

## Effect of Reflexology on Infantile Colic

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### Abstract

**Objective:** The aim of this study was to explore the effect of reflexology on infantile colic.

**Design:** A total of 64 babies with colic were included in this study ( $n=31$ : study group;  $n=33$ : control group). Following a pediatrician's diagnosis, two groups (study and control) were created. Sociodemographic data (including mother's age, educational status, and smoking habits of parents) and medical history of the baby (including gender, birth weight, mode of delivery, time of the onset breastfeeding after birth, and nutrition style) were collected. The Infant Colic Scale (ICS) was used to measure the colic severity in the infants. Reflexology was applied to the study group by the researcher and their mother 2 days a week for 3 weeks. The babies in the control group did not receive reflexology. Assessments were performed before and after the intervention in both groups.

**Results:** The groups were similar regarding sociodemographic background and medical history. While there was no difference between the groups in ICS scores before application of reflexology ( $p>0.05$ ), the mean ICS score of the study group was significantly lower than that of control group at the end of the intervention ( $p<0.001$ ).

**Conclusion:** Reflexology application for babies suffering from infantile colic may be a promising method to alleviate colic severity.

**Keywords:** complementary therapies, colic, infant

### Introduction

INFANTILE COLIC IS a significant health problem characterized by unexplained and severe crying periods, beginning at 2 to 3 weeks and peaking at 6 to 8 weeks after birth in healthy infants. Colic negatively affects both the baby and the family in the early stages of life. It often occurs at a certain period of the time of the day (usually after lunch and evening hours) and continues until approximately the third month of the life.<sup>1–3</sup> Colic presents with various clinical symptoms, including excessive, inconsolable, and intense crying, abdominal discomfort and pain, bloating, altered patterns of excretion, extensor movement patterns, redness of the face, altered sleep patterns, and regurgitation.<sup>4</sup> It was described by Wessel et al. as restlessness and crying lasting for more than 3 weeks for at least 3 days a week occurring for 3 h a day.<sup>2,5–8</sup> Clinical presentation may be mild, moderate, or severe. In the case of mild colic, the baby may experience gratuitous discomfort in the evening, whereas babies with moderate or severe colic usually experience flushing of the

face, frowning down, and pulling the legs toward the abdomen; the severe crying periods last a few minutes, repeating the same symptoms a few minutes later.<sup>9,10</sup> This kind of attack usually lasts for ~2 to 3 h with rumbling of the bowels and passing gas and/or stool with subsequent calming.<sup>9</sup>

Although the etiology of infantile colic is not fully understood, diarrhea, intestinal hormones and motility, food allergy or intolerance (to cow or soybean milk), immature nervous and digestion systems, individual differences, air swallowing during feeding or crying, mother's diet type, baby's nutrition style (breast milk or formula), and excessive stimulation play a role in its etiology.<sup>11–14</sup> Current treatment options for infantile colic, including pharmacological and nonpharmacological methods (diet modification, therapeutic touch, aromatherapy, massage, and rhythmic shaking), are usually ineffective.<sup>15</sup> Reflexology is a nonpharmacological treatment option that can be used to relieve infantile colic pain. Reflexology is a science that defines reflex zones both in the hands and feet, which are associated with glands, organs, and other parts of the body.<sup>16,17</sup> Reflexology

based on touching skills provides both physical and mental relaxation and may have positive effects on relieving pain and on physiological vital parameters (pulse and oxygen saturation) in infants.<sup>17–19</sup>

We aimed to explore the effects of reflexology on infantile colic using The Infant Colic Scale (ICS).

## Materials and Methods

### *Participants and setting*

This was a controlled intervention study to determine the effect of reflexology applied to the reflex points of the feet of the babies suffering from infantile colic. The present study complied with the Helsinki Declaration and was approved by the Ethics Committee of the Ege University Faculty of Medicine.

Sixty-four colicky babies and their families were recruited by a pediatric hospital in Izmir, Turkey between June 2013 and November 2013. In experimental studies, it is recommended to take use least 30 samples in each group to use parametric tests.<sup>20</sup> According to our previous experiences, we considered possible case losses during the study; therefore, an additional 10% of participants greater than the planned sample size were included as backup samples. At the beginning of the study, 33 infants for the study group and 33 infants in the control group were included with their families. However, as two parents in the control group were out of town due to the summer period, the study was completed with 33 participants in the study group and 31 in the control group. A comparison of the gestational age, birth-weight, nutrition style, gender, and mode of delivery was carried out between the two groups. The sample group was chosen using randomization.

Infants were diagnosed with infantile colic by a pediatrician in an outpatient clinic using inclusion criteria as follows: <9 weeks, birth weight of between 2,500 and 4,000 g, term delivery between 38 and 42 weeks of gestation, no chronic disorders, not receiving any treatment for colic symptoms, born from a healthy mother, and cooperative parents.

### *Study group protocol*

All of the parents of the babies in the study group provided informed consent. A questionnaire form that consisted of 40 questions was used to gather sociodemographic characteristics of the parents and infants with colic. The severity of symptoms was evaluated with the ICS that consisted of 19 questions. The original ICS was developed by Cirgin Ellett et al. for diagnostic work-up and for evaluating the severity of infantile colic.<sup>21</sup> The ICS arises from the five theoretical explanations for colic as follows: allergy/intolerance to protein from cow or soy milk or soy, immaturity of the gastrointestinal system, immaturity of the central nervous system, infant temperament, and problems with parent-child interactions. These five explanations provided the organizational framework for the development of this multidimensional likert scale of 22 items. The internal consistency of the scale was also established with a Cronbach alpha coefficient of 0.73.<sup>20</sup> The transcultural adaptation of this scale to Turkish was created by Cetinkaya and Basbakkal. In the Turkish validity reliability study, the

scale question number was reduced from 22 to 19 questions. The Cronbach's alpha coefficients were 0.55 to 0.89 for the subscales and 0.73 for the total scale. Lower total ICS score indicates lower colic severity and higher score indicates more severe symptoms.<sup>22</sup>

After baby was diagnosed in study group, the researchers trained mothers on infantile colic and reflexology, including the ideal application time and the lubricant (olive oil) to be used at the time of application, and demonstrated the application of reflexology on the baby. The mothers were then provided with a reflexology protocol and infantile colic booklet and oil. Reflexology application was administered to the infants across six sessions over 3 weeks for 2 days per week and one session per day. Each session took 5–15 min. The first practice was carried out in a private room reserved for reflexology at the hospital by the researcher (who was certified in reflexology) and then was applied at home by the mothers. Mothers who had received reflexology education were also asked to apply reflexology to their infants 3 times a day on average. The mothers had been told to not to consume crucifers, cow milk, chocolate, onions, or cigarettes, which are bowel gasifiers. The booklet containing all this information and reflexology protocol were prepared based on the literature and given to the mothers. The mothers were phoned by the researcher twice a week. The mothers were alerted by telephone by the researcher twice a week to read the booklet to comply with this diet.

### *Control group protocols*

All of the parents of the babies in the control group provided informed consent. A questionnaire form that consisted of 40 questions was used to gather sociodemographic characteristics of the parents and infants with colic. In this group, parents were asked to continue if they had carried out any action to alleviate the colic symptoms and a date was given for 3 weeks later. All other protocols matched those of the study group.

### *Intervention*

Soles of the feet were used for reflexology application since they are flat and more suitable. For colic pain relief, reflexology was applied to the gastrointestinal (gastrointestinal point) and solar plexus regions. The practitioner washed, dried, and warmed their hands before beginning practice. The baby was comfortably placed down and the clothes in the area of application were removed. The practitioner lightly touched the solar plexus region to warm the whole body first with baby oil containing olive oil. Then, the stomach and intestines were gently touched with fingertips and reflexology was applied using caterpillar movements. Reflexology was terminated after light touches to the solar plexus region again. The same procedure was applied to the other foot. At the time of application, the responses of the baby were observed. The application was terminated when the baby lost eye contact and exhibited excessive mobilization indicating restlessness. As babies are sensitive, a soft touch and a short duration of application sufficed.

The reflexology application time (session) was adjusted accordingly to when the baby is happiest and relaxed. The best time for this is the time after a short sleep or after a period of nursing.

TABLE 1. SOCIODEMOGRAPHIC VARIABLES OF THE FAMILY

Characteristic	Study group (n = 31)		Control group (n = 33)		$\chi^2$ <sup>a</sup>	P
	n	%	n	%		
Mother's age						
Ages 20–24	4	12.90	7	21.21	4.842	0.304
Ages 25–29	18	58.07	14	42.42		
30 and older	9	29.03	12	36.37		
Mother's education					8.670	0.123
Primary school	6	19.35	9	27.27		
High school	13	41.94	18	54.55		
University	12	38.71	6	18.18		
Mother's smoking					Fisher <sup>b</sup>	0.217
Yes	4	12.90	9	27.27		
No	27	87.10	24	72.73		
Father's smoking					0.080	0.777
Yes	18	58.1	18	54.5		
No	13	41.9	15	45.5		

<sup>a</sup>Calculated from the chi-square test.

<sup>b</sup>Fisher exact test.

#### Statistical analyses

Data were analyzed using the Statistical Package for Social Science (SPSS) 16.0 for Windows (SPSS, Inc., Chicago, IL). Hatice Uler, a research assistant at Ege University Medical Faculty Biostatistics Department, analyzed the data.

The independent *t* test was used to compare the mean scores of the dependent variable points and crosstabs were used to compare independent variables between groups. The paired *t* test was used to compare the means of the dependent variables within groups. A *p*-value of less than 0.05 was considered significant.

#### Results

The study and control groups' baseline characteristics are shown in Tables 1 and 2. The study and control groups were homogeneously distributed. No significant differences were detected between study and control groups in terms of sociodemographic variables (*p* > 0.05).

The mean preintervention ICS score of the study group was  $78.51 \pm 8.22$  and  $58.44 \pm 9.58$  after reflexology application ( $t = 11.95$ ;  $p = 0.001$ ), whereas the mean ICS score of the control group at the beginning and end of the study was  $80.27 \pm 12.59$  and  $79.27 \pm 12.83$  ( $t = 0.62$ ;  $p = 0.53$ ), respectively. The difference between the pre- and postintervention ICS scores of the study group was statistically significant. The ICS scores of the study and the control groups were comparable at the beginning of the study ( $p > 0.05$ ), whereas the mean ICS score of the study group was significantly lower than that of the control group at the end of the study (Table 3).

#### Discussion

This study was conducted to investigate the effects of reflexology on the symptoms of infantile colic. We found that that colic severity was significantly reduced after a reflexology intervention was applied to the study group compared to controls.

The diagnosis of infantile colic should be established in healthy babies. For this reason, we did not include babies with any other diseases. Furthermore, since infantile colic is diagnosed between 0 and 3 months of age and the application of reflexology intervention requires 3 weeks, the infants were not older than 3 months of age at the end of the study. However, this could represent a confounding factor in our study. We have addressed this issue as a limitation of our study with regards to other findings in the literature.

To our knowledge, there is very little data investigating the effects of reflexology on infantile colic. However, a number

TABLE 2. SOCIODEMOGRAPHIC VARIABLES OF THE INFANT

Characteristic	Study group (n = 31)		Control group (n = 33)		$\chi^2$ <sup>a</sup>	P
	n	%	n	%		
Baby's gender						
Girl	13	41.94	17	51.52	0.589	0.443
Boy	18	58.06	16	48.48		
Mode of delivery					1.058	0.304
Vaginal birth	19	61.29	16	48.48		
Caesarean birth	12	38.71	17	51.52		
Birthweight (g)					0.027	0.987
2,500–3,000	8	25.81	9	27.27		
3,001–3,500	16	51.61	17	51.52		
3,501–4,000	7	22.58	7	21.21		
Nutrition style					0.223	0.636
Breastfeeding	25	80.65	25	75.76		
Breastfeeding + formula milk	6	19.35	8	24.24		
Time of the onset breastfeeding after birth					0.624	0.732
Half an hour to an hour	12	38.71	13	39.40		
1 to 2 h	8	25.81	6	18.18		
After 2 h	11	35.48	14	42.42		

<sup>a</sup>Calculated from the chi-square test.

TABLE 3. DISTRIBUTION OF INFANT COLIC SCALE AVERAGE POINTS BEFORE FIRST AND AFTER FINAL APPLICATION OF COLICKY INFANTS

	n	Average points of ICS before the first application		Average points of ICS after the final application		t	p <sup>a</sup>
		Mean	SD	Mean	SD		
Study group	31	78.51	8.22	58.44	9.58	11.95	0.001
Control group	33	80.27	12.59	79.27	12.83	0.62	0.53
		$p > 0.05^b$		$p < 0.05^b$			

<sup>a</sup>Value obtained from paired samples *t* test.

<sup>b</sup>Value obtained from independent samples *t* test.  
ICS, infant colic scale; SD, standard deviation.

of complementary and alternative methods, including massage therapy, have recently been studied to reduce the severity of colic symptoms in Turkey and other countries.<sup>23–32</sup> In a study conducted in the eastern part of Turkey, researchers found that caretakers reported using different methods, including drugs and natural methods, to address colic; however, they most commonly used behavioral methods, such as massage, warming, swinging, and holding.<sup>29</sup> Previous studies investigating the effect of massage application on colic severity have revealed that massage is superior to swinging the baby in the cradle or in the arms.<sup>25,32</sup>

Some studies (with contradicting results) have reported that massage is less effective on infantile colic than other therapies. For example, Arıkan et al. found that hydrolyzed formula was the most effective method for reducing colic severity.<sup>30</sup> Another study reported that aromatherapy reduced crying duration and colic severity in infants.<sup>27</sup> Chiropractic is another method that has been proposed to have a positive effect on reduction of colic pain severity. A randomized controlled trial found that infants who received spinal manipulation had a significant reduction in crying duration on an hourly basis due to a decrease in colic pain compared to those who used over-the-counter drugs.<sup>33</sup> The results of a study by Miller et al. as well as others, support this conclusion.<sup>28</sup> However, Olafsdottir et al. found no significant difference between the infants in the chiropractic group and those remaining in the arms of the nurses for 10 min on colic severity.<sup>7</sup>

Acupuncture has also been reported to be effective in reducing colic. Studies have indicated that minimal acupuncture reduces crying and restlessness due to colic and is a safe method of treatment.<sup>24,34–36</sup> A multi-center, randomized, controlled trial, however, did not produce significant results using this method.<sup>26</sup> Playing white noise and swinging the baby have been described as pain-relieving methods on infantile colic, as well.<sup>37,38</sup> Sezici and Yigit showed that both methods reduced pain severity, and prolonged sleeping duration, while swinging was found to be more effective than playing white noise.<sup>39</sup>

Pain management is important for infants who are not able to verbally express their pain. Among significant behavioral pain responses in infants, there are changes in sleep patterns and crying. Although these are important parameters, we could not include these data in our study because most of the mothers reported that it was very stressful to record crying and sleep changes and did not report these data in the infant diary.

Our study findings were similar to the results of the studies described above. We found reflexology to be an

effective for relieving colic pain, as the difference between the pre- and postintervention ICS scores of the study group was statistically significant. The ICS scores of the study and the control groups were comparable at the beginning of the study ( $p > 0.05$ ), whereas the mean ICS score of the study group was significantly lower than that of the control group at the end of the study (Table 3). Reflexology induces endorphin and enkephalin release by stimulating the pituitary gland through the pressure and massage performed on reflex points on hands and feet. It resolves problems in organs that correspond with these points and reduces pain.<sup>40</sup>

The study was subject to some limitations. First, researchers were not blinded to the study information since they were responsible for randomization and matching the study groups. Second, the participation rate in the study was relatively low. Therefore, large-scale randomized controlled studies are required to confirm this positive effect. Third, factors peculiar to the person who performs the reflexology can also affect the results.

## Conclusion

To the best of our knowledge, there is no study in the literature examining the direct effect of reflexology on infantile colic. However, there are studies showing that alternative and complementary therapies have positive effects on colic. The results of our study showed that reflexology application reduced infantile colic severity.

## Author Disclosure Statement

No competing financial interests exist.

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