



Psychological risk factors in childbirth

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ABSTRACT

Objectives: The purpose of this study was to investigate the influence that psychosocial risk factors in pregnant women have on medical complications during child delivery and in the post-partum period.

Methods: This study was based on a sample of 500 pregnant women. The protocol consists of a questionnaire based on standardized questionnaires (SCID-II, PDPI, PPQ-Modified), divided into four sections, administered in the third trimester of pregnancy (part I and II investigate personality type and risk factors arising during pregnancy), at child delivery (part III compiles data from the clinical file) and two months post-partum (part IV identifies the presence of post-partum post-traumatic stress disorder, PP-PTSD). The statistical analyses found significant correlations between identified psycho-social and demographic information and complications during labour and post-partum PTSD.

Results: The most significant correlations were (1) Birth Week with Nationality, (2) PP-PTSD with Borderline personality, Anxiety, Depression and overall Health, (3) PP-PTSD with work satisfaction and (4) the need for Epidural with Worries and Borderline personality. Logistic regression models were developed to predict Birth Type from Age; PP-PTSD from Overall Health and Borderline personality; and the need for Epidurals from Borderline personality and Worries.

Conclusions: The study shows that a number of psychosocial factors in expectant mothers do impact aspects of the childbirth experience.

Keywords: post partum; post traumatic stress disorder; epidural; borderline personality.

SOMMARIO

Lo scopo della presente ricerca è investigare l'influenza di fattori psico-sociali nelle gestanti sulle complicanze mediche al parto e del post-partum. Questo studio è basato su un campione di 500 gestanti. Il protocollo si basa principalmente su questionari standardizzati (SCID-II, PDPI, PPQ-Modified) ed è diviso in quattro sezioni somministrato nel terzo trimestre di gravidanza (parti 1 e 2 indagano il tipo di personalità e la presenza di fattori rischio insorti durante la gravidanza) al parto (parte 3 è costituita da una scheda di registrazione compilata con i dati contenuti nella cartella clinica) e 2 mesi dopo il parto (parte 4 è costituita da un questionario che rileva la presenza del Disturbo Post traumatico da stress post-partum, PP-PTSD). Le analisi hanno rilevato una correlazione tra fattori psicosociali e dati demografici con le complicanze durante il travaglio e il PP-PTSD. Le correlazioni più significative emerse sono state (1) la settimana in cui avviene il parto e la nazionalità, (2) il PP-PTSD e il profilo di personalità Borderline, l'Ansia e la Depressione e lo stato generale di salute (3) PP-PTSD e la soddisfazione lavorativa e (4) le preoccupazioni il tipo di personalità Borderline e l'utilizzo dell'epidurale. Utilizzando la regressione logica emerge che l'età è predittiva del tipo di parto, il livello globale di salute autopercepito. Il tipo di personalità Borderline è predittiva del PP-PTSD, unitamente alle preoccupazioni rispetto al parto predittive dell'utilizzo dell'epidurale. Lo studio mostra la significatività dell'impatto di fattori psico-sociali identificabili sull'esperienza del parto.

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INTRODUCTION

The World Health Organization defines Health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”⁽⁸⁾. According to WHO, medical clinical practice is moving towards humanization of care, and so attention should be given not only to organic factors, but also to psychological, relational and social aspects. Based on these considerations, we devised a research project with the aim of investigating the possible correlation between medical and social and psychological aspects in the childbirth experience.

In Italy, the perinatal psychology scenario is rather multifaceted. Clinical care is mostly entrusted to local services and the network between local and hospital services does not always guarantee continuity of care and also a sufficiently long follow-up on individual cases.

On the other hand, the transition to motherhood is a focal point in the life of the future mother and child, a moment of vulnerability that can activate or reactivate psychological discomfort. Childbirth is a life event that carries potential risks and complications. The psychological distress of the mother, her insecurity or self-perception of incapacity may therefore have negative influences on the attachment bond with the child. Attachment theory^(6,7,8), as well as highlighting the central role of the parent-child relationship in the development of the mental functioning in the child, also addresses an additional perspective which entails that when parents assume the parental role they act on the basis of expectations and modalities that refer to past experiences with their attachment figures. It is an unconscious belief system in which the primary relational experiences of the individual are integrated and synthesized⁽⁹⁾.

These cognitive and emotional models are then stored from birth and constitute a wealth of implicit relational memories. Such memories can be reactivated at any time by conditioning the emotions and behavioural reactions and the way of processing information without awareness of memory^(27,19).

Numerous studies have examined the relationship between post partum depression and dysfunctional attachment, demonstrating that maternal depression is associated with an irritable and/or inconsistent mode of care. During the vis-a-vis mother-child interaction the success of the adaptive reciprocity is modulated by mutual adaptation intent⁽¹⁰⁾.

Targeted diagnostic and therapeutic actions in this phase of transition of the woman and of

the couple towards the family have an important preventive potential on the well-being of the individual and of the newly formed family.

The research project aims to bridge the gap between obstetrics and perinatal psychology in order to integrate the study and assessment of psychological and social aspects with the medical aspects and improve the stages of diagnostic investigation and therapeutic protocols.

The M.A.T.E.R. project (Maternal Adjustment Transcultural Empowerment Representation) was therefore developed. This project has led to the introduction of a comprehensive psychological approach to perinatal care in the Department of Obstetrics and Gynecology at “Maggiore Hospital” in Lodi, Italy.

The psychological framework of reference that guided our clinical practice was the transcultural model⁽⁷⁾ that conceptualizes transition to motherhood as a dynamic process in which physical, mental and social factors interact within a context strongly influenced by culture. The transcultural approach is based on empowerment through psychoeducation and the analysis of representation structured through life experience in a cultural context. The transcultural psychoeducational model provides the clinical framework upon which the intervention is structured. “Informed consent” was obtained from all the participants, which helped the clinicians secure a better therapeutic alliance and compliance.

The purpose of this research was to investigate the influence of personality types, stressful and traumatic events in pregnant women on child delivery complications and the adjustment process in the post-partum period.

In the statistical analysis, for every complication identified the researchers analyzed

- the correlation between the complications in child delivery and risk factors or demographic factors
- the combination of risk factors and complications in child delivery

METHODS

The present study was carried out at the Obstetrics Department of the Maggiore hospital in Lodi, Italy in the following timeframes:

- Collection of protocol: from November 2012 to January 2015
- Collection of clinical data from the hospital records: from January 2013 to

February 2015

- Data entry (and revision): from July 2013 to July 2015
- Statistical Analysis: from September 2015 to November 2015
- Results: December 2015

The study is based on a sample of 500 pregnant women, most of whom were Italian, who were participants in a preparatory course for child delivery conducted at the hospital. The questionnaire was administered by the psychologist during the first meeting of this course. The questionnaire was proposed to all the course participants, but participation was voluntary. The procedures followed were in accordance with the ethical standards of the hospital and with the Helsinki Declaration of 1975, as revised in 1983.

The study uses a protocol which consists of an extensive questionnaire called M.A.T.E.R. that is based primarily on the following standardized questionnaires:

- Structured Clinical Interview for DSM IV for Axis II Personality Disorders (SCID-II)⁽¹⁵⁾
- Postpartum Depression Predictors Inventory (PDPI)⁽⁵⁾
- Postpartum Personality Questionnaire (PPQ-Modified)⁽⁹⁾.

The criteria for choosing these questionnaires were the following:

- Self-administered
- The number of items (the scale had to be complete and the total number of items had to be such to allow the administration in 30-40 minutes.
- The scale had already been successfully used in other research in Italian contexts
- They had to have the most international possible validation

The self-administered SCID-II questionnaire provides an overview of the type(s) the expectant mother personality, investigates the presence of dependent, avoidant, obsessive, paranoid, depressive, borderline personality traits.

The Post partum Depression Predictors Inventory (PDPI) is a check list that helps detect the presence of potential risk factors for post partum depression such as marital status, socio-economic difficulties, and the impact of an unexpected and unplanned pregnancy.

The Post partum Post-traumatic Stress Disorder Questionnaire (PPQ-Modified) is a questionnaire composed of 14 yes/no questions that detect the presence of post traumatic symptoms in post-partum, such as an increase in arousal, the avoidance of aspects related to childbirth and the

rekindling of the traumatic event.

The MATER questionnaires were administered starting from the third trimester of pregnancy. The questionnaire was structured according to the principles of the bio-psycho-social-cultural model and was divided into the following four sections:

Section I: Investigates a woman's self-perception of health before pregnancy in order to identify personality-bound risk factors using the criteria of the SCID-II questionnaire, presence/absence of stressful and/or traumatic events, quality of relationship and demographic factors.

Section II: Investigates the possible presence of risks that arise during pregnancy.

Section III: Focuses on delivery, exploring the presence of pre- and post-natal complications involving clinical data from the hospital's records.

Section IV: Aims at identifying possible medical complications in the post-partum period and the presence of Post-Partum Post Traumatic Stress Disorder (PP-PTSD) through the administration of PPQ-Modified, functioning as a preliminary assessment for post-partum PTSD.

Sample characteristics: The study was based on a sample of 500 women, although not all the women answered all the questions in the questionnaire. The following is a summary of the characteristics of the sample. We begin with demographics: age; marital, education and employment status; job satisfaction and nationality.

Age: The age of the women in the study varied from 17 to 45, with 91.2% between 26 and 40. The average age was 32.2, with a median of 33.

Marital status: 64.4% of the women were married, an additional 29.0% were living with their partner and 6.6% were single, divorced or widowed.

Economic status: Of the 479 women providing their economic status, the split among low, low-median, median, median-high and high was 2.9%, 11.1%, 69.7%, 15.4% and 0.8%.

Educational level: The highest educational level obtained split among elementary school, high school, graduated high school, 4-year college degree, 5-year college degree and graduate degree was 1.2%, 8.4%, 46.0%, 11.4%, 22.1% and 10.8%.

Employment: The split among full-time employment, part-time employment, self-employment, occasional, student and unemployed was 69.5%, 10.2%, 7.0%, 1.2% and 1.6%.

Job satisfaction: Of the 472 women responding to this question, 24.4% were very satisfied with their job, 60.0% were somewhat satisfied, 11.0% were not very satisfied 4.7% and were dissatisfied.

Nationality: Of the 487 women who responded to this question, 91.4% were Italian. One (0.2%) was from Eastern Europe and all the rest were from Northern or Western Europe. Of those with a partner, 93.1% were of the same nationality as their partner.

Demographic summary: Based on the above characteristics, the “typical” subject was a 32 years-old Italian woman, married to an Italian man, employed full-time, somewhat satisfied with her job, of median economic status, and with a high school or college degree.

Overall health: The subjects were asked to rate their overall health from 1 (best) to 5 (worst). 25% gave themselves a rating of 1, 69.4% a rating of 2, 5.6% a rating of 3 and no one a rating of 4 or 5.

Personality disturbances: The women were asked questions to evaluate whether they had any of seven personality disturbances (based on SCID II). The distribution of responses is shown in **Table 1**.

Post-partum depression: Three factors predictive of post-partum depression were evaluated using standard PDPI scores. The results are shown in **Table 2**.

Stressors: Each woman in the study was asked whether she was experiencing any of 10 types of stressors, where 1 = she was experiencing the stressor and 0 = she was not experiencing the stressor.

An aggregate score of 0 to 40 was calculated based on the weights for each type of stressor as follows: financial problems (3), relational problems (5), personal health (4), scholastic (2), migration (5), health of a dear one (4), moving (2), work loss (5), work change (4) and death of a dear one (6).

Based on the aggregate score, an assessment was made as follows: 0-9: little stress, 10-20: moderate stress and 21-40: very stressed.

Worries: Each woman in the study was asked to rate the following eight types of worries during labour from 0 to 7, where 0 = no worry and 7 = extremely high level of worry: start of labour, admission to hospital, labour, moment of birth, pain, complication for the mother, complication for the baby and post-birth.

An aggregate score of 0 to 56 was then calculated. Based on the aggregate score, an assessment was made as follows: 0-34: little worry, 35-42: moderate worry and 43-56: very worried.

Table 3 displays the distribution of the 500 women into the three assessment categories for stressors and worries.

Note that for stressors the distribution is heavily skewed towards little stress, with 27.6% of the women scoring 0. For worries, 19.6% of the women had a score of 0; excluding these women, the remaining sample for worries was more normally distributed with a mean of 32.8.

Table 1.
Personality Disturbances.

	Avoidance	Dependence	OCD	Depression	Paranoid	Narcissistic	Borderline
Absence of disturbance	82.8%	94.0%	43.2%	92.0%	86.0%	94.2%	73.3%
Disturbance, below threshold	7.4%	3.8%	15.2%	5.0%	4.4%	3.4%	8.0%
Disturbance, above threshold	9.8%	2.2%	41.6%	3.0%	9.6%	2.4%	18.7%

Table 2.
Sleep Disorder, Anxiety and Trauma.

	Sleep Disorder	Anxiety	Trauma
Absence of disturbance	81.3%	42.6%	49.1%
Disturbance, below threshold	16.9%	44.2%	49.1%
Disturbance, above threshold	1.8%	13.3%	1.8%

Table 3.
Stressors and Worries.

	Stressors	Worries
Little	74.8%	60.9%
Moderate	23.2%	22.8%
Very	2.0%	16.2%

Post-partum PTSD: Following their delivery, each woman in the study answered 14 questions to assess their risk for post-partum PTSD. They gave a score of 0, 1, 2, 3 or 4 to each question. The scores were then added to yield an aggregate score between 0 and 56. Note that 246 of the 500 women did not participate in this part of the study.

The highest score obtained was 29, the lowest 0, with most scores in the range 0 to 8. The mean score was 5.6. An aggregate score of 0-18 was viewed as low risk and 19 or higher as high risk. Only 3.4% of the women were at high risk. In fact, only 13.0% of the women had a score of 12 or higher.

Breast feeding: 252 of the 500 women in the study answered the question about breast feeding their baby. 54.4% said they would use breast-feeding, 32.5% said they would use formula and 13.1% said they would use a combination of both.

Clinical Complications: Following the birth of the baby, the medical staff assessed various aspects of each woman's labour and birth, especially those related to complications. These results are summarized in **Table 4**.

Here, the baseline for the birth week (or number of weeks of pregnancy) is 37-41 weeks. Only 2.8% of the births were in 35-36 weeks, 2.8% in 30-34 weeks, none earlier and 10.8% in more than 41 weeks.

For birth type, the baseline is spontaneous. 10.6% of the women had an elective Caesarean, 13.8% had an urgent Caesarean and 3.8% required vacuum extraction.

The baseline for labour duration is 0-12 hours. 6.3% of the labours lasted 13-15 hours and 0.5% lasted more than 15 hours.

69.0% of the women in the sample did not use oxytocin in the first stage of labour (baseline), while 31.0% did. Also 52.0% of the women did not have an epidural (baseline), while 48.0% did.

The baseline for laceration is no episiotomy. 80.8% had an episiotomy, 7.6% had vaginal perineal lacerations of the first or second degree and 7.6% had vaginal perineal lacerations of the third degree.

For hemorrhaging, the baseline is 0-500 ml of

blood. 22.7% lost 501-1,000 ml and 3.5% more than 1,000 ml.

For fetal pH, the baseline is more than 7. For 3.4% of the women the pH was 7, while for 0.5% the pH was between 6 and 7. None had a pH less than 6.

Satisfaction with the questionnaire: The women were asked to rate their satisfaction with the questionnaire. Of the 493 women who responded, only 7 (1.4%) were not satisfied with the questionnaire. The other 466 women (98.6%) were satisfied with the questionnaire.

RESULTS

We performed various statistical analyses to determine whether there is an association between (1) age, nationality, personality factors (OCD, paranoid, narcissistic and borderline), PDPI factors, overall health, job satisfaction, worries and stressors and (2) medical complications, post-partum PTSD and breast-feeding.

The analysis was done using the Real Statistics statistical software package (www.real-statistics.com) based on the following tests/models: two sample t test, Mann-Whitney test, Chi-square independence test (Pearson's, Maximum Likelihood and Fisher exact test), ANOVA, Welch's ANOVA, Games-Howell, Contrasts and Logistic Regression. Generally, we tested for statistical significance with 95% confidence (i.e. $\alpha = 0.05$).

Age comparisons: Columns 2 and 3 of **Table 5** summarize the p-values of the t and Mann-Whitney tests used to determine whether there was a substantial difference in the ages of the women who had medical complications (baseline vs. non-baseline) and post-partum PTSD (low risk vs high risk).

Columns 4 and 5 of **Table 5** summarize the p-values of the ANOVA and Welch's ANOVA tests used to determine whether there is a substantial difference in the ages of the women among the various categories of Birth Week, Birth Type, Laceration and Hemorrhage complications as well as among the three categories of breast-feeding.

Table 4.
Clinical Complications.

	Birth Week	Birth Type	Labor Duration	Oxytocin	Epidural	Laceration	Hemorrhage	Fetal pH
Baseline	83.6%	71.8%	93.1%	69.0%	52.0%	11.1%	73.8%	96.4%
Outside Baseline	16.4%	28.2%	6.9%	31.0%	48.0%	88.9%	26.2%	3.6%

For all the cases where the t-test was used, the samples were reasonably symmetric, with the exception of Fetal pH, in which case the Mann-Whitney result was used instead. Whenever the t test was used, the unequal variance correction was applied, although the results were not very different when equal variances was assumed. Two tailed tests were used.

In the five cases where ANOVA was used, Welch's ANOVA was also employed, although only for Birth Type was this necessary since the homogeneity of variances assumption was violated. As can be seen from **Table 5**, the results were fairly similar between ordinary ANOVA and Welch's ANOVA.

The only significant result was for Birth Type [F(3,78.88) = 7.28, p = 0.00024] based on Welch's ANOVA. The result is similar using standard ANOVA [F(3,496) = 6.41, p = 0.00029, RMSSE = 0.34]. A summary of the mean ages for the four types of Birth Type is shown in **Table 6**.

Since the homogeneity of variance assumption was not met, we used Games-Howell as the post-hoc test. The only significant pairwise differences based on Games-Howell with $\alpha = 0.05$ were 1 vs 2 [p = 0.0078, r = 0.50], 2 vs. 3 [p = 0.00086, r = 0.57]

and 3 vs. 4 [p = 0.0078, r = 0.52].

This result is consistent with the t test [t(498) = 3.31, p = 0.0010, d = 0.33] comparing age between women with the baseline birth type [M = 31.8, SD = 4.38] and those outside [M = 33.3, SD = 4.37].

Logistic regression: A logistic regression model was developed to see whether the need for an Epidural could be predicted from Age. The result was negative with a p-value of .19 and an accuracy rate on the available data of only 54% (only slightly better than chance). Epidural was chosen since it had the second lowest p-value.

A logistic regression model was also created to see whether a spontaneous vs. non-spontaneous birth could be predicted from Age. This time the result was significant: the p-value for this model is 0.0009 with accuracy of 72% and the coefficients are as described in **Table 7**.

Thus, the probability of a spontaneous birth can be approximated by the reciprocal of one plus the exponential of 3.42355 minus 0.076467 times the Age.

Comparisons based on nationality: **Table 8** summarizes the p-values from the two-tailed Fisher exact test used to determine whether there is a substantial difference between Italian and

Table 5.
Age Comparisons.

<i>Complication</i>	t-test	Mann-Whitney	ANOVA	Welch's
Birth Week			0.57	0.62
Birth Type	0.001	0.001	0.0003	0.0002
Labor Duration	0.83	0.79		
Oxytocin	0.23	0.20		
Epidural	0.19	0.15		
Laceration			0.48	0.46
Hemorrhage			0.58	0.59
Fetal pH	0.37	0.69		
Post-part PTSD	0.69	0.80		
Breast-feeding			0.72	0.75

Table 6.
Mean Age by Birth Type.

Groups	Descriptions	Count	Mean	comp	q-stat	df	p-value
1	Spontaneous	359	31.82451	1-2	4.70	64.62	0.0078
2	Cesarean (elective)	53	34.20755	1-3	2.51	27.63	0.3072
3	Vacuum extraction	19	30.89474	1-4	3.49	99.04	0.0710
4	Cesarean (urgent)	69	33.18840	2-3	5.67	68.35	0.0009
				2-4	1.71	101.25	0.6233
				3-4	4.72	61.20	0.0077

Table 7.
Logistic regression model.

	coeff b	s.e.	Wald	p-value	exp(b)	lower	upper
Intercept	-3.42355	0.781364	19.19756	1.18E-05	0.032597		
Age	0.076467	0.023583	10.51353	0.001185	1.079466	1.030707	1.130532

Table 8.
Nationality (p-values for Fisher exact test).

Birth Week	Birth Type	Labor Duration	Oxytocin	Epidural	Laceration	Hemorrhage	Fetal pH	Post-part PTSD	Breast Feeding
0.0013	0.59	1.00	0.57	0.87	0.26	0.73	0.20	0.51	0.33

non-Italian women for medical complications (baseline vs. non-baseline), post-partum PTSD (baseline vs. non-baseline) and breastfeeding (based on the three categories). We used a 3×2 contingency table for breast-feeding and a 2×2 contingency table for the other tests. We chose to use the Fisher exact test instead of the chi-square test of independence since some of the cells contained values less than 5.

The only significant result is for Birth Week. The number of weeks that a woman was pregnant is not independent of the woman's nationality [$p = 0.0013$]. We get a similar result using the maximum likelihood version of the chi-square test [chi-square = 10.80, $p = 0.0010$, Cramer V = 0.15, Odds Ratio = 3.37]. In fact, 14.2% of the Italian women had a pregnancy outside the baseline range of 37-41 weeks, while 35.7% of non-Italian women had a pregnancy outside this range.

Other comparison based on Fisher's exact test: We used the same approach employed in making comparisons based on Nationality for other characteristics of the sample such as Overall Health, Job Satisfaction, etc. Once again, we used two-tailed Fisher's exact tests.

For Overall Health, we compared best health (rating 1) with other (rating 2 combined with 3). For Job Satisfaction, we compared satisfied (rating 1 combined with 2) with not satisfied (ratings 3 combined with 4). For the Personality Disturbances (OCD, Depression, etc.) and Post-partum Depression predictors (Sleep Disorder, etc.), we compared absence of the disturbance with presence of the disturbance. For Stressors, we compared little stressed with moderate/very stressed and similarly for Worries.

Table 9 summarizes the p-values for these analyses.

Table 9.
Testing other comparisons.

	Birth Week	Birth Type	Labor Duration	Oxytocin	Epidural	Lacer.	Hemorr.	Fetal pH	Post-part PTSD	Breast Feeding
Overall Health	0.26	0.36	0.47	0.90	0.81	0.44	0.48	0.091	1.00	0.90
Job Satisfaction	0.30	0.78	1.00	0.88	0.89	0.65	0.47	1.00	0.39	0.49
Nationality	0.0013	0.59	1.00	0.57	0.87	0.26	0.73	0.20	0.51	0.33
Sleep Disorder	1.00	1.00	0.44	0.89	0.61	0.68	0.69	1.00	0.65	0.024
Anxiety	0.47	0.76	0.41	0.057	0.10	0.87	0.14	1.00	0.74	0.048
Trauma	0.47	1.0	1.00	0.58	1.00	0.41	0.84	0.64	0.52	0.0083
OCD	0.72	0.37	0.31	0.27	0.71	0.87	0.92	1.00	0.088	0.69
Depression	0.83	0.15	0.13	0.84	0.15	0.34	0.26	0.18	0.038	0.26
Paranoia	0.49	0.89	0.38	1.00	0.24	0.35	0.070	0.30	0.13	0.87
Narcissism	0.45	0.39	0.36	0.21	0.064	0.71	0.66	0.62	0.49	0.54
Borderline	0.50	0.37	0.49	0.80	0.0084	0.35	1.00	0.42	0.015	0.92
Worries	0.90	0.26	0.011	0.82	0.18	1.00	0.20	0.81	0.72	0.0096
Stressors	0.40	0.82	0.64	0.90	1.00	0.85	0.63	1.00	0.70	0.0000

There were no significant results for Overall Health, Job Satisfaction, Paranoia or Narcissism. There were also no significant results for Birth Type, Oxytocin, Laceration, Hemorrhaging or Fetal PH, although the Oxytocin vs. Anxiety was borderline with $p = 0.057$.

Whether or not a woman's labour was in the baseline duration is not independent of whether the woman had a low level of worries or a moderate to high level [$p = 0.011$]. We get a similar result using the maximum likelihood version of the chi-square test [chi-square = 6.63, $p = 0.010$, Cramer V = 0.13, Odds Ratio = 2.88]. In fact, 11.3% of women who had a moderate to high level of worries also had labours lasting longer than the baseline range of 0-12 hours, while the labours of only 4.2% of the women with a low level of worries were outside this range.

Whether or not a woman required an epidural is not independent of whether or not the woman had a borderline disturbance [$p = 0.0084$]. We get a similar result using the maximum likelihood version of the chi-square test [chi-square = 7.12, $p = 0.0076$, Cramer V = 0.13, Odds Ratio = 1.85]. In fact, 59.2% of women with borderline disturbance required an epidural, while 43.9% of woman without borderline disturbance required an epidural.

Whether or not a woman was at high risk for post-partum PTSD is not independent of whether or not the woman had a borderline disturbance [$p = 0.015$]. We get a similar result using the maximum likelihood version of the chi-square test [chi-square = 6.20, $p = 0.013$, Cramer V = 0.16, Odds Ratio = 5.66]. In fact, 8.75% of women with borderline disturbance had a high risk for post-partum PTSD, while 1.63% of woman without borderline disturbance had a high risk for post-partum PTSD.

Whether or not a woman was at high risk for post-partum PTSD is not independent of whether or not the woman had depression [$p = 0.038$]. We get a similar result using the maximum likelihood version of the chi-square test [chi-square = 4.34, $p = 0.037$, Cramer V = 0.13, Odds Ratio = 5.63].

In fact, 13.0% of women with depression had a high risk for post-partum PTSD, while 2.60% of woman without depression had a high risk for post-partum PTSD.

Which type of feeding approach a woman used is not independent of a number of factors, namely Sleep Disorder [$p = 0.024$], Anxiety [$p = 0.048$], Trauma [$p = 0.0083$], Worries [$p = 0.0096$] and Stressors [$p = 0.0000063$].

If instead of combining categories 2 and 3 for Overall Health, we combine categories 1 and 2, then none of the results are significant.

Analyses using Mann-Whitney: We used the Mann-Whitney test for post-partum PTSD and Worries as described next.

Post-partum PTSD: We also studied whether there is a significant difference for a variety of characteristics between the post-partum PTSD scores of women in the baseline group and those not in the baseline group. Since these data are not symmetric nor normally distributed, we used the Mann-Whitney test. The p-values for each of the tests are shown in the first two data rows of Table 10. The next row shows Cohen's d effect size for the corresponding t tests and r effect sizes for the Mann-Whitney tests.

We see that in addition to a significant result for Depression and Borderline (as before), there are also significant results for Overall Health, Job Satisfaction, Anxiety, Trauma, Paranoia and Worries.

If instead of combining categories 2 and 3 for Overall Health, we combine categories 1 and 2, we still get a significant result [$p = 0.037$, $d = 0.63$, $r = 0.13$] from the Mann-Whitney test.

Worries: We also studied whether there is a significant difference for a number of medical complication between women in the baseline worries group and those not in the baseline group. Since these data are not symmetric nor normally distributed, we used the Mann-Whitney test, with the results shown in **Table 11**.

The only significant result is for Epidural [$p = 0.015$], i.e. women who had an epidural

Table 10.
Mann-Whitney tests for post-partum PTSD.

	Overall Health	Job Sat	Nation	Sleep Disord	Anxiety	Trauma	OCD	Depress	Paranoia	Narciss	Border-line	Worry	Stress
t test p	0.00059	0.037	0.53	0.90	0.00076	0.13	0.0047	0.0013	0.0054	0.61	0.00000	0.04	0.73
MW p	0.00043	0.039	0.62	0.94	0.00000	0.027	0.0041	0.0031	0.0012	0.76	0.00000	0.012	0.60
d effect	0.44	0.38	0.14	0.021	0.42	0.19	0.35	0.73	0.61	0.17	0.68	0.28	0.051
r effect	0.22	0.13	0.03	0.0045	0.25	0.14	0.18	0.19	0.20	0.019	0.30	0.16	0.033

Table 11.
Mann-Whitney tests for Worries.

	Birth Week	Birth Type	Labor Duration	Oxytocin	Epidural	Laceration	Hemorrhage	Fetal pH
t test p	0.82	0.070	0.22	0.90	0.0076	0.79	0.55	0.28
MW p	0.98	0.12	0.088	0.96	0.015	0.93	0.36	0.28
d effect	0.029	0.18	0.27	0.014	0.27	0.048	0.061	0.26
r effect	0.0013	0.069	0.088	0.0023	0.12	0.0044	0.042	0.051

had a significantly higher worry score [Mdn = 30] than those who did not have an epidural [Mdn = 27].

Summary of significant results: Based on the various analyses, **Table 12** summarizes all the cases where we identified a significant result. x indicates a significant result using Fisher's exact test, o indicates a significant result using Mann-Whitney or a t test and + indicates a significant result using Welch's ANOVA.

Statistical power: Whereas the p-values presented previously represent the probability of incorrectly finding a significant result, the statistical power of a test is the probability of correctly finding a significant result. Generally, we seek tests that have power of at least 80%, better yet at least 90%.

The power of the tests for which we found a significant result are shown in **Table 13**.

When the Mann-Whitney test was used, we show the power of the t test, noting that the power of a Mann-Whitney test is approximately 95.5% of the power of the corresponding t-test when the data are normally distributed and

generally better than the t test for skewed data. When Welch's ANOVA was used we show the power analysis for ordinary ANOVA.

When Fisher's exact test was used, we approximated the power of the test using the power of the corresponding chi-square test. Note that when a 4 × 2 contingency table is used for Nationality × Birth Week, the effect size increases to .179574 and the power to 92.9%.

Compound analyses: In this phase of the analysis, we looked to create binary logistic regression models that would predict some of the outcomes described previously where the model had at least two independent predictors.

Post-partum PTSD: As we can see from **Table 12**, the outcome that has the largest number of factors associated with it is post-partum PTSD. We therefore created a binary logistic regression model with the nine predictors shown in **Table 12**. It turns out that this model is not significantly different from the null model. In fact, a model with only Depression is sufficient. This is probably because only 9 of the 254 women

Table 12.
Summary of significant results.

	Birth Type	Birth Week	Labor Duration	Epidural	Post-part PTSD	Breast Feeding
Overall Health					o	
Age	+x					
Nationality		x				
Job Satisfaction					o	
Anxiety					o	x
Sleep						x
Trauma					o	x
OCD					o	
Depression					xo	
Paranoia					o	
Borderline				x	xo	
Stressors						x
Worries			x	o	o	x

Table 13.
Statistical Power.

Characteristic	Factor	Test	p-value	Sample 1 Size	Sample 2 Size	df	Effect Size	Power
Overall Health	Post-part PTSD	Mann-Whitney	0.00043	182	72		0.44319	88.7%
Age	Birth Type	Welch's ANOVA	0.00024	500			0.336396	99.9%
Age	Birth Type	t test	0.0010	359	141	498	0.328642	91.0%
Nationality	Birth Week	Fisher Exact	0.0013	487		1	0.14533	89.4%
Job Satisfaction	Post-part PTSD	Mann-Whitney	0.039	203	51		0.375895	66.7%
Anxiety	Post-part PTSD	Mann-Whitney	0.00000	151	103		0.42534	91.2%
Anxiety	Breast Feeding	Fisher Exact	0.048	251		2	0.155517	58.9%
Sleep	Breast Feeding	Fisher Exact	0.0124	251		2	0.172462	68.6%
Trauma	Post-part PTSD	Mann-Whitney	0.027	140	114		0.193272	33.2%
Trauma	Breast Feeding	Fisher Exact	0.0083	251		2	0.195387	79.8%
OCD	Post-part PTSD	Mann-Whitney	0.0041	151	103		0.351002	78.1%
Depression	Post-part PTSD	Mann-Whitney	0.0031	231	23		0.729126	91.3%
Depression	Post-part PTSD	Fisher Exact	0.038	254		1	0.130102	54.5%
Paranoia	Post-part PTSD	Mann-Whitney	0.0012	217	37		0.607074	20.0%
Borderline	Epidural	Fisher Exact	0.0084	392		1	0.133196	75.1%
Borderline	Post-part PTSD	Fisher Exact	0.015	254		1	0.152868	68.3%
Borderline	Post-part PTSD	Mann-Whitney	0.00000	184	70		0.678115	99.8%
Stressors	Breast Feeding	Fisher Exact	0.00000	417		2	0.261712	99.9%
Worries	Labor Duration	Fisher Exact	0.011	379		1	0.130059	71.6%
Worries	Epidural	Mann-Whitney	0.015	204	189		0.270088	76.1%
Worries	Post-part PTSD	Mann-Whitney	0.012	164	90		0.278334	56.1%
Worries	Breast Feeding	Fisher Exact	0.0096	351		2	0.162723	78.5%

participating in this part of the study were in the high risk group.

As a result, we changed the requirement for high risk (at least for the purpose of this analysis) to a score of 12 or more. Now 33 of 254 were at high risk. Eliminating those predictors which were not significant, we came up with the model shown in **Table 14**.

Thus, the probability that the Post-partum PTSD score is at least 12 can be estimated by the reciprocal of one plus the exponential of 4.25711 minus 1.020398 times Overall Health minus 0.658406 times Borderline.

This model is 88.0% accurate in predicting whether a woman in the study had post-partum PTSD. Keep in mind, however, that of the 251 women in study for which Overall Health, Borderline and PTSD data were available, only 33 had a score of 12 or more for post-partum PTSD. This means that if we used a model whereby we always predicted that a woman would not have post-partum PTSD, it would be 86.9% accurate. This, in turn, means that our binary regression model, although significantly more accurate statistically, is only 1.4% more accurate.

Epidural: Another outcome with more than one factor associated with it is Epidural (as well as Breast-feeding). We therefore created a binary logistic regression model with the two predictors shown in **Table 15**.

Thus, the probability of that a woman is given an Epidural is estimated by the reciprocal of one plus the exponential of 0.58108 minus 0.308289 times Borderline minus 0.014163 times Worries.

This model is 57.3% accurate in predicting whether a woman in the study needed an Epidural. Keep in mind that of the 390 women in study for which Borderline, Worries and Epidural

data were available, 188 required an Epidural. If we had used a model that always predicts that a woman would not have an Epidural, it would be 52.05% accurate, which means that our binary regression model is about 10.1% more accurate.

Correlations: Since so many tests were run, using alpha = 0.05 we would expect that many significant results are subject to a higher than 0.05 type I error. In any case, only a small number of correlations were found linking psycho-social and demographic characteristics with complications during labour, post-partum PTSD and breast-feeding. The most solid of these associations (based on the statistical tests and power analyses) are:

- Birth Week and Nationality: non-Italian women had significantly more pregnancies that were outside the normal range of weeks in comparison to Italian women
- Birth Type and Age: older women had significantly more births out of the baseline compared to younger women
- Post-partum PTSD: women with Borderline disorder, Anxiety, Depression or who had a lower Overall Health score, had significantly higher post-partum PTSD scores compared to women without one of these characteristics. The result for OCD was marginal since power was only 78.1%.
- Breast-feeding: women with higher Stressors use a significantly different breast-feeding regime than women with lower Stressors. The results for Trauma and Worries was marginal since the power of these tests was just under 80%.
- Epidural: women with higher Worries or

Table 14.

Logistic Regression model for Post-partum PTSD.

	coeff b	s.e.	Wald	p-value	exp(b)	lower	upper
Intercept	-4.25711	0.830222	26.29303	2.93E-07	0.014163		
Overall Health	1.020398	0.405634	6.328045	0.011884	2.774299	1.252785	6.143698
Borderline	0.658406	0.213328	9.525569	0.002026	1.931711	1.271618	2.934455

Table 15.

Logistic Regression model for Epidural.

	coeff b	s.e.	Wald	p-value	exp(b)	lower	upper
Intercept	-0.58108	0.19809	8.605019	0.003352	0.559293		
Borderline	0.308289	0.136353	5.111974	0.023761	1.361094	1.041896	1.778081
Worries	0.014163	0.006363	4.954829	0.026018	1.014264	1.001694	1.026991

Borderline personality had a significantly greater need for epidurals, although the power of these results is marginal at 76.1% and 75.1%

- Labour Duration: women with higher Worries had a significantly longer labours, although the power of this results is marginal at 71.6%

Predictive Models: Logistic regression models were created to make the following predictions:

- Age to predict Birth Type (spontaneous or not)
- Overall Health and Borderline personality to predict Post-partum PTSD
- Borderline personality and Worries to predict use of Epidurals

These models are significantly better than chance predictions, although the gain is not always very large.

DISCUSSION

The study shows that medical complications related to the childbirth experience are not directly influenced by psychological factors pertaining to the expectant mother's mental functioning. This is not the case with the epidural procedure. Epidural was more frequently used in those subjects who had received a diagnosis of Borderline Personality Disorder and this may be related to the criterion of Emotional Lability^(1,2) which can influence the individual's ability to withstand pain. As for the Birth week, a correlation was found with being a foreigner.

The most significant result is that assessment in the post-partum period is unrelated to medical complications but is statistically correlated to personality profile. Borderline Personality Disorder, Anxiety and Depression are linked to PP-PTSD independent of type of birth and other medical complications.

Such findings differ from what was previously shown in the literature, namely a correlation between PP-PTSD⁽¹¹⁾ and a high level of obstetric intervention and dissatisfaction with their intrapartum care, but not to antecedent factors.

Other studies⁽²⁶⁾ concluded that antecedent factors like history of sexual trauma, significant pain in the first stage of labour, feelings of powerlessness, expectations, medical intervention, and interaction with medical personnel were significant predictors of perceptions of the childbirth as traumatic.

Borderline Personality disorders^(17,18,22,24) are personality disorders strongly characterized by

a traumatic attachment with parental caregivers or traumatic events that pose a threat to physical integrity. In other words, relational or psychological traumatic events could make the childbirth experience more traumatic than the mere occurrence of medical complications during childbirth.

Depression^(1,2) is characterized by a negative self-ideation, deep sadness, feeling of worthlessness and guilt, often engendered by adverse events like loss and separation. This clinical framework probably has a negative impact on self-perception and one's ability to face difficulties. It follows that this type of ideation may have a negative influence on the way the expectant mother mentally processes the childbirth experience and the way in which it is subsequently remembered by the woman.

One final consideration is about Breastfeeding. WHO recommends exclusive breastfeeding during the first six months of the life of the baby, but only half of the mothers in the sample breastfed their child for two consecutive months after child delivery.

Pregnancy depression predicts a shorter breastfeeding duration, but not breastfeeding intention or onset. Breastfeeding duration is associated with postpartum depression in almost all studies. Postpartum depression predicts and is predicted by breastfeeding cessation in several studies. Pregnancy and postpartum depression are associated with a shorter breastfeeding duration. Breastfeeding may mediate the association between pregnancy and postpartum depression. Pregnancy depression predicts shorter breastfeeding duration and that may increase depressive symptoms during postpartum⁽¹⁴⁾.

Whether the mother breastfed her baby was found to be related to social stressors like loss, relocation, economic problems and general health problems. In order to ensure new mothers follow the WHO guidelines, it is important to identify through psychological assessment potential risk factors and stressors and provide adequate help and support.

These findings suggest several intervention points for health care practitioners, including careful prenatal screening of past trauma history, depression, and Borderline Personality Disorder.

In order to reach the largest number of women, it is thus important to integrate mental health screening with medical protocol screening, using a multidisciplinary team to achieve a patient-centred approach to healthcare and wellbeing.

Prevention is not only for the new mother, but

also for the new baby. Careful prenatal screening and evidence-based psychotherapeutic treatment that addresses trauma⁽²²⁾ will help the creation

of a safe attachment bond. In this way, mothers without depression could breastfeed their new born longer than mothers with depression.

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