

A prospective 10-year study on children who had severe infantile colic

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Abstract

Aim: To evaluate the association between infantile colic and gastrointestinal, allergic and psychological disorders in childhood. **Methods:** A prospective study was conducted on 103 infants aged 31–87 d. After 10 y, between 2001 and 2003, the children were recalled and a paediatrician evaluated the selected disorders by anamnesis, medical examination, laboratory tests and parent interviews. **Results:** Of the 103 infants enrolled, 96 completed the study. There was an association between infantile colic and recurrent abdominal pain ($p=0.001$) and allergic disorders: allergic rhinitis, conjunctivitis, asthmatic bronchitis, pollenosis, atopic eczema and food allergy ($p<0.05$). Sleep disorders, fussiness, aggressiveness and feelings of supremacy are more frequent in children who suffered from colic during early infancy ($p<0.05$). A family history of gastrointestinal diseases and atopic diseases was significantly higher in infants with colic than in controls ($p<0.05$).

Conclusion: Susceptibility to recurrent abdominal pain, allergic and psychological disorders in childhood may be increased by infantile colic. Our findings confirm that severe infantile colic might be the early expression of some of the most common disorders in childhood.

Key Words: *Allergic disorders, follow-up, psychological disorders, recurrent abdominal pain, severe infantile colic*

Introduction

Infantile colic is a common problem in infancy and is sometimes difficult to treat successfully. The classic and most often-cited definition of infantile colic is based on crying duration: crying lasting for 3 or more hours a day, for 3 or more days a week, and for at least 3 wk [1]. The disturbance can be graded as mild, moderate or severe, but no consensus has been reached on the definition of each grade [2–4].

The aetiology of infantile colic is not completely understood. Some hypotheses suggest the disorder is organic while others claim it is socio-psychological. However, infant colic may well be a consequence of synergistic interaction between biological and behavioural factors. The former includes abnormal gastrointestinal function and allergic problems [3–6]; in the latter, inadequate and inappropriate maternal–infant interaction, the mother’s anxiety and distress during pregnancy, or the infant’s difficult temperament play an important role [7–9]. Other recent hypotheses suggest the possible role of low levels of cholecystokinin in colicky infants, predisposing them to excessive crying [10].

In this context, it is interesting to note that psychological and allergic disorders, such as atopic eczema and food allergy, have been described in children who suffered from colic as infants [5, 11–13]. Behavioural problems in childhood have been reported by Wolke et al. [14] and Canivet, who reported that ex-colicky infants displayed negative emotions and were moody during meals [15]. However, as yet, there have been too few studies on long-term outcome, which also takes into consideration psychological, allergic and gastrointestinal disorders [6,16].

The aim of this study was to evaluate the relationship between infantile colic and gastroenterological, allergic and psychological disorders later in childhood with a follow-up of 10 y on children with infantile colic during the first months of life.

Patients and methods

A prospective study was performed on infants who were enrolled from January 1991 to December 1993. At the time of the enrolment, the infants were 31–87 d old. They were divided into two groups: colicky and

not colicky (Table I). Each group was then controlled between 2001 and 2003, or when each child was 10 y old.

The first group was originally made up of 52 infants who had been examined for severe infantile colic at the Department of Paediatrics at the Regina Margherita Children's Hospital, Turin. Four infants from this group did not come back after our recall 10 y later and were considered to have withdrawn. To be diagnosed as severely colicky and to be hospitalized, the infants had to have a history of persistent, full-force crying with no apparent reason several times a day, for an overall duration ≥ 4 h/d, lasting more than 4 d/wk with no response to the common consolation procedures. These criteria enabled us to select subjects with severe colic among those who fitted Wessel's criteria.

The second group was originally composed of 51 infants hospitalized in the same period at our Department for diseases that were unrelated to infantile colic, and gastrointestinal, allergic and psychological disorders. None of the children had chronic or severe illnesses. Three infants from this group did not come back after our recall 10 y later and were considered to have withdrawn.

The remaining 96 children were evaluated 10 y later for gastrointestinal disorders (gastritis and peptic ulcer, recurrent abdominal pain, and constipation), allergic diseases (allergic rhinitis and conjunctivitis, asthmatic bronchitis, pollenosis, anaphylaxis, atopic eczema, urticaria, and food allergy) and psychological disorders (sleep disorders, enuresis, aggressiveness, fussiness, feelings of supremacy and enjoying school).

Recurrent abdominal pain is a pain lasting for at least 6 mo with loss of daily functioning, unrelated to physiological activity of the gut and unexplained by structural or other gastrointestinal disorders [17]. Sleeping disorders consist of restless sleep and waking ≥ 5 times/night. These disorders were selected because of the same aetiopathogenesis of infantile colic. Diagnosis was based on clinical evaluation at our

Institute: anamnesis, medical examination and laboratory tests were conducted on the children by paediatricians from our Department. Parents were asked about their child's behaviour, temperament, and sleeping and eating habits. Every question was followed by four alternative answers. They were also asked if they had ever suffered from the same disorders as their child.

The study was approved by the local ethics committee.

Statistical analysis

All statistical analysis was carried out using commercially available software (Statsoft Windows, version release 5, 1995, © Statsoft, USA) together with the χ^2 test and Fisher's exact test; whereas the relative risk was evaluated using 95% confidence limits. Statistical significance was set to $p < 0.05$.

Results

Among the examined gastrointestinal disorders, recurrent abdominal pain was observed in 33.33% of the ex-colicky infants and in 4.42% of the ex-non-colicky infants ($p = 0.001$; RR 10.7). No significant difference between the two groups of infants was found for gastritis, peptic ulcer and constipation. As is common in allergic diseases, allergic rhinitis and conjunctivitis were found in 27.08% of the ex-colicky infants versus 4.42% of the formerly ex-non-colicky infants ($p < 0.05$; RR 8.7); asthmatic bronchitis was found in 22.90% of the ex-colicky subjects and in 6.20% of the ex-non-colicky infants ($p < 0.05$; RR 4.0); pollenosis was found in 20.08% of the ex-colicky subjects and in 4.42% of the ex-non-colicky infants ($p < 0.05$; RR 5.4); atopic eczema was found in 31.25% of the ex-colicky subjects and in 6.20% of the ex-non-colicky infants ($p < 0.05$; RR 6.3); and food allergy was found in 22.90% of the ex-colicky infants and in 6.20% of the ex-non-colicky infants ($p < 0.05$; RR 4.0).

Table I. Characteristics and family history of colicky and non-colicky infants.

	Infants with colic ($n = 48$)	Infants without colic ($n = 48$)	Statistical analysis
Gestational age (wk)	39.5 ± 0.8	39.6 ± 0.7	n.s.
Birthweight (g)	3439 ± 165	3455 ± 186	n.s.
Gender (M/F)	22/26	23/25	n.s.
Type of feeding (Breastfed/formula-fed)	20/28	25/23	n.s.
Family history of gastrointestinal diseases	16 (33.33%)	6 (12.5%)	$p = 0.031$ ES = 0.086 95% CI: 0.037–0.373
Family history of allergic diseases	23 (47.9%)	12 (25%)	$p = 0.033$ ES = 0.098 95% CI: 0.037–0.423
Family history of psychological disorders	20 (41.67%)	11 (22.92%)	$p = 0.077$ ES = 0.096 95% CI: 0.003–0.377

Table II. Gastrointestinal, allergic and psychological disorders evaluated after 10 y in children who had colic during infancy versus children who had not.

Groups	Disorders	p (χ^2)	Infants with colic	Infants without colic	RR
Gastrointestinal disease	Gastritis, peptic ulcer	0.153	3 (6.2%)	0.00	–
	Recurrent abdominal pain	0.001	16 (33.33%)	2 (4.42%)	10.7
	Constipation	1.000	8 (16.66%)	8 (16.66%)	1.0
Allergic disease	Allergic rhinitis-conjunctivitis	0.002	13 (27.08%)	2 (4.42%)	8.7
	Asthmatic bronchitis	0.036	11 (22.9%)	3 (6.2%)	4.0
	Pollenosis	0.024	10 (20.8%)	2 (4.42%)	5.4
	Anaphylaxis	0.315	1 (2.1%)	0	–
	Atopic eczema	0.003	15 (31.25%)	3 (6.2%)	6.3
	Urticaria	0.079	7 (14.58%)	2 (4.42%)	3.9
	Food allergy	0.036	11 (22.9%)	3 (6.2%)	4.0
Psychological disorder	Sleep disorders	0.001	27 (56.25%)	6 (12.5%)	10.9
	Enuresis	0.057	7 (14.58%)	1 (2.1%)	6.8
	Aggressiveness	0.032	20 (41.67%)	3 (6.2%)	13.4
	Fussiness	0.021	33 (68.65%)	7 (14.58%)	14.6
	Supremacy	0.031	18 (37.5%)	2 (4.42%)	13.1
	Enjoying school	0.396	41 (85.41%)	38 (79.16%)	1.6

No differences were found between the two groups for anaphylaxis and urticaria. With regards to psychological disorders, sleep disorders were found in 56.25% of ex-colicky subjects and in 12.50% of ex-non-colicky infants ($p=0.001$; RR 10.9); aggressiveness was found in 41.67% of ex-colicky subjects and in 6.20% of ex-non-colicky infants ($p<0.05$; RR 13.4); fussiness was found in 68.65% of ex-colicky subjects and in 14.58% of ex-non-colicky infants ($p<0.05$; RR 14.6); a feeling of supremacy was found in 37.50% of ex-colicky subjects and in 4.42% of ex-non-colicky infants ($p<0.05$; RR 13.1). No differences between the two groups were found for enuresis or enjoying nursery/school (Table II).

The interviews revealed a family history of gastrointestinal diseases in 33.33% of ex-colicky infants versus 12.50% of ex-non-colicky infants ($p=0.031$), a family history of allergic diseases in 47.90% of ex-colicky infants versus 25.0% of ex-non-colicky infants ($p=0.033$), and a family history of psychological diseases in 41.67% of ex-colicky infants versus 22.92% of ex-non-colicky infants ($p=0.077$) (Table I).

Discussion

Some gastrointestinal, allergic and psychological disorders in childhood are significantly more frequent in subjects who were affected by infantile colic. The results of our study show an association between infantile colic and recurrent abdominal pain, in accordance with a previous study by Croffie [18]. These findings should not be surprising, as both disturbances share the same aetiopathogenetic factors (diet, autonomic imbalance, hormonal and behavioural factors) and symptoms (swelling of the abdomen from intestinal gas and irritability) [19].

Nevertheless, this association is in contrast with Joseph's work [20]. We found no association with any other gastrointestinal disorder, probably because the diseases we examined generally have a later onset.

As with allergic disorders, we found an association between colic and atopic eczema, food allergy, and respiratory and ocular allergies. This is in accordance with most authors [3,11], but there is also contradictory evidence [21]: this is partially due to the different criteria followed to define colicky infants [2]. Furthermore, we cannot make a comparison with other prospective studies reported in literature because the majority of them were not carried out over a 10-y period.

In this context it is interesting to note that, in some children affected by cow milk allergy during infancy, a local ratio of gastrointestinal diseases, such as recurrent abdominal pain, may persist [22,23].

It is well known that gastrointestinal dysmotility, characteristically found in infants with severe colic, is related to food allergy [3,5,6]. The gut wall contains one of the largest lymphoid organs in the body: mucosal inflammatory cytokines, mast-cell degranulation and their interaction with the enteric nervous system are thought to be a major cause of gastrointestinal hypermotility and responsible for the development of recurrent abdominal pain [24]. Furthermore, a recent experimental work reports that neonatal rats exposed to colonic inflammation developed chronic visceral hypersensitivity during adult life [25]: bearing this in mind, we suggest that infantile colic might be considered the first expression of functional gastrointestinal disorders, such as recurrent abdominal pain.

Regarding psychological problems, our results agree with the literature [26,27] and show a

particularly strong association with sleep disorders and fussiness.

Our findings confirm both biological and psychological aetiopathogenetical theories about infantile colic, even though their full meaning is still not clear. In particular, since a high percentage of colicky infants show allergic and psychological disorders later in childhood, allergic and psychological factors could play a major role in determining colic in these infants. Besides this, the majority of colicky infants had more than one of the examined disorders: these data confirm the multifactorial aetiology in infantile colic and suggest the importance of reinforcing our acknowledgement of the weight of each aetiological factor, in order to improve the effectiveness of our approach to colicky infants.

On the other hand, interviews with parents suggest an association between a family history of gastrointestinal and allergic disorders and colic in their children. The hypothesis of a supposed and still unclear inheritance in developing such functional disturbances should be investigated further.

In conclusion, our results confirm the theory that states that infantile colic might be the early expression of some of the most common disorders in childhood. Other long-term, follow-up studies are needed, but we think they would be useful only if the criteria defining colic were more homogeneous and clearly defined [2], in order to make valid comparisons between different works.

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