



# Effect of Maternal Depression and Environmental Factors on Infantile Colic

ORIGINAL  
ARTICLE

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ABSTRACT

**Objective:** Infantile colic, a condition with unclear etiology that typically occurs in the evening in the first 3 months of life among healthy infants, occurs less frequently after 3 months. The intensity and continuous nature of the act of crying is utterly saddening and wearing for parents. The aim of the present study was to investigate the effect of maternal depression and other environmental factors on infantile colic.

**Materials and Methods:** The mothers of 100 patients diagnosed with infantile colic according to the Rome 4 criteria and 50 healthy control subjects were asked to complete a questionnaire examining environmental factors and demographic properties.

**Results:** In the comparison of the patients' Patient Health Questionnaire (PHQ) 2 and PHQ9 test scores, PHQ2 test scores were  $1.42 \pm 1.40102$  (0–5) in the control group and  $4.09 \pm 1.61492$  (0–6) in the infantile colic group ( $p \leq 0.001$ ) according to the PHQ9 test. Mothers in the control group attained  $6.28 \pm 4.915578$  (1–21) points, whereas those in the infantile colic group had  $16.47 \pm 6.95070$  (3–26) points ( $p \leq 0.001$ ).

**Conclusion:** In conclusion, in addition to the importance of using breast milk alone in the first 6 months and avoiding unnecessary antibiotherapy to eliminate the risk factors for infantile colic, examining maternal depression for solving problems of infants with frequent crying attacks is also of importance for family and public health.

**Keywords:** Maternal depression, infantile colic, breastfeeding

**Cite this article as:**  
Güngör Ş, Kırık S, Özkars MY, Korulmaz A. Effect of Maternal Depression and Environmental Factors on Infantile Colic. Erciyes Med J 2019; 41(1): 80-4.

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Submitted  
20.11.2018

Accepted  
14.12.2018

Available Online Date  
08.01.2019

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## INTRODUCTION

Infantile colic, a condition of excessive crying due to unclear etiology, which mostly occurs as attacks in the evenings in healthy infants, is a stressful problem for parents. It is seen in one out of ten infants. It usually starts in the first weeks after birth and peaks at 6–8 weeks. Although its prevalence decreases between 3 and 6 months, the intensity and persistence of the act of crying is utterly saddening and wearing. When maternal depression is added to this stressful condition, infant–mother relationship may be negatively affected (1, 2). Therefore, we aimed to investigate the effect of maternal depression and other environmental factors on infantile colic.

## MATERIALS and METHODS

### Patient Selection

A total of 100 patients who presented to the Pediatric Gastroenterology Division and were diagnosed with infantile colic according to the Rome 4 criteria (2) between July 2017 and September 2018 and 50 healthy infants without infantile colic or other chronic disorders who presented to the Sütçü İmam University Faculty of Medicine, Department of Pediatrics were enrolled in the study. A questionnaire form examining environmental factors and demographic properties and the Patient Health Questionnaire (PHQ) 2 test were completed by the patients' mothers under the supervision of a physician. Informed consent was obtained from the patients' mothers. The study was approved by the ethics committee prior to study onset (ethics committee date: 11.10.2017, Session 16, Ethics Committee Decree No. 09, ethics committee protocol no. 161).

### Maternal Depression

To detect maternal depression, the mother of every enrolled patient was administered the PHQ2 test that includes the first two questions (little interest or pleasure in doing things, feeling down, depressed, or hopeless) of the PHQ9 test used to detect depressive emotional status in the last 2 weeks. All mothers were asked to sign one of the answers “not at all = 0, several days, more than half the days, nearly every day.” Patients with 3 points or higher were asked to complete the PHQ9 test (3). According to their scores in the PHQ9 test, their depression severity was classified as follows:

**Table 1.** Comparisons of patients with infantile colic and control groups with respect to demographic and environmental risk factors

	Control group (50)		Patients with infantile colic (100)		p
	n	%	n	%	
Age (days)	86.14±39.435 (23-180)		72.83±47.114 (23-180)		
Sex					
Male	27	54	69	69	0.071
Female	23	46	31	31	
Mode of delivery					
C/S	19	38	55	55	0.050
NSVR	31	62	45	45	
First infant	18	36	39	39	0.721
Phototherapy	10	20	18	18	0.767
Formula use in the first week	23	46	72	72	0.002
Illiteracy	1	2	6	6	
Primary school graduate	19	38	43	43	0.437
High school graduate	19	38	27	27	
College graduate	11	22	24	24	
Housewife	41	82	75	75	0.334
Working mother	9	18	25	25	
Maternal antenatal nervousness	23	46	65	65	0.026
Maternal smoking history	8	16	15	15	0.873
Smoking in the household	32	64	51	51	0.131
Maternal antibiotic use in the first week	16	3	50	50	0.036
Chi-square					

C/S: Cesarean section; NSVR: Normal spontaneous vaginal route

### Depression Severity

- No depression = 0–4,
- Mild depression = 5–9,
- Moderate depression = 10–14,
- Moderately severe depression = 15–19,
- Severe depression = 20–27.

A PHQ9 score of  $\geq 10$  points has a sensitivity of 88% and a specificity of 88% for major depression (4). Thus, mothers with a score of  $\geq 10$  points were considered to be depressed. When they were diagnosed to be depressed, they were referred to the adult psychiatry outpatient clinic.

### Environmental Factors

A questionnaire form examining environmental factors was filled out by every infantile colic patient. The questioned parameters included maternal psychological prenatal preparation, maternal prenatal nervousness and concern, age of colic onset, gestational week, birth weight, sex, first pregnancy status, newborn jaundice, history of phototherapy, use of formula in the first week of life, maternal antibiotic use in the first week, maternal educational status, maternal occupation, the number of household, maternal smoking status, and household smoking status.

### Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences for Windows (SPSS Inc., Chicago, IL, USA) 16.0 software package. Data were expressed as mean  $\pm$  standard deviation, number (n), and percentage (%). The distribution of the continuous variables was tested using Kolmogorov–Smirnov test. Normally distributed variables were compared with Student's t-test or one-sided analysis of variance; non-normally distributed variables were compared using Mann–Whitney U test or Kruskal–Wallis test. Chi-square test, Student's t-test, or Mann–Whitney U test was used to test statistical significance. Logistic regression analysis was used to show a correlation between a dependent variable and one or multiple variables. A p value of  $<0.05$  was considered statistically significant.

## RESULTS

A comparison of the groups by demographic properties showed that the mean ages were  $86.14 \pm 39.435$  (23–180) days in the control group and  $72.83 \pm 47.114$  (23–180) days in the infantile colic group ( $p=0.071$ ). The female-to-male ratios were 23/27 in the control group and 31/69 in the infantile colic group ( $p=0.071$ ).

A comparison of the patients by mode of delivery revealed that in the control group, the number of cesarean sections (C/S) was 19

**Table 2.** Intergroup comparison of maternal depression

	Control group (50)		IC patients (100)		p
	n	%	n	%	
PHQ2 score	1.42±1.40102 (0-5)		4.09±1.61492 (0-6)		<0.001
PHQ9 score	6.28±4.915578 (1-21)		16.47±6.95070 (3-26)		<0.001
No. of depressed mothers	9	18	87	87	<0.001
No. of non-depressed mothers	28	56	11	11	
Mild depression	13	26	14	14	<0.001
Moderate depression	4	8	17	17	
Moderately severe depression	4	8	26	26	
Severe depression	1	2	32	32	
Chi-square, independent Student's t-test					
IC: Infantile colic; PHQ: Patient Health Questionnaire					

(38%) and the number of deliveries by normal spontaneous vaginal route was 31 (62%), whereas in the infantile colic group, they were 55 (55%) and 45 (45%) ( $p=0.050$ ).

There was no significant difference between the study groups with respect to the first child, receiving phototherapy for jaundice, maternal educational status, maternal occupation, maternal smoking, or household smoking ( $p\geq 0.05$ ). However, prenatal maternal nervousness, maternal antibiotic use in the first week, and use of supplemental food in the first week were significantly more common in the infantile colic group than in the control group ( $p=0.026$ ,  $p=0.036$ , and  $p=0.002$ , respectively). An assessment of the patients' mothers by the PHQ2 test revealed that a total of 94 (62.7%) mothers had a score of  $\geq 3$  points. However, depression was deemed non-existent as five patients in the infantile colic group and two from the control group, making a total of seven patients, obtained  $<10$  points from the PHQ9 test. Accordingly, only 87 (58%) patients had  $>10$  points in the PHQ9 test. Of the 87 patients, 78 (78%) were mothers of patients with infantile colic, and 9 (18%) were mothers of subjects in the control group ( $p\leq 0.001$ ).

A comparison of the patients by their scores of the PHQ2 and PHQ9 tests indicated that the mean PHQ2 test scores were  $1.42\pm 1.40102$  (0–5) in the control group and  $4.09\pm 1.61492$  (0–6) in the colic group ( $p\leq 0.001$ ) (Table 2). According to the PHQ9 test, mothers in the control group attained  $6.28\pm 4.915578$  (1–21) points, whereas those in the infantile colic group attained  $16.47\pm 6.95070$  (3–26) points, with the difference being significant ( $p\leq 0.001$ ) (Table 2).

A comparison of maternal depression grades between the groups showed that in the control group, the number of non-depressed mothers was 28 (56%), the number of mildly depressed ones was 13 (26%), the number of those moderately depressed was 4 (8%), the number of moderately severely depressed ones was 4 (8%), and the number of severely depressed ones was 1 (2%). The corresponding figures for mothers of infants with infantile colic were 11 (11%), 13 (13%), 17 (17%), 26 (26%), and 32 (32%). The intergroup difference was statistically significant ( $p\leq 0.001$ ) (Table 2).

A logistic regression analysis of factors potentially affecting devel-

oping infantile colic showed that gender, age, birth weight, birth week, maternal profession, and maternal educational status did not significantly affect infantile colic risk (Table 3). An evaluation made by delivery mode revealed a significantly higher rate of C/S in the infantile colic group ( $p=0.050$ ) (Table 1). However, a logistic regression analysis did refuse that mode of delivery was a risk factor for developing infantile colic (Table 3).

We found that, as independent predictors of infantile colic, using supplemental food other than breast milk in the first month after birth increased the rate of developing infantile colic by 2.792-fold (odds ratio (OR) 2.792, 95% confidence interval (CI) 1.298–6.005;  $p=0.009$ ) and using formula in the first month by 3.019-fold (OR 3.019, 95% CI 1.489–6.121) (Table 3). We also noted that antibiotic use by a breastfeeding mother on the first week increased the odds of infantile colic by a factor of 2.135, a maternal score of  $\geq 3$  points in the PHQ2 test by a factor of 17.310, and a score of  $\geq 10$  points by a factor of 16.152. Similarly, among infants with infantile colic, the prevalence of maternal depression was 16.152-fold greater ( $p<0.01$  for both conditions) (Table 3).

## DISCUSSION

Although the exact cause of infantile colic, a condition that deeply affects domestic life, cannot be explained, it is reported to occur more commonly in the first 3 months and show no sex predilection (5, 6). Although a domestic study reported by Akman et al. indicated that infantile colic risk is increased in female gender, our study findings showed that gender is not a risk factor for infantile colic, thereby supporting other studies reporting similar findings (7–9).

In previous studies, an evaluation of maternal working status and mode of delivery has shown that maternal working and educational status, birth weight, and gestational week did not affect infantile colic development, which was in agreement with our study, (6, 9–11). However, similar to our study, several studies reported that delivery by C/S mildly increases infantile colic risk, albeit without statistical significance (11–13).

Although there are conflicting data about smoking in the literature,

**Table 3.** Logistic regression analysis of factors affecting infantile colic development

	p	OR	95% CI	Risk
Sex	0.073	0.527	0.262-1.061	No
Age	0.089	0.994	0.986-1.001	No
Mode of delivery	0.051	1.994	0.996-3.991	No
Week of delivery	0.942	1	0.999-1.001	No
Birth weight	0.532	0.504	0.059-4.306	No
Use of formula in the first week	0.002	3.019	1.489-6.121	Yes
Use of supplementary food apart from breast milk in the first month	0.009	2.792	1.298-6.005	Yes
Use of antibiotics by the mother in the first week	0.038	2.135	1.043-4.330	Yes
Mother's profession	0.336	1.519	0.648-3.559	No
Mother's educational status	0.466	0.865	0.586-1.278	No
Mothers earning a score of $\geq 3$ from the PHQ2 test	<0.001	17.310	7.410-40.439	Yes
Mothers earning a score of $\geq 10$ from the PHQ9 test	<0.001	16.152	6.816-38.275	Yes
Maternal depression	<0.001	16.152	6.816-38.275	Yes
Logistic regression analysis				
PHQ: Patient Health Questionnaire				

it is hypothesized that nicotine increases motilin levels, resulting in phasic intestinal contractions and thus pain (15). Alagöz et al. reported that smoking in the household increases infantile colic risk by 2.4 times (12). Canivet et al. reported that maternal daily smoking increases infantile colic risk (OR 1.74, 95% CI 1.08–2.82); they reported that there is no any significant correlation between maternal smoking and colic among 5-week-old infants, but they added that breastfeeding reduces infantile colic risk, including those of smoking mothers (13).

Although studies exist advocating that breastfeeding plays no protective role on colic development, we demonstrated that smoking in the household did not increase infantile colic risk ( $p=0.131$ ), whereas feeding with supplemental food increased infantile colic rate by a factor of 2.792 (OR 2.792, 95% CI 1.298–6.005;  $p=0.009$ ) and using formula in the first week by a factor of 3.019 (OR 3.019, 95% CI 1.489–6.121) (Table 3) (5).

As for the relationship between infantile colic and antibiotic use, Osterloo et al. reported that using antibiotics in the first week of life is an independent risk factor for developing infantile colic (OR 1.66, 95% CI 1.00–2.77;  $p=0.05$ ) (15). We also observed that mother's antibiotic use in the first week postpartum increased the risk of infantile colic by a factor of 2.135 (95% CI 1.043–4.330;  $p=0.038$ ). This corroborates the emphasis made by Leppälä et al. that intrapartum antibiotic exposure paves the way for a change of intestinal microbiota content and colic development by acting on early intestinal colonization (16).

To date, many studies have been performed to investigate the effects of maternal depression on infants. It has been stressed that maternal depression may cause unfavorable parent–child interaction as well as a deterioration of domestic relationships (17). Radesky et al. (1) reported that prolonged crying attacks, particularly those that exceeded 10 min, are associated with postnatal depression. Vik et al. reported that not only mothers and other

family members of infants with infantile colic but also those of prolonged crying episodes have increased prevalence of depression and various other emotional problems (18).

In our study with the PHQ test, the PHQ2 and PHQ9 test scores were approximately 2.5 times higher among mothers of patients with infantile colic than among those of the control group.

We also found that infantile colic increased maternal depression by 16 times compared with the control group, and infants of mothers who scored  $\geq 3$  points had an approximately 17 times increased incidence of infantile colic. This in fact defined the risk of co-occurrence of infantile colic and maternal depression.

Our study has limitations. The major limitations are the absence of keeping an infant crying diary and the lack of detailed examination of other factors that can cause maternal depression. However, it provides us an idea about whether depressed mothers and other environmental factors increase the rate of infantile colic.

In conclusion, the present study showed that only breastfeeding in the first 6 months and avoidance of unnecessary antibiotherapy could reduce the risk of colic. In addition to this, it is important for family and community health to question the depression of mothers while evaluating infants with frequent crying attacks.

**Ethics Committee Approval:** The study was approved by the ethics committee prior to study onset (ethics committee date: 11.10.2017, Session 16, Ethics Committee Decree No. 09, ethics committee protocol no. 161).

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Conceived and designed the experiments or case: ŞG, SK. Performed the experiments or case: SK, MYÖ. Analyzed the data: MYÖ, AK. Wrote the paper: ŞG, SK. All authors have read and approved the final manuscript.

**Conflict of Interest:** The authors have no conflict of interest to declare.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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