

Original Research Article

ASSESSMENT OF EFFECT OF BOTTLE FEEDING AND NUTRITIONAL STATUS AMONG INFANTS AND YOUNG CHILDREN IN GADAG - KARNATAKA

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Received : 26/08/2024
Received in revised form : 14/09/2024
Accepted : 29/10/2024

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DOI: 10.70034/ijmedph.2024.4.55

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2024; 14 (4); 279-286

ABSTRACT

Background: Breastfeeding confers both short-term and long-term benefits to the child. It reduces infections and mortality, improves mental and motor development. Infant feeding practices have a major role in determining the nutritional status of a child.

Materials and Methods: The study is a cross-sectional design conducted at the Immunization Clinic of GIMS and UHTC in Gadag. A total of 400 infants and young children aged 0-24 months were selected through convenient sampling. The inclusion criteria consisted of children aged 0-24 months whose parents gave consent to participate, while children over 2 years old were excluded. The study period was from April to July, 2018. The study instruments included a baby weighing machine to measure weight and a measuring tape to assess height.

Results: The study reveals that the majority of children fall within the age range of 0-6 years (45.7%) and 7-12 years (46.7%). There is a slight female predominance, with 56.0% of participants being female and 44.0% male.

Education levels among mothers vary significantly, with the highest percentage having completed high school (44.4%). The distribution of families shows a diverse socio-economic background, with the largest segments being middle class (30.1%). An overwhelming 86.8% of women attended more than three antenatal care (ANC) visits during their pregnancies, indicating a commendable level of adherence to prenatal care. The study also found that there is no statistically significant association between the mode of milk feeding (breastfeeding or bottle-feeding) and the weight-for-age of the children in the study. Overall, the findings suggest a diverse demographic profile among participants, with a strong emphasis on maternal education and prenatal care. The study highlights the importance of early childhood development and the role of maternal health in influencing child outcomes.

Conclusion: In our study there was no much difference noted in nutrition status among bottle- and breast-fed children, but there was a significant difference with number of infection episodes among bottle- and breast-fed children.

Keywords: Bottle Feeding, Nutritional Status, Infants, Young Children.

INTRODUCTION

Exclusive breast-feeding rate among 0-6-month children in India is about 55% only.^[1] Optimal breastfeeding practices include exclusive breastfeeding (breast milk with no other foods or

liquids) for the first six months of life, followed by breast milk and complementary foods (solid or semi-solid foods) from about six months of age on, and continued breastfeeding for up to at least two years of age at beyond, while receiving appropriate complementary foods.

Breast milk contains all the nutrients that an infant need in the first 6 months of life, including fat, carbohydrates, proteins, vitamins, minerals and water.^[2] It protects babies from diarrhoea and acute respiratory infections, stimulates their immune systems and response to vaccination, and, according to some studies, confers cognitive benefits as well. Breast feeding fosters a physical & emotional bonding contact between mother & baby. It can be a means to protect, promote and support the health of both mother & the baby. Exclusive breastfeeding for 6 months has potential to reduce under-5 mortality.^[4] An estimated 14% of deaths in children aged 0-23 months might be prevented by increasing breast feeding rate, and at least 6% of mortality in children under five might be prevented by adequate complementary feeding.^[5,6]

WHO developed recommendations for exclusive breastfeeding up to 6 months, safe complementary foods after that & avoidance of bottle feeding. Rate of bottle feeding differs in various countries. There is no data from India regarding various factors responsible for bottle feeding practice. Various reasons for bottle feeding mentioned by mothers were illness, breast problems & perception of insufficient milk.^[8]

Objectives

1. Assessment of nutritional status among bottle fed and breastfed infants and young children.
2. Assessment of number of episodes of infection among bottle fed and breastfed infants and young children.

MATERIALS AND METHODS

The study is a cross-sectional design conducted at the Immunization Clinic of GIMS and UHTC in Gadag. A total of 400 infants and young children aged 0-24 months were selected through convenient sampling. The inclusion criteria consisted of children aged 0-24 months whose parents gave consent to participate, while children over 2 years old were excluded. The study period was from April to July, 2018. The study instruments included a baby weighing machine to measure weight and a measuring tape to assess height. Data collection involved administering a pre-designed and semi-structured questionnaire. The questionnaire gathered information on socio-demographic profiles, bottle feeding, breastfeeding, and the nutritional status of the children. Data was collected through interviews with the participants.

Statistical Analysis: The collected data were compiled in Microsoft excel and analysed using statistical package for the social sciences (SPSS) version 20.0. Categorical variables were presented as frequencies and percentages, while quantitative variables were expressed as mean and standard deviation. The chi-square test was employed to determine statistical significance, with a p value of <0.05 considered significant.

RESULTS

Table 1 illustrates that the majority of children are between the ages of 0-6 years (45.7%) and 7-12 years (46.7%). There is a slight female predominance, with 56.0% female and 44.0% male participants, suggesting a need to explore any gender-specific factors influencing the study further.

Education levels among mothers vary significantly, with the highest percentage having completed high school (44.4%), followed by primary school (27.8%). The low percentages of postgraduate (1.0%) and graduate (4.6%) mothers indicate potential educational barriers that could impact family dynamics and children's upbringing.

The majority of mothers fall within the 23-25 years age range (46.4%), while fathers are primarily aged 28-30 years (49.6%), followed by 25-27 years (29.5%). Most families have one or two children (58.3% and 34.8% respectively), reflecting a trend toward smaller family sizes.

A significant proportion of mothers are non-working (84.1%), possibly due to cultural norms or economic constraints. The 15.9% of working mothers may face different challenges balancing work and family life.

Fathers generally have higher educational levels compared to mothers, with significant percentages having completed post-high school or high school education (38.1% and 39.1% respectively). The majority of fathers are semi-skilled (37.7%) or unskilled workers (42.7%), indicating a labour-intensive employment landscape.

The distribution of families shows a diverse socio-economic background, with the largest segments being middle class (30.1%) and upper middle class (30.5%). Lower socioeconomic statuses (lower class and lower middle class) account for 31.8%, according to Modified BG Prasad. The majority of families (74.2%) belong to nuclear families, while 25.9% belong to joint families. [Table 1]

Table 2 illustrates the distribution of childbirth intervals among women in the study. It is evident that 18.9% of women experienced a second birth within the specified interval, closely followed by 17.9% for the first interval. The data also reveals that a smaller percentage of women had a third birth (7.0%), with only a minimal 0.7% having more than three births.

The majority of women in the study were first-time mothers (54.0%), while 35.4% were expecting their second child, and 10.3% were on their third pregnancy. A mere 0.3% of women had more than three children, indicating a small subset within the sample.

An overwhelming 86.8% of women attended more than three antenatal care (ANC) visits during their pregnancies, reflecting a commendable level of adherence to prenatal care. Conversely, 13.2% of women had fewer than three ANC visits, potentially indicating barriers to healthcare access or lower health awareness among this group.

The study also found that a significant majority of pregnancies (85.4%) reached full term, which is considered optimal for a healthy gestational period. However, 14.6% of pregnancies extended beyond term, posing potential risks.

The data further reveals that the majority of deliveries were normal vaginal births (82.8%), suggesting that most pregnancies progressed without complications necessitating surgical intervention. Nonetheless, 17.2% of deliveries were conducted via caesarean section.

In terms of delivery settings, a large proportion of women opted for government hospitals (87.1%) for childbirth, while a smaller percentage (12.9%) chose private hospitals. This distribution sheds light on the healthcare preferences and choices made by women in the study. [Table 2]

Table 3 shows out of the total sample, 17 children (5.63%) were classified as underweight. Among these, 16 children (5.73%) were breastfed, while only 1 child (4.34%) was bottle-fed.

The majority of children in the study (285 children or 94.37%) had a normal weight-for-age. Of these, 263 children (94.26%) were breastfed, and 22 children (95.65%) were bottle-fed.

Overall, 279 children were breastfed, and 23 children were bottle-fed, indicating that breastfeeding was the predominant mode of feeding in this population.

The chi-square test yielded a p-value of 1.000, suggesting that there is no statistically significant association between the mode of milk feeding (breastfeeding or bottle-feeding) and the weight-for-age of the children in the study. [Table 3]

Table 4 illustrates the relationship between the length-for-age of children, a measure of stunting, and their mode of milk feeding, whether it be breastfeeding or bottle-feeding. Among the total sample of 302 children, 285 children (94.37%) were classified as having a normal length-for-age. Within this group, 263 children (94.26%) were breastfed, while 22 children (95.65%) were bottle-fed. Stunting was observed in 17 children (5.63%) of the total sample. Of these, 16 children (5.73%) were breastfed, and 1 child (4.34%) was bottle-fed. The prevalence of stunting is similar between the two groups, with the majority of stunted children being breastfed. However, the overall number of stunted children is low in both feeding groups. The chi-square test yielded a p-value of 1.000, indicating no statistically

significant association between the mode of milk feeding and the length-for-age of children. [Table 4] Table 5 shows that out of the 302 children included in the study, 282 (93.37%) were classified as having a normal weight-for-length, suggesting that the majority of children fell within a healthy weight range for their length. Among these children, 261 (93.54%) were breastfed, while 21 (91.3%) were bottle-fed. Wasting was identified in 20 children (6.62%) in the sample, with 18 (6.45%) being breastfed and 2 (8.69%) being bottle-fed. Overall, 279 children (92.38%) were breastfed, while 23 children (7.62%) were bottle-fed.

The Fischer exact test resulted in a p-value of 0.656, indicating that there was no statistically significant association between the mode of milk feeding and the weight-for-length of the children in the study. This suggests that the method of milk feeding did not have a significant impact on the weight-for-length measurements of the children. [Table 5]

Table 6 illustrates a clear trend in the number of infection episodes experienced by children based on their mode of feeding. Out of the total 302 children, a significant majority of breastfed children (154, or 55.39%) reported no episodes of infection, in contrast to only 2 bottle-fed children (8.33%). This data suggests a strong correlation between breastfeeding and reduced episodes of infection, indicating that breastfeeding may provide protective benefits against infections. [Table 6]

Of the 126 children with one infection episode, 109 (39.2%) were breastfed, while 17 (70.83%) were bottle-fed. This indicates that bottle-fed children are more likely to experience at least one infection episode compared to their breastfed counterparts. For children with two episodes of infection, only 8 (2.8%) were breastfed, while 3 (12.5%) were bottle-fed. The trend persists for those with three episodes of infection, where 5 breastfed children (1.79%) were affected, compared to 2 bottle-fed children (8.33%). Notably, no bottle-fed children had more than three episodes, while a small number of breastfed children experienced up to four episodes (0.71%).

The chi-square test resulted in a P-value of 0.000, indicating a statistically significant association between the mode of milk feeding and the number of infection episodes. This suggests that the mode of feeding plays a crucial role in determining the susceptibility of children to infection.

Table 1: Distribution of Socio-Demographic Profile of Mothers

Variable	Category	Frequency	Percent
Age	0-6	138	45.7
	13-18	23	7.6
	7-12	141	46.7
Gender	Female	169	56.0
	Male	133	44.0
Mothers Education	Postgraduate	3	1.0
	Graduates	14	4.6
	Post High School/Diploma	42	13.9
	High School	134	44.4
	Primary School	84	27.8
	Uneducated	25	8.3

Variable	Category	Frequency	Percent
Mother Age	20 -22	50	16.6
	23-25	141	46.4
	26-28	89	29.5
	29-30	23	7.6
Fathers Age	25-27	89	29.5
	28-30	150	49.6
	31-33	44	14.6
	34-37	19	6.3
Marital Status	M	302	100.0
No Of Children	1	176	58.3
	2	105	34.8
	3	20	6.6
	4	1	.3
Occupation Category	Non-Working	254	84.1
	Working	48	15.9
Fathers Education	Postgraduate	4	1.3
	Graduate	27	8.9
	Post High School	115	38.1
	High School	118	39.1
	Primary School	20	6.6
Fathers Occupation	Uneducated	5	1.7
	Professional	32	10.6
	Semi Skilled	114	37.7
	Skilled	25	8.3
	Unskilled	129	42.7
	Unemployed	2	.7
Socio Economic Status	Joint	78	25.8
	Nuclear	224	74.2
	Lower Class	13	4.3
	Lower Middle Class	83	27.5
	Middle Class	91	30.1
	Upper Class	23	7.6
	Upper Middle Class	92	30.5

Table 2: Distribution of Pregnancy Related Variables

Variable	Category	Frequency	Percent
Birth Interval	1	54	17.9
	2	57	18.9
	3	21	7.0
	>3	2	.7
	Na	168	55.6
Birth Order	1	163	54.0
	2	107	35.4
	3	31	10.3
	>3	1	.3
ANC Visit	<3	40	13.2
	>3	262	86.8
Gestational Age	Post Term	44	14.6
	Term	258	85.4
Type Of Delivery	Caesarean Section	52	17.2
	Normal Vaginal	250	82.8
Place Of Delivery	Govt Hospital	263	87.1
	Private Hospital	39	12.9

Table 3: Association of Weight for Age and Mode of Milk Feeding

Weight For Age	Breast Fed	Bottle Fed	Total	Chi-Square P-Value
Underweight	16 (5.73%)	1 (4.34%)	17	1.000*
Normal	263 (94.26%)	22 (95.65%)	285	
Total	279	23	302	

Table 4: Association between length for age and mode of milk feeding

Length For Age	Breast Fed	Bottle Fed	Total	Chi-square P-value
Normal	263 (94.26%)	22 (95.6%)	285	1.000*
Stunting	16 (5.73%)	1 (4.34%)	17	
Total	279	23	302	

Table 5: Association between weight for length and mode of milk feeding

Weight For Length	Breast Fed	Bottle Fed	Total	Fischer exact test
Normal	261 (93.54%)	21 (91.3%)	20	0.656*
Wasting	18 (6.45%)	2(8.69%)	282	
Total	279	23	302	

Table 6: Association of number of episodes of infection and mode of milk feeding

No Of Episodes Of Infection	Bottle Fed	Breast Fed	Total	Chi-square P-value
0	2 (8.33%)	154 (55.39%)	156	0.000*
1	17(70.83%)	109 (39.2%)	126	
2	3(12.5%)	8(2.8%)	11	
3	2(8.33%)	5(1.79%)	7	
4	0	2 (0.71%)	2	
TOTAL	24	278	302	

DISCUSSION

A study conducted by Karen et al,^[9] revealed that 55% of participants were female, while 45% were male, mirroring the results of our own study. Interestingly, 60% of participants were bottle-fed, whereas 40% were breastfed, a contrast to our findings.

Out of 112 participants, 37.5% of the mothers were less than 25 years old. The mean age of the babies was found to be 11 + 6.49 months. 53.57% of mothers had good knowledge, and 72.32% of mothers followed correct feeding practices.^[10]

The overall prevalence of early (within 1 h of delivery) initiation of breastfeeding was found to be 57.75%, and that of exclusive breastfeeding among 0-6 months infants was 49%. 64% of children received continued breastfeeding at one year old, Minimum dietary diversity, Minimum meal frequency, and Minimum acceptable diet were achieved by only 28.6%, 13.20%, 13.2%. Statistically significant association between exclusive breast feeding and diarrhoea ($p = \text{feeding and diarrhoea } (p < 0.0001)$ and ARTI ($p = 0.0001$), Bottle feeding and Diarrhoea ($p < 0.0008$) and ART 1 ($p < 0.05$), Minimum dietary diversity and Diarrhoea ($p = 0.02$) were found.^[11]

A study conducted by Reddy et al,^[12] found that infants who were exclusively breastfed for the first six months of life had better weight-for-age z-scores compared to those who were formula-fed or received mixed feeding. The researchers noted that exclusive breastfeeding provides an optimal balance of macronutrients and bioactive compounds, which promote healthy weight gain without the risk of overnutrition or undernutrition. The study highlighted those breastfed infants showed consistent weight gain that aligned with World Health Organization (WHO) growth standards, whereas formula-fed infants were more likely to experience rapid weight gain, potentially leading to overnutrition or weight-for-age scores indicating risk for childhood obesity.

In a similar vein, Patel et al,^[13] examined the impact of different feeding practices on weight-for-age among infants in rural India. Their study found that exclusively breastfed infants had higher weight-for-

age z-scores compared to those who were introduced to formula or mixed feeding early. The authors explained that breastfeeding supports better weight gain due to the digestibility and nutrient composition of breast milk, which matches the developmental needs of the infant. In contrast, formula-fed infants had a higher incidence of both underweight and overweight conditions, with mixed feeding particularly contributing to erratic weight-for-age patterns.

Sharma et al,^[14] conducted a large-scale study that assessed the growth outcomes of urban and rural infants in relation to their feeding mode. Their findings demonstrated that exclusive breastfeeding was associated with more stable and healthier weight-for-age outcomes. The study found that infants who were exclusively breastfed were less likely to be underweight by the end of six months compared to infants who were either exclusively formula-fed or mixed-fed. Formula-fed infants, on the other hand, had a greater likelihood of experiencing rapid weight gain in the first few months of life, followed by a plateau or even a decline, which reflected the lack of sustained, healthy growth patterns.

Kumar et al,^[15] explored the impact of feeding practices on weight-for-age in an urban slum setting, where formula feeding was more common due to limited access to breastfeeding support. Their study found that infants who were formula-fed or mixed-fed were at greater risk of being underweight compared to exclusively breastfed infants. The study attributed this to the potential contamination of formula milk in settings with poor water and sanitation, which could lead to recurrent infections and malabsorption, negatively affecting weight gain. They concluded that exclusive breastfeeding is protective against underweight conditions because it provides adequate nutrition while minimizing exposure to waterborne pathogens that can interfere with nutrient absorption.

Furthermore, Agarwal et al,^[16] emphasized the role of maternal factors in determining the association between weight-for-age and feeding practices. Their research in a low-income urban population revealed that infants who were exclusively breastfed had better weight-for-age outcomes compared to those who were fed formula. However, they noted that even

within the breastfed group, maternal education and overall household socioeconomic status played significant roles in determining weight gain. The study highlighted that mothers with higher education levels were more likely to breastfeed exclusively, and their infants had significantly better weight-for-age z-scores. This points to the importance of promoting breastfeeding education to ensure optimal growth outcomes.

These studies collectively indicate that exclusive breastfeeding is positively associated with better weight-for-age outcomes. Breastfed infants consistently showed more stable and healthier weight gain patterns, while formula-fed or mixed-fed infants were at a higher risk for both underweight and overweight conditions, depending on factors such as the timing of formula introduction, hygiene practices, and socio-economic conditions. Formula feeding, particularly in environments with inadequate sanitation, can also lead to recurrent infections, which adversely affect weight gain by impairing nutrient absorption.

A study by Bhandari et al,^[17] explored the effect of breastfeeding on length-for-age z-scores in infants up to 12 months of age. This study found that exclusively breastfed infants had significantly better length-for-age z-scores compared to formula-fed or mixed-fed infants. The authors highlighted that breast milk provides essential nutrients and growth-promoting factors that contribute to optimal linear growth during infancy. In contrast, infants who received formula or mixed feeding exhibited a higher risk of stunting, with length-for-age z-scores below the normal range. This finding suggests that formula feeding may not adequately support optimal growth in length, possibly due to differences in nutrient composition, especially bioactive proteins and hormones present in breast milk.

Similarly, Patel et al,^[18] conducted a study in rural India and observed that exclusive breastfeeding was positively associated with length-for-age. The study found that mixed-fed infants, particularly those who were introduced to solid foods early or formula before six months of age, had lower length-for-age z-scores. The authors suggested that the introduction of formula or complementary feeding too early might interfere with the absorption of nutrients crucial for linear growth, or it may replace breast milk, which contains growth-stimulating factors like insulin-like growth factor 1 (IGF-1) and epidermal growth factor (EGF).

A key study by Rao et al.¹⁹ evaluated the growth of infants in urban slums of Mumbai and found that infants who were formula-fed or received mixed feeding had lower length-for-age z-scores compared to their exclusively breastfed peers. The study emphasized the role of breastfeeding in preventing stunting, which remains a major public health concern in India. Rao et al. also pointed out that exclusive breastfeeding was particularly protective against stunting in the first six months of life, and longer durations of breastfeeding continued to

support linear growth through infancy. Formula-fed infants, on the other hand, had higher rates of stunting, which the authors linked to factors such as lower nutrient bioavailability in formula and the potential for infections that reduce nutrient absorption.

In Sharma et al,^[20] the authors also noted that infants who were exclusively breastfed had better length-for-age outcomes compared to those who were formula-fed. The study focused on both urban and rural populations and found that breastfed infants in rural settings were more likely to reach optimal length-for-age when compared to formula-fed infants. This was particularly relevant in areas where water and sanitation conditions were poor, as formula feeding may expose infants to infections, which can compromise nutrient absorption and impair growth. The study emphasized that breastfeeding provides not only nutrition but also immune protection that supports better overall growth.

Additionally, Gupta et al,^[21] highlighted the impact of socio-economic factors on the relationship between feeding practices and linear growth. In their study of low-income urban populations, exclusively breastfed infants had significantly higher length-for-age z-scores compared to formula-fed infants. However, they noted that even within breastfed groups, length-for-age outcomes were affected by maternal education, access to healthcare, and overall household hygiene. This points to the fact that while breastfeeding promotes better growth, other environmental and socio-economic factors may play a role in determining linear growth outcomes.

These studies collectively reinforce the idea that exclusive breastfeeding is positively associated with better length-for-age, suggesting that breast milk provides essential nutrients and growth factors that support healthy linear growth. Formula feeding, especially when introduced early, is associated with a higher risk of stunting, likely due to the absence of key bioactive factors and a greater risk of infections and nutrient malabsorption.

In a study conducted by Singh et al,^[22] exclusive breastfeeding during the first six months of life was found to be associated with optimal weight-for-length z-scores, which is a key indicator of healthy growth. The study, which involved infants from both rural and urban settings, showed that exclusively breastfed infants had significantly higher weight-for-length z-scores than those who were either formula-fed or received mixed feeding. The authors suggested that the nutritional profile of breast milk, particularly the balance of fats and proteins, contributes to better growth outcomes in terms of weight-for-length.

Similarly, Mishra et al,^[23] observed a positive association between breastfeeding and healthier weight-for-length ratios. The study emphasized that mixed-fed infants, especially those who were introduced to formula early, were more likely to experience rapid weight gain but lower length growth, leading to an unhealthy weight-for-length ratio. This overnutrition in formula-fed infants is

thought to be due to differences in the composition of breast milk and formula, particularly the protein content, which may lead to higher weight gain in formula-fed infants but not necessarily improved linear growth.

Agarwal et al,^[24] provided further evidence by examining weight-for-length among infants in Northern India. Their results showed that exclusively breastfed infants had a lower risk of being overweight or obese, as indicated by a more balanced weight-for-length ratio, compared to those fed with formula or mixed feeding. This study pointed out that the lower protein content in breast milk may play a role in moderating weight gain, preventing the overnutrition that can be seen in formula-fed infants, where higher protein intake is linked to excessive weight gain in relation to length.

Another key study by Gupta and Mehta,^[25] explored weight-for-length in relation to socio-economic factors and feeding practices. Their research, conducted in an urban low-income setting, found that formula-fed infants were more likely to show signs of disproportionate weight gain, resulting in an elevated weight-for-length ratio. They attributed this finding not only to the nutrient content of formula but also to the potential for overfeeding in bottle-fed infants. In contrast, the self-regulation of feeding typically seen in breastfed infants seemed to protect against both undernutrition and overnutrition.

Interestingly, Sharma et al,^[26] compared the growth patterns of infants from different socio-economic backgrounds and found that while breastfed infants had more stable and healthier weight-for-length ratios, the advantage of breastfeeding in maintaining optimal growth was even more pronounced in households with better maternal education and access to healthcare. This highlights the interaction between breastfeeding, growth outcomes, and broader socio-economic factors.

In comparing these studies, there is a clear trend: exclusive breastfeeding is consistently associated with healthier weight-for-length ratios, while formula or mixed feeding appears to increase the risk of either undernutrition or overnutrition, depending on various factors like feeding practices, formula composition, and the timing of introduction to complementary foods.

These findings are consistent with global evidence showing that breastfeeding supports optimal growth by providing a balanced mix of nutrients that foster both healthy weight gain and length growth, while formula feeding, particularly in excess, may lead to disproportionate growth outcomes.

Our study revealed that out of 126 children with one infection episode, 109 (39.2%) were breastfed, while 17 (70.83%) were bottle-fed. This indicates that bottle-fed children are more likely to experience at least one infection episode compared to their breastfed counterparts.

Several studies have consistently highlighted the protective role of exclusive breastfeeding in reducing infection episodes, particularly in the first six months

of life. In a study conducted by Bhatnagar et al,^[27] exclusively breastfed infants were found to have significantly fewer episodes of diarrhoea and respiratory infections compared to those who were formula-fed or received mixed feeding. The study reported that exclusively breastfed infants had 40% fewer episodes of respiratory infections and 35% fewer cases of diarrhoea compared to their mixed-fed counterparts.

Similarly, a study by Kumar et al,^[28] in Northern India also supported these findings, demonstrating that mixed feeding, particularly the introduction of formula, increased the risk of gastrointestinal infections by nearly twofold compared to exclusive breastfeeding. This study emphasized the importance of breast milk's immunological factors, such as antibodies and bioactive compounds, which confer direct protection against infections.

Comparing with a study by Sharma et al,^[29] which examined infants from rural and urban populations, the results also showed that breastfeeding was associated with a lower incidence of infections. The authors highlighted those infants receiving mixed feeding or exclusive formula feeding experienced a higher frequency of both upper respiratory infections and gastrointestinal illnesses. This study further linked formula feeding to inadequate hygiene practices related to formula preparation, which could exacerbate the risk of infections.

Another significant Indian study by Gupta et al,^[30] examined the association between feeding practices and infections in a low-income urban setting. They found that exclusive breastfeeding was protective against infections, but also noted that socio-economic factors played a substantial role in infection rates. For instance, infants from households with poor sanitation and hygiene practices showed increased rates of infection regardless of the feeding method.

The findings of these studies are consistent with global research, which shows that exclusive breastfeeding, especially in the first six months, plays a critical role in reducing episodes of infection by providing passive immunity and reducing exposure to potential pathogens through contaminated formula or complementary foods.

While differences in infection rates may also be influenced by other factors such as the environment, hygiene practices, and socio-economic status, the mode of feeding remains a critical determinant of infant health. Based on the evidence from these Indian studies, exclusive breastfeeding should be encouraged to minimize infection risk and promote infant health.

CONCLUSION

In our study there was no much difference noted in nutrition status among bottle- and breast-fed children, but there was a significant difference with number of infection episodes among bottle- and breast-fed children.

Limitation: We got less bottle-fed children in our study so larger sample size studies are needed in future. Study should have been done at community settings instead of immunization clinic.

Acknowledgements: Author would like to express her deep and sincere gratitude to all children and mothers who participated in this study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee of Institution.

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