

How Education Level Affects Risk of Post-Partum Depression: A Comparison Before and During Covid-19

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Abstract: The aim of this study is to investigate the relationship between education level and risk of postnatal depression before and during the Covid-19 pandemic in a sample of gestational parents in Northern Italy. In this case-control study, two groups were compared: the pre and mid- Covid-19 pandemic period groups. Mothers included gave birth between January 2018 and October 2020 and completed the Edinburgh Postnatal Depression Scale (EPDS) within two days of delivery. Before administering the questionnaire, the sociodemographic and labor and delivery characteristics were collected through a brief anamnestic interview. The analyses based on the EPDS outcomes show a significant increase in the risk of developing postpartum depression in women who have given birth during the pandemic period. Additionally, a higher education level may be an overall protective factor against the development of depressive symptoms, especially in the Covid period.

Keywords: covid-19; pandemic; anhedonia; anxiety; depression; edinburgh postnatal depression scale (EPDS); postnatal depression

Introduction

In the etiology of mental health disorders and depression, the role of socioeconomic status has received much attention in the scientific literature. Indicators of socioeconomic deprivation such as unemployment, low income, and low education level have been cited as risk factors for mental health disorders in general (Bartley, 1994; Jenkins et al., 1985; Patel & Oomman, 1999; Weich, 1997; World Health Organization [WHO], 2001) and also concerning postpartum depression (PPD) (Ahmed et al.,

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2012; Beck, 2002; Goyal et al., 2010; Inandi et al., 2005; Neter et al., 1995; Séguin et al., 1999; Wisner et al., 2013). A low socioeconomic status correlates with a higher incidence of postnatal depression. A low level of education has also already emerged as a risk factor for postpartum depression (Matsumura et al., 2019), regardless of employment status and income bracket. Di Florio et al. (2017) highlighted how education might influence how postpartum depressive symptoms are experienced and reported by mothers. In their sample, mothers with a low level of education had greater difficulty in verbalizing psychological and emotional distress. Researchers have explored the level of education related to socioeconomic status, but it has rarely been a focus of interest (Braveman et al., 2005). Currently, there is a lack of research on the role played by this variable in extraordinary and emergency situations, such as the global Covid-19 pandemic.

The declaration of pandemic status by the World Health Organization (WHO) has had numerous consequences at healthcare, political, economic, and social levels; psychological and emotional repercussions have been equally critical. Studies have highlighted (Chen et al., 2021; Madera et al., 2021; Ozamiz-Etxebarria et al., 2020) that psychological distress such as anxiety, depression, and psycho-physical stress have increased considerably as the state of health emergency progresses.

In light of this background, it is interesting to investigate the relationship between education level and risk of postnatal depression before and during the Covid period. We sought to (a) define whether education level can act as a risk factor, a neutral factor, or even as a protective factor for postpartum depression and (b) determine to what extent education affects perinatal mental health before Covid-19 and during the Covid-19 pandemic.

Materials and Methods

In this retrospective case-controlled study, we compared a group of mothers who gave birth before the Covid-19 pandemic to a group of mothers who gave birth during the Covid period. The study was conducted at the Complex Operative Unit of Obstetrics and Gynecology of the Fracastoro Hospital of ULSS-9 Scaligera in San Bonifacio, Verona. From January 2018 to October 2020, the Simple Operative Unit of Hospital Clinical Psychology team went daily to the maternity ward to perform screening for postpartum depression. After receiving an oral explanation about the study and its purpose, adherent mothers took part in the screening in a single session on the second day after delivery in the maternity ward. Each day, the team administered an interview form containing the participants' sociodemographic information (such as age,

nationality, marital status, education, and occupation) and the Edinburgh Postnatal Depression Scale (EPDS, see Appendix 1) (Benvenuti, 1999; Carpiniello et al., 1997; Cox et al., 1987) completed in self-report mode. The mothers had to meet certain inclusion criteria: having given birth between 37 and 42 weeks of gestation, not having undergone general anesthesia, and not being under psychological treatment at the time of admission.

The EPDS is a ten-item self-report instrument with a 4-point Likert scale (0-3) for thirty maximum points. It is the gold standard for screening for postnatal depression. The present study used a cut-off of 12 (or higher) to identify the risk of developing depressive symptoms. The instrument has three subscales (Tuohy & McVey, 2008): the anhedonia subscale (items 1 and 2), the anxiety subscale (items 3,4,5,6), and the depression subscale (items 7,8,9,10). The original version showed 86% sensitivity and 78% specificity for a cut-off of 12/13, with a standardized alpha coefficient of 0.87 (Cox et al., 1987).

Statistical Analysis

The statistical analyses were conducted using SPSS 20 software. First, we focused on participants' sociodemographic and obstetric characteristics to analyze the goodness of the sample. Then, we examined the total scores on the EPDS and its subscales, both as independent and dependent factors related to the education level. The data were subjected to descriptive and inferential analyses. Inferential statistical analyses involved *t*-tests for independent samples, Chi-square, and two-way Kolmogorov-Smirnov tests were applied for the descriptive sample variables. To analyze the effect of Covid and education level, two-way analyses of variance (ANOVA) and, when necessary, post-hoc *t*-tests were applied. The significance criterion was set at $p = 0.05$.

Results

The aim of this study was to assess the effects that education level may have on EPDS outcomes, considering the education level both as an independent factor and in interaction with the periods considered. Of 900 participants, the pre-Covid period group consisted of 605 women and the Covid period group consisted of 295 women. Table 1 and Table 2 show the participants' sociodemographic and labor and delivery variables.

Characteristics of the Sample

How education level affects risk of post-partum depression: a comparison before and during Covid-19

Table 1

Sociodemographic Characteristics

	Pre-Covid period group	Covid period group	
Sample	605 (67.2%)	295 (32.78%)	
Age	32.39 (4.95)	32.33 (4.96)	
Nationality			††
Italian	482 (79.7%)	267 (90.5%)	
Not Italian	123 (20.3%)	28 (9.5%)	
Education level			
Elementary school	9 (1.5%)	0 (0%)	
Middle school	75 (12.4%)	31 (10.5%)	
High school	328 (54.2%)	146 (49.5%)	
College	193 (31.9%)	118 (40%)	
Employment			†
Occupied	431 (71%)	239 (81%)	
Unemployed	174 (28.8%)	56 (19%)	
Civil status			
Married	383 (63.3%)	179 (60.7%)	
Cohabitant	216 (35.5%)	114 (38.6%)	
Single	4 (0.7%)	2 (0.7%)	

Values are M (SD) and N (%). †p < 0.005, ††p < 0.001; Chi-squared

Table 2

Obstetric Characteristics

	Pre-Covid period group	Covid period group
Labor		
Spontaneous	328 (54.2%)	159 (53.9%)
Induced	195 (32.2%)	95 (32.2%)
Non-cesarean labor	82 (13.6%)	41 (13.9%)
Delivery		
Natural	441 (72.9%)	215 (72.9%)
Operative	33 (5.5%)	15 (5.1%)
Planned cesarean	64 (10.6%)	36 (12.2%)
Emergency cesarean	67 (11.1%)	29 (9.8%)

Values are N (%). †p < 0.005, ††p < 0.001; Chi-squared

Table 3

Edinburgh Postnatal Depression Scale (EPDS) scores

	Pre-Covid period group	Covid period group	
EPDS total	5.31 (3.88)	6.28 (4.02)	**
EPDS – anhedonia	0.69 (0.95)	0.87 (1.07)	*
EPDS – anxiety	3.51 (2.44)	4.17 (2.46)	**
EPDS – depression	1.13 (1.42)	1.23 (1.49)	

*Values are M(SD). *p < 0.01, **p < 0.001*

Table 4

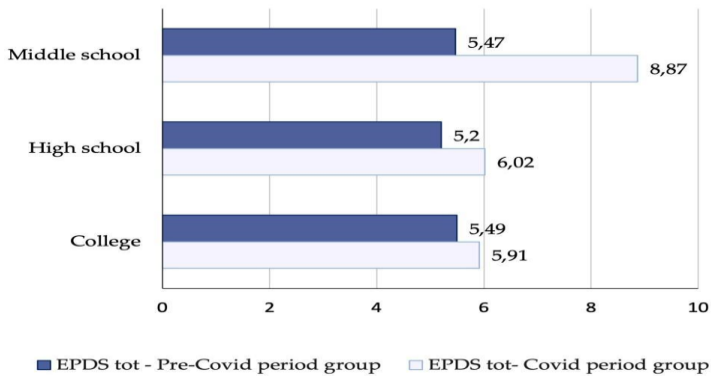
Edinburgh Postnatal Depression Scale (EPDS) and Education Level

	Pre-Covid period group	Covid period group	
EPDS – total	5.31 (3.88)	6.28 (4.02)	
Middle school	5.47 (0.45)	8.87 (0.70)	**
High school	5.20 (0.22)	6.02 (0.32)	*
College	5.49 (0.28)	5.91 (0.36)	
EPDS – anhedonia	0.69 (0.95)	0.87 (1.07)	*
Middle school	0.65 (0.12)	1.32 (0.18)	*
High school	0.67 (0.06)	0.84 (0.08)	
College	0.78 (0.07)	0.78 (0.9)	
EPDS – anxiety	3.51 (2.44)	4.17 (2.46)	**
Middle school	3.57 (2.81)	5.58 (0.44)	**
High school	3.52 (0.13)	4.01 (0.20)	*
College	3.52 (0.18)	3.97 (0.23)	
EPDS – depression	1.13 (1.42)	1.23 (1.49)	
Middle school	1.37 (0.17)	1.87 (0.26)	
High school	1.02 (0.08)	1.16 (0.12)	
College	1.22 (0.10)	1.16 (0.13)	

*Values are M(SD). *p < 0.005, **p < 0.001*

Figure 1

Edinburgh Postnatal Depression Scale (EPDS) Total Scores and Education Level



The *t*-test analysis showed no significant differences between the two groups in terms of age ($t(898) = 0.174, p = 0.86$). The Chi-square analyses showed significant differences between the two groups regarding nationality ($\chi^2(1) = 16.686, p < 0.001$) and occupation ($\chi^2(1) = 9.964, p < 0.005$); the differences regarding marital status were not significant ($\chi^2(3) = 1.663, p = 0.645$). The two-way Kolmogorov-Smirnov test also showed that the two samples were not statistically different based on education level ($Z = 1.141, p = 0.148$). Finally, the groups were compared based on labor and delivery characteristics, and no significant differences were found ($p = 0.99; p = 0.84$).

Symptoms of anhedonia, anxiety and depression (EDPS)

The ANOVA showed that women in the Covid period had a significantly higher mean score on the total EPDS than the control group (6.28 ± 4.02 vs 5.31 ± 3.88 ; [$F(2,884) = 20.505, p < 0.001$]). Regarding the subscales, the Covid period group had statistically significant higher scores with respect to anhedonia (0.87 ± 1.07 vs 0.69 ± 0.95 ; [$F(2,884) = 10.549, p < 0.005$]), and anxiety (4.71 ± 2.46 vs 3.51 ± 2.44 ; [$F(2,884) = 22.799, p < 0.001$]); no significant differences emerged for the depression subscale (1.23 ± 1.49 vs 1.13 ± 1.42 ; [$F(1,884) = 2.313, p = 0.129$]). See Table 3.

Risk and protective factors related to education level

The ANOVA also examined the effects of education on EPDS scores as a potential independent risk factor—before and during the Covid period. Due to the small number of women with elementary education, we excluded the category, and only middle school, high school, and university education levels were considered in the analysis. Some significant differences emerged; both with regard to the different EPDS scores according to the level of education (middle, high school and university degree) [$F(1,884) = 5.959, p < 0.005$], and regarding the interaction between the education level and the period considered [$F(2,884) = 5.076, p < 0.01$].

Specifically, during the Covid period, women with middle school education level [$t(104) = -3.927, p < 0.001$] and high school education level [$t(472) = -2.117, p < 0.05$] showed a significant increase in total EPDS scores, whereas no such differences were found in the population of women with a university education level [$t(308) = -0.931, p = 0.353$]. Similarly, significant interactions were found in the anhedonia and anxiety subscales related to the period considered. In fact, during the Covid period [$F(2,884) = 3.843, p < 0.05$] women with middle school education level reported higher scores on the subscales anhedonia [$t(104) = -2.704, p < 0.05$] and anxiety [$t(104) = -3.938, p < 0.001$] and women with high school education level reported higher scores on the subscale anxiety [$t(472) = -2.028, p < 0.05$]. Whereas, women with a high level of education (university degree) did not show significant increases associated with the Covid period on any of the 3 subscales (anhedonia [$t(308) = -0.005, p = 0.996$], anxiety [$t(308) = -1.630, p = 0.104$], depression [$t(308) = -0.330, p = 0.742$]). A final noteworthy aspect concerns the subscale of depression. Although no significant effects emerged in relation to the pre-Covid or Covid periods [$F(1,884) = 2.313, p = 0.129$] or in relation to the interaction between the period and the sample's education level [$F(2,884) = 1.288, p = 0.276$], higher education proved to be an overall protective factor against the development of depressive symptoms. In fact, a high education level was associated with lower scores on the depression subscale in both periods [$F(2,884) = 4.916, p < 0.01$]. See Table 4 and Figure 1.

Discussion and Conclusions

The scientific literature has already highlighted how a low level of education is a risk factor in the etiology of mental health disorders (Bartley, 1994; Jenkins et al., 1985; Patel & Oomman, 1999; Weich, 1997; WHO, 2001), particularly in the perinatal period (Chen et al., 2021; Chien et al., 2006; Ege et al., 2008; Kheirabadi et al., 2009; Yağmur & Ulukoca, 2010). In this study, women who gave birth during the Covid period reported significantly higher EPDS scores than the pre-Covid group, thus highlighting an increased risk for postpartum depression due to the health emergency period and aligning with other results in the literature (Davenport et al., 2020; Durankuş & Aksu, 2020; Hessami et al., 2020; Madera et al., 2021; Ostacoli et al., 2020; Wah Hui et al., 2021; Zanardo et al., 2020).

This study aimed to investigate the relationship between education level and the risk of postnatal depression before and during the Covid period. The results showed that participants with middle or high school education levels reported significantly higher EPDS total scores, whereas there were no significant differences for women with a university degree. Two conclusions can be drawn from this: 1) a high level of education may be a general protective factor for emotional vulnerability during the perinatal period; 2) a low level of education may have a significant negative effect on women's emotional vulnerability and stability during the pandemic period. Overall, the statistical analyses indicate that a high level of education is an independent protective factor in both normal health circumstances and critical events such as the Covid pandemic; in contrast, a low education level is a risk factor, especially during the pandemic.

Therefore, education may influence how postpartum depressive symptoms are experienced, recognized, and reported by women. Furthermore, it may act as a modulating variable that influences the subjective experience, self-awareness, and acceptance, consequently affecting the communication of symptoms of psychological distress and help-seeking behavior of women who have given birth. While a higher level of education contributes to a less stigmatizing view of mental health related to motherhood (Cook & Wang, 2010), lower levels of education are more frequently associated with anhedonic manifestations.

Currently, to our knowledge, this is the first study involving such a large sample on the Italian national territory. Furthermore, the strengths of this study include the similarity of the sociodemographic characteristics between the groups, particularly the education level variable, which is the subject of this research, and the characteristics relating to childbirth in

which the two groups are statistically comparable (see Tables 1 and 2). It is possible to assume that a high level of education may be a protective factor for postnatal depression. In addition, a high level of education may be an independent protective factor, whereas a low education level could be a risk factor, especially in the Covid period. On a practical level, this translates into the need to pay more attention to situations of reticence in expressing symptoms of psychological distress.

However, it must also be recognized that our study has some limitations. Our analyses compared different groups, thus, we cannot interpret our results on the effects of education on mental status in a strictly causal manner, as there might be other confounding factors, only accountable using longitudinal studies. Secondly, education level is a general predictor of better job prospects, such as employment status, salary levels, insurance coverage, or work location and benefits, all possibly contributing to the mental status. Thirdly, people with high level of education tend to engage in social activities, which leads to a higher satisfaction with life, known to be a protective factor for depression (Diener, 1984). Finally, the combination of these factors, generally tied together, has been associated with a higher impact on mental status in difficult economic times, as it has been the case during the COVID-19 pandemic (OECD, 2012).

Future studies could be conducted in a multi-center perspective to obtain a more representative sample and thus more generalizable results.

Conflict of interest and Funding

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.

Informed Consent

Informed consent was obtained from all subjects involved in the study.

Acknowledgments

The authors thank the UOC of Obstetrics and Gynecology of the Fracastoro Hospital in San Bonifacio (VR), for the sensitivity shown towards the psychological health of women and for supporting this constantly evolving project.

Appendix

Edinburgh Postnatal Depression Scale (EPDS)

1	I have been able to laugh and see the funny side of things	0 <input type="checkbox"/> As much as I always could	A N H E D O N I A
		1 <input type="checkbox"/> Not quite so much now	
		2 <input type="checkbox"/> Definitely not so much now	
2	I have looked forward with enjoyment to things	3 <input type="checkbox"/> Not at all	
		0 <input type="checkbox"/> As much as I ever did	
		1 <input type="checkbox"/> Rather less than I used to	
3	I have blamed myself unnecessarily when things went wrong	2 <input type="checkbox"/> Definitely less than I used to	
		3 <input type="checkbox"/> Hardly at all	
		3 <input type="checkbox"/> Yes, most of the time	
4	I have been anxious or worried for no good reason	2 <input type="checkbox"/> Yes, some of the time	
		1 <input type="checkbox"/> Not very often	
		0 <input type="checkbox"/> No, never	
5	I have felt scared or panicky for no very good reason	0 <input type="checkbox"/> Not at all	
		1 <input type="checkbox"/> Hardly ever	
		2 <input type="checkbox"/> Yes, sometimes	
6	Things have been getting on top of me	3 <input type="checkbox"/> Yes, very often	
		3 <input type="checkbox"/> Yes, quite a lot	
		2 <input type="checkbox"/> Yes, sometimes	
7	I have been so unhappy that I have had difficulty sleeping	1 <input type="checkbox"/> No, not much	D E P R E S S I O N
		0 <input type="checkbox"/> No, not at all	
		3 <input type="checkbox"/> Yes, most of the time I haven't been able to cope	
8	I have felt sad or miserable	2 <input type="checkbox"/> Yes, sometimes I haven't been coping as well as usual	
		1 <input type="checkbox"/> No, most of the time I have coped quite well	
		0 <input type="checkbox"/> No, I have been coping as well as ever	
9	I have been so unhappy that I have been crying	3 <input type="checkbox"/> Yes, most of the time	
		2 <input type="checkbox"/> Yes, sometimes	
		1 <input type="checkbox"/> Not very often	
10	The thought of harming myself has occurred to me	0 <input type="checkbox"/> No, not at all	
		3 <input type="checkbox"/> Yes, most of the time	
		2 <input type="checkbox"/> Yes, quite often	
		1 <input type="checkbox"/> Not very often	
		0 <input type="checkbox"/> No, not at all	
		3 <input type="checkbox"/> Yes, most of the time	
		2 <input type="checkbox"/> Yes, quite often	
		1 <input type="checkbox"/> Only occasionally	
		0 <input type="checkbox"/> No, never	
		3 <input type="checkbox"/> Yes, quite often	
		2 <input type="checkbox"/> Sometimes	
		1 <input type="checkbox"/> Hardly ever	
		0 <input type="checkbox"/> Never	

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