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Common gastrointestinal distress among infants: Role of optimal nutritional interventions

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ABSTRACT

The immature gastrointestinal (GI) tract makes infants vulnerable to transient disorders including colic, gastro-oesophageal reflux (GER) and constipation. These conditions cause a significant distress to infants and caregivers, and are among the most common reasons for the paediatrician referral. In addition, these conditions are associated with a significant morbidity, hospitalisations and high healthcare costs, adding to the burden of the disease. Although they are additions to the ongoing physiological development or arise from maladaptive behavioural responses, the evidence remains limited. The vague aetiology and the self-limiting nature, has devoid these conditions of robust clinical attention, both in the research and clinical practice. Frequent early-life intestinal insults may translate as a risk factor in the development of chronic GI disorders and psychological problems later in life. Emerging evidence suggests that providing an optimal nutritional intervention closer to the breast milk can be a path breaking approach to manage these frequently encountered conditions and aid the growth and development of infants.

1. Infantile GI distress: a synopsis

Globally, prevalence of infantile colic is estimated to be approximately 10%–40% with a peak prevalence at 6 weeks.[1] Approximately 70%–85% have regurgitation within the first two months of life, which generally resolves without intervention in 95% of the infants by one year.[2,3] Constipation manifests in approximately 17%–40% of the infants during the first year of life, which gradually resolves in 60% of the infants after the age of 1 year. Despite the widespread prevalence, only 3% of the patients seek medical attention.[4–6] The aetiology of colic, gastro-oesophageal reflux (GER) and constipation in infants remains largely unknown.[1]

Dysbiosis of the gut microflora, intolerance to cow's milk protein, lactose intolerance, Gastrointestinal (GI) immaturity, increased serotonin, improper feeding techniques, maternal smoking, delayed gastric emptying are some of the overarching factors identified to be associated with the GI distress among infants.[1,7,8]

2. Gaps in the current treatment approaches

The current management options for most of the GI distress disorders include a few standard approaches such as continued breastfeeding, counselling, reassurance and maternal dietary modification such as dietary exclusions.[1,4,10] The ambiguity associated with the aetiology and pathogenesis of the infantile GI distress disorders limits the recommendations with most suggesting no intervention in the presence of positive weight gain and no associated red flags.[8,11,12]

In infants with colic, a change in formula or complementary intervention can be tried; however, soy formulas have been strongly discouraged. The probiotic strain *Lactobacillus reuteri* DSM 17938 has shown promising outcomes in the reduction of symptoms; however, requires an in depth research to strongly recommend its use.[1,8,13] Modifications in the infants' diet such as decrease in the volume, thicker feeds and an increase in the frequency of feed has been identified to be beneficial in

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regurgitation. Switching to extensively hydrolysed protein or amino acid-based formula may be a suggested option. Anti-regurgitation formulas specialised to improve uncomplicated regurgitation and quality of life can be used.[10,14] The treatment of constipation is mainly focused on disimpaction of faeces and maintaining a regular bowel movement. Further diagnostics are required to distinguish between functional and organic constipations.[4–6]

The present gaps demand a need for concrete recommendations for the common GI distress among infants.[8,11,12] Rome III diagnostics criteria for functional GI disorders used by Medical Professionals for the diagnosis of infantile GI distress,[9] which has been discussed in Table 1.

3. Limitations of traditionally used nutrition options

In India, the complementary feeding practices are vastly suboptimal, as evidenced from the National Family Health Survey (NFHS) 3. Only 69% of the infants younger than 2 months are exclusively breastfed, which declines to 28% between 4 and 5 months of age. The decline occurs because mothers supplement breast milk with plain water initially, and later with cow's milk. With the usage of cow's milk as the top replacement option for breast milk that is introduced as early as 4 months of age, it is clear that incorrect feeding practices are being followed in the country.[15]

Cow's milk can serve more harm than benefits. Cow's milk is a poor source of key nutrients such as iron, essential fatty acids, zinc, vitamin C, and niacin while has a higher saturated fatty acid content. Its low iron content as well as capacity to cause occult blood loss may increase the risk of anaemia. Further, the high amounts of calcium and casein can interfere with nutrient absorption. Despite the high amount, calcium absorption from cow's milk is estimated to be 20% lower than that of human milk. Moreover, the whey casein ratio in cow's milk is 20:80 compared to the optimal ratio of 60:40 in breast milk. Also, the lactose content in cow's milk is considerably lower than the breast milk, constituting approximately 50–70 g/L, thus a comparatively suboptimal energy source. The high protein and mineral content can lead to a high renal solute and urine concentration, which in the long term can cause dehydration. In addition, cow's milk protein allergy (CMPA), an immunological reaction to one or more milk proteins has been associated with long-term health consequences.[16–21] Cow's milk can be a source of pathogenic bacteria such as *Salmonella* and *Escherichia coli*.[22,23]

3.1. Need for quality nutrition closer to breast milk

Breast milk is a gold standard offering an umbrella of benefits during infancy. Its specific nutritional characteristics and active support in nutritive, metabolic, immunological and protective functions makes it a vital component to help support GI health.[14,18,19,24–27] (Table 2). Thus, in the unavailability of breast milk, offering nutritional interventions comparable to its composition can support digestive health. As conventional therapies have mainly focused on relief of symptoms, infantile GI distress requires an effective nutritional intervention over the pharmaceutical treatment.[28,29]

Table 2
Properties of Breast Milk Specific to GI Health.

Nutritional characteristics	Content
Whey Casein ratio	60:40
Calcium Phosphorus ratio	2:1
Osmolality	300 mOsm/L
Contains optimum vitamins, minerals, fats, lactose and probiotics	–

3.2. Suggested nutritional characteristics to alleviate infantile GI distress

- Optimal lactose content
- Whey Casein ratio
- Calcium Phosphorus ratio
- Osmolality
- Probiotics + Prebiotics

3.3. Optimal lactose content

Lactose has an ability to attract water into the intestinal lumen, which produces an osmotic laxative effect. In addition, the prebiotic effect of lactose helps regulate intestinal microbiota. A study was conducted by Infante et al, to evaluate the impact of a formula with high levels of lactose in infants with functional constipation. Thirty healthy term-born, formula-fed infants, aged 4–10 weeks were included. Stool composition was measured by near-infrared reflectance analysis (NIRA). In addition, parents answered questions about crying associated with defecation and stool consistency at baseline and after two weeks of the adapted formula. The study resulted in a considerable reduction in the symptoms of constipation (Baseline 90% vs. after two weeks 10%) such as hard stools and/or pain and difficulty during defection in infants (Fig. 1).[30]

In addition, studies have suggested that lactose-containing formulas show better absorption of key nutrients. Studies have suggested a 25% increase in copper absorption, 15% increase in calcium absorption ($P < 0.01$), 11% increase in manganese absorption ($P < 0.05$), 8% increase in magnesium absorption ($P < 0.001$) and 7% increase in zinc absorption, in the presence of lactose.[31]

Human milk is known to contain almost double the quantity of lactose compared with milk of other mammals. Breastfed infants have at least 8 points higher intelligence quotient in later life than non-breastfed ones. It also helps facilitating the synthesis of cerebrosides and myelination of the central nervous system.[32] In

Table 1
Rome III criteria for functional GI disorders.

Infantile colic	Unexplained crying for more than 3 hours per day, more than 3 days per week and longer than 1 week
GER:	Presence of 2 or more regurgitation episodes per day for 3 or more weeks with no warning signs
Functional constipation:	One month of at least 2 of the following in infants up to 4 years of age • Two or fewer defecations per week • At least 1episode per week of incontinence after the acquisition of toileting skills • History of excessive stool retention, history of painful or hard bowel movements • Presence of a large faecal mass in the rectum • History of large-diameter stools that may obstruct the toilet

Footnote: GER: Gastro-oesophageal reflux.

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