

## Temporary Strict Maternal Avoidance of Cow's Milk and Infantile Colic

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**Abstract-** Infant colic is a common problem characterized by excessive crying and fussing. We examined whether colic symptoms of exclusively breast-milk-fed infants would be improved by temporary strict maternal avoidance of cow's milk. This study is analytic and experimental. Sixty-six subjects were recruited during winter of 2006 from a clinic in Isfahan, Iran. Breast-milk-fed infants with "colic", age 3-6 months and to be in otherwise good health were referred by pediatricians. The intervention was 1 week period of strict maternal avoidance of cow's milk while they continued exclusive breast-milk-feeding. All infants showed improvement in distressed behavior (crying and fussing) during intervention. The total recorded crying and fussing time was reduced by an average of 31%. A significant difference was found in cry and fuss time between first and last 2 days of intervention ( $P = 0.000$ ). Cow's milk proteins may play an etiologic role in colic. We propose that a brief intervention with strict maternal avoidance of cow's milk may be an effective treatment for colic in some breast-milk-fed infants.

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**Key words:** Milk; milk, human; infantile colic; crying

### Introduction

Infantile colic is a common syndrome occurring during the first several months of life (1-5). The incidence of colic is dependent upon definition and survey methods (4, 5). One study reported an equal incidence of colic in breastfed infants and in formula-fed infants (6). Another study found that colic incidence was age-dependent: 31% at 2 weeks of age and 12% at 6 weeks among formula-fed infants; but 21% at 2 weeks and 31% at 6 weeks for breastfed infants (7). Generally, colic is thought to represent a transient, nonorganic, behavior dysregulation among otherwise healthy infants (8). The cause of infantile colic has remained unclear (2, 8, 9). It is hypothesized that cow's milk proteins, transferred via breast milk from mother to infant, might be responsible for colic symptoms. This hypothesis suggests that strict elimination of cow's milk from the maternal diet may prove beneficial, and re-introduction detrimental, in

infantile colic. In studies of 85 breastfed infants with colic, 56% of the infants had a resolution of colic symptoms after their mothers strictly eliminated cow's milk from the maternal diets (10, 11). When the mothers re-introduced cow's milk back to their diets, 66% of the responding infants had recurrences of colic symptoms (10). There are several possible explanations for these observations that only a fraction of the colicky infants show the predicted responses to maternal dietary avoidance of, and re-introduction of, milk products (6, 10, 11). One possibility is that avoidance diets were insufficiently long or strict, and that re-introduction diets contained too little of the causative substance. Another possibility is that substances in the diet other than cow's milk may also be transferred via breast milk and cause colic (12). Other possibilities are that esophageal reflux (13), high lactose concentrations in feedings, maternal/infant variations in the mechanics of milk transfer, or other factors might account for some of the cases of col-

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ic. Therefore, the purpose of the present study was to determine whether strict maternal avoidance of cow's milk would improve colic.

## Patients and Methods

This study is analytic and experimental. The subjects were recruited during winter of 2006 from a clinic in Esfahan, Iran that is affiliated with Isfahan University of Medical Sciences. The study had the approval of University ethics committee. Mothers of each patient gave informed consent. Breast-milk-fed infants with "colic", defined for recruitment purposes as "excessive unexplained crying", were referred by pediatrician following criteria were met: (a) age 3-6 months; (b) followed by a pediatrician and found to be in otherwise good health; (c) by history, having a duration of total cry and fuss behavior of a least 3 h per d, for at least 3 d a weeks, and for at least 2 weeks; (d) exclusively breast-milk-fed. The study involved 66 colicky infants. We did not include those with organic disease, or drug abuse in mothers.

Sixty-six consecutive subjects who met the study criteria (33 males, 33 females) completed the questionnaire. All infants were full-term; birth weights ranged from 3.0 to 3.9 kg. All subjects exceeded their birth weight by 1-2 weeks of age.

Detailed lactation and breastfeeding histories were obtained for all mother-infant pairs. Parents contempo-

aneously charted infant behavior each day on a timeline, which is divided into 15-min intervals. This allowed for accurate 24-h documentation of infant cry, fuss, sleep, awake and content, and feeding behaviors during the entire study period (14). Daily maternal dietary intake was recorded and reviewed. All subjects met Wessel's criteria (1) for colic demonstrated an average of at least 3 h of "cry and fuss" behavior per day. The initial day of prospective charting was considered to be the first study day. During the 8 d "intervention period", mothers began strict avoidance of cow's milk. The daily charts were also completed for 7<sup>th</sup> and 8<sup>th</sup> days by mothers.

*Data analysis:* Data were analyzed using SPSS for windows. There were no missing data. Independent-t test is used for comparing means between 2 groups and t-paired test is used for comparing means before and after intervention.

## Results

The daily results of "cry and fuss time" during the first, second, 7<sup>th</sup> and 8<sup>th</sup> days of intervention are presented for the 66 infants in Table 1. All infants demonstrated at least 3 h of combined fussing and crying behavior during each of the first and second days while consuming breast milk.

**Table 1.** The cry and fuss time during intervention period in 2 groups

Cry & Fuss time (min)	First Day		Second Day		7 <sup>th</sup> Day		8 <sup>th</sup> Day	
	Case	Control	Case	Control	Case	Control	Case	Control
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
<270	6(18.1)	13(39.4)	11(33.2)	9(27.3)	18(54.6)	15(45.4)	24(72.8)	19(57.5)
270-330	11(33.4)	7(21.2)	13(39.4)	18(54.7)	10(30.3)	7(21.3)	8(24.2)	8(24.3)
345-390	8(24.2)	8(24.2)	6(18.1)	3(9)	4(12.2)	9(27.4)	1(3)	6(18.2)
>390	8(24.1)	5(15.1)	3(9.1)	3(9.1)	1(3)	2(6)	0	0
Total	33(100)	33(100)	33(100)	33(100)	33(100)	33(100)	33(100)	33(100)
Mean (SD)	345(77.1)	315(78.7)	300(71.5)	300(58.4)	240(85.4)	270(84.1)	210(74.6)	240(71.5)

**Table 2.** Sum of cry and fuss time in first and last 2 days of intervention period in 2 groups

Cry & Fuss time (min)	First 2 days		Last 2 days	
	Case	Control	Case	Control
	N (%)	N (%)	N (%)	N (%)
<510	7(21.1)	8(24.3)	21(63.9)	17(51.4)
510-650	5(15.1)	9(27.3)	8(24.3)	6(18.1)
615-690	11(33.5)	7(21.2)	3(9)	7(21.2)
705-795	6(18.2)	5(15.1)	1(3)	3(9)
>795	4(12)	4(12.1)	0	0
Total	33(100)	33(100)	33(100)	33(100)
Mean(SD)	645(144.6)	615(129.3)	450(156.2)	510(142.5)

**Table 3.** Cry and fuss time differences in first and last 2 days of intervention period in 2 groups.

Cry & Fuss time (min)	Case (n=33)		Control (n=33)		p
	Mean	SD	Mean	SD	
1st&2nd days	645	144.6	615	129.3	0.096
7 <sup>th</sup> &8 <sup>th</sup> days	450	156.2	510	142.6	0.011
Difference between first&last 2 days	195	101.32	105	92.31	<0.00

**Table 4.** Fussing changes after intervention in 2 groups

	Case N (%)	Control N (%)
Increase	0	3(9)
No change	0	3(9.1)
1-12% decrease	3(9)	7(21)
13-19% decrease	6(18)	6(18)
20-29 decrease	8(24.2)	7(21)
30-39 decrease	9(27)	5(15)
>39 decrease	7(21.1)	2(6)
Total	33(100)	33(100)
Mean(SD)	0.31(0.18)	0.17(0.15)

The sum of “cry and fuss time” during the first and last 2 days of intervention are presented in Table 2.

The results of “cry and fuss time” differences between 2 groups during the first and the last 2 days of intervention period are presented in Table 3.

Considering the mothers' viewpoints, the infants had been improved after intervention in comparison before intervention. The results of “cry and fuss time” changes in 8<sup>th</sup> day of intervention in comparison before interventions in 2 groups are presented in Table 4. The total recorded crying and fussing time was reduced by an average of 31% in the case group. However, all infants in the case group showed some improvement in distressed behavior (crying and fussing) during intervention period.

## Discussion

The objective of this study was to examine whether the colic symptoms of exclusively breast-milk-fed infants with colic would be improved by temporary strict maternal avoidance of cow's milk.

The improvement of colicky infants is consistent with the following hypotheses concerning the etiology of infantile colic (15): (a) one or more cow's milk proteins are causing colic (10, 16-19); (b) infants with immaturity of the gastrointestinal tract may be predisposed to colic symptoms (1); and (c) infantile colic might be caused or aggravated by esophagitis associated with “reflux” of stomach contents (13), since immunologic reactions to dietary proteins might be contributing to

such reflux (20, 21). Our observations counter hypotheses that attribute colic to suboptimal parent- child interactions (22), to an extreme variation of “normal crying” (23), or to a myriad of etiologically different entities (24).

One cow's milk-derived substance, bovine IgG (BGG), is an attractive candidate protein because immunoglobulins are relatively resistant to proteolysis and have prolonged half-lives (19). Alternatively, substances of maternal origin in breast milk (e.g., an immunoglobulin of a different allotype, or different HLA antigens on leukocytes) might conceivably lead to an adverse immunologic response (15).

Infantile colic can be a serious problem, since it can disrupt family functioning and has led to infant abuse and mortality. In current practice, when faced with a breastfed infant who has colic, parents and pediatricians have three possible alternatives. (a) The mother can continue breastfeeding with few or no changes in her own diet and allow the colic problem to run its natural course. Although some infants improve spontaneously (1), colic symptoms tend to increase between 2 and 6 weeks of age (7). (b) The mother could discontinue breastfeeding and initiate infant feeding of formulas that contain non-human proteins, which, in turn, almost always leads to a worsening of colic symptoms. (c) The mother can strictly avoid cow's milk in her own diet while continuing to breastfeed (15). This appears to be a reasonable approach, but the success rate in improving the infant's colic symptoms has been found to be only about 31% after about 1 weeks of maternal dietary restriction (11).

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