Relationship between Psychiatric Symptoms in Expectant Parents and Postpartum Depression and Infantile Colic: a Multicenter Follow-up Study

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SUMMARY

Objective: The aim of this study is to evaluate the relationship between postpartum depression (PPD), infantile colic (IC) and different psychosocial variables, psychiatric symptoms, attachment style and perceived social support in expectant parents.

Method: Two hundred forty-five expectant mothers and 150 expectant fathers were first interviewed between 22 and 34 weeks of pregnancy. Each expectant parent filled out a sociodemographic data form, Adult Attachment Style Scale (AASS), State Anxiety Inventory (SAI), Edinburgh Postnatal Depression Scale (EPDS), Multidimensional Scale of Perceived Social Support (MSPSS) and Brief Symptom Inventory (BSI. A second interview was conducted between 4 and 24 weeks postpartum. The mothers filled out a data form consisting of health, nutrition, sleep, and crying problems of the infant, as well as EPDS and SAI, while fathers filled out SAI.

Results: One in every four mothers had PPD symptoms above the threshold on EPDS. Maternal and paternal insecure attachment style, maternal psychiatric symptoms, and postpartum anxiety level were found to be the predictors of PPD. One of every five infants had IC, and maternal education level, hostility score, and PPD symptoms, along with paternal insecure attachment style and psychiatric symptoms, were the main predictors of IC.

Conclusion: Results about PPD and IC regarding maternal variables are consistent with the literature. In addition, paternal insecure attachment style was found to be an important risk factor for both PPD and IC. Fathers should also be included in further studies exploring PPD or IC.

Keywords: postpartum depression, infantile colic, attachment, risk factors

INTRODUCTION

Pregnancy and the birth process are the periods when physiological, psychological and social stress factors are found together for the expectant mother and father. The prevalence of depression is very high for women in the motherhood period, and this prevalence increases significantly in the post-pregnancy period (Kessler et al. 2003). Postpartum depression (PPD) is seen in approximately 10-15% of mothers and may have adverse psychosocial effects on mother, baby and the whole family (Kessler et al. 2003, Robertson et al. 2004).

In a meta-analysis of studies conducted on risk factors related to PPD, it was reported that depression during pregnancy, anxiety, stressful life experiences, low social support level, and depression history in the past are correlated with PPD (Robertson et al. 2004). It was reported that an insecure attachment pattern of the mother is correlated with development of depression and duration of the depressed period (McMahon et al. 2005, Sabuncuoğlu and Berkem 2006, Karabekiroğlu and Rodopman-Arman 2011). In addition, it is assumed that culture-dependent factors, such as the sex of infant and expectations from the baby, have a role in PPD development (Patel et al. 2002, Xie et al. 2007). The number of studies conducted on risk factors related to PPD development in Turkish women is relatively limited. In studies conducted in Turkey, PPD was found in rates varying between 15-30%, and it was found that low education level, poverty, gestational psychiatric problems, premenstrual mood changes, family history of depression, depression, PPD history in the past, satisfaction from marriage, and stressful experiences during pregnancy were the factors related to PPD (Algül et al. 2007, Durukan et al. 2011, Nur et al. 2004).

Analyzing this matter from the perspective of infant mental health, it was reported that there is a clear relationship between PPD, insecure attachment pattern, and social, emotional and developmental problems seen in infants in the early years. There are findings which show that infantile colic and sleeping and eating problems are encountered more frequently in babies of mothers with PPD. Long-term crying crises, which start generally two to three weeks after birth, are seen in one of five infants, and result especially from stomach pain and gas pains, are called infantile colic (IC) (Miller and Barr 1991). Crying jags lasting for more than three hours a day, seen for more than three days a week, for a minimum of three weeks, are the diagnosis criteria (Wessel et al. 1954). These crying periods continue each day frequently without any interruption and stop around at the end of the third month. The mother's age and education level, depression and anxiety symptoms in mother, number of previous birth, alcohol use and smoking during pregnancy, sex and birth weight of infant, baby's temperament and nursing condition, and gastrointestinal function disorder are considered among the variables that can be correlated with IC (Sondergaard et al. 2003; Yalçın et al. 2010). Considering that factors assumed to be associated with IC are also associated with each other, the main reason for IC development is not well understood. In studies conducted in Turkey, mother's education level, domestic violence, mothers' smoking, insecure attachment pattern and mother's hostility and depression scores were the factors that were found to be correlated with IC (Akman et al. 2006; Yalçın et al. 2010). As it is believed that IC is correlated with long-term mental health, interest in this subject is increasing. It is believed that accurate detection of IC predictors and understanding of the relationship between excessive crying in the infancy period and inattention, excessive emotional reactions, touch sensitivity and extroversion problems can be protective for mental health. Within the light of all this information, PPD and IC are two important study subjects to assess early-period infant mental health and foresee the development of future psychopathology. There is some evidence showing that these two disorders are associated with each other. In the prenatal period, determination of factors that can foresee PPD and IC development and early intervention are very important for the mental health of both the mother and infant. The number of studies conducted in this scope is very limited in Turkey. The present study aims to determine the relationship between parents' psychosocial variables, psychiatric symptoms, attachment patterns, and perceived social support in the prenatal period and the mother's depression symptoms in the postnatal period; and also to determine the relationship between parents' variables and IC considering the anxiety and depression symptoms of mother in the postnatal period.

METHOD

Population and Sample

Pregnant women in the second and third trimesters followed in the obstetrics and gynecology clinics of seven different universities and public hospitals and their spouses were invited to take part in this research. The presence of a history of psychotic disorder in the future mother or father was determined as main exclusion criterion. Follow-up interviews were conducted between the first and sixth months of the postnatal period. Data of parents who experienced infant loss during, before, or after the pregnancy period were not included in the analysis stage of this research.

Assessment Instruments

Socio-demographic Data Form questions future parents' ages, education, occupation and professional status, presence of affinity relationship, psychiatric and medical health problems, whether the pregnancy is planned/desired or not, previous pregnancies and number of child(ren), pregnancy and related health issues, and smoking during pregnancy. The education

period of future parents who were literate but did not graduate from primary school was considered to be two years.

Postnatal Data Form questions IC, nutrition, sleeping, and excessive crying problems, the proximity between expectation of parents from their baby and realities, conformity between reality and expectations on baby's sex in addition to medical health problems of infant in order to assess health problems related to the birth and infant. The presence of any diagnosed health issues of the infant was determined depending on parents' notifications. Parents were asked about the presence of nutrition, sleeping and excessive crying problems with the answer options "Yes" and No". IC was defined to be crying crises which occurred in a healthy infant two weeks after birth, emerging at certain hours of the day, lasting for around three months and a minimum of three hours a day without any reason, developing a minimum of three days a week and lasting for three weeks, according to a modified version of Wessel's definition (Wessel et al. 1954).

Brief Symptom Inventory (BSI) is a Likert-type self-notification scale consisting of 53 items and was developed by Derogatis (1992). In Turkey, an adaptation was made by Şahin and Durak (1994). The BSI consists of five factors: "Anxiety", "Depression, "Negative Self", "Somatization" and "Hostility". Three indicators of Global Disorder Detector have been named as Disorder Severity Index (DSI), Total Symptom Index (TSI) and Symptom Disorder Index (SDI) (Savaşır and Şahin 1997).

Adult Attachment Style Scale (AASS) is a Likert-type self-notification scale which was developed by Collins and Read (1990) on the basis of the Attachment Style Measure developed by Hazan and Shaver (1987). It assesses all three adult attachment types: Secure, avoidant, anxious/ambivalent. Avoidant and anxious/ambivalent attachment styles comprise the insecure attachment group. AASS was translated into the Turkish language and proved to be valid by Alp (1998).

Edinburgh Postnatal Depression Scale (EPNDS) is a globally approved self-notification scale that can be used to determine the severity of postnatal depression and measure the severity change (Cox et al. 1987). It consists of ten four-point Likert-type questions. It has been reported that, when the cutoff score is considered to be 12-13 in studies, EPNDS becomes more sensitive in detecting people with real depression symptoms (Cox and Holden 20052). The originality and sensitivity of EPNDS is very high for the detection of depression and symptoms not only in the perinatal period but also during the pregnancy period (Cox and Holden 2005). In Turkey, validity and reliability studies were conducted by Engindeniz et al. (1996) and Aydın et al. (2004).

Multi-Dimensional Scale of Perceived Social Support (MSPSS) assesses the sufficiency of social support subjectively (Zimet et al. 1988). It comprises three groups being family, friends and a special person as the source of the support, and consists of four items. Low scores indicate the failure in perception of scale or lack of support. Its Turkish validity was assessed by Eker et al. (2001).

State-Trait Anxiety Inventory (STAI) is a Likert-type scale that was developed to measure state-trait anxiety levels. High scores show high anxiety levels.

Transaction

In order to conduct the research, ethics committee approval no. 427 was obtained from Ondokuz Mayıs University, Medical Research and Ethics Committee on 09.02.2011. Data from a total of 245 mothers and 150 fathers who complied with the research inclusion criteria in seven different provinces (Samsun n=68, Kocaeli n=57, İzmir n=42, Ankara n=26, Mardin n=30, Edirne n=20 and Batman n=2) were included in the analysis stage. The first interview was made between the 22nd and 34th weeks of pregnancy (median: 29th week of pregnancy). Parents completed the socio-demographic data form developed by the authors and the AASS, STAI, EPNDS, MSPSS and BSI individually. In the second interview performed 4-24 weeks (median 12 weeks) after birth and 12-48 weeks after the first interview, parents completed the postnatal data form, and mothers completed the AASS and STAI while fathers filled out only the STAI once again.

Data Analysis

Statistical Program for Social Sciences SPSS version 18.0 was used for the statistical analysis. Kolmogorov-Simirnov test and histogram investigation were used to determine whether all scores covered normal distribution. It was found that all the measured data, including ages and education duration of parents, were not normally distributed. When the deficient data rate in the measured data was below 10%, median values were used to replace the deficient data. In other data determined by counting, the deficient data were considered as "unknown". In analysis, Chi-square test or Fisher's exact chi-square test were conducted to assess the counted data. Mann-Whitney U test was used to assess the measured data, as parametric test assumptions were not met. As parametric test assumptions were not met, Spearman test was used in correlation analyses. In multivariable analysis, possible factors that were determined with $p<0.20$ significance level were used in single-variable analysis, and independent predictors were investigated with logistic regression analysis for PPD and IC separately. Relationships were reported with estimated risk rate having 95% confidence interval. Hosmer-Lemeshow test was used for model fit and variables deemed to be more significant in clinical terms among independent variables which were determined to have high level correlation in the matrix were included in the model. All analyses were conducted on a two-tailed basis. The significance level was considered to be 0.05 in all statistical tests.

FINDINGS

Socio-demographic Characteristics of Research Group

In the research group, the ages of mothers (n=245) ranged from 17-44 years, with a median age of 28, while the ages of the fathers (n=150) ranged from 20-68, with a median age of 31. The education duration of parents ranged from 2-15 years, with a median education duration of 11 years. It was found that 35.1% of mothers (n=86) were employed and 2.9% of fathers (n=7) were unemployed. It was found that the median value of the mother's age and parent's education duration were significantly lower in unemployed mothers compared to the employed (Z: -4.88 p<0.001; Z: -10.71 p<0.001; Z: -9.44 p<0.001). Of all mothers included in the research, 49.8% (n=122) reported a previous pregnancy history and 46.5% (n=114) stated that they had had a baby previously. The number of child(ren) before the pregnancy in question ranged between one and four, and the median number of previous children was found to be one. Of all mothers included in the research, 21.2% (n=52) reported having psychiatric complaints or treatment history, including major depression and anxiety disorders, in the pre-pregnancy period.

Pregnancy, Birth and Infant Characteristics

Of all mothers included in the research, 19.2% (n=47) stated that this pregnancy was an unplanned and unintended one. It was found that a low median level of paternal education, a history of previous pregnancy and children, and smoking during pregnancy were significantly higher in unplanned and unintended pregnancies (Z: -2,31 p: 0.021; χ²: 4.58 p: 0.03; χ²: 5.38 p: 0.02; χ²: 7.71 p:0.005, respectively). Of all mothers, 14.7% (n=36) reported smoking during pregnancy. According to the assessment on postnatal data, it was found that 18.8% (n=46) of mothers experienced pregnancy-related medical problems and 9.4% (n=23) had medical problems related to birth. Of mothers, 7.3% (n=18) stated that they could not breastfeed their babies for various reasons. It was found that 10.2% (n=25) infants had various medical health problems. Of all mothers, 6.9% (n=17) reported nutrition problem, 17.6% (n=43) reported sleeping problems and 22.4% (n=55) reported excessive crying in their babies. It was found that 18.4% of babies (n=45) had crying crises that met the definition of IC. It was found that 52% of the babies were male. Of all mothers, 20.4% (n=50) stated that their babies did not look like the baby in their imagination, and 18% (n=44) reported inconformity between reality and sex expectancy in pre-pregnancy period. As for fathers, 6% (n=9) stated that their babies looked like the baby in their imagination, and 12% (n=18) reported inconformity between reality and sex expectancy in pre-pregnancy period.

Prenatal Measurements

In the first assessment, during the prenatal period, a score of 12 was considered as the cutoff score in EPNDS; it was found that 30.3% of mothers (n=74) and 14.7% of fathers (n=22) received scores of 12 or higher; pregnancy-related prenatal depression risk was found to be significantly higher in mothers compared to fathers (χ²: 4.63 p: 0.031). In mothers having prenatal suprathreshold depression symptoms, age, education duration, and occupation rate were found to be significantly low, while the rate of previous pregnancy and having child(ren) and smoking during pregnancy rate were found to be significantly high (p: 0.04; p: 0.001; p<0.001; p: 0.012; p: 0.038; p: 0.001, respectively). In addition, all scales and sub-measurements applied to the group of mothers having prenatal suprathreshold depression symptoms revealed significantly high scores (p<0.001). Comparing these two groups with the scale scores of fathers, it was found that EPNDS, "somatization", and total scores of fathers were significantly higher in the group of mothers having a depression risk (p<0.01; p:0.12; p:0.048, respectively).

Analyzing AASS as a secure and insecure attachment style on categorical basis, the insecure attachment rate was found to be 29.8% (n=739 in mothers and 33.8% (n=50) in fathers, and no significant difference was found between mothers and fathers. It was found that unemployed mothers received significantly higher scores in all measurements conducted in the first interview except for AASS secure attachment sub-scale compared to employed mothers (p: 0.035 to p<0.001). It was found that the mother's education duration had a low significant correlation (p: 0.035 to p<0.001) with the mother's age and highly significant inverse correlation with the father's education duration (r: 0.75, p<0.001) and low significant inverse correlation with all scale scores of the mother except for the AASS secure attachment sub-scale (r: 0.14 to 0.34, p: 0.001 to 0.036). Similarly, the father's education duration showed low but statistically significantly inverse correlation with STAI score, AASS anxious/ambivalent sub-scale score, all BSI sub-scale scores except for depression sub-scale, and MSPSS (r: 0.16 to 0.28, p:0.001 to 0.039). It was found that, in unplanned and unintended pregnancies, median prenatal EPNDS scores of parents and median BSI depression sub-scale scores of mothers were significantly high (Z: -3.28 p: 0.001; Z: -2.16 p: 0.031; Z: -2.31 p: 0.021, respectively).

Postnatal Suprathreshold Depression in Mothers and Correlated Factors

In the second interview, conducted during the postnatal period, EPNDS results of 203 mothers (82.9%) were obtained, and potentially correlated socio-demographic data of mothers having suprathreshold depression symptoms (n=54, 26.6%) according to a cut-off score of 12, fathers' data and infants' data with other measurements were compared to the data of mothers having sub-threshold symptoms as presented in Table 1. Logistic regression analysis was used to determine predictors of suprathreshold PPD symptoms according to EPNDS. Independent variables first included in the model

Table 1. Socio-demographic Variables Associated with Postnatal Suprathreshold Depression in Mothers According to the Results of the Edinburgh Postnatal Depression Scale, Infant-Related Data and Measurement Results

	Postnatal depression in mothers (n=54)	No postnatal depression in mothers (n=149)	Statistics
	n (%)	n (%)	
Employed mother	12 (22.2)	68 (45.6)	χ^2: 9.01 p: 0.003
Medical health problem in mother	10 (18.9)	23 (15.5)	χ^2: 0.32 p: 0.57
Psychiatric complaint history of mother	22 (40.7)	21 (14.1)	χ^2: 16.86 p<0.001
Psychiatric complaint history in family	10 (18.5)	29 (19.6)	χ^2: 0.03 p: 0.86
Affinity between mother and father	6 (11.5)	20 (14.2)	χ^2: 0.23 p: 0.63
Prenatal suprathreshold depression in mother	34 (63.0)	29 (19.5)	χ^2: 35.04 p<0.001
Prenatal suprathreshold depression in father	7 (30.4)	11 (11)	χ^2: 5.69 p: 0.06
Unplanned/unintended pregnancy	14 (25.9)	26 (17.4)	χ^2: 1.80 p: 0.18
Previous pregnancy history	34 (63)	69 (46.3)	χ^2: 4.39 p: 0.036
Previous child/infant loss	0 (0)	5 (3.4)	χ^2: 1.86 p: 0.17
Medical problem in pregnancy	13 (24.1)	39 (26.2)	χ^2: 0.09 p: 0.76
Smoking during pregnancy	12 (22.6)	21 (14.1)	χ^2: 2.09 p: 0.15
Sufficient support of spouse during pregnancy	41 (75.9)	122 (81.9)	χ^2: 0.88 p: 0.34
Sufficient support of family during pregnancy	33 (61.1)	116 (77.9)	χ^2 5.69 p: 0.017
Secure attachment style in mother	29 (53.7)	116 (77.9)	χ^2: 11.33 p: 0.001
Secure attachment style in father	10 (45.5)	72 (72)	χ^2: 5.76 p: 0.016
Medical problem during birth	7 (14.3)	14 (10.5)	χ^2: 0.49 p: 0.48
Sufficient support of spouse during birth	32 (66.7)	111 (83.5)	χ^2: 5.99 p: 0.014
Sufficient support of family during birth	34 (70.8)	111 (83.5)	χ^2: 3.52 p: 0.06
Female sex of infant	20 (37.0)	79 (53.0)	χ^2: 0.498 p: 0.48
Breastfeeding	37 (75.5)	127 (95.5)	χ^2: 16.04 p<0.001
Medical health problem in infant	9 (18.4)	15 (11.3)	χ^2: 1.57 p: 0.21
Nutrition problem complaint in infant	9 (18.4)	8 (6)	χ^2: 6.45 p: 0.011
Sleeping problem complaint in infant	17 (35.4)	26 (19.5)	χ^2: 5.69 p: 0.05
Excessive crying complaint in infant	24 (44.4)	30 (20.4)	χ^2: 11.61 p: 0.001
Infantile colic in infant	25 (46.3)	18 (12.1)	χ^2: 27.79 p<0.001
Resemblance with the baby in imagination	10 (22.7)	75 (75)	χ^2: 34.93 p<0.001
Inconformity with the sex expectancy	13 (24.1)	25 (16.8)	χ^2: 1.39 p: 0.23
	Median (min-max)	Median (min-max)	
Mother's age	27.5 (18-37)	29 (17-44)	Z: -0.83 p: 0.41
Mother's education period	10 (2-15)	11 (5-15)	Z: -2.29 p: 0.022
Father's age	32 (23-65)	31 (20-59)	Z: -0.24 p: 0.81
Father's education period	10 (2-15)	11 (5-15)	Z: -2.32 p: 0.020
Mother's prenatal STAI score	43.5 (22-61)	33 (17-53)	Z: -5.29 p<0.001
Mother's postnatal STAI score	43 (22-61)	28 (20-57)	Z: -4.63 p<0.001
Mother's prenatal EPNDS score	14 (2-25)	6 (0-22)	Z: -6.45 p<0.001

Table 1.

	Postnatal depression in mothers (n=54)	No postnatal depression in mothers (n=149)	Statistics
	n (%)	n (%)	
Mother's MSPSS scores			
Family	24.5 (4-28)	28 (10-28)	Z: -1.99 p: 0.046
Friend	19 (4-28)	21 (4-28)	Z: -2.40 p: 0.016
A special person	16 (4-28)	20 (4-28)	Z: -2.33 p: 0.020
Mother's BSI scores			
Depression	15 (0-32)	7 (0-34)	Z: -4.67 p<0.001
Anxiety	11(2-29)	4(0-27)	Z: -4.85 p<0.001
Negative Self	9 (0-30)	4 (0-24)	Z: -4.05 p<0.001
Somatization	8.5 (0-21)	6 (0-19)	Z: -3.45 p: 0.001
Hostility	7 (0-16)	3 (0-18)	Z: -3.98 p<0.001
Total	47 (9-108)	24 (0-118)	Z: -4.67 p<0.001
DSI	0.89 (0.17-2.04)	0.45 (0-2.23)	Z: -4.67 p<0.001
Mother's EPNDS scores			
Secure	15 (7-22)	15 (9-25)	Z: -1.29 p: 0.19
Avoidant	13 (9-20)	11 (6-20)	Z: -4.69 p<0.001
Anxious/Ambivalent	9.6 (5-21.6)	7.2 (4.8-18)	Z: -5.02 p<0.001
Father's prenatal STAI score	34.5 (24-48)	31 (20-48)	Z: -1.85 p: 0.06
Father's postnatal STAI score	33 (23-50)	28 (20-48)	Z: -2.16 p: 0.030
Father's prenatal EPNDS score	15 (1-22)	9 (7-11)	Z: -2.44 p: 0.015
Father's MSPSS scores			
Family	24 (15-28)	27 (6-28)	Z: -1.89 p: 0.06
Friend	20 (5-28)	22 (4-28)	Z: -1.02 p: 0.31
A special person	17 (4-28)	19 (4-28)	Z: -0.68 p: 0.49
Father's BSI scores			
Depression	6 (0-14)	3 (0-35)	Z: -1.51 p: 0.13
Anxiety	5 (0-22)	3 (0-38)	Z: -2.07 p: 0.038
Negative Self	5 (0-16)	3 (0-36)	Z: -0.73 p: 0.46
Somatization	4 (0-14)	1 (0-27)	Z: -2.39 p: 0.017
Hostility	5 (0-19)	4 (0-23)	Z: -1.68 p: 0.093
Total	20 (3-58)	16 (0-149)	Z: -2.23 p: 0.026
DSI	0.38 (0.06-1.09)	0.30 (0-2.81)	Z: -2.23 p: 0.026
Father's AASS scores			
Secure	14(1021)	16 (9-24)	Z: -1.65 p: 0.09
Avoidant	13 (6-18)	11 (6-20)	Z: -2.05 p: 0.04
Anxious/Ambivalent	8.4 (5-10)	7 (5-15.6)	Z: -1.52 p: 0.13

STAI: State-Trait Anxiety Inventory, EPNDS: Edinburgh Post-natal Depression Scale, MSPSS: Multidimensional Scale of Perceived Social Support, BSI: Brief Symptom Inventory, DSI: Disorder Severity Index, AASS: Adult Attachment Style Scale Results

Table 2. Variables that Predict Postnatal Suprathreshold Depression in Mothers According to their Edinburgh Postnatal Depression Scale Results

	Beta	Standard Error	Wald	p	OO	Confidence Interval 95%
Mother's education period	0.093	0.290	0.103	0.74	1.09	0.62-1.93
Unplanned/ unintended pregnancy	-0.344	2.432	0.020	0.88	0.70	0.01-83.37
Previous child/infant loss	-0.077	1.683	0.012	0.76	0.64	0.04-20.40
Previously having child(ren)	0.229	2.208	0.011	0.91	1.25	0.02-95.33
Smoking during pregnancy	-0.067	1.573	0.002	0.96	0.93	0.04-20.40
Psychiatric complaint history of mother	-2.619	1.567	2.795	0.09	0.07	0.01-1.57
Insecure attachment style in mother	3.020	1.519	3.952	0.04	20.49	1.04-402.42
Insecure attachment style in father	2.060	0.999	4.251	0.03	7.85	1.10-55.62
Mother BSI DSI	0.073	0.026	7.708	0.005	1.08	1.02-1.13
Father BSI DSI	0.014	0.028	0.261	0.61	1.01	0.96-1.07
Breastfeeding	0.785	1.710	0.211	0.64	2.19	0.07-2.62
Resemblance with the baby in imagination	0.969	1.432	0.458	0.49	2.63	0.15-43.64
Mother's MSPSS scores						
Family	-0.205	0.187	1.206	0.27	0.81	0.56-1.17
Friend	0.073	0.095	0.599	0.43	1.07	0.89-1.29
A special person	0.121	0.157	0.595	0.44	1.12	0.82-1.53
Mother's postnatal STAI score	0.207	0.063	10.694	0.001	1.22	1.08-1.39
Presence of infantile colic in infant	-2.418	1.784	1.837	0.17	0.09	0.01-2.94

OO Odds rate, STAI: State-Trait Anxiety Inventory, MSPSS: Multidimensional Scale of Perceived Social Support, BSI: Brief Symptom Inventory, DSI: Disorder Severity Index

were parents' education period, being an employed mother, history of maternal psychiatric complaint, presence of unplanned/unintended pregnancy, previous pregnancy history, previous child/infant loss, having child(ren), smoking during pregnancy, parent's attachment style, breastfeeding, presence of IC, resemblance with the baby in imagination, postnatal STAI scores of parents, MSPSS scores of mother and Disorder Severity Index (DSI) scores of parents which were determined to have a significant relationship with PPD at $p<0.20$ level in single-variable analyses. Among variables found to be in a high level correlation with each other, of mother's education, father's education and mother's occupation variables,; among previous pregnancy history and having child(ren), having child(ren) was selected and other variables were excluded from the model. According to the results, it was found that insecure attachment style of mothers increases the risk of suprathreshold PPD symptoms approximately twenty-fold in mothers and eight-fold in fathers. In addition, it was found that a high DSI determined using prenatal BSI and anxiety level determined with postnatal STAI in mothers predicted suprathreshold PPD symptoms at high rates (Table 2).

Infantile Colic in Infants and Correlated Factors. In the second interview, conducted during the postnatal period, data of 206 infants were obtained; according to modified Wessel criteria, it was found that 21.8% of infants (n=45) had crying crises in conformity with the definition of IC. Socio-demographic variables, parents' data, and other measurements were compared and investigated depending on the presence of IC in infants as presented in Table 3. Logistic regression analysis was used to determine the predictors of crying crises in conformity with the IC definition according to the modified Wessel criteria. Independent variables firstly included in the model were mother's age, parents' education period, being an employed mother, history of maternal psychiatric complaint, affinity between parents, postnatal EPNDS score of mother, medical problem during birth, father's attachment style, breastfeeding, additional medical health problems in infant, resemblance to the baby in imagination, postnatal STAI scores of parents, and mother's BSI hostility and DSI score, father's MPSPSS and BSI DSI scores which were determined to have a significant relationship with IC at $p<0.20$ level in single-variable analyses. Additionally, the mother's attachment style, which was assumed to be clinically significant, was included into the model. Variables found to be in a high level correlation with each other were mother's age, mother's education, father's education and affinity between mother and father; the mother's education was selected and other variables were excluded from the model. Similarly, found to be in high correlation with each other, the father's BSI DSI score was selected from among the father's MSPSS scores, father's postnatal STAI scores, and father's BSI DSI scores, and other variables were excluded from the model. According to

Table 3. Socio-demographic Variables in Infants by the Presence of Infantile Colic and Parents' Measurement Results

	Infants with infantile colic (n=45)	Infants without infantile colic (n=161)	Statistics
	n (%)	n (%)	
Employed mother	9 (20)	71 (44.1)	χ^2: 8.59 p: 0.003
Medical health problem in mother	6 (13.3)	28 (17.6)	χ^2: 0.46 p: 0.49
Psychiatric complaint history of mother	14 (31.1)	30 (18.6)	χ^2: 3.26 p: 0.07
Psychiatric complaint history in family	11 (24.4)	28 (17.5)	χ^2: 1.09 p: 0.29
Affinity between mother and father	10 (22.7)	17 (11.2)	χ^2: 3.70 p: 0.06
Prenatal suprathreshold depression in mother	22 (48.9)	41 (25.5)	χ^2: 9.08 p: 0.003
Postnatal suprathreshold depression in mother	25 (58.1)	29 (18.1)	χ^2: 27.79 p<0.001
Prenatal suprathreshold depression in father	2 (20)	16 (20.8)	χ^2: 0.03 p: 0.95
Unplanned/unintended pregnancy	10 (22.2)	30 (18.6)	χ^2: 0.28 p: 0.59
Previous pregnancy history	20 (44.4)	77 (47.8)	χ^2: 0.16 p: 0.68
Previous child/infant loss	1 (2.2)	5 (3.1)	χ^2: 0.09 p: 0.75
Previously having child(ren)	20 (44.4)	77 (47.8)	χ^2: 0.16 p: 0.68
Medical problem in pregnancy	9 (20)	44 (27.3)	χ^2: 0.98 p: 0.32
Smoking during pregnancy	5 (11.1)	28 (17.5)	χ^2: 1.06 p: 0.30
Sufficient support of spouse during pregnancy	41 (91.1)	125 (77.6)	χ^2: 4.07 p: 0.043
Sufficient support of family during pregnancy	34 (75.6)	118 (73.3)	χ^2: 0.093 p: 0.76
Secure attachment style in mother	29 (64.4)	118 (73.3)	χ^2: 1.34 p: 0.24
Secure attachment style in father	5 (33.3)	77 (71.3)	χ^2: 8.54 p: 0.003
Medical problem in birth	7 (18.9)	14 (9.5)	χ^2: 2.63 p: 0.11
Sufficient support of spouse during birth	32 (88.9)	114 (77)	χ^2: 2.48 p: 0.12
Sufficient support of family during birth	33 (91.7)	115 (77.7)	χ^2: 3.58 p: 0.06
Female sex of infant	21 (46.7)	78 (48.4)	χ^2: 0.045 p: 0.83
Breastfeeding	30 (81.1)	137 (92.6)	χ^2: 4.44 p: 0.035
Additional medical health problem in infant	8 (21.6)	17 (11.5)	χ^2: 2.60 p: 0.11
Nutrition problem complaint of infant	9 (24.3)	8 (5.4)	χ^2: 12.69 p<0.001
Sleeping problem complaint in infant	15 (40.5)	28 (19)	χ^2: 7.93 p: 0.019
Resemblance with the baby in imagination	18 (42.9)	69 (65.7)	χ^2: 8.84 p: 0.012
Inconformity with the sex expectancy	9 (20)	29 (18)	χ^2: 0.09 p: 0.76
	Median (min-max)	Median (min-max)	
Mother's age	26 (18-44)	29 (17-41)	Z: -2.32 p: 0.020
Mother's education period	8 (5-15)	11 (2-15)	Z: -3.02 p: 0.003
Father's age	32 (20-65)	31 (21-59)	Z: -0.23 p: 0.82
Father's education period	11 (2-15)	11 (5-15)	Z: -2.14 p: 0.032
Mother's STAI score	38.5 (21-55)	34 (17-61)	Z: -2.65 p: 0.008
Mother's postnatal STAI score	36 (22-58)	29.5 (20-61)	Z: -1.30 p: 0.19
Mother's prenatal EPNDS score	10 (1-25)	7 (0-22)	Z: -3.53 p<0.001
Mother's postnatal EPNDS score	14 (1-26)	5 (0-6	Z: -4.82 p<0.001

Table 3.

	Infants with infantile colic (n=45)	Infants without infantile colic (n=161)	Statistics
	n (%)	n (%)	
Mother's MSPSS scores			
Family	27 (10-28)	27 (4-28)	Z: -0.32 p: 0.75
Friend	20 (4-28)	20 (4-28)	Z: -0.66 p: 0.51
A special person	19 (4-28)	20 (4-28)	Z: -1.09 p: 0.27
Mother's BSI scores			
Depression	12 (0-29)	8 (0-34)	Z: -1.84 p: 0.067
Anxiety	6(1-27)	6(0-27)	Z: -0.93 p: 0.35
Negative Self	6 (0-30)	4 (0-26)	Z: -1.39 p: 0.16
Somatization	6.5 (0-21)	6 (0-19)	Z: -1.35 p: 0.17
Hostility	5 (0-16)	4 (0-18)	Z: -2.44 p: 0.015
Total	31 (5.108)	24.5 (0-118)	Z: -1.97 p: 0.049
DSI	0.59 (0.09-2.03)	0.46 (0-2.23)	Z: -1.97 p: 0.049
Mother's EPNDS scores			
Secure	15 (8-24)	15 (7-25)	Z: -1.31 p: 0.19
Avoidant	13 (6-20)	12 (6-20)	Z: -2.57 p: 0.010
Anxious/Ambivalent	8.4 (6-21.6)	7.2 (4.8-18)	Z: -2.91 p: 0.004
Father's STAI score	35 (20-47)	31 (20-48)	Z: -0.21 p: 0.83
Father's postnatal STAI score	34 (24-42)	28 (20-50)	Z: -1.92 p: 0.054
Father's EPNDS score	8 (1-15)	6(0-22)	Z: -0.75 p: 0.45
Father's MSPSS scores			
Family	24 (15-28)	27 (6-28)	Z: -1.79 p: 0.07
Friend	19.5 (5-28)	22 (4-28)	Z: -1.35 p: 0.17
A special person	12.5 (4-28)	20 (4-28)	Z: -1.96 p: 0.051
Father's BSI scores			
Depression	6 (0-22)	3 (0-35)	Z: -1.51 p: 0.13
Anxiety	4.5(0-19)	3(0-38)	Z: -1.21 p: 0.22
Negative Self	7.5 (0-16)	3 (0-36)	Z: -2.36 p: 0.019
Somatization	5(0-14)	2 (0-27)	Z: -2.54 p: 0.011
Hostility	7 (4-19)	4 (0-23)	Z: -3.03 p: 0.002
Total	27 (13-77)	16 (0-149)	Z: -2.74 p: 0.006
DSI	0.51 (0.25-1.45)	0.30 (0-2.81)	Z: -2.74 p: 0.006
Father's AASS scores			
Secure	14 (9-17)	16 (9-24)	Z: -2.43 p: 0.015
Avoidant	14 (6-18)	11.5 (6-20)	Z: -2.25 p: 0.025
Anxious/Ambivalent	9 (5-12)	7.2 (5-15.6)	Z: -1.02 p: 0.31

STAI: State-Trait Anxiety Inventory, EPNDS: Edinburgh Post-natal Depression Scale, MSPSS: Multidimensional Scale of Perceived Social Support, BSI: Brief Symptom Inventory, DSI: Disorder Severity Index, AASS: Adult Attachment Style Scale Results

Table 4. Variables that Predict Infantile Colic in Infants

	Beta	Standard Error	Wald	p	OO	Confidence Interval 95%
Mother's education period	0.316	0.155	4.134	*0.042*	1.371	1.01-1.85
Psychiatric complaint history of mother	-1.900	1.217	2.438	0.118	0.150	0.01-1.62
Mother's postnatal EPNDS score	-0.316	0.111	8.078	*0.004*	0.729	0.58-.90
Insecure attachment style in mother	0.218	1.738	0.016	0.900	1.244	0.04-37.49
Insecure attachment style in father	2.575	1.076	5.733	*0.017*	1.315	0.01-0.62
Medical problem in birth	1.794	2.343	0.587	0.444	6.016	0.06-593.43
Breastfeeding	-0.461	2.085	0.049	0.825	0.631	0.01-37.52
Additional medical health problem in infant	4.540	3.396	1.787	0.181	93.735	0.12-7293.03
Resemblance with the baby in imagination	-1.930	1.949	0.981	0.322	0.145	0.01-6.61
Mother's postnatal STAI score	0.284	0.251	1.283	0.257	1.329	0.82-2.17
Mother's BSI hostility score	-0.243	0.086	7.899	*0.005*	0.784	0.66-0.92
Mother BSI DSI	0.057	0.047	1.447	0.229	1.058	0.96-1.16
Father BSI DSI	-0.050	0.019	6.678	*0.010*	0.951	0.91-0.98

OO Odds rate, EPNDS: Edinburgh Post-natal Depression Scale, STAI: State-Trait Anxiety Inventory, BSI: Brief Symptom Inventory, DSI: Disorder Severity Index

the results, it was found that the mother's education period, postnatal EPNDS score, and mother's BSI hostility score, and father's insecure attachment style and BSI DSI were the main variables that predict IC independently (Table 4).

DISCUSSION

The infancy period, which covers the years when development occurs at the most rapid pace and in the most complex form, is considered to be a "sensitive period". The risks and protective factors present during this period lay the ground for later psychopathology according to all developmental theories. PPD and IC are among the main subjects that are widely researched and assumed to be risk factors for mental health in this period. It is assumed that these two subjects, which have many common features, are interrelated and have long-term effects on the mental health of both mother and infant (Vik et al. 2009). In this study, a total of two hundred and forty-five mothers were assessed twice, once during the prenatal period and again during the postnatal period. Accordingly, the most important finding was that variables related to father are among the main predictors of both PPD development in the mother and IC development in the infant. It is assumed that paternal variables must be evaluated, and the father has a role in the mother-infant equation in the subjects of maternal-fetal mental health and infant mental health.

In this research, another important finding was the fact that the education duration of both fathers and mothers was correlated with many psychiatric variables such as anxiety, general psychopathology, attachment pattern and perceived social support. This finding shows that educational level could be a significant variable associated with a tendency towards psychopathologies that could emerge in both mothers and fathers in the prenatal period. In the literature, the mother's education level is considered to be a risk factor for both infant and child mental health. In this study, it was found that the mother's education level was correlated with PPD in the mother, and it was one of the main predictors of IC in the infant as well. Similarly, in the literature, it is reported that a parent's low education level and low socio-economic level, which has a clear correlation with the parent's education level, are correlated with prenatal and postnatal depression in mothers and IC in infants (Howell et al. 2006; Sondergaard et al. 2003; Yalçın et al. 2010). In this study, we found that suprathreshold depression symptoms in the prenatal period were correlated with unplanned and unintended pregnancies and smoking during pregnancy in addition to the parent's education level. These results show that unplanned pregnancy and smoking during pregnancy may pose risks for maternal mental health.

In the study group, suprathreshold PPD symptoms were found approximately one fourth of mothers. Although this study did not aim to determine the prevalence of PPD, this rate is in conformity with previously reported rates in Turkey (Algül et al. 2007; Nur et al. 2004). It was found that, in mothers having suprathreshold PPD symptoms, the parent's education period is shorter and occupation rates of mothers are significantly lower. Additionally, previous pregnancy history and psychiatric complaint history of mothers were more frequent in mothers with suprathreshold PPD symptoms, while the secure attachment style rates were lower. Analyzing the father's prenatal condition in mothers who had suprathreshold PPD symptoms, it was found that depression, anxiety, somatization, total psychopathology scores, postnatal

anxiety score, and insecure attachment style rates were high. According to the investigation of these differences in regression analysis, it was found that insecure attachment style of mothers, prenatal general psychopathology and postnatal anxiety levels were among the main predictors of PPD symptoms in agreement with the literature (Beck and Indman 2005, Karabekiroğlu and Rodopman-Arman 2011, McMahon et al. 2005; Robertson et al. 2004, Sabuncuoğlu and Berkem 2006). In this study, which also assessed fathers in terms of mother's PPD, one of the most original findings is that an insecure attachment style in fathers assessed during the prenatal period increased the prevalence of PPD symptoms eight-fold. In the literature, although we did not find any studies on the effect of the father's attachment style on PPD, it has been reported that mothers with PPD symptoms look to the father for support, and it is possible that both healthy parent and infant-father relationships might decrease the adverse effects of PPD (Paulson et al. 2006).

Similar to the information in the main literature and the previously determined rates in Turkey, this research also found that almost one-fifth of infants had crying crises that conformed to the definition of IC (Akman et al. 2006; Yalçın et al. 2010). Prenatal and postnatal suprathreshold depression symptoms, high prenatal anxiety and hostility level, insecure attachment style, young maternal age, and low maternal education level were determined as maternal factors associated with IC. As for paternal variables, it was found that low education level, prenatal high negative-self esteem, somatization, hostility level and insecure attachment style were associated with IC. Considering the infant-related variables assessed in the present study, no significant relationship was found between the sex of the infant and IC, which is a different finding from the international literature, although it is in agreement with the literature in Turkey (Sondergaard et al. 2003; Yalçın et al. 2010). In regression analysis, it was found that low educational level, hostility, and PPD symptoms in mothers, and insecure attachment style and general psychopathology level in fathers were the main variables that predicted IC. In parallel with our results, the mother's age and education level, depression and anxiety symptoms, and hostility level were among the variables assumed to be in correlation with IC in the literature (Sondergaard et al. 2003; Yalçın et al. 2010). According to the results related to fathers and IC in the literature, it is reported that PPD seen in fathers could be a risk factor for IC, and infants with IC could have challenges in relationships with their fathers, which is similar to the relationships between mother and infant (van den Berg et al. 2009; Räihä et al. 2002).

The strengths of this study include being multi-centered, having a high number of participant parents, separate assessments for the prenatal and postnatal periods, assessment of both mothers and fathers, and being a monitoring study.

Conducting this research as a monitoring study and collecting data on parents' psychopathology, perceived social support and attachment in the prenatal period without any direct correlation or contribution of birth and the infant enabled us to collect these data accurately and independently from the postnatal processes.

On the other hand, the lack of opportunity to sample randomly restricts the generalization of the data to all pregnancies. Many factors were investigated in this study due to the fact that there are many factors that affect fetal-maternal mental health in the prenatal period, and these factors are interrelated. However, collective assessment of many variables makes the assessment of data challenging. Another limitation is the fact that the diagnosis of IC was made through history rather than examination. It is more reliable to assess other medical factors that may lead to excessive crying in infants (such as milk allergy, etc.) in a detailed way and make the diagnosis through a pediatrician examination.

Despite these limitations, in this study, which investigated the relationship between psychosocial variables and psychiatric symptoms of both parents in the prenatal period and PPD in the mother and IC in the infant, it was found that both of these conditions are correlated with many prenatal psychiatric variables. A general insecure attachment pattern and general psychopathology level of the future parents are among the main predictors for both of these conditions. In this study, maternal data are in agreement with the international literature, and it is shown that fathers affect not only PPD but also IC development. Accordingly, this study supports the idea that PPD and IC include not only the mother and infant in scope of treatment, but rather should be considered to be associated with family-related conditions.

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