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## Is There a Relationship Between Helicobacter Pylori and Infantile Colic? Evaluation With Sociodemographic Variables

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### ABSTRACT

**Introduction:** Infantile colic is a common condition in early infancy, characterised by episodes of inconsolable, high-pitched crying in otherwise healthy infants during the first three months of life. Despite its high prevalence and frequent healthcare utilisation, the etiology of infantile colic remains unclear, and no definitive risk factors have been established.

**Objective:** To investigate the association between Helicobacter pylori infection and infantile colic in infants aged 6 weeks to 3 months and to evaluate other potential risk factors.

**Methods:** This case-control study included 70 infants presenting to an outpatient clinic. Thirty-five infants diagnosed with infantile colic were compared with 35 age-matched healthy infants without colic. Helicobacter pylori positivity and additional potential risk factors were assessed and analysed between groups.

**Results:** Helicobacter pylori positivity was detected in 20% of infants with infantile colic and in 6.1% of infants in the control group. Although H. pylori infection was more frequently observed in the colic group, the difference did not reach statistical significance. No other evaluated risk factor showed a significant association with infantile colic.

**Conclusion:** While Helicobacter pylori infection was detected more frequently among infants with infantile colic, the findings do not support a significant etiological relationship. Larger, well-designed studies are needed to clarify the potential role of H. pylori in the pathogenesis of infantile colic.

**Keywords:** Infantile Colic, Helicobacter Pylori, Risk Factors, Etiology, Incidence, Treatment.

### INTRODUCTION

Infantile colic (IC), defined as prolonged, excessive crying spells that force most mothers to seek emergency medical attention in the first weeks after birth, is a clinical condition diagnosed according to the Rome III criteria. According to these criteria, IC is determined as episodes of unexplained irritability or crying lasting more than 3 hours per day, occurring at least 3 days per week, and persisting for at least one week, in infants up to 4 months of age (1,2). Crying attacks begin 2–3 weeks after birth, usually occur in the afternoon and evening hours, peak at around 6 weeks of age, and resolve spontaneously by 3 months (3, 4). There are numerous theories about the etiology of IC. However, none of them are supported by sufficient evidence, and some aspects of its etiopathogenesis remain unclear. A physiological cause can be identified in fewer than 5% of cases (4,5). Most theories suggest that gastrointestinal disturbances trigger crying episodes (4). Carbohydrate malabsorption due to dietary factors may lead to colonic gas production and abdominal cramps. Although this has been proposed as a possible cause of colic, markers indicating malabsorption, such as fecal occult blood and alpha-1 antitrypsin levels, have been found to be no different between infants with and without carbohydrate malabsorption (5,6).

H. pylori is a slow-growing, gram-negative, unipolar, spiral-shaped, microaerophilic bacterium. It has been shown to colonize only the gastric epithelium (7). The bacterium rapidly loses viability at room temperature, survives for 2 days at +4 °C, and remains viable long-term at -70 °C. Although it can tolerate a wide pH range (5.5–8.5), optimal growth occurs at pH 6.9–8.0. The most distinctive and potent enzyme of H. pylori is urease, which enables it to break down urea and survive at lower pH levels. Its cell wall is rich in lipopolysaccharides (LPS). It has been shown that the similarity between its LPS and human antigens facilitates immune evasion and contributes to autoimmune responses in the host (7,8).

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Recent studies have focused on the role of IL-8 secretion induced by *H. pylori* in its pathogenesis. The LPS structure of *H. pylori* is considered the primary factor responsible for this IL-8 release (8).

Recent studies emphasize that inappropriate interactions between the gut microbiota and certain receptors may affect intestinal motor function, leading to intestinal dysmotility and potentially colic symptoms (9). In addition to intestinal microflora, intestinal inflammation has been considered in etiology of IC (9). It was found that fetal calprotectin levels which were significantly high in intestinal bowel diseases, twice as high in colicky infants compared to healthy controls (4). It has been shown that *H. pylori* are transmissible from person to person as sited in the study of Yang T. et al. (10). Hence, it may be possible to assume that vaginal yeast often transmits to neonates during delivery. Some studies have shown the presence of high levels of *H. pylori* in infants with IC (10). However, no studies investigating the association of *H. pylori* infection with IC in the presence of different sociodemographic factors were found in the literature. Therefore that work was undertaken to shed light on the subject by examining *H. pylori* positivity in infants with IC and various sociodemographic characteristics of mothers and infants.

## METHODS

This study was conducted on a total of 70 infants aged between 6 weeks and 3 months who presented to the outpatient clinic, including 35 infants diagnosed with IC and 35 infants without IC. Infants with central nervous system anomalies, gastrointestinal system dysfunction or anomalies, or those who had used any medication—including antibiotics—within the previous four weeks were excluded. Of the infants included in the study, 23 were premature infants born at 32–37 weeks of gestation. Corrected ages were calculated for infants with a history of preterm birth, and the study was conducted based on the corrected ages of these 23 premature infants. Two cases from the non-colic group were excluded from the study due to the lack of the required data. Verbal information was provided to the families of all participating infants, and written informed consent was obtained. The study protocol was prepared in accordance with the principles of the Declaration of Helsinki was approved by the Clinical Research Ethics Committee of the University Yildırım Beyazıt (Approval Number: 99950669/174).

The diagnosis of infantile colic was made according to the Rome III diagnostic criteria. The Rome III criteria define infantile colic as unexplained episodes of irritability or crying lasting at least 3 hours per day, occurring at least 3 days per week, in infants up to 4 months of age with no evidence of failure to thrive. Crying duration were determined by the mothers.

Stool samples collected from the infants were stored at  $-70^{\circ}\text{C}$  until analysis. Prior to testing, stool samples were brought to room temperature and analyzed for *H. pylori* antigen using a monoclonal antibody-based immunochromatographic assay (Abon Biopharm® [Hangzhou] Co. LTD, China) in accordance with the manufacturer's instructions. Test results were reported as positive or negative. Stool samples were mixed with diluent solution in a test tube and left to stand for two minutes. Five drops (approximately 150  $\mu\text{L}$ ) of the mixture were then applied to the sample well of the test cassette. The test result was evaluated after a 10-minute incubation at room temperature.

## Statistical Analysis

All analyses were performed using SPSS v17.0 (Statistical Package for Social Sciences, Chicago Inc., 2008). Two-sided  $p < 0.05$  was considered significant. Homogeneity of variance was assessed using the Levene test. Normally distributed data were presented as Mean  $\pm$  SD. Categorical variables were summarized as n (%) and evaluated with Pearson's chi-square and Fisher's exact test when appropriate. Correlation analyses between the variables were examined using Spearman Correlation Analysis method.

## RESULTS

A total of 68 infants were included in the study. The study group consisted of 35 infants, and the control group included 33 infants. Findings related to the infants, their mothers, and other variables were evaluated in terms of IC and *H. pylori*.

According to the Rome III diagnostic criteria, cases diagnosed with IC constituted 51.5% ( $n=35$ ) of the infants. The presence of *H. pylori* was detected in 13.2% ( $n=9$ ) of the cases (Table 1).

**Table 1.** Presence of IC and H. pylori positivity in the infants included in the study

Infantile colic		Total	Helibacter pylori		Total
Present n (%)	Absent n (%)		Present n (%)	Absent n (%)	
35 (51.5)	33 (48.5)	68 (100)	9 (13.2)	59 (86.8)	68 (100)

Infants, 66.2% (n=45) had a gestational age of 38 weeks or more, while 33.8% (n=23) had a gestational age of 32–37 weeks. The infants were 58.8% male (n=40) and 41.2% female (n=28). A total of 66.2% (n=45) of the cases were delivered by cesarean section, and 33.8% (n=23) were delivered via spontaneous vaginal birth. According to birth weights, 86.8% (n=59) of the infants weighed more than 2500 g, whereas 13.2% (n=9) weighed 2500 g or less. In terms of feeding type, 77.9% (n=53) were exclusively breastfed, and 2.9% (n=2) were exclusively formula-fed (Table 2).

**Table 2.** Gestational age, sex, mode of delivery, birth weight, and feeding type of the infants included in the study

Gestasyonel Age	n	%
32 -37 weeks	23	33.8
38-40 weeks	45	66.2
<b>Sex</b>		
Male	40	58.8
Female	28	41.2
<b>Delivnery Method</b>		
Spontaneous vaginale	23	33.8
Cesarean section	45	66.2
<b>Birth Weight</b>		
≤ 2500 g	9	13.2
≥ 2500 g	59	86.8
<b>Feeding</b>		
Exclusive Breast Milk	53	77.9
Breast Milk+Formula	13	19.1
Exclusive Formula	2	2.9
<b>Total</b>	<b>68</b>	<b>100</b>

\*: Fisher's exact t.

A total of 82.4% (n=56) of the mothers were between 21–35 years old, and 17.6% (n=12) were aged 36–42 years. Additionally, 47.1% (n=32) were university graduates, and the majority, 66.2% (n=45), were not employed. Considering the number of household members, families with 3–4 people constituted 70.6% (n=48) of all cases (Table 3).

**Table 3.** Age, education level, employment status, and number of household members among mothers included in the study

Maternal Age	n	%
21-35 years	56	82.4
36-42 years	12	17.6
<b>Education Level</b>		
Primary school	4	5.9
Middle school	17	25.0
High school	15	22.1
University	32	47.1
<b>Employment Status</b>		
Employed	23	33.8
Unemployed	45	66.2
<b>Household Size</b>		
3 to 4 people	48	70.6
5 and above	20	29.4

\*: Fisher's exact t.

IC was found in 43.5% (n=10) of infants with a gestational age of 32–37 weeks, and in 55.6% (n=25) of those with a gestational age of 38–40 weeks. IC was detected in 60% (n=24) of male infants and 39.3% (n=11) of female infants. IC was present in 52.2% (n=12) of infants born by spontaneous vaginal delivery and 51.1% (n=23) of infants born by cesarean section. Among infants with birth weights ≤2500 g, 22.2% (n=2) had IC, compared with 55.9% of infants weighing ≥ 2500 g. Regarding feeding type, 49.1% (n=26) of exclusively breastfed infants, 50% (n=1) of exclusively formula-fed infants, and 61.5% (n=8) of mixed-fed infants had IC. IC was present in 51.5% (n=17) of pacifier users and 51.4% of non-

users. No statistically significant association was found between IC and gestational age, sex, mode of delivery, birth weight, pacifier use, or feeding type ( $p > 0.05$ ) (Table 4).

**Table 4.** Relationship between infants' gestational age, sex, mode of delivery, birth weight, feeding type, and presence of IC

	Infantile colic Present n (%)	Infantile colic Absent (%)	Total n (%)	p
<b>Gestational Age</b>				
32-37 weeks	10 (43.5)	13 (56.5)	23 (33.8)	0.346
38-40 weeks	25 (55.6)	20 (44.4)	45 (66.2)	
<b>Sex</b>				
Male	24 (60.0)	16 (40.0)	40 (58.8)	0.093
Female	11 (39.3)	17 (60.7)	28 (41.1)	
<b>Deliverty Method</b>				
Spontaneous vaginale	12 (52.2)	11 (47.8)	23 (33.8)	0.934
Cesarean section	23 (51.1)	22 (48.9)	45 (66.2)	
<b>Birth Weight</b>				
≤ 2500 g	2 (22.2)	7 (77.8)	9 (13.2)	0.079*
≥ 2500 g	33 (55.9)	26 (44.1)	59 (86.8)	
<b>Feeding</b>				
Exclusive Breast Milk	26 (49.1)	27 (50.9)	53 (77.9)	0.767*
Breast Milk+ Formula	8 (61.5)	5 (38.5)	13 (19.1)	
Exclusive Formula	1 (50.0)	1 (50.0)	2 (2.9)	
<b>Total</b>	35 (51.5)	33 (48.5)	68 (100)	

\*: Fisher's exact t.

IC was present in 50% (n=28) of infants born to mothers aged 21–35 years and 58.3% (n=7) of infants born to mothers aged 36–42 years. When maternal education level was evaluated: 75% (n=3) of infants of mothers with primary education, 58.8% (n=10) with middle school education, 46.7% (n=7) with high school education, and 46.9% (n=15) of infants of university graduates had IC. IC was found in 56.5% (n=13) of infants of employed mothers and in 48.9% (n=22) of infants of unemployed mothers. IC was present in 52.1% (n=25) of infants living in nuclear families and 50% (n=10) of those living in extended families. No statistically significant association was found between IC and maternal age, education level, employment status, or number of household members ( $p > 0.05$ ) (Table 5).

**Table 5.** Relationship between maternal age, education level, employment status, family size, and presence of IC

	Infantile colic Present n (%)	Infantile colic Absent n (%)	Total	p
<b>Maternal Age</b>				
21-35 years	28 (50.0)	28 (50.0)	56 (82.3)	600
36-42 years	7 (58.3)	5 (41.7)	12 (17.6)	
<b>Education Level</b>				
Primary school	3 (75.0)	1 (25.0)	4 (05.8)	0.705*
Middle school	10 (58.8)	7 (41.2)	17 (25.0)	
High school	7 (46.7)	8 (53.3)	15 (22.0)	
University	15 (46.9)	15 (53.1)	32 (47.0)	
<b>Employment Status</b>				
Employed	22 (48.9)	23 (51.1)	45 (66.1)	0.551
Unemployed	13 (56.5)	10 (43.5)	23 (33.8)	
<b>Household Size</b>				
3 to 4 people	25 (52.1)	23 (47.9)	48 (70.5)	0.876
5 and above	10 (50.0)	10 (50.0)	20 (29.4)	
<b>Total</b>	35 (51.5)	33 (48.5)	68 (100)	

\*: Fisher's exact.

H. pylori positivity was found in 21.7% (n=5) of infants with a gestational age of 32–37 weeks, compared with 8.9% (n=4) of infants with a gestational age of 38–40 weeks. According to sex, H. pylori positivity was present in 15% (n=6) of male infants and 10.7% (n=3) of female infants. When analyzed by delivery mode, H. pylori was found in 13% (n=3) of infants delivered vaginally and 13.3% (n=6) delivered by cesarean section. H. pylori positivity was present in 22.2% (n=2) of infants with birth weights ≤ 2500 g and 11.9% (n=7) of infants with birth weights ≥ 2500 g. According to feeding type, H. pylori was found in 13.2% (n=7) of exclusively breastfed infants and 15.4% (n=2) of mixed-fed infants, while none of the exclusively formula-fed infants had H. pylori. H. pylori positivity was found in 11.4%

(n=4) of pacifier users and 15.2% (n=5) of non-users. No statistically significant association was found between H. pylori positivity and gestational age, sex, mode of delivery, birth weight, feeding type, or pacifier use ( $p > 0.05$ ) (Table 6).

**Table 6.** Relationship between infants' gestational age, sex, mode of delivery, birth weight, feeding type, and H. pylori positivity

	Helicobacter pylori Present n (%)	Helicobacter pylori Absent n (%)	Total n (%)	P
<b>Gestasyonel Age</b>				
32 -37 weeks	5 (21.7)	18 (78.3)	23 (33.8)	0.255*
38-40 week	4 (8.9)	41 (91.1)	45 (66.1)	
<b>Sex</b>				
Male	6 (15.0)	34 (85.0)	40 (58.8)	0.093*
Female	3 (10.7)	25 (89.3)	28 (41.1)	
<b>Delivnery Method</b>				
Spontaneous vaginale	3 (13.0)	20 (87.0)	23 (33.8)	1.000*
Cesarean section	6 (13.3)	39 (86.7)	45 (66.1)	
<b>Birth Weight</b>				
≤ 2500 g	2 (22.2)	7 (77.8)	9 (13.2)	0.340*
≥ 2500 g	7 (11.9)	52 (88.1)	59 (86.7)	
<b>Feeding</b>				
Exclusive Breast Milk	7 (13.2)	46 (86.8)	53 (77.9)	1.000*
Breast Milk+ Formula	2 (15.4)	11 (84.6)	13 (19.1)	
Exclusive Formula	0	2 (100.0)	2 (02.9)	
<b>Total</b>	9 (13.2)	59 (86.8)	68 (100)	

\*: Fisher's exact t.

H. pylori positivity was found in 12.5% (n=7) of infants of mothers aged 21–35 years, and 16.2% (n=2) of infants of mothers aged 36–42 years. Regarding maternal education, H. pylori positivity was detected in 29.4% (n=5) of infants of mothers with middle school education, 13.3% (n=2) of infants of high school graduates, and 6.3% (n=2) of infants of university graduates. H. pylori positivity was found in 17.4% (n=4) of infants of employed mothers and 11.1% (n=5) of infants of unemployed mothers. Among infants living in nuclear families, 12.5% (n=6) were H. pylori positive, compared with 15% (n=3) of those living in extended families. No statistically significant association was found between H. pylori positivity and maternal age, education level, employment status, or family size ( $p > 0.05$ ) (Table 7).

**Table 7.** Relationship between maternal age, education level, employment status, family size, and H. pylori positivity

	Helicobacter pylori Present n (%)	Helicobacter pylori Absent n (%)	Total n (%)	p
<b>Maternal Age</b>				
21-35 years	7 (12.5)	49 (87.5)	56 (82.3)	0.654*
36-42 years	2 (16.7)	2 (16.7)	12 (17.6)	
<b>Education Level</b>				
Primary school	0	4 (100)	4 (05.9)	0.137*
Middle school	5 (29.4)	12 (70.6)	17 (25.0)	
High school	2 (13.3)	13 (86.7)	15 (22.0)	
University	2 (6.3)	30 (93.8)	32 (47.0)	
<b>Employment Status</b>				
Employed	5 (11.1)	40 (88.9)	45 (66.1)	0.474*
Unemployed	4 (17.4)	19 (82.6)	23 (33.8)	
<b>Household Size</b>				
3 to 4 people	6 (12.5)	42 (87.5)	48 (70.5)	1.000*
5 and above	3 (15.0)	17 (85.0)	20 (29.4)	
<b>Total</b>	9 (13.2)	59 (86.8)	68 (100)	

\*: Fisher's exact t.

Among infants with IC, 20% (n=7) were H. pylori positive, whereas 6.1% (n=2) of infants without IC were H. pylori positive. No statistically significant association was found between IC and H. pylori positivity ( $p > 0.05$ ) (Table 8).

**Table 8.** Relationship between presence of IC and H. pylori positivity in infants

	Helicobacter pylori Present n (%)	Helicobacter pylori Absent n (%)	Total n (%)	p
<b>Infantile colic Precens</b>				
Absent	2 (6.1)	31 (93.9)	33 (48.5)	0.151*
Present	7 (20.0)	28 (80.0)	35 (51.4)	
<b>Total</b>	9 (13.2)	59 (86.8)	68 (100)	

\*: Fisher's exact t.

No correlation was detected between IC, H. pylori positivity, and sociodemographic variables.

**Table 9.** Correlation between presence of IC, H. pylori positivity, and demographic variables

	Infantile colic	Helicobacter pylori
<b>Gestational Age</b>	-0.114 0.353	0.179 0.143
<b>Sex</b>	-0.204 0.095	-0.062 0.614
<b>Delivery Method</b>	0.010 0.935	-0.004 0.974
<b>Feeding</b>	-0.094 0.448	-0.008 0.951
<b>Maternal Age</b>	-0.068 0.584	0.067 0.590
<b>Employment Status</b>	0.072 0.558	0.088 0.477
<b>Education Level</b>	0.128 0.299	0.196 0.110
<b>Household Size</b>	0.044 0.721	-0.003 0.977
<b>Infantile colic</b>	1	0.206 0.093

## DISCUSSION

Infantile colic (IC) is a very common clinical condition affecting newborn babies in the first trimester of life (11,12). Although numerous etiological factors have been proposed, a definitive cause has not yet been determined. Since IC occurs early in life, many studies have investigated its relationship with gestational age, some of which have reported no association between them (13,14). In a study performed by Milidou and his colleagues, it has been stated that the infants born before 32 gestational weeks had a 1.5-fold increased risk of IC compared to the term infants (14). In our study, all infants had a gestational age greater than 32 weeks. The prevalence of IC among infants born at 32–37 weeks was similar to that of infants born at 38–40 weeks.

While some studies have emphasized no sex-related difference in the prevalence of IC (15,16) a study from Amsterdam reported significantly higher IC rates in male infants (15). In a large Danish cohort study of 27,940 infants, IC was more common among the girls, although the difference was not statistically significant (16). In our study, 24 of the infants with IC were male and 11 were female; the control group consisted of 16 males and 17 females. Although 60% of the case group was male, we detected no significant association between sex and IC.

Some studies have reported no association between the mode of delivery and IC (17), although Rautava et al. suggested a possible link between IC and cesarean delivery (18) In our study, 51.1% of the IC group and 48.9% of the control group were delivered by cesarean section. We found no difference between vaginal and cesarean delivery in terms of IC prevalence, which is consistent with the literature (17). However, the sample size of our study group was not very large, which may have influenced the results.

Although several studies have found no effect of birth weight on IC (18,19), a large cohort study conducted by Milidou et al. reported that infants below the 10th percentile for birth weight had a 1.2-fold increased risk of IC (19). In another study evaluating 1,955 infants, it was found that the infants weighing  $\leq 2500$  g had a 2.7-fold increased risk of IC (20). In our study, only two infants in the IC group and seven infants in the control group weighed  $\leq 2500$  g, and no significant correlation between birth weight and IC was detected. This may be attributable to the study duration and limited sample size.

Feeding practices are known to influence intestinal microbiota. Studies examining the relationship between feeding type and IC have yielded conflicting results. Some have shown a higher incidence of IC in breastfed infants, whereas the others have reported a protective effect of breastfeeding (21-23). Oggero et al. reported an improvement in 95.5% of colicky infants fed soy-based and/or hydrolyzed formulas in their study (24). Lucassen et al. found that whey hydrolyzed formulas decreased daily crying time by 63 minutes (25). Lothe et al. implicated a positive correlation between cow's milk-based formulas and IC risk (26). In contrast, other studies found no difference in IC prevalence or crying patterns between breastfed and formula-fed infants (27,28). Evans and his colleagues noted higher IC rates in infants who switched breasts without fully emptying one breast; prolonged feeding on one side was hypothesized to reduce IC most likely due to lower lactose content intake (29). Thomas et al., however, found no difference in IC prevalence between exclusively breastfed infants and those receiving formula or mixed feeding (30). Overall, feeding type did not appear to be a factor determining IC. In our study, 74% of infants with IC and 81% of healthy controls were exclusively breastfed and we find out that exclusive breastfeeding was not associated with IC. This result was consistent with much literature (30).

Regarding socioeconomic and maternal factors, some studies have reported an inverse relationship between maternal education and IC, while some others have found no association between them (31,32). Maternal age and employment status have also been reported not to influence IC incidence (32, 33). In our study, no significant association was found between maternal education and IC; however, only four mothers were primary school graduates, and three of their infants had IC. Although the number was small, IC appeared to be more common among the infants of mothers with lower education levels. According to our results, IC was more frequent among the firstborn infants (59.4%) which was consistent with the literature (34). However no relationship was found with maternal employment status or number of household members.

*H. pylori* infection can be transmitted in early infancy, most commonly from infected family members (35,36). Risk factors may include low socioeconomic status, larger number of siblings, race/ethnicity, rural residence, low maternal education, crowded households, and *H. pylori* positivity among family members (37). We hypothesized that the factors influencing *H. pylori* infection might also contribute to IC and evaluated such factors accordingly.

In our study, no relationship was found between birth weight and *H. pylori* positivity. This result was compatible with the literature implicating lack of an association between *H. pylori* infection and birth weight or birth order (25). Similarly, no association was found between *H. pylori* positivity, birth order, or gestational age.

Studies on sex and *H. pylori* infection have yielded inconsistent findings. One study reported that male infants had higher risk (38), whereas Queiroz et al. found female sex to be a most likely risk factor (39). Other studies reported no sex-related difference (40). In our study, *H. pylori* positivity rates were similar in male and female infants. Although most studies have not identified an association between mode of delivery and *H. pylori* infection, some studies reported higher risk in vaginally delivered infants (38,41). In our study, no difference was found between cesarean and vaginal delivery groups, possibly due to the small number of infants.

Some studies have indicated that breastfeeding may prevent *H. pylori* colonization during childhood (42-44). but the evidence is inconsistent with some other studies reporting that breastfeeding is a risk factor for *H. pylori* infection in infancy (42). In our study, no association was found between feeding type and *H. pylori* positivity. It has been reported that the primary source of *H. pylori* infection in early childhood is often the mother, transmitted via the fecal-oral route (42). Families presenting to our hospital generally had higher socioeconomic status compared with regional and national averages. The

higher maternal education and socioeconomic status—along with improved hygiene and access to healthcare—may have contributed to the low prevalence of *H. pylori* in our cohort study.

Approximately half of the families in our study were nuclear families with 3–4 members. Although smaller household size may reduce *H. pylori* transmission, this association has not been clearly supported in the literature (42). In many cases, additional household members were present primarily for infant care, which may also explain the lack of association between household size, IC, and *H. pylori*. No studies have explored associations between *H. pylori* infection and maternal age, maternal employment status, or similar variables in infants; thus, this research was undertaken to clarify these issues.

Only a few studies have investigated the relationship between *H. pylori* and IC, all conducted in developing countries, and they reported a significant association. In one study, *H. pylori* was detected in 81.8% of 55 infants with IC and only 23% of 30 infants without IC. Another study found *H. pylori* in 62% of 50 infants with IC compared with 10% of 50 controls; both studies reported statistically significant associations (38;40). As Turkey is a developing country, we expected to find a significant association between *H. pylori* incidence and IC in our study. Given our findings, it may be possible to imply that *H. pylori* is more common in infants with IC, which is consistent with previously cited studies (38,40) but the association did not reach statistical significance, likely due to the limited sample size.

## CONCLUSION

This is the first study to examine the association between *H. pylori* and IC across various variables, including gestational age, infant weight, sex, mode of delivery, breastfeeding, and maternal education level. Our findings indicate a high prevalence of *H. pylori* positivity in infants with IC, and an even higher prevalence in underweight, exclusively breastfed infants. However, no statistically significant relationship was found between the variables. This may be due to the limitations of our study. These limitations can be summarized as follows:

Firstly, the sample size of our study group was not very large; secondly, the duration of the study was short; thirdly, the socioeconomic levels of the families in our study region were high; fourthly, the mothers and fathers of the babies included in the study were well educated; and furthermore, the families participating in the study were mostly nuclear families with few children. Therefore, more detailed and comprehensive large-scale studies are needed to confirm this conclusions.

## DESCRIPTIONS

**No financial support.**

**No conflict of interest.**

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