressor event with negative impact during pregnancy (Paykel)	**1.7 (1.3-2.2)**	**<0.001**
Childhood trauma (CTQ)	**1.6 (1.1-2.3)**	**0.020**
C-section delivery	**1.5 (1.1-2.0)**	**0.011**
Newborn related events (preterm, small for gestational age, NICU)	**1.7 (1.2-2.6)**	**0.008**
Emergency consultation during pregnancy	**1.8 (1.4-2.4)**	**<0.001**
Education level : Primary or high school	**0.6 (0.4-0.8)**	**0.003**

Abbreviations: aOR, adjusted odds-ratio; CTQ, Childhood trauma questionnaire; PPD, postpartum depression.

Supplementary Table 3: Association between moderate to severe immediate postpartum anxiety (HAD>10) and postpartum depression among women evaluated at one year postpartum

	All (N=2401)	Moderate to severe immediate postpartum anxiety (N=178)	Controls (N= 2222)	Perinatal anxiety vs Controls		
	N (%)	N (%)	N (%)	OR (95%CI)	aOR (95%CI)[1]	aOR (95%CI)[2]
Perinatal depression						
No	1916 (79.8)	108 (60.3)	1808 (81.4)	1 (ref)	1 (ref)	1 (ref)
Postpartum depression	485 (20.2)	71 (39.7)	414 (18.6)	**2.9 (2.1-3.9)**	**2.8 (2.0-3.8)**	**2.4 (1.8-3.4)**
Early postpartum depression	250 (10.4)	44 (24.6)	206 (9.3)	**3.6 (2.4-5.2)**	**3.4 (2.3-5.0)**	**2.9 (2.0-4.3)**
Late postpartum depression	235 (9.8)	27 (15.1)	208 (9.4)	**2.2 (1.4-3.4)**	**2.1 (1.3-3.3)**	**1.9 (1.2-2.9)**

Abbreviations: aOR, adjusted odd ratio; CI, confidence interval
Significant differences are in bold.
1: multivariate model adjusted on socio-demographic covariates
2: multivariate model adjusted on the history of MDE (including during this pregnancy) and socio-demographic covariates