

What factors predispose to postpartum depression in Ecuadorian women? A cross-sectional analysis

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Abstract:

Background: Analyzing the factors that influence postpartum depression contributes significantly to the current literature, since episodes of postpartum depression usually leave various psychological sequelae for the mother and the newborn. Several studies provide empirical evidence suggesting that factors such as having experienced a stillbirth episode, having planned the baby by the mother and her partner, being of a non-indigenous ethnicity, having had a normal delivery and living in an urban area significantly affect the experience of postpartum depressive episodes.

Material and methods: We used a representative sample of 20648 mothers from the 2018 National Health and Nutrition Survey (ENSANUT). We used a binary logistic linear regression model where we estimated the Odds Ratio (OR) and marginal impacts with their 95% confidence intervals (95% CI) for each of the independent variables.

Results: Our results show that having had an episode of stillbirth (OR=2.521; CI=2.106 - 3.018), having planned childbirth on the part of the mother (OR=0.648; CI=0.590 - 0.710) and her partner (OR=0.841; CI=0.762 - 0.928), being of an ethnicity other than indigenous, having had a normal delivery (OR=0.775; CI=0.721 - 0.833) and living in an urban area (OR=1.085; CI=1.006 - 1.171) are factors that significantly affect the probability of experiencing an episode of postpartum depression.

Conclusions: Based on our findings, we recommend health policy makers and medical professionals to consider that postpartum depression has a great significance or commitment in the puerperal population, constituting a pressing psychological condition, which should not be underestimated, but rather, encouraged to give it the due attention it deserves. In addition, we should not exclude the risk factors involved in the possible development of this pathology.

Keywords: Postpartum depression; Cross-sectional studies; Maternal mental health; Ecuador.

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I. Introduction

The most common mood disorder associated with childbirth is postpartum depression (PPD). This is defined as a major depressive mood disorder that appears between 4 weeks and one year after childbirth.¹ Major depressive episodes (MDE) are more frequent in women during the puerperium, as they increase the probability of suffering from it. The prevalence during pregnancy is 12.4% and 9.6% in the year after delivery. The worldwide incidence of postpartum depression ranges between 15% of women and is estimated to affect about 56% of Latina women.² This situation represents a psychiatric emergency because of the risk to the mother, the child and the family due to the mother's delusions.³ Although maternity has been pointed out by some authors as a protective factor against suicide, suicide has been found to be one of the main causes of death in the perinatal period in high-income countries.⁴

Postpartum depression is related to psychological symptoms and alteration of biological patterns, among which are a sad emotional state, high levels of fatigue, sleep disorders and affectation of the

hypothalamic-pituitary axis, which secretes the hormone cortisol, generated in stressful situations. Although the symptoms usually appear after the birth of the baby, women develop depression after childbirth, they present psychological symptoms during the development of pregnancy (anxiety, depression and pregnancy-specific stress).⁵

In addition to this serious problem, women do not seek psychological and medical help during pregnancy and the postpartum period, so they do not have access to information about warning signs and sources of help to turn to.⁶ To counteract this problem, it would be ideal to promote psychological follow-up throughout pregnancy and puerperium, providing information on warning signs to pregnant women. In addition, it would be ideal to screen all women for postpartum depression in the first hours after the birth of their baby through the application of psychological scales of postpartum depression, as well as the control of stress levels during pregnancy through psychological instruments, which can predict the group of pregnant women at risk of presenting symptoms of postpartum depression, thus strengthening maternal and infant health and development.⁵

Theoretically, no evidence has been found on the specific cause of this disorder; however, factors that may be associated have been described, among which are: demographic, psychosocial and perinatal factors that generate susceptibility to PPD.⁷ Demographic factors include: low or no education, extreme age, number of children; psychosocial factors that have a strong association are personal history of low self-esteem, previous postpartum depression, lack of family or social support, partner support, family violence and stress during pregnancy as if it were an unwanted pregnancy.⁸ Previous psychiatric history; psychological factors, coexistence of chronic diseases, the presence of illness in the newborn and pregnancy-related medical complications.⁹

It can be affirmed that the determination of the relationship of this pathology with the risk factors, are the pillar or the basis of the control of postpartum depression and its consequences. In recent years there have been numerous investigations related to postpartum depression, among which we find in a cross-sectional study of 1,359 women who had given birth to a single live baby in the U.S. concluded that there was a statistically significant relationship between age and depressive symptoms ($p < 0.001$), since mothers younger than 25 years presented a greater risk of PPD and, therefore, periodic evaluations should be performed for prolonged periods.¹⁰ Another longitudinal study of 622 women in the community found that the risk factors predictive of postpartum depression were: a history of depression during pregnancy (OR 3.77, $p = 0.03$), previous postpartum depression (OR 2.21, $p = 0.02$), and an Edinburgh Postnatal Depression Scale (EPDS) score > 9 in the first postpartum week (OR 18.23, $p < 0.001$).⁹ Another study carried out in the USA, aimed at determining the frequency of mental or psychiatric disorders during pregnancy and postpartum, showed that pregnancy in itself is not frequently associated with mental problems, but the puerperium is a vulnerable stage with a high risk of triggering depression or other psychological problems, presenting high prevalence rates of 4.7%, more frequently associated with married women, university students, with low socioeconomic income, urban housing and multiparity.¹¹

Moderate postpartum depression often follows a natural evolution towards improvement around 6 months after delivery. However, if this condition is prolonged and worsens, reaching the level of severe postpartum depression, it can have serious consequences for both the patient and the newborn, altering the mother-child bond that is established during the first weeks of the postpartum period. The impact on the newborn translates into neglect by the mother, decreased breastfeeding, with an increased risk of malnutrition and a greater number of diarrheal episodes and respiratory infections.¹

It is alarming that this disease, being a psychiatric emergency, is not identified in maternal and child care centers, despite the fact that its prevalence exceeds that of other obstetric pathologies, such as preeclampsia, premature delivery, or gestational diabetes, among others. In addition, it has been determined that in many cases women who suffer from postpartum depression fail to inform their family members and treating physicians. Thus, in many cases, affected women do not receive timely and adequate treatment.¹² Against this background, the aim of this study is to determine the factors that influence the occurrence of postpartum depression. To this end, we use different measures of both the variable of interest (risk factors) and our dependent variable, postpartum depression.

Therefore, with our study we seek to deepen the study of the factors that influence postpartum depression for its prevention, through the implementation of public policies that will help reduce the impact of this psychiatric condition.

II. Material And Methods

Study Design and Population: A cross-sectional study was conducted with data obtained from the 2018 National Health and Nutrition Survey of Ecuador (ENSANUT), whose data were obtained and presented by the National Institute of Statistics and Census (INEC). After cleaning the database, a total of ... Ecuadorian women were obtained. Data on normal and cesarean deliveries carried out by women who reported a pregnancy in the last 5 years were included.

Inclusion and Exclusion Criteria: Women who responded to the questions on the form for women of childbearing age 10-49 years, childhood health, and breastfeeding were included. Missing data values and women who did not report a pregnancy in the last 5 years were excluded.

Source of Information: The ENSANUT 2018 is a survey included in the National Statistical Program that employs probability sampling applied every 5 years and whose target population is all household members in the 24 provinces of Ecuador. The ENSANUT 2018 includes the form referring to Women of Childbearing Age, Childhood Health and Breastfeeding, which aims to collect information on women aged 10-49 years to make representative estimates at the national level, urban-rural, by geographic domain for the 24 provinces of the country.

Study Variables. Our dependent variable of interest is the risk factors that predispose the mother to depression during the puerperium. The information for this variable was obtained through the questions: "After any of your deliveries, did you feel sad, was it a little sad or a lot sad, how long did you feel sad? Our independent variable, which refers to risk factors, included sociodemographic information on the mother (place of residence, age, marital status, level of education). In addition, control variables were considered through the information obtained by the question "Of all the pregnancies you have had in your life, did you have a child who died/died before birth (stillbirth), but after five months of pregnancy? At the time you became pregnant with (...), did you want to: have this child, wait longer, did not want any more children, did not want to have children, did you have any follow-up after delivery, did you have any follow-up after delivery, did you have any follow-up after delivery?"

Statistical Analysis. The ENSANUT 2018 survey database was analyzed with the statistical package Stata v15 (Stata Corporation, College Station, Texas, USA). A value of $p < 0.05$ was considered to determine statistical significance between variables. The Chi-square test was used to determine the overall correlation between the variables of interest. The association was evaluated by prevalence ratios with their respective 95% confidence intervals with an analysis for each of the variables included in the study. To determine the model of risk factors that affect postpartum depression in the postpartum period, binary logistic regression was applied to calculate the OR with their 95% confidence intervals; in addition, the sociodemographic characteristics were reported as absolute frequencies; the numerical variables were reported as means.

Finally, for the determination of the predictor variables, the ROC curve was applied with the probabilities estimated by applying logistic regression under the method of introducing their confidence intervals and their statistical significance $p < 0.05$.

Ethical considerations. The present study did not require the approval of an institutional ethics committee for its execution, since it is an analysis of data freely available to the public and it was not necessary to use informed consent.

III. Result

Table 1 presents the descriptive statistics of the variables used in this study. Here we observe that 22.47% (CI=21.90% - 23.04%) of Ecuadorian women reported having suffered from postpartum depression. This information is of great relevance given that this percentage is relatively high. Our data also reveal that the average age of the mothers surveyed is 28 years. In addition, 2.56% (CI=2.35% - 2.78%) of women reported having experienced an episode of stillbirth (fetus stillborn at more than 20 weeks gestation). Likewise 26.73% (CI=26.14% - 27.31%) of mothers reported that they did not want to have the baby at that time, while 21.41% (CI=20.86% - 21.95%) reported that their partner did not want to have the baby either. Our data also indicate that 38.66% (CI=38.01% - 39.30%) of the mothers did not have a postpartum checkup. Also 30% of the mothers were married while 75.61% reported being of mixed race ethnicity. We also found that the average number of children is 2 and 42.64% of the women have a high school level of education and 60% report being from the urban sector. In addition, 60.11% (CI=59.74% - 61.04%) reported having a normal (vaginal) birth.

Table N° 1: Descriptive statistics of the variables used in this study.

Variable	N	Mean	SD	Min	Max	95% CI
<i>Postpartum depression</i>						
No	16010	77.53%	0.42	0	1	76.96% - 78.10%
Yes	4641	22.47%	0.42	0	1	21.90% - 23.04%
<i>Mother's age</i>						
Age	21892	27.88	7.62			27.78 - 27.99
<i>Sex of newborn</i>						
Man	11283	51.54%	0.50	0	1	50.88% - 52.20%
woman	10609	48.46%	0.50	0	1	47.80% - 49.12%

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Mortinato								
No	20129	97.44%	0.16	0	1	97.22%	-	97.65%
Yes	529	2.56%	0.16	0	1	2.35%	-	2.78%
You wanted to have the baby								
No	5851	26.73%	0.44	0	1	26.14%	-	27.31%
Yes	16041	73.27%	0.44	0	1	72.69%	-	73.86%
Her partner wanted to have the baby								
No	4686	21.41%	0.41	0	1	20.86%	-	21.95%
Yes	17206	78.59%	0.41	0	1	78.05%	-	79.14%
Postpartum checkup								
No	8463	38.66%	0.49	0	1	38.01%	-	39.30%
Yes	13429	61.34%	0.49	0	1	60.70%	-	61.99%
Marital status								
Another	15324	70.00%	0.46	0	1	69.39%	-	70.61%
married?	6568	30.00%	0.46	0	1	29.39%	-	30.61%
Mother's ethnicity								
Indigenous	3224	14.73%	0.35	0	1	14.26%	-	15.20%
Afro-Ecuadorian	882	4.03%	0.20	0	1	3.77%	-	4.29%
Mongrel	16553	75.61%	0.43	0	1	75.04%	-	76.18%
White	289	1.32%	0.11	0	1	1.17%	-	1.47%
Montubio	944	4.31%	0.20	0	1	4.04%	-	4.58%
Sons								
Number of children at home	20658	2.23	1.32	0		2.16	-	2.52
Form of delivery								
Cesarea	8733	39.89%	0.49	0	1	39.24%	-	40.54%
Normal	13159	60.11%	0.49	0	1	59.46%	-	60.76%
Mother's level of education								
None	260	1.19%	0.11	0	1	1.04%	-	1.33%
Basic Education	7926	36.21%	0.48	0	1	35.57%	-	36.84%
Middle/High School	9334	42.64%	0.49	0	1	41.98%	-	43.29%
Superior	4372	19.97%	0.40	0	1	19.44%	-	20.50%
Residential area								
Rural	8671	39.61%	0.49	0	1	38.96%	-	40.26%
Urban	13221	60.39%	0.49	0	1	59.74%	-	61.04%
Mother's region of origin								
Sierra	8299	37.91%	0.49	0	1	37.27%	-	38.55%
Costa	8115	37.07%	0.48	0	1	36.43%	-	37.71%
Amazon	5070	23.16%	0.42	0	1	22.60%	-	23.72%
Insular	408	1.86%	0.14	0	1	1.68%	-	2.04%

Subsequently, we performed a correlation matrix to perform a detailed analysis of the correlation between the variables and to highlight possible problems of multicollinearity. **Table 2** shows significant correlations between postpartum depression and the independent variables: stillbirth, mother's and partner's desire to have the baby, married marital status, mother's ethnicity, number of children in the household, mode of delivery and mother's region of origin. All these variables have an expected sign which is correct. In addition, we observe that no correlation between the independent variables is greater than 50%. This shows that there are probably no serious multicollinearity problems among the variables. Below we perform a formal test to test for multicollinearity among the variables.

Table N°2: Correlation matrix of the variables

	Var 1	Var 2	Var 3	Var 4	Var 5	Var 6	Var 7	Var 8	Var 9	Var 10	Var 11	Var 12	Var 13	Var 14
Var 1	1													
Var 2	0.1005*	1												
Var 3	-0.0089	0.0095	1											
Var 4	0.0826*	0.0739*	-0.0023	1										
Var 5	0.1001*	0.0485*	-0.0045	-0.0116	1									
Var 6	0.0840*	0.0307*	0.0046	-0.0119	0.6216*	1								
Var 7	0.0113	0.0394*	-0.0054	0.0014	0.0220*	0.0251*	1							
Var 8	0.0276*	0.3312*	0.0061	0.0217*	0.0689*	0.0787*	0.0489*	1						
Var 9	-0.0468*	0.0058	0.0073	0.0000	0.0114	0.0148*	0.0547*	-0.0697*	1					
Var 10	0.0716*	0.4734*	0.0021	0.0529*	-0.0685*	-0.0404*	-0.0471*	0.1700*	-0.1847*	1				
Var 11	-0.0393*	-0.0979*	0.0080	0.0074	-0.0207*	-0.0267*	-0.0781*	-0.0228*	-0.2026*	0.1239*	1			
Var 12	-0.0098	0.0531*	0.0099	-0.0440*	0.0219*	0.0187*	0.1295*	0.1134*	0.1410*	-0.3042*	-0.1964*	1		
Var 13	0.0087	0.0548*	-0.0007	0.0015	-0.0123	-0.0021	0.0529*	0.0065	0.2222*	-0.1598*	-0.1992*	0.3081*	1	
Var 14	-0.0196*	-0.0450*	-0.0028	-0.0079	0.0059	0.0055	-0.0455*	-0.0683*	-0.1774*	0.1067*	0.0786*	-0.0485*	-0.1707*	1

Note: Var 1= Postpartum depression. Var 2=Mother's age. Var 3=Newborn's sex. Var 4=Mortinate. Var 5=You wanted to have the baby. Var 6=Your partner wanted to have the baby. Var 7=Postpartum checkup. Var 8=Marital status. Var 9=Ethnicity of mother. Var 10=Number of children in the household. Var 11=Shape of delivery. Var 12=Mother's educational level. Var 13=Area of residence. Var 14=Region of origin of the mother. Asterisks mean: *p < 0.05.

As mentioned above, we performed a formal test to rule out the presence of multicollinearity among our independent variables. In **Table 3** we present a multicollinearity analysis. We use the Variance Inflation Factor (VIF) to perform this test. Previous literature indicates that a VIF greater than 5 can demonstrate that multicollinearity exists in our data. As we can see, no variable has a VIF greater than 5, therefore we rule out multicollinearity problems in our independent variables. This analysis is important since multicollinearity problems cause instability of the parameters of a regression, incorrect signs and higher standard errors, which translates into statistical insignificance of the parameters.

Table N° 3: Multicollinearity test of the variables

Variable	VIF	SQRT VIF	Tolerance	R-Squared
Mother's age	1.49	1.22	0.6695	0.3305
Sex of newborn	1.00	1.00	0.9966	0.0004
Mortinato	1.01	1.00	0.9918	0.0082
You wanted to have the baby	1.64	1.28	0.6101	0.3899
Her partner wanted to have the baby	1.63	1.28	0.6145	0.3855
Postpartum checkup	1.02	1.01	0.9764	0.0236
Marital status	1.13	1.06	0.8821	0.1179
Mother's ethnicity	1.13	1.07	0.8812	0.1188
Number of children	1.58	1.26	0.6310	0.3690
Form of delivery	1.09	1.05	0.9146	0.0854
Level of education	1.29	1.14	0.7746	0.2254
Residential area	1.17	1.08	0.8583	0.1417
Mother's region of origin	1.05	1.02	0.9537	0.0463
Mean VIF	1.28			

Next, **Figure 1** shows the average age of mothers and depression. Here we observe that women who reported having experienced postpartum depression are women with a higher number of years of age. This same pattern can be observed when we analyze the average age and having experienced stillbirth episodes, since women who reported having experienced a stillbirth episode are also women with a higher number of years of age.

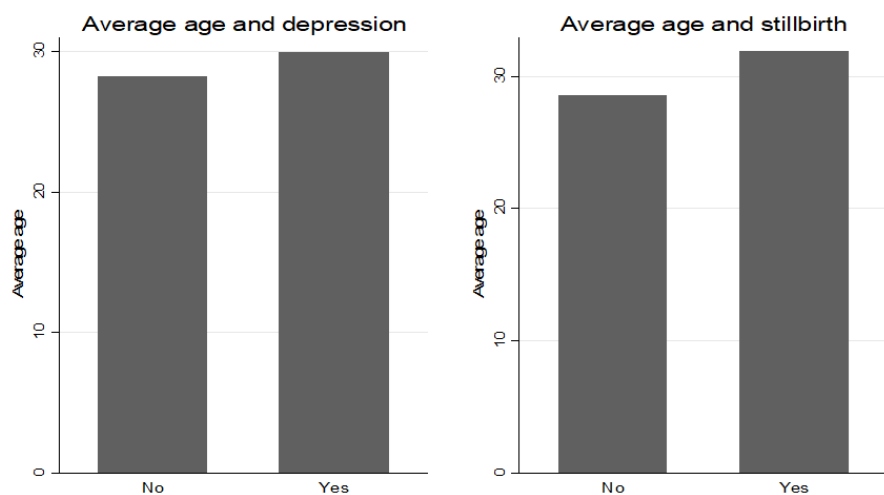


Figure N°1. Average age and postpartum depression and average age and stillbirth

In **Table 4** we can observe the age grouped into 7 categories and the number of women who reported experiencing postpartum depression and women who experienced a stillbirth episode. Here we can observe a more disaggregated pattern than in Figure 1 since we observe the number of women according to their age range who experienced the aforementioned episodes. For example, for the case of postpartum depression we observe that 1316 women aged 18-25 years and 1066 women aged 26-30 years experienced postpartum depression. Likewise, when we looked at the stillbirth variable, we found that 57 women aged 26-30 years and 48 women aged 31-35 years experienced an episode of stillbirth. This analysis is of great relevance since it allows us to provide more precise evidence of the frequency with which these events occurred, which may be determinant in understanding postpartum depression in Ecuadorian women.

Table N°4. Grouped age and number of mothers with postpartum depression and stillbirths.

Age grouped	Depression		Mortinato	
	No	Yes	No	Yes
13-17 years old	442	64	4	3
18-25 years old	6081	1316	59	43
26-30 years old	3625	1066	72	57
31-35 years old	2880	963	85	48
36-40 years old	1793	648	41	49
41-45 years old	736	299	28	24
46-49 years old	156	54	8	7

A multivariate logistic regression analysis to analyze factors influencing postpartum depression is shown below in **Table 5**. Our logistic regression involves 20648 women respondents. Here we note that the dependent variable is a dichotomous variable that takes the value of 1 if the mother experienced an episode of postpartum depression and 0 if she did not. We show that, as expected, the odd ratio (OR) of having experienced a stillbirth is significant and greater than 1. This shows that having experienced an episode of stillbirth (death of the baby after 20 weeks of gestation) increases 2.5 times (CI=2.106 - 3.018) the risk of postpartum depression. Another significant OR is associated with the question of whether the mother wished to have her baby, since we observed an OR that is less than 1. This means that women who wished to have their baby decrease 0.64 (CI=0.590 - 0.710) times the risk of suffering from postpartum depression. This scenario is repeated when we analyze the variable containing the question related to whether the mother's partner wanted to have the baby. This finding is extremely interesting, since the magnitude of the OR is much greater than the previous coefficient mentioned, since in this case, women who reported that their partner wanted to have the baby decrease 0.84 (CI=0.762 - 0.928) times the probability of suffering from postpartum depression. Another variable that stands out in the analysis is the mother's ethnicity, since we observed that women with an ethnicity other than indigenous ethnicity have a lower risk of postpartum depression. Finally, we observed that a normal mode of delivery (vaginal) reduces 0.77 (CI=0.721 - 0.833) times the probability of postpartum depression.

In **Table 5** we observe that the chi-square (X^2) and log-likelihood statistics are stable and statistically correct. The chi-square statistic is significant suggesting that together, the independent variables jointly explain

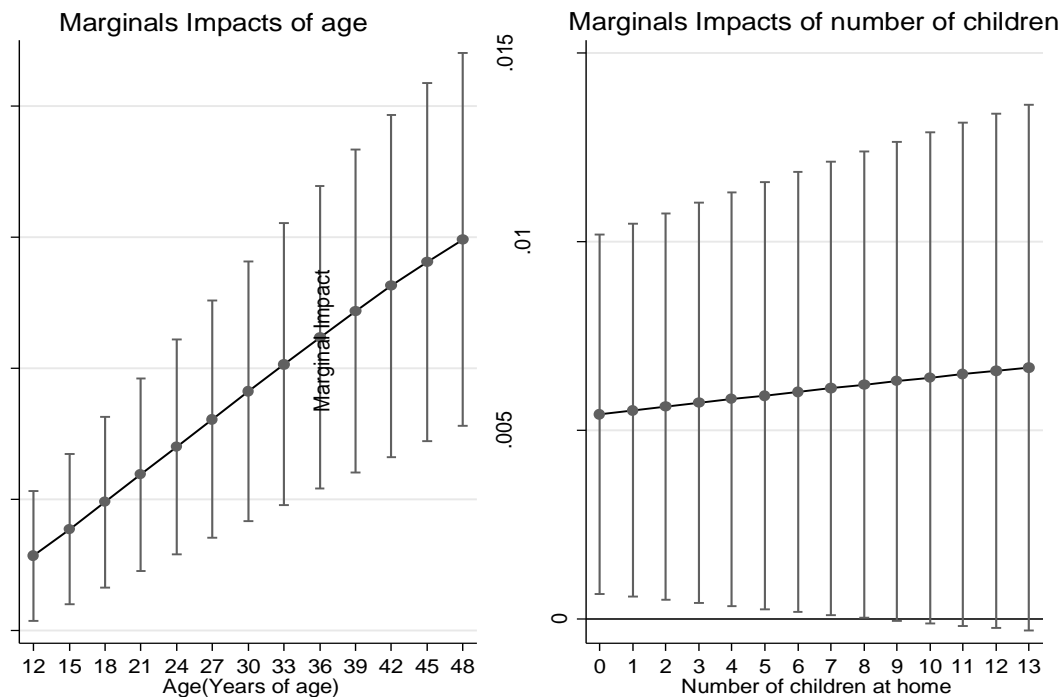
the variability of the dependent variable. On the other hand, the log-likelihood statistic is negative and it is observed that it collects as much information as possible.

Table N°5. Logistic regression analysis between postpartum depression and risk factors.

	OR	Std. Err.	P-value	95% CI	
Dep. var: Depression=1, 0 otherwise					
Mortinato					
No	Ref.				
Yes	2.521***	0.231	0.000	2.106	- 3.018
Mother's age					
Age	1.028***	0.003	0.000	1.022	- 1.033
Sex of newborn					
Man	Ref.				
Woman	0.950	0.032	0.133	0.889	- 1.016
You wanted to have the baby					
No	Ref.				
Yes	0.648***	0.031	0.000	0.590	- 0.710
Her partner wanted to have the baby					
No	Ref.				
Yes	0.841***	0.042	0.001	0.762	- 0.928
Postpartum checkup					
No	Ref.				
Yes	1.025	0.036	0.492	0.956	- 1.099
Marital status					
Another married?	0.972	0.038	0.460	0.901	- 1.048
Mother's ethnicity					
Indigenous	Ref.				
Afro-Ecuadorian	0.817*	0.082	0.045	0.670	- 0.995
Mongrel	0.773***	0.042	0.000	0.696	- 0.860
White	0.592**	0.100	0.002	0.425	- 0.826
Montubio	0.678***	0.073	0.000	0.548	- 0.838
Sons					
Number of children at home	1.043**	0.016	0.006	1.012	- 1.076
Form of delivery					
Cesarea	Ref.				
Normal	0.775***	0.028	0.000	0.721	- 0.833
Mother's level of education					
None	Ref.				
Basic Education	0.853	0.126	0.281	0.638	- 1.139
Middle/High School	0.800	0.119	0.133	0.597	- 1.071
Superior	0.804	0.123	0.153	0.596	- 1.085
Residential area					
Rural	Ref.				
Urban	1.085*	0.042	0.033	1.006	- 1.171
Mother's region of origin					
Sierra	Ref.				
Costa	0.663***	0.027	0.000	0.612	- 0.719
Amazon	0.996	0.045	0.932	0.912	- 1.089
Insular	0.875	0.112	0.297	0.681	- 1.125
Constant	0.284***	0.050	0.000	0.201	- 0.401
Observations	20648				
AIC	23975.03				
BIC	23138.09				
R ²	0.025				
X ²	3.956***				
Log-likelihood	-31461.514				

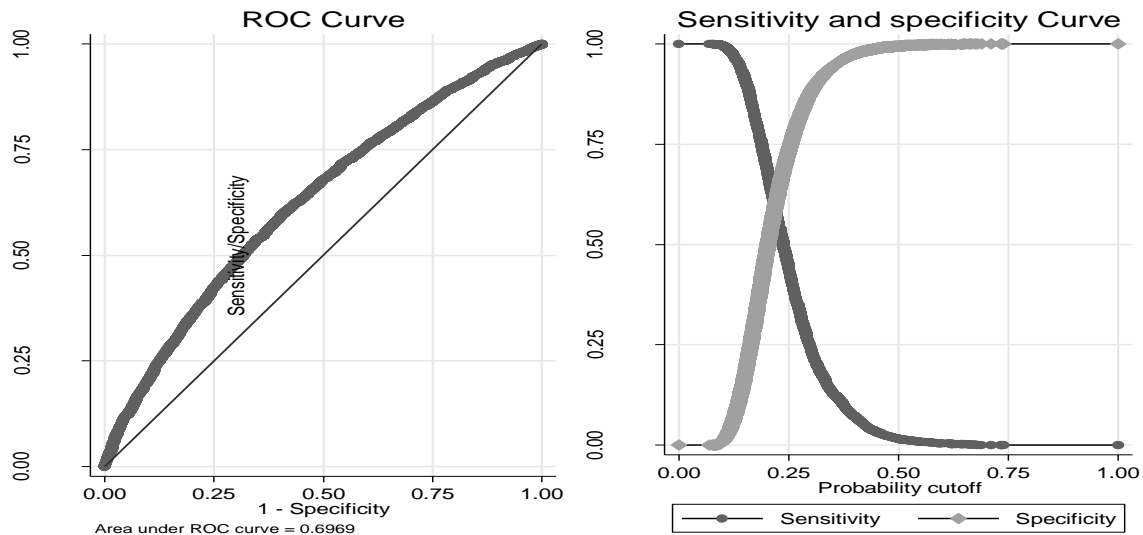
After estimating the logit model, we can estimate the marginal impacts (MI) of the independent variable on the probability of postpartum depression. **Figure 2** shows that as age increases, the probability of postpartum depression increases. Specifically, a 21-year-old woman has a 0.4% chance of having postpartum depression, compared to a 39-year-old woman who has a 0.6% chance of having postpartum depression. Likewise, we observe that having a greater number of children at home increases the probability of suffering

from postpartum depression since we observe an increasing marginal effect of this continuous variable (number of children).



Marginal impacts of age and number of children on the probability of postpartum depression and stillbirth and their respective 95% confidence intervals.

Finally, to determine the discriminatory power of the predictor variables, the ROC curve was applied with the probabilities estimated by applying logistic regression under the method of introducing their confidence intervals and their statistical significance $p < 0.05$. The ROC curve coincides with the probability of correctly distinguishing a case of postpartum depression from one that is not, through the significant predictor variables, the worst scenario being when the area is equal to 0.50. In our case, having had an episode of stillbirth, having planned the baby by the mother and her partner, being of an ethnicity other than indigenous having had a normal delivery and living in the urban area, represented an area under the curve of 0.6969 (95% CI: 0.651-0.794), considering that they adequately predict cases of postpartum depression ($p < 0.001$). On the other hand, the sensitivity and specificity curve shows an adequate shape, given that it is observed to have a normal behavior. Specifically, we observed that the curves cross at an approximate value of 0.25, given a good formation of the curves.



ROC curve and sensitivity and specificity curve for the determination of the sensitivity of the model of factors associated with normal birth weight.

IV. Discussion

Postpartum depression is a fairly frequent and underdiagnosed psychiatric emergency that has been on the rise in recent years, perhaps due to the lack of psychological care during pregnancy, childbirth and the puerperium, the decrease in attendance at postpartum consultation and multiple social risk factors identified in this research, which today are part of the daily life of Ecuadorian women, causing negative repercussions at personal, family and social levels, requiring the urgent intervention of a multidisciplinary team. Although it is known that during the puerperium both the existing biochemical changes as well as stress can trigger PPD, there is no evidence that a lack of physical activity during the puerperium can trigger PPD.¹³ There is no evidence that a hormonal or neurotransmitter imbalance is the cause, therefore, after the literature review of several studies, we have found that most of them focus their study objective on the demographic, social and psychological factors that may influence the mood of the woman after childbirth and not exclusively on those of a biological nature.

In the present study, an association was found between PPD and some factors: maternal age, history of having had a deceased child before birth (stillbirth), unwanted pregnancy on the part of the mother and partner, marital status, ethnicity, number of children and origin of the mother, in the case of postpartum depression. Maternal age was evidenced as the main risk factor, since we observed that 1316 women aged 18-25 years and 1066 women aged 26-30 years experienced postpartum depression, which coincides with the studies carried out by Lee, Blom et al.¹⁴, Blom et al.¹⁵, McMahon et al.¹⁶ and Mori et al.¹⁷ where it is important to note that the highest risk range would be for women under 18 years of age as well as for those over 30 years of age, since as age increases, the likelihood of postpartum depression increases. Specifically, a 21-year-old woman has a 0.4% chance of postpartum depression, compared to a 39-year-old woman who has a 0.6% chance of postpartum depression. This fact could be due to the fact that younger women have a social and economic situation that is not appropriate for facing motherhood and older women may have greater psychological pressure in the face of possible obstetric complications that may arise during pregnancy, especially in those cases in which gestation has been achieved through assisted reproduction techniques, as McMahon et al. refer to in their study.¹⁶ We can also highlight the lack of social and family support, as suggested by Satoh et al.¹⁸ Blom et al.¹⁵ and Mori et al.¹⁷.

It was found that having experienced an episode of stillbirth (death of the baby after 20 weeks of gestation) increases 2.5 times (CI=2.106 - 3.018) the risk of suffering postpartum depression, results that coincide with Lara et al.¹⁹ who states that gestational loss is a traumatic event that has a negative impact on the woman's perception of future reproductive events, and that each new pregnancy is fraught with emotions such as fear and anxiety, which, if the grief is not managed in time, can lead to perinatal depression.

Another significant OR is the one associated with the question of whether the mother wanted to have her baby, since we observed an OR that is less than 1. This means that women who wanted to have their baby decrease 0.64 (CI=0.590 - 0.710) times the risk of suffering from postpartum depression. This scenario is repeated when we analyze the variable containing the question related to whether the mother's partner wanted to have the baby. This finding is extremely interesting, since the magnitude of the OR is much larger than the previous coefficient mentioned, since, in this case, women who reported that their partner wanted to have the baby decrease 0.84 (CI=0.762 - 0.928) times the probability of suffering from postpartum depression. These results coincide with research conducted by Vilouta et al.²⁰ The results presented in this study indicate that not

having the support of the family constitutes a significant factor in the risk of developing postpartum depression, as do the results obtained by Alvarado et al.²¹ who indicated that problems with family members had a significant association with PPD ($p=0.007$), and by Rojas et al.²² who found that most of the women who studied cared for their babies alone and, if they received help, in most cases it came from their own mother, whose presence would condition a greater risk of PPD due to greater psychosocial stress. They also pointed out that one in three women who suffer from psychological distress at the end of pregnancy, and who perceive social isolation, will develop PPD. It is worth mentioning that most of the factors that appear to be associated with the possibility of presenting PPD are of a family nature, therefore, if the family is considered the first socializing agent, and then the couple that becomes part of this environment, it is the interactions that occur in this environment that would have the greatest impact on the affectivity of the woman throughout her life, especially in periods of greater sensitivity such as pregnancy and the puerperium.

Another variable that stands out in the analysis is the mother's ethnicity, since we observed that women with an ethnicity different from the indigenous ethnicity have a lower risk of postpartum depression. Finally, we observed that a normal mode of delivery (vaginal) reduces 0.77 (CI=0.721 - 0.833) times the probability of postpartum depression. When evaluating the mode of birth, we found that vaginal delivery represented a protective factor for the development of PPD while women whose children were delivered by cesarean section were three times more at risk for depression; coinciding with another study where it was found that women with a cesarean section presented a much higher risk.²³ In contrast, the results obtained in other studies showed that the type of delivery, either cesarean section or vaginal delivery, was not statistically different for the risk of postpartum depression.²⁴ The present study also shows that the use of anesthetics during delivery (cesarean section or epidural analgesia) was independently related to scores higher than 13 on the EDPS and to the occurrence of postpartum depression (OR= 3.2).

It has also been suggested that the number of births is a factor associated with postnatal depression, and research has concluded that the birth of the first child represents a unique stressor and correlates more strongly with depression than the second or third birth.²⁵ However, as well as the results obtained by Moreno et al.²⁶ and Latorre et al.²⁷ in this study, parity was not shown to be a determining factor for the presence of postpartum depression; similar scores were observed between primigravid and multiparous women, which indicates that a screening instrument such as the EDPS should be applied universally to all postpartum women and not be restricted to populations of supposedly higher risk. Another factor that has a direct impact on PPD is personal history of psychiatric illness, studies by Mayberry et al.²⁸ and Xie et al.²⁹ consider this risk factor as an exclusion criterion when selecting the study sample, and do not include questions about this history in their assessment surveys.

Bejdoun et al.³⁰ also found that another risk factor that has been less studied, but no less important, is the fact that the woman is a victim of domestic violence. This not only affects the marital and family relationship, but also damages the woman's self-esteem and psychological capacity to face the new role as a mother. On the other hand, we have found that most studies identify a series of factors as predisposing to the possibility of presenting PPD.

Therefore, we consider that these four factors: older age of the mother, the mother having had a history of termination of pregnancy due to stillbirth, unwanted pregnancy, high number of children and lack of support from the partner, are predictors of PPD risk and should be part, together, of the training, prevention and follow-up processes for pregnant women; these five factors, which in the proposed model adequately predict the event, their probabilities are predictive as well.

V. Conclusion

This cross-sectional study used a representative sample of 20648 Ecuadorian women of reproductive age 10-49 years from the 2018 National Health and Nutrition Survey (ENSANUT) of Ecuador. A linear regression model was used to estimate the associated parameters and a binary logistic regression to estimate the Odds Ratio (OR) and their 95% confidence intervals (95% CI) for each of the independent variables.

Our results reveal that the average age of the mothers surveyed is 28 years. In addition 2.56% (CI=2.35% - 2.78%) of women reported having experienced an episode of stillbirth (fetus stillborn at more than 20 weeks gestation). Likewise 26.73% (CI=26.14% - 27.31%) of mothers reported that they did not want to have the baby at that time, while 21.41% (CI=20.86% - 21.95%) reported that their partner did not want to have the baby either. Our data also indicate that 38.66% (CI=38.01% - 39.30%) of the mothers did not have a postpartum checkup. Also 30% of the mothers were married while 75.61% reported being of mixed race ethnicity. We also found that the average number of children is 2 and 42.64% of the women have a high school level of education and 60% report being from the urban sector. In addition, 60.11% (CI=59.74% - 61.04%) reported having a normal (vaginal) birth.

Our logistic regression involves 20648 female respondents. Here we observe that the dependent variable is a dichotomous variable that takes the value of 1 if the mother experienced an episode of postpartum depression and 0 if she did not. We show that, as expected, the odd ratio (OR) of having experienced a stillbirth

is significant and greater than 1. This shows that having experienced an episode of stillbirth (death of the baby after 20 weeks of gestation) increases 2.5 times (CI=2.106 - 3.018) the risk of postpartum depression. Another significant OR is associated with the question of whether the mother wished to have her baby, since we observed an OR that is less than 1. This means that women who wished to have their baby decrease 0.64 (CI=0.590 - 0.710) times the risk of suffering from postpartum depression. This scenario is repeated when we analyze the variable containing the question related to whether the mother's partner wanted to have the baby. This finding is extremely interesting, since the magnitude of the OR is much greater than the previous coefficient mentioned, since, in this case, women who reported that their partner wanted to have the baby decrease 0.84 (CI=0.762 - 0.928) times the probability of suffering from postpartum depression. Another variable that stands out in the analysis is the mother's ethnicity, since we observed that women with an ethnicity other than indigenous ethnicity have a lower risk of postpartum depression. Finally, we observed that a normal mode of delivery (vaginal) reduces 0.77 (CI=0.721 - 0.833) times the probability of postpartum depression.

Based on our findings, we recommend that health policy makers and medical professionals consider that postpartum depression has a great significance or commitment in the puerperal population, constituting a pressing psychological condition, which should not be underestimated, but rather, should be encouraged to pay the due attention it deserves. In addition, we should not exclude the risk factors involved in the possible development of this pathology. It is worth mentioning that, although postpartum depression is more frequent in adolescent women, it also occurs in multiparous women who present obstetric complications during pregnancy or after childbirth, unwanted or planned pregnancy, unemployed and with social status.

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