



## Short communication

# Prevalence of maternal antenatal and postnatal depression and their association with sociodemographic and socioeconomic factors: A multicentre study in Italy

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## A B S T R A C T

**Background:** Perinatal depression is a widespread and burdensome mental disorder. The objectives of this study were to assess the prevalence of both antenatal and postnatal depression in a large sample of women in Italy and to analyse their association with sociodemographic and socioeconomic factors.

**Methods:** Cross-sectional data from eleven healthcare centres located throughout Italy (2017–2018) were analysed ( $n = 1471$ ). Depressive disorder was assessed with the Edinburgh Postnatal Depression Scale (EPDS), and sociodemographic and socioeconomic factors were also measured. Prevalences by perinatal period and by sociodemographic and socioeconomic factors were estimated, and their associations were evaluated using logistic regression models. All analyses were stratified by perinatal period: antenatal (i.e., from conception to delivery) vs. postnatal (i.e., the nine months after delivery).

**Results:** With a cut-off score set at 12 points, the prevalence of perinatal depression was 6.4% during pregnancy and 19.9% in the postnatal period, and the odds ratio for postpartum vs. antepartum depression was 3.65 (2.56–5.39). High economic status was associated with an approximate fivefold reduction in odds of depression in the antenatal period (ORa: 0.23, 95%CI: 0.10–0.54) and about a sixfold reduction in the postnatal period (ORa: 0.15, 95%CI: 0.05–0.45).

**Limitations:** The data were cross-sectional. The EPDS has a sensitivity of 55.6%.

**Conclusion:** The prevalence of perinatal depression in Italy is strongly associated with socioeconomic disadvantages. Early procedures to evaluate socioeconomic status and the provision of economical support for mothers might reduce the prevalence of perinatal depression and its direct and indirect costs.

## 1. Introduction

Perinatal depression (PND) is one of the most frequent complications in pregnant or postpartum women (Gavin et al., 2005; Schmied et al., 2013). It can cause severe short- and long-term negative effects on both the mother's mental health and the foetus/child's development (Stein et al., 2014) as well as exacerbate the already high treatment costs faced by national healthcare systems (Bauer et al., 2014). The prevalence of PND is high worldwide. It is estimated to affect approximately 17% of all women at some point during their perinatal period (Underwood et al., 2016; Hahn-Holbrook et al., 2017; Okagbue et al., 2017), and some studies have found PND to be underdiagnosed (O'Hara and McCabe, 2013). Nevertheless, heterogeneity is significant even across countries with comparable economic circumstances (Hahn-Holbrook et al., 2017).

Several studies have investigated the relationship between socio-demographic and economic risk factors with the two subsets of PND:

antenatal depression (AND; Biaggi et al., 2016) and postpartum depression (PPD; Hahn-Holbrook et al., 2017). Results showed that most of these factors were related to differences in the prevalence of AND and/or PPD. However, both the prevalence and distribution of these factors may vary over time, especially in a period of extreme socio-economic change (Dijkstra-Kersten et al., 2015; Ruiz-Pérez et al., 2017). One example is the 2008 global economic crisis that, among other effects in Italy, led to a significant escalation of prescriptions for antidepressants (Mattei et al., 2014), a decreased birth rate (Istat, demographic indicators for the year 2014) and diminished medical, scientific, and health growth (Lee and Mason, 2011) that could continue to reduce the availability of resources for families and health services in the next few years (Reynaud and Miccoli, 2019). For instance, the prevalence of PND in Italy ranged between 2.2% and 17.3% depending on the year of the study (Banti et al., 2011; Di Venanzio et al., 2017). Therefore, the likelihood of ensuring appropriate early assessment and timely intervention programmes related to primary and

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secondary PND prevention was and will be influenced by periodic estimations of its prevalence and its association with sociodemographic and economic factors.

As diagnoses of several mental illnesses—including maternal perinatal—are based primarily on self-perceived symptoms, evaluating and monitoring them using valid, reliable, and feasible self-rating scales should be considered. Several self-report questionnaires to assess the depressive symptoms listed in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders have been developed. Some of these focus specifically on maternal PND. The Edinburgh Postnatal Depression Scale (EPDS; Cox et al. 1987) is the most widely used. It is considered the best screening test with optimal sensitivity and specificity characteristics for depressive symptoms during the perinatal period (Moraes et al., 2017). The EPDS has also been validated for antenatal use (Bergink et al. 2011; Gibson et al. 2009) and is now available in several non-English language translations.

The aims of this study were the following: a) assess the prevalence of perinatal depression in both antenatal and postnatal periods (further stratified by trimesters) in a large sample of women attending healthcare centres in Italy, and b) analyse its association with socio-demographic and socioeconomic factors.

## 2. Methods

A total of 1471 women (1160 during pregnancy and 311 after delivery) were recruited from eleven healthcare centres located throughout Italy. The Observatory of Perinatal Clinical Psychology, University of Brescia (<https://www.unibs.it/node/12195>) coordinated and managed the implementation of the study in each healthcare centre. The Study design was developed in mutual agreement of scientific collaboration between the University of Brescia, Department of Clinical and Experimental Sciences, Observatory of Perinatal Clinical Psychology and the Italian National Institute of Health (Istituto Superiore di Sanità). Information about the rationale and methodology of the study were detailed in the study protocol (Cena et al., 2020; Imbasciati, Cena, 2020).

Trained psychologists evaluated the participants' depression through unstructured clinical interviews and a patient-rated EPDS ten-item questionnaire that requires women to respond to ten statements related to symptoms of depressed moods, anhedonia, anxiety, and self-harm that had occurred in the previous week. Each symptom was scored on a 4-point Likert scale. The total score ranged from 0 to 30, where higher scores indicated more severe depressive symptoms. Generally, women with perinatal depression had total scores of 12, as established by past studies, including the validated Italian EPDS (Benvenuti et al., 1999) that showed good sensitivity, high specificity, and high positive predictive values (55.6%, 98.9%, and 90.9%, respectively). Moreover, a recent validation study of Danish version of the EPDS found that for ICD-10 moderate and severe depression, a cut score of 12 or more was suggested with a sensitivity of 77%, specificity of 96%, and positive predictive values of 49.5% (Smith-Nielsen et al., 2018).

The sociodemographic variables considered in the study were age, nationality, marital status, previous pregnancies, number of abortions, number of previous children living at the time of this pregnancy/birth, planning of the pregnancy, and recourses to assisted reproductive technology. The socioeconomic variables were educational level, working status, and economic status.

A statistical analysis including descriptive and stepwise multiple logistic regression models was conducted. For descriptive analyses, frequencies and percentages were calculated for categorical variables, and chi-square tests were utilised for comparison. A logistic regression model was used to evaluate the associations between the socio-demographic and socioeconomic variables and the risks of prenatal or postnatal depression as measured by the EPDS. In the analysis models, each sociodemographic and socioeconomic variable was included both

**Table 1**

Results of screening for PPD risk, separated by perinatal periods and totals. Frequencies and percentages.

Period	Weeks	Women per quarter	EPDS < 12 n (%)	EPDS ≥ 12 n (%)
ANTENATAL	1–13	2	2 (100.0)	0
	14–26	129	113 (87.6)	16 (12.4)
	27–40	1029	971 (94.4)	58 (5.6)
<i>Total Prenatal</i>		<i>1160</i>	<i>1086 (93.6)</i>	<i>74 (6.4)</i>
POSTNATAL	1–13	220	180 (81.8)	40 (18.2)
	14–26	66	52 (78.8)	14 (21.2)
	27–40	16	10 (62.5)	6 (37.5)
<i>Total Postnatal</i>		<i>302</i>	<i>248 (80.1)</i>	<i>60 (19.9)</i>
<b>Total sample</b>		<b>1462</b>	<b>1328 (90.7)</b>	<b>133 (9.2)</b>
<b>Odds Ratio Postnatal/Antenatal (95% CI)</b>			<b>3.65 (2.56–5.39)</b>	<b>**</b>

\*\*  $p < 0.01$ . The sample in this table does not include nine participants evaluated between 41–52 months after delivery

individually and together with the other variables. The goodness-of-fit for our model was assessed using Hosmer-Lemeshow test. All analyses were performed using the Statistical Package for Social Sciences (SPSS) version 25.

## 3. Results

The prevalence of depression (Table 1) was 6.4% among pregnant women and 19.9% among women during the first nine months after delivery. A further division of both the antenatal and postnatal periods into trimesters of thirteen weeks each was also applied. The prevalence of AND was high (12.4%) in the second trimester of pregnancy and then decreased in the third trimester. After delivery, the prevalence of postnatal depression increased to between 18.2–21.2% in the first six months. It reached maximum of 37.5% during the ninth month following the birth.

Overall, the odds ratio of postnatal depression vs. antenatal depression was 3.65 (2.56–5.39), thereby indicating that the odds of depression was almost four times greater after delivery than during pregnancy.

Bivariate analyses (Table S1) showed a significantly lower risk of AND in women with temporary employment ( $p < 0.05$ ), those with no previous pregnancies ( $p < 0.05$ ), and those with no other children ( $p < 0.05$ ), while the odds was higher in pregnant women with economic problems ( $p < 0.05$ ). PPD is only associated with several to many economic problems ( $p < 0.01$ ). These trends were confirmed after adjustment using logistic regressions (Table 2). In particular, the absence or presence of a few economic problems was associated with about a fivefold reduction in odds of perinatal depression (ORa = 0.23, 95% CI: 0.10–0.54) in the antenatal period and about a sixfold reduction (ORa = 0.15, 95% CI: 0.05–0.45) in the postnatal period.

The Hosmer-Lemeshow goodness-of-fit test showed a chi-square value of 4.73 (8 df,  $p = 0.786$ ) for the antenatal period and a chi-square value of 1.38 (8 df,  $p = 0.994$ ) for the postnatal period, confirming model adequacy.

## 4. Discussion

To our knowledge, this is one of the largest studies to assess the prevalence of perinatal depression in pregnant and postpartum women who attended healthcare centres in Italy. Furthermore, the results reveal that both the prevalence and the risk of postnatal depression were considerably higher than antenatal depression, and there was a higher prevalence among women with economic disadvantages. The prevalence of AND found in our study was generally lower than the average rate of approximately 17% reported by recently published estimates for pregnant women at both national and international levels (Underwood et al., 2016; Okagbue et al., 2017). At the same time, the

**Table 2**

Association of sociodemographic and socioeconomic characteristics and antenatal/postnatal depression. Single variable and multiple logistic regression models stratified by perinatal period.

	Antenatal (N = 1160)			Postnatal (N = 311)				
	OR(95% CI)	p value	ORa(95% CI)	p value	OR(95% CI)	ORa(95% CI)	p value	
<b>Age</b>								
18–29	Ref.		Ref.		Ref.			
30–35	1.46 (0.76–2.79)	0.26	1.65 (0.81–3.36)	0.17	0.76 (0.33–1.76)	0.53	0.80 (0.30–2.14)	0.66
> 35	1.58 (0.79–3.16)	0.19	1.59 (0.73–3.45)	0.24	1.28 (0.57–2.86)	0.55	1.60 (0.59–4.30)	0.35
<b>Nationality</b>								
Italian	Ref.		Ref.		Ref.		Ref.	
Non-Italian	0.35 (0.08–1.44)	0.14	0.31 (0.07–1.33)	0.11	1.63 (0.65–4.11)	0.29	0.89 (0.29–2.79)	0.84
<b>Marital status</b>								
Single, separated, divorced, or widowed	Ref.		Ref.		Ref.		Ref.	
Married or cohabiting	0.74 (0.34–1.59)	0.44	0.88 (0.39–1.97)	0.75	0.46 (0.20–1.04)	0.06	0.59 (0.23–1.51)	0.27
<b>Educational level</b>								
University	0.63 (0.33–1.23)	0.18	0.62 (0.28–1.40)	0.25	1.09 (0.49–2.43)	0.83	2.05 (0.74–5.69)	0.16
Secondary	0.72 (0.36–1.43)	0.35	0.61 (0.28–1.34)	0.22	0.75 (0.32–1.76)	0.51	0.95 (0.36–2.51)	0.92
Primary or illiterate	Ref.		Ref.		Ref.		Ref.	
<b>Working status</b>								
Permanent employee	1.30 (0.69–2.46)	0.42	1.71 (0.82–3.60)	0.15	0.76 (0.40–1.45)	0.41	0.85 (0.38–1.87)	0.68
Temporary employee	0.14 (0.02–1.10)	0.06	0.15 (0.02–1.20)	0.07	0.60 (0.18–2.01)	0.41	0.58 (0.15–2.34)	0.45
Student, homemaker or unemployed	Ref.		Ref.		Ref.		Ref.	
<b>Economic status</b>								
Average high status	0.36 (0.17–0.78)	0.01	0.23 (0.10–0.54)	0.001	0.21 (0.09–0.53)	0.001	0.15 (0.05–0.45)	0.001
A few problems without specific difficulties	0.46 (0.22–0.96)	0.04	0.36 (0.16–0.81)	0.01	0.32 (0.14–0.76)	0.01	0.26 (0.10–0.70)	0.008
Same or many problems	Ref.		Ref.		Ref.		Ref.	
<b>Planned pregnancy</b>								
No	Ref.		Ref.		Ref.		Ref.	
Yes	0.86 (0.51–1.43)	0.55	0.84 (0.48–1.45)	0.53	0.65 (0.35–1.23)	0.19	0.77 (0.38–1.60)	0.49
<b>Resort to assisted reproductive technology</b>								
No	Ref.		Ref.		Ref.		Ref.	
Yes	0.72 (0.26–2.04)	0.54	0.81 (0.28–2.35)	0.70	0.70 (0.46–3.16)	0.70	0.77 (0.26–2.25)	0.63
<b>Previous pregnancies</b>								
No	Ref.		Ref.		Ref.		Ref.	
Yes	1.63 (0.99–2.68)	0.05	1.29 (0.55–3.02)	0.56	1.07 (0.61–1.89)	0.81	0.46 (0.12–1.78)	0.26
<b>Past abortion(s)</b>								
No	Ref.		Ref.		Ref.		Ref.	
Yes	1.31 (0.79–2.19)	0.29	1.17 (0.63–2.18)	0.62	1.32 (0.73–2.40)	0.36	1.40 (0.69–2.88)	0.36
<b>Children living at the time of this pregnancy/birth</b>								
No	Ref.		Ref.		Ref.		Ref.	
Yes	1.74 (1.00–3.00)	0.05	1.19 (0.50–2.84)	0.69	1.13 (0.64–2.02)	0.67	1.89 (0.49–7.31)	0.36
<b>Sensitivity analysis (EPDS ≥ 11)</b>								
Sensitivity analysis (EPDS ≥ 12)	66.0%				70.8%			
	66.7%				62.3%			

Note: OR = odds ratio; ORa = odds ratio adjusted. The effects of confounding sociodemographic and socioeconomic factors were adjusted by stepwise logistic regression analysis.

Regarding the economic status: “Same or many problems” = having debts, difficulties or inability to pay daily expenses and rent; “A few problems without specific difficulties” = relatively modest standard of living but without particular difficulties; “Average high status” = home owned, possibility of taking holidays or traveling for pleasure.

prevalence of PPD was higher than the average rate of 17.7% reported by recent studies of women during the postpartum period (Hahn-Holbrook et al., 2017). The differences in PND prevalence could be related to different assessment tools and procedures and/or the particular clinical, sociodemographic, and economic characteristics of dissimilar study samples. Regarding the use of the EPDS in this study, despite having lower diagnostic sensitivity and specificity compared to a structured clinical interview, its satisfactory psychometric properties (Benvenuti et al., 1999) and acceptability provide a reasonably accurate

estimation of depression risks, and its widespread use in epidemiological and clinical studies (Moraes et al., 2017; Smith-Nielsen et al., 2018) may encourage additional reliable comparisons spanning different countries or from different regions within a country.

Regarding the differences in prevalence of AND and PPD, our study shows that depression is approximately three times more prevalent in the postpartum period than it is in the antenatal period. These results are inconsistent with the results of previous studies that reported higher rates of depression during pregnancy than in the postpartum period

(Banti et al., 2011; Underwood et al., 2016, 2017). Furthermore, our study found that the prevalence of AND was highest during the second trimester, while the prevalence of PPD increased in the first two trimesters and reached its maximum during the third and fourth trimesters. These observations are inconsistent with the results from a recent systematic review of the prevalence of depression during the pregnancy trimesters that found that AND was most prevalent in the last trimester and less frequent in the second trimester (Okagbue et al., 2019). However, the results were not straightforward in all studies. In addition, our findings are inconsistent with previous results indicating that the peak prevalence at three months postpartum remained steady until seven months (Gavin et al., 2005) and often remained present until nine months after delivery (Underwood et al., 2017).

Our study shows that the absence of other children (that is strictly related to having no previous pregnancies) is a protective factor for AND. This finding is consistent with previous results indicating that the presence of previous children is a risk factor for PND (Underwood et al. 2016). This is probably based on the absence of economic difficulties associated with raising more than one child during difficult times. One interpretation lending support for this comes from another result of our study, namely, socioeconomic disadvantage is related to higher AND and PPD levels. This association is clearly consistent with previous studies (Biaggi et al., 2016; Hahn-Holbrook et al., 2017; Okagbue et al., 2017) and may be related to the ongoing European economic crisis, especially its adverse effects on the southern nations like Italy (Reibling et al., 2017). From this perspective, the high prevalence rate of AND could in part be caused by concerns of being unable to afford the costs of raising a child, and these concerns somehow increase after the child is born. Likewise, women with only temporary employment are accustomed to dealing with unstable and difficult economic circumstances.

Two limitations of this study should be noted. First, cross-sectional approaches to PND do not allow for a comprehensive exploration of factors that predict persistent depressive symptoms that commence during pregnancy and persist during the postnatal period, nor for the factors that predict isolated episodes of AND or PPD. The lack of follow-up data may limit generalizability of our results. Second, the sensitivity of the Italian version of the EPDS together with its specificity (55.6 and 98.9, respectively, with a cut-off point of 12+) can be considered satisfactory even though the sensitivity is imperfect; therefore, an undetermined proportion of women could be registering false negatives.

## 5. Conclusions

There is a significant association between PND and economic conditions. Our findings lead us to hypothesise that early interventions to evaluate socioeconomic status and provide support for marginalised mothers (and their families) might reduce the prevalence of perinatal depression and its direct and indirect costs. In this respect, our findings may provide Italian health policy planners with useful information to help develop new perinatal prevention programmes focused on socioeconomically disadvantaged families that may prove to be cost-effective for both the health and social welfare systems.

## AUTHOR CONTRIBUTIONS

LC and GP contributed equally to the general study design.

LC and AT from the Observatory of Perinatal Clinical Psychology coordinate and manage the implementation of the study in each healthcare centre.

FM and AS designed the plan of statistical analysis of the study.

AG serves primarily as research statistical analysis supervisor.

AS, LC and FM participated in the writing of the manuscript.

All authors have critically reviewed and agreed this final version of the article.

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## CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Supplementary materials

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