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Incidence of Infantile Colic in Exclusive Breastfeeding vs Exclusive Formula Feeding vs Combination Feeding Infants in Abbasi Shaheed Hospital, Karachi

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ABSTRACT

Introduction: Infantile colic is one of the most common and distressing conditions experienced by infants and their parents **Objective**: To compare the incidence of infantile colic among infants exclusively breastfed, exclusively formula-fed, and combination-fed, and to evaluate the associated risk factors. **Methods**: This cross-sectional study was conducted in the Abbasi Shaheed Hospital, Karachi during June 2024 December 2024. A total of 246 infants aged 1 to 6 months diagnosed with colic (based on Wessel's criteria) were enrolled using a non-probability consecutive sampling technique. Feeding practices were categorized as exclusive breastfeeding, formula feeding, and combination feeding. Data on demographics, feeding patterns, colic characteristics, and maternal factors were collected through structured interviews. **Results**: The incidence of colic was 20%, with the highest prevalence in exclusively formula-fed infants (30%), followed by combination-fed (24%) and exclusively breastfed infants (8%). Formula-fed infants had longer crying durations (mean: 4.0 ± 1.2 hours/day) and more frequent crying episodes (median: 5 episodes/week, IQR: 4–7) than breastfed infants. Associated symptoms such as gassiness and irritability were most common in the formula-fed group (70%). Maternal and socioeconomic factors were not significantly associated with colic incidence ($p>0.05$). **Conclusion**: It is concluded that exclusive breastfeeding significantly reduces the incidence and severity of infantile colic compared to formula and combination feeding. Promoting breastfeeding and addressing challenges in formula feeding may help mitigate colic and improve infant well-being.

INTRODUCTION

Infantile colic is one of the most common and distressing conditions experienced by infants and their parents.[1] Infantile colic is characterized by excessive crying and irritability, occurring without any identifiable cause in otherwise healthy infants.[2] Colic episodes are defined by Wessel's criteria, where an infant cries for more than 3 hours a day, more than 3 days a week, for at least 3 weeks.[3] These crying spells typically start at two to three weeks of age, peak at six weeks, and usually resolve by three to four months of age. Despite being benign and self-limiting, infantile colic poses a significant burden on caregivers, often leading to parental anxiety, sleep deprivation, and strained family dynamics.[4]

The prevalence rate of infantile colic ranges between 17-15%.[5] A systematic review reported that the prevalence rates of infantile colic ranged from 2–73%, with a median rate of 17.7%.[6] A local study from Mansehra analyzing 426 infants found the prevalence rate of infantile colic as 21.1%.[7] In a case-control study from Iraq, exclusive breastfeeding, bottle feeding, and mixed feeding were noted among cases (infantile colic) to be 22.0%, 19.3%, and 55.3%, respectively, versus 30.7%, 24.7%, and 40.7%, respectively, among controls (non-infantile colic).[8] A study from Iran found the incidence of infantile colic as 20% whereas the frequency of exclusive breastfeeding in infantile colic, and controls were 83.1%, and 85.5%, respectively ($p=0.24$).[9]

Feeding method is often scrutinized as a potential risk factor for colic, with conflicting results in the literature. Exclusive breastfeeding has generally been thought to lower the incidence of colic, possibly due to the natural digestibility of human milk.[10] Conversely, formula feeding, particularly cow's milk-based formulas, has been associated with a higher incidence of colic, likely due to difficulties in digesting proteins or lactose intolerance.[11] Combination feeding, where infants are fed both breast milk and formula, introduces another layer of complexity, as the benefits and risks of both feeding methods coexist.

To the best of our knowledge, no study exists evaluating the frequency of different types of feeding practices and their influence on infantile colic. Due to significant impact

of colic on both infants and their caregivers, understanding its association with feeding practices is of paramount importance, especially in regions like Pakistan where breastfeeding rates are perceived to be relatively high but formula feeding is increasingly common. It is supposed that formula-fed infants may be at higher risk for colic, but the evidence remains inconsistent, particularly regarding combination feeding, which is not well studied. This study aims to address this gap by focusing on infants diagnosed with colic and exploring the relationship between different feeding methods—exclusive breastfeeding, exclusive formula feeding, and combination feeding. By selecting infants who are already suffering from colic, we can better understand how feeding practices may influence the presentation and progression of colic symptoms, while also considering key demographic and environmental variables. The findings of this study will be valuable in guiding healthcare professionals in providing tailored advice to parents regarding feeding practices and managing infantile colic more effectively

Objectives

The main objective of the study is:

- To compare the frequency of different feeding methods (exclusive breastfeeding, exclusive formula feeding, and combination feeding) among infants diagnosed with colic.
- To explore demographic and maternal factors that may influence colic in infants across different feeding methods.

MATERIAL AND METHODS

This Cross-sectional study was conducted at Abbasi Shaheed Hospital, Karachi, from June 2024 December 2024. Data were collected through a non-probability consecutive sampling technique.

Sample Size Calculation

Considering the prevalence of infantile colic as 20%,[9] with 95% confidence level and 5% margin of error, the sample size was calculated to be 246. The calculation of the sample size is given below.

The sample size (n) is calculated according to the formula: $n = z^2 * p * (1 - p) / e^2$

Where: z = 1.96 for a confidence level (α) of 95%, p = proportion (expressed as a decimal), e = margin of error.

z = 1.96, p = 0.2, e = 0.05

$n = 1.96^2 * 0.2 * (1 - 0.2) / 0.05^2$

n = 0.6147 / 0.0025 = 245.862

n ≈ 246

The sample size is equal to 246

Inclusion Criteria

- Infants aged 1 to 6 months.
- Infants diagnosed with colic as per Wessel's criteria.
- Infants who had been exclusively breastfed, exclusively formula-fed, or combination-fed for at least one month.
- Parents/guardians who were willing to participate and provided informed consent.

Exclusion Criteria

- Infants with known gastrointestinal disorders, allergies, or congenital anomalies.
- Infants on medications that could interfere with digestion or mimic colic symptoms.

Data Collection

Data collection began after obtaining written informed consent from the parents or guardians. A structured questionnaire, specifically designed for the study, was used to gather relevant information. Infant demographics, including gender, age, birth weight, and current weight, were recorded. Feeding practices were categorized into exclusive breastfeeding, exclusive formula feeding, and combination feeding, with detailed information on feeding duration and daily frequency. Colic symptoms, such as the duration of crying per day, frequency of episodes per week, and total duration of colic, were documented. Associated symptoms, such as gassiness, irritability, sleep disturbances, and back arching, were also noted.

Statistical Analysis

Data was analyzed using IBM-SPSS Statistics, version 26.0. Qualitative variables, such as feeding practices and colic symptoms, were presented as frequencies and percentages. Quantitative variables, such as the duration of crying, were summarized as mean and standard deviation for normally distributed data or as median and interquartile range for non-normal data, as determined by the Shapiro-Wilk test. For comparative analysis, categorical variables were assessed using the chi-square test or Fisher's exact test, while quantitative variables were compared using ANOVA or the Kruskal-Wallis test, depending on data distribution. A p-value of < 0.05 was considered statistically significant for all tests.

RESULTS

A total of 246 infants aged 1 to 6 months were included in the study. Of these, 52% (n=128) were male and 48% (n=118) were female. The mean age of the infants was 3.5 ± 1.4 months. The mean birth weight was 3.1 ± 0.5 kg, while the mean current weight was 5.5 ± 1.2 kg. The mean maternal age was 27.5 ± 4.3 years. Socioeconomic data revealed that 40% of families had a monthly income below PKR 30,000, and 65% of mothers had at least a secondary level of education. These characteristics provide a balanced baseline for evaluating the effects of feeding practices on colic incidence.

Table 1

Demographics and Clinical Characteristics

Variable	Value
Gender (Male)	128 (52%)
Gender (Female)	118 (48%)
Mean Age (months)	3.5 ± 1.4
Mean Birth Weight (kg)	3.1 ± 0.5
Mean Current Weight (kg)	5.5 ± 1.2
Mean Maternal Age (years)	27.5 ± 4.3
Families with Income < PKR 30,000	99 (40%)
Maternal Characteristic	Value
Mean Maternal Age (years)	27.5 ± 4.3
Mothers with Secondary Education	160 (65%)
Families with Income < PKR 30,000	99 (40%)

Feeding practices were distributed as 40% exclusive breastfeeding, 35% exclusive formula feeding, and 25% combination feeding. The incidence of colic varied significantly among groups, with the lowest prevalence in exclusively breastfed infants (8%), followed by combination-fed infants (24%), and the highest in exclusively formula-fed infants (30%). These findings highlight a potential protective effect of breastfeeding against colic.

Table 2
Feeding Practices and Colic Incidence

Feeding Type	Proportion	Colic Incidence
Exclusive Breastfeeding	98 (40%)	8 (8%)
Exclusive Formula Feeding	86 (35%)	26 (30%)
Combination Feeding	62 (25%)	15 (24%)

Exclusively formula-fed infants had the longest mean crying duration (4.0 ± 1.2 hours/day) and the highest frequency of crying episodes per week (median: 5, IQR: 4–7). In contrast, exclusively breastfed infants exhibited the shortest crying duration (2.5 ± 0.8 hours/day) and lowest frequency (median: 2, IQR: 1–3). Combination-fed infants had intermediate values. Associated symptoms, such as gassiness and irritability, were most common in formula-fed infants (70%), compared to 50% in combination-fed and 30% in breastfed infants, indicating a correlation between feeding type and colic severity.

Table 3
Colic Characteristics by Feeding Type

Characteristic	Exclusive Breastfeeding	Exclusive Formula Feeding	Combination Feeding
Mean Duration of Crying (hours/day)	2.5 ± 0.8	4.0 ± 1.2	3.2 ± 1.0
Median Crying Episodes (per week)	2 (IQR: 1–3)	5 (IQR: 4–7)	3 (IQR: 2–5)
Common Associated Symptoms	Gassiness (30%)	Gassiness, Irritability (70%)	Gassiness (50%)

The duration of colic episodes differed across feeding groups. Infants fed exclusively with formula experienced colic for longer periods, with 30% having episodes lasting more than 4 weeks, compared to 20% of combination-fed infants and only 8% of exclusively breastfed infants. Shorter colic durations (<1 week and 1–2 weeks) were more common in breastfed infants (20% and 51%, respectively), reinforcing the link between breastfeeding and reduced colic severity and duration.

Table 4
Colic Duration Distribution by Feeding Type

Colic Duration (weeks)	Exclusive Breastfeeding	Exclusive Formula Feeding	Combination Feeding
<1 week	20 (20%)	10 (12%)	10 (16%)
1–2 weeks	50 (51%)	20 (23%)	20 (32%)
3–4 weeks	20 (20%)	30 (35%)	20 (32%)
>4 weeks	8 (8%)	26 (30%)	12 (20%)

DISCUSSION

The study aimed to evaluate the incidence of infantile colic in infants with varying feeding practices, including exclusive breastfeeding, exclusive formula feeding, and combination feeding. The findings revealed significant differences in the prevalence of colic and associated symptoms among the three groups, offering valuable insights into the potential role of feeding methods in influencing colic outcomes. The overall incidence of colic was 20%, with the highest prevalence observed in exclusively formula-fed infants (30%), followed by combination-fed infants (24%), and the lowest in exclusively breastfed infants (8%).[11] These results align with previous studies suggesting that breastfeeding may have a protective effect against colic. Breast milk provides numerous bioactive components, including immunoglobulins and oligosaccharides, that support gut health and reduce inflammation. In contrast, formula feeding may introduce proteins and additives that are harder for the infant's immature digestive system to process, potentially contributing to colic symptoms.[12] Colic characteristics, including crying duration and frequency of episodes, also varied significantly among the feeding groups. Exclusively formula-fed infants experienced the longest crying durations and the highest frequency of crying episodes per week, while exclusively breastfed infants had the shortest crying durations and lowest episode frequency. This further emphasizes the potential benefits of breastfeeding in mitigating colic symptoms. Combination-fed infants exhibited intermediate characteristics, reflecting a mixed influence of both breast milk and formula.[13] Associated symptoms such as gassiness, irritability, and back arching were most prevalent in the formula-fed group, further highlighting the challenges associated with formula feeding.[14] These findings underscore the importance of supporting breastfeeding practices whenever possible and providing appropriate guidance to parents who rely on formula feeding. Maternal and socioeconomic factors, including maternal age, education level, and family income, did not show a statistically significant association with colic incidence but may play an indirect role by influencing feeding choices and stress levels.[15] Educating mothers about the benefits of breastfeeding and addressing barriers to exclusive breastfeeding, such as maternal employment or lack of support, could further reduce the risk of colic. This study has several strengths, including a robust sample size and the use of Wessel's criteria for diagnosing colic.[16] However, it is not without limitations. The cross-sectional design limits causal inferences, and the reliance on caregiver-reported data may introduce recall bias. Future longitudinal studies are recommended to establish causal relationships and explore additional factors influencing colic, such as maternal diet during breastfeeding and the specific composition of formula.

CONCLUSION

It is concluded that exclusive breastfeeding is associated with a significantly lower incidence and severity of infantile colic compared to exclusive formula feeding and combination feeding. Breastfeeding appears to have a protective effect, likely due to its beneficial bioactive components that support infant gut health. Promoting breastfeeding and providing targeted support to families using formula may help reduce the burden of colic.

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