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Infant Colic – Possible Causes and Treatment

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ABSTRACT

Introduction and Purpose:
Infant colic (IC) is an ailment that refers to many infants until the age of 5 months of life. It is manifested by crying that start and stop without any obvious cause, irritability, paroxsyms, curling the legs and body flexing. Until today, there is said, that occurring of IC is multifactorial. [6,7]. Our aim is to show possible causes of infant colic and ways of treatment. Our article was based on the PubMed database.

State of Knowledge:
Many studies show that there is no one reason that causes infant colic and that there are some methods that may help baby relieve the colic pain.
Factors that can have affect on occurring IC are allergy on cow's milk, immature digestive system of newborns, disbiosis of intestine microbiota. [1,5]
Some kind of methods may contain manual therapies, such as craniosacral therapy, gut microbiota that inhabit intestines of newborns and infants, mother's diet and supplementation of lactase. [1,2]

Summary:
This review describes that manual therapy such as craniosacral therapy, gut microbiota containing supplementation BB-12 and Lactobacillus rhamnosus ATCC, supplementation of lactase and mother's elimination diet has positive impact on babies and help them reduce symptoms of infant colic resulting in baby's health and parent's tranquility. [3,9]

Keywords: infant colic, infant colic treatment, craniosacral therapy, manual therapy, gut microbiota, probiotics, breastfeeding, diet, allergy, cow milk, lactase

INTRODUCTION

Infant colic (IC) is an ailment occurring in 25% of infants during their first months of life. It refers to many infants until the age of 5 months of life. It is manifested by crying that start and stop without any obvious cause, irritability, paroxsyms, curling the legs and body flexing. Crying lasts in IC at least three hours per day, on at least three days per week, for at least three weeks. It usually disappears in 3-4 months of life, but sometimes it lasts up to 12 months of life.

In pathophysiologic way it is caused by the fact, that digestive system and intestinal neuroendocrine system of infant are immature, so digestion processes do not occur properly. In the intestines excess gases accumulate and flatulence occurs, which is painful.

IC has affect not only on infant, but also on parents, siblings and rest of the family. Today, the reason of IC is not fully known, it may be multifactoral, but there are some theses that may explain it. [6,7]

There are researches that show, if gut microbiota has affect on occurrence of IC. [1]

Moreover, mother's diet, supplementing probiotics and manual therapy, such as Craniosacral Therapy, has an impact on IC. [9]

In this review, we will describe association between occurring infant colic, possible factors that can have affect on it and ways of therapy.

GUT MICROBIOTA

Gut microbiota consists of huge amounts of microorganisms (microbiome) that inhabit human gastrointestinal tract. Mostly there are bacteria, but also fungi and protozoa that have positive affect of human intestine. Newborns do not have fully developed microbiota, so that dysbiosis may contribute to occurance of infant colic.[1]

To confirm that thesis, there was carried out a research that support potential therapeutic influence of probiotics supporting microbiota on infant colic. [1]

This was randomized, double blind, placebo-controlled clinical research which was carried out at the Department of Translational Medical Science-Pediatric Section of University of Naples "Federico II" in Naples in Italy. In this research took part group of paediatricians who took care of babies. [1]

To take this research there was strict criteria of age, weight, gestational age, Apgar score and way of feeding that qualified infants to take part in.

Babies were divided into groups. In first group infants had been served probiotic BB-12 (Bifidobacterium animalis subsp. lactis BB-12®, DSM 15954, 1 × 109 CFU/daily dose in oil maltodextrin suspension; Bifidolactis Infant, Sofar SpA). The second group of infants was placebo group (babies had been served oil maltodextrin suspension – 6 drops for next 28 days). The infant's parents did not know in which group their baby was – all the data, for example connecting type of giving substance to the child, was blinded. [1]

Research lasted one week before giving infants BB-12/oil maltodextrin suspension and next 4 weeks of serving products.

The main measures of this research was everyday crying episodes during the day and its duration, bowel movements, number and consistency of infant's stool and duration of sleeping. [1] The results were checked after 28 days of the research.

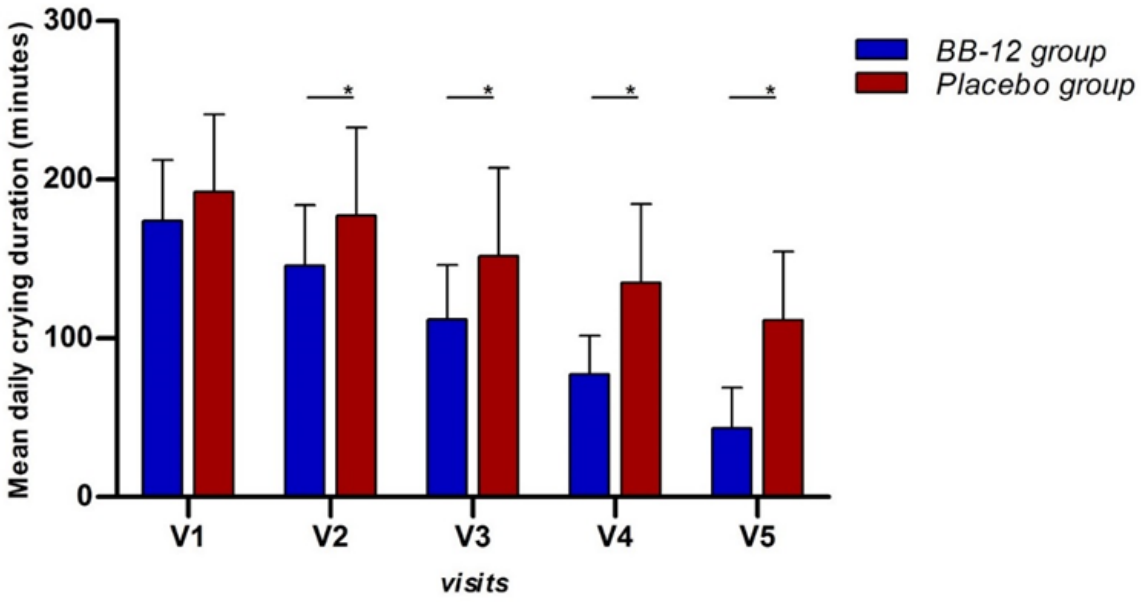

Figure 1. Mean daily crying duration (minutes) for each week.
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It revealed, that daily duration of crying episodes were significantly shorter in group of infants that were served BB-12 than in babies from placebo group. Also BB-12 has beneficial effect on consistency of stool and time of transit. [1]

Moreover this research showed, that BB-12 has positive effect on immune system of infant by increasing the amount of immune biomarkers. [1]
According to this research, Bifidobacterium animalis subsp. lactis BB-12 has a positive impact on reducing symptoms of infant colic, such as daily crying duration. [1]
This shows, that gut microbiota may have important role of proper functioning digestive system, positive impact on reducing most symptoms of IC and can support infant's immune system. But still there are no specific evidence, that will make probiotics a way of treating infant colic, however, daily crying time appeared to reduce with probiotic use compared to placebo in babies with infantile colic. [1,8]

ORAL LACTASE IN INFANT COLIC

However, there are still many studies, lactose intolerance is considered as a cause of infant colic. [2]
Lactase is an enzyme, which hydrolizes lactose to galactose and glucose. Lactose, which is undigested, produces hydrogen and lactic acid, which can cause flatulence and diarrhoea and consequently – crying, irritability and pain. [2]
Because newborns and infants are usually feeded by milk (mother's milk or from bottle), supplementation milk with lactase enzyme may alleviate symptoms of infant colic.
There are two randomized, double-blind, placebo-controlled crossover studies which reveal decrease of crying time during incubating milk feed (from mother breast or bottle) with lactase. [2]
This trial was conducted from February 2018 to February 2020 in the division of Pediatric Gastroenterology, Hepatology and Nutrition, Department of Pediatrics at a medical school affiliated hospital in Delhi in India. [2]
In this research participated infants which had symptoms of infant colic, but did not have any other disease. [2]

To take this research there was strict criteria of age, weight, gestational age that qualified infants to take part in. [2]
162 infants were divided into two groups – experimental and placebo group.
The infant's parents did not know in which group their baby was – all the data, for example connecting type of giving substance to the child, was blinded. [2]

Babies from experimental group received 5 drops (0.2 mL) of the lactase enzyme preparation (Yamoo drops, Walter Bushnell Pvt. Ltd; 600 FCC units/mL). Babies from placebo group received placebo (liquid with the same ingredients as lactase enzyme preparation except for lactase). [2]

The main measures of this research was everyday crying episodes during the day and its duration and number of days in which infant colic occurred.

The secondary outcomes included occurrence of vomiting, diarrhoea, milk regurgitation, constipation and parents satisfaction. [2]

The results were checked after 28 days of the research.

It revealed, that crying and fussing duration of infants from experimental group was 155,1 (101,4) min, while infants from placebo group was 234,1 (127,1) min.

Infants receiving lactase reducted crying and fussion time by 35,1-52,2 min/day. [2]

Outcome	Lactase Mean (SD)	Placebo Mean (SD)	Mean Difference (95% CI)	*P value*
Week 1				
Crying or fussing duration (min/d)	240.7 (109.4)	301.7 (112.0)	-61.1 (-95.3, -26.6)	0.001
Crying duration (min/d)	137 (59.3)	172.2 (66.4)	-35.1 (-54.7, -15.6)	0.001
Fussing duration (min/d)	103.7 (58.5)	130.9 (56.3)	-27.1(-44.9, -9.3)	0.003
Week 2				
Crying and fussing duration (min/d)	174.8 (120.3)	241.7 (126.4)	-66.8 (-105.2, -28.4)	0.001
Crying duration (min/d)	98.6 (67.1)	138.8 (76.5)	-40.2 (-62.6, -17.7)	0.001
Fussing duration (min/d)	79.2 (59.7)	105.8 (59.5)	-26.6 (-45.1, -8)	0.005
Week 3				
Crying and Fussing duration (min/d)	110.3 (114.7)	199.4 (144.8)	-89.1 (-130.4, -47.7)	0.001
Crying duration (min/d)	61.3 (61.8)	113.5 (82.9)	-52.2 (-75.4, -29)	0.001
Fussing duration (min/d)	49.0 (57.5)	86.0 (67.1)	-36.9 (-56.7, -17.2)	0.001
Week 4				
Crying and fussing duration (min/d)	89.9 (115.2)	178.5 (153.2)	-88.6 (-131.8, -45.4)	0.001
Crying duration (min/d)	49.9 (63.54)	100 (86.0)	-50 (-74.1, -25.9)	0.001
Fussing duration (min/d)	39.9 (55.2)	78.5 (71.1)	-38.5 (-58.9, -18.2)	0.001
Average (over 4 weeks)				
Crying or fussing duration (min/d)	155.1 (101.5)	234.1 (127.1)	-79.1 (-114.7, -43.4)	< 0.001
Crying duration (min/d)	86.55 (54.8)	132.4 (72.8)	-45.9 (-66.0, -25.9)	< 0.001
Fussing duration (min/d)	68.6 (51.3)	101.8 (59.2)	-33.2 (-50.4, -16.0)	< 0.001
Colic days	12.1 (7.8)	17.6 (8.4)	-5.5 (-8.0, -2.3)	< 0.001

Table 1. Evaluation of primary outcome variables during the treatment in both groups. – table 2. [2]

According to this research it was documented reduction in crying and fussing duration in infants that were receiving lactase to milk in comparison to infants from placebo group that was receiving placebo during the all 4-week treatment period.

Another result of this study was reduced amount of days with colic in infants from experimental group.
As a conclusion, we can say, that oral lactase treatment causes relief and reduction of symptoms of infant colic, such as duration of crying or fusing. [2]

CRANIOSACRAL THERAPY

Craniosacral Therapy (CST) involves gently touching the skull, sacrum, diaphragm and other areas of the body. The purpose of this therapy is to relax the fascial and connective tissue structures, enabling the proper functioning of the organs and the cooperation between them. [3,10]

According to infant colic, there is research, that showed usefulness of Craniosacral Therapy in Infant Colic. [3]

In this randomized research, 58 infants with colic participated. They were divided into two groups, 29 infants in each group. The first group – control group – did not have any manual therapy, including CST. The second group – experimental group – had few (1-3) sessions of CST until the symptoms of infant colic disappeared.
The effect of research was shown after 24 days of study.
As a main measure of IC disappearance was crying hours. As a second measure was sleeping hours. [3]

In the experimental group, after 24 days, there was disaperrance of symptoms IC for babies that have manual therapy CST. In the control group, after 24 days, there were no improvement of condition.
The conclusion of this research shown, that Craniosacral Therapy (1-3 session) can help babies decline of symptoms of infant colic. [3]

INFLUENCE OF MOTHER DIET AND PROBIOTIC ON INFANT COLIC

There is said, that mother's diet has huge influence on occurring infant colic. Some research shows, that infant colic can be also induced by allergy on cow milk, but this is quite controversial. Nowadays protein of cow's milk is the most common food that triggers food allergy in infants under 12 months of life. [4,5]

Moreover, using probiotics during breast-feeding can reduce symptoms of infant colic ensuring appropriate microbiota in intestines.

There is a biomarker measured in feces, indicating intestinal inflammation – it is called calprotectine. [4]

There is study, that shows influence of mother's elimination of cow milk and diary from diet and using probiotic on severity of infant colic. This is randomized study which was taken from March 2018 to October 2019.

All this study was under control of doctors of the University of Turin-Regina Margherita Children Hospital—Città della Salute e della Scienza di Torino.

To take this research there was strict criteria of age, weight, gestational age, only breast-feeded babies and mother's diet that qualified infants to take part in.

In this research participated 47 infants with diagnosed infant colic, who were feeded only with mother's milk.

Mothers were asked for eliminate cow's diary products, Infants were divided into two groups – experimental group and placebo group. Babies from experimental group were served 5 drops of Lactobacillus rhamnosus (ATCC 53103) (5 × 109 colony for units per day). Probiotic product consisted of a suspension of freeze-dried L. rhamnousus ATCC53103 in a mixture of mais oil and mono and diglyceride oil. Babies from placebo group were served placebo. Placebo product consisted of mixture of mais oil and mono and diglyceride oil. [4]

Parents were asked to collect 5-10g faeces from infants and then it was analysed for calprotectin values.

After 28 days of study results were shown. As a main measure of infant colic disappearance was crying hours. As a second measure was amount of calprotectin level and bacteria in faeces.

Group	Day 0 Mean	Day 28 Mean	Difference between Means	*p* Value
L. rhamnosus (*n* = 24)	242.0	104.7	−137.3	0.001
Placebo (*n* = 21)	247.9	239.6	−8.3	$p > 0.05$

Paired sample *t*-test.

Table 2. Crying and fussing time (mean minutes per day) in the *L. rhamnosus* and placebo group at Day 0 and Day 28. – Table 2. [4]

	L. rhamnosus Group (n = 24)	p Value	Placebo Group (n = 21)	p Value
		Total Bacteria		
Day 0	293,576 (±1,433,471)	0.040 #	16,110 (±64,580)	$p > 0.05$
Day 30	409,845 (±721,248)		13,655 (±14,445)	
		E. Coli		
Day 0	318 (±34)	$p > 0.05$	156 (±1169)	
Day 28	3123 (±1864)		131 (±4235)	$p > 0.05$
		Lactobacillus		
Day 0	28,857 (1 ± 55,662)	0.048 #	3835 (±20,023)	$p > 0.05$
Day 28	79,570 (±298,763)		4625 (±28,606)	
		Bifidobacteria		
Day 0	20,350 (±432,389)	$p > 0.05$	10,884(3 ± 9032)	$p > 0.05$
Day 28	66,043 (±503,326)		10,127(±26,786)	

Mann–Whitney *t*-test; # $p < 0.05$.

Table 3. Certain bacterial species of gut microbiota (mean +- standard deviation) *genome/mg feces*, in a group of infants; *Lactobacillus rhamonsus GG (ATCC 53103)* or placebo at enrolment Day 0 and after 28 days of supplementation. – Table 5. [4]

In the experimental group, after 28 days, there was disaperrance of symptoms of infant colic for babies, which was manifested by reduction of crying and fussing time and faecal calprotectin levels, with increased total bacteria and Lactobacillus spp.

In the control group, after 28 days, there were no improvement of crying and fussing time. Also amount of total bacteria and Lactobacillus spp. did not increased significantly.

As a conclusion, this study showed that infants treated with Lactobacillus rhamnosus ATCC 53103 for 28 days, in association with mother's cow's milk elimination diet, presented features related to the effect of probiotic treatment, such as reduction in crying and fussing time and faecal calprotectin, with increased total bacteria and Lactobacillus.[4,8]

RESULTS

All this studies showed, that cause of infant colic can be multifactoral.

In research about gut microbiota, serving probiotic with BB-12 effected in shorten of daily duration of crying episodes in group of infants that were served BB-12 than in babies from placebo group. Also BB-12 has beneficial effect on consistency of stool and time of transit.

Moreover this research showed, that BB-12 has positive effect on immune system of infant by increasing the amount of immune biomarkers. [1,4]

Research about influence of oral lactase on occuring infant colic revealed, that crying and fussing time in infants from experimental group was shorter, than in infants from placebo group, which was much longer. [2]

Results from study about affect Craniosacral Therapy on IC showed, that in the experimental group, after 24 days, there was disaperrance of symptoms IC for babies that have manual therapy CST. In the control group, after 24 days, there were no improvement of condition. [3]

Study about influence of mother diet and probiotic on infant colic showed its impact on reducing colic symptoms. In the experimental group, after 28 days, there was disaperrance of symptoms infant colic for babies, which was manifested by reduction of crying and fussing time and faecal calprotectin levels, with increased total bacteria and Lactobacillus spp.

In the control group, after 28 days, there were no improvement of crying and fussing time. Also amount of total bacteria and Lactobacillus spp. did not increased significantly. [4,5]

CONSLUSION

Researches showed that all above has impact on infact colic. IC is multifactoral, so it does not have one way of treatment. If we want to treat entire IC, we should take into consideration many factors and methods, that reduces symptoms of infant colic and brings babie's relief. [1,3]

As a conclusion we can say, that each of the above-mentioned methods has positive impact on the occurrence of infant colic.

According to gut microbiota, study performed by - Roberto Berni Canani, Principal Investigator, Federico II University [1] - shows, that dysbiosis can contribute to occurance of infant colic. For proper functioning gastrointestinal system it is very important to keep the balance in amount of bacteria, that have positive affect on digestion processes, and therefore, to avoid symptoms of infant colic. In this research, Bifidobacterium animalis subsp. lactis BB-12 has a positive impact on reducing symptoms of infant colic, such as daily crying duration.[1,4]. But still there are no specific evidence, that will make probiotics a way of

treating infant colic, however, time of daily crying appeared to reduce when probiotic were used compared to placebo group with babies with infantile colic. [1,4,8]

Lactose intolerance is considered as a possible cause of infant colic. Study shows, that oral lactase treatment can relieve symptoms of infant colic, such as duration of crying or fusing. [2]

Craniosacral therapy is considered as one of methods of reducing symptoms of IC. Above study shown, that 1-3 sessions of CST can help babies decline of symptoms of infant colic. [3,10]

Moreover, mother diet and probiotic have influence on infant colic by bringing relief babies [9]. Using Lactobacillus rhamnosus ATCC 53103, in association with mother's cow's milk elimination diet can reduct symptoms of infant colic, such as crying and fussing. Moreover, faecal calprotectin level decreases and total bacteria and Lactobacillus amount increase. [4,5]

All of the conclusions show, that infant colic can be multifactoral and there can be many ways of treating it. But despite that fact, there are still more studies needed that will explain exact causes of infant colic and ways of treatments. [6,7]

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