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Original Research Article

Investigating atopic dermatitis and evaluating the influence of breastfeeding on infants in South Indian region

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ABSTRACT

Background: Atopic dermatitis (AD) is a common inflammatory skin condition affecting infants globally, including in India. Its prevalence is rising, with formula-fed infants showing higher rates than breastfed ones. Breastfeeding provides numerous benefits, including optimal nutrition and immune protection. Although several studies have explored the link between breastfeeding and AD, the evidence is inconsistent. This study aims to assess the prevalence of AD among Indian infants in the Srikakulam region and examine the effect of exclusive breastfeeding (EBF) and formula feeding on AD rates.
Methods: This cross-sectional study used convenience sampling to collect data from 180 guardians of infants aged 0-6 months in the Srikakulam region, Andhra Pradesh, from April to June 2024. Data on demographics, feeding practices, and AD diagnoses confirmed by pediatricians were gathered through an electronic questionnaire. Analysis was done using SPSS V.21.0 with chi-square and correlation tests.
Results: Among the 180 infants, 72.2% had AD. A significant gender difference was observed, with 85 males and 45 females affected ($p<0.05$). Most AD cases were found in the 4-8 month age group. EBF was practiced in 30% of infants, while 70% were formula-fed. Formula-fed infants had more hospitalizations.
Conclusions: This study shows a high prevalence of AD in the Srikakulam region, with males more affected. EBF may offer protection against severe AD, emphasizing the need for public health efforts to promote EBF. Further research is needed to deepen understanding.

Keywords: Atopic dermatitis, Breastfeeding, Cross-sectional study, Eczema, Exclusive breastfeeding, Infant health, Infant nutrition, Immune protection

INTRODUCTION

Atopic dermatitis (AD) is a prevalent inflammatory skin condition affecting infants and children globally, including in India. The prevalence of AD has been rising worldwide, including in India, where it is estimated to affect up to 20% of children under the age of six years. Notably, the prevalence of AD is higher in formula-fed infants compared to breastfed infants, suggesting that breastfeeding may offer a protective effect against the

development of AD.[1] The etiology of AD is multifactorial, involving genetic, environmental, and immunological factors. Higher prevalence rates in developed countries further suggest that lifestyle factors play a significant role in its development.

Breastfeeding offers numerous benefits for both mother and infant, including optimal nutrition and immune protection.[3] The World Health Organization recommends exclusive breastfeeding (EBF) for the first six months to support optimal growth and development and to reduce the risk of infectious diseases and other health conditions. Breast milk contains cytokines and growth factors essential for the development of the infant's immune system.[4,5] Various studies have explored the relationship between breastfeeding and AD, though the evidence remains inconsistent. For instance, a meta-analysis of 21 studies found that EBF for at least four months was associated with a reduced risk of AD (odds ratio [OR] 0.68; 95% confidence interval [CI] 0.62-0.75).[6] However, some studies have found no significant association between breastfeeding and AD.[5]

Research examining the association between breastfeeding and AD among Indian infants is limited. One study indicated that EBF for at least six months was associated with a lower risk of AD (OR 0.14; 95% CI 0.03-0.67).[7] Another study conducted in Jeddah, India, found that EBF for at least six months was linked to a reduced risk of eczema (OR 0.44; 95% CI 0.21-0.94).[6] The immunological properties of breast milk, such as the presence of immunoglobulin A (IgA), which protects against infections and allergens, are thought to contribute to the reduced risk of AD. IgA also modulates the gut microbiota, which plays a role in the development of AD.[8] Nevertheless, the evidence for this association remains inconsistent, and few studies have focused on Indian infants. The duration of EBF may also be crucial in reducing the risk of AD. For example, a study in the United States found that longer EBF was associated with a lower risk of AD (OR 0.89 per month; 95% CI 0.82-0.97).[8] Similarly, a study in Japan found that EBF for at least six months was associated with a lower risk of AD (OR 0.70; 95% CI 0.52-0.93).[9]

Despite numerous studies reporting the protective effect of breastfeeding against AD, research on this topic is limited in India, particularly in the Srikakulam region, Andhra Pradesh. This region experiences harsh summers with no humidity, where temperatures can reach 49 degrees Celsius. Research indicates that high temperatures with less humid air can cause the early onset of eczema, leading to AD.[10] Thus, this research proposal aims to investigate the effect of breastfeeding on the incidence of AD among Indian infants up to six months old in the Srikakulam region.

This study aimed to investigate the prevalence of AD among Indian infants in the Srikakulam region, based on guardians' reports, and to assess the impact of EBF and formula feeding on the prevalence of AD in this population.

METHODS

This cross-sectional study collected data through convenience sampling. Data were gathered from 180 guardians of Indian infants, both girls and boys aged 0-6 months, living in the Srikakulam region. Data collection sites included maternity hospitals, children's hospitals, and primary health care centres in the Srikakulam region, Andhra Pradesh, based on the researchers' convenience. The study was conducted from April 2024 to June 2024.

The sample size was not determined by a definite population, as the AD population had not been previously studied in the region. The age limit for EBF ranges from 4 to 6 months according to World Health Organization and European recommendations. Data were collected using a well-structured, pre-designed, validated electronic questionnaire from a similar previous study.[10] The questionnaire comprised three sections. Section one included questions related to demographics (such as gender, age of the infant, guardian education, and residency), section two contained questions related to feeding practices (exclusive or non-EBF), and section three consisted of questions about the onset of AD among infants and the risk factors. Paediatricians confirmed and diagnosed positive cases of AD after receiving approval from the mothers. Data were collected using the electronic questionnaire through one-to-one interviews with the participants' parents at the maternity and children's hospitals and primary health care centres in the Srikakulam region.

Data were analysed using the Statistical Package for Social Sciences (SPSS, V.21.0. IBM). Descriptive analysis was used to calculate the mean, frequency, and percentage for demographic variables. A chi-square and correlation test were performed to find the association of AD with gender and age. The association of AD risk factors with feeding practices was also analysed using the chi-square test. A p-value of less than 0.05 was considered significant.

Online consent was obtained from all participants. The questions were posed in Telugu, and consent was secured accordingly. Participants were given full autonomy to decide whether to participate. The confidentiality of participants' personal data was strictly maintained throughout the study.

RESULTS

In this study, 180 infants were taken as a sample, and data were collected from their guardians. Based on the guardian details, 75 (41.7%) mothers were aged 26-35. There were 79 (43.9%) parents with kinship relations and 148 (82.2%) parents who lived in Srikakulam Region, Andhra Pradesh. Based on the educational level, 126

(70%) guardians had studied for a bachelor's degree (Table 1).

Table 1: Demographic details of guardians (n=180).

Characteristics	N	Percentages
Mothers' age (in years)		
19-25	20	11.1
26-35	75	41.7
36-40	40	22.2
41-45	30	16.7
Older than 45	15	8.3
Is there a kinship relationship between parents?		
Yes	79	43.9
No	101	56.1
Place of living		
Inside Srikakulam region	148	82.2
Outside Srikakulam region	32	17.8
The guardian's educational level		
Secondary school	25	13.9
Bachelor's	126	70
Master's	24	13.3
Ph.D.	5	2.8

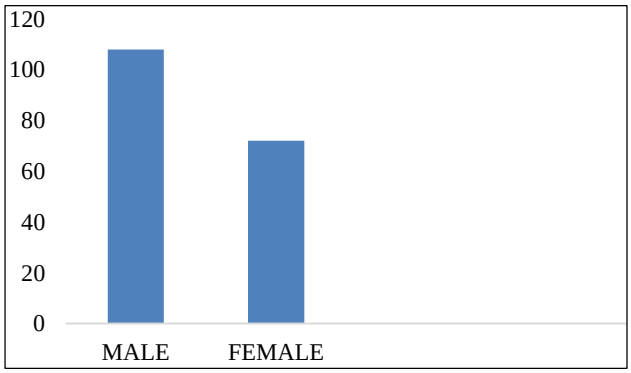

Figure 1: Gender distribution of infants.

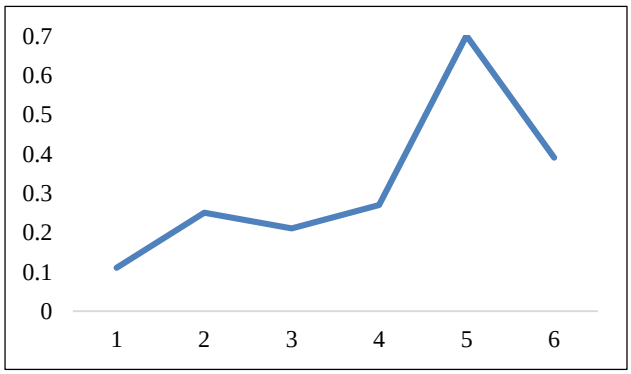

Figure 2: Age distribution curve of the infants.

There were 108 (60%) male infants and 72 (40%) female infants (Figure 1). Among the infants, 123 (68.3%) were aged 5-6 months, 45 (25%) were 4-8 months, and 22 (12.2%) were only 1-2 months old (Figure 2). Regarding the prevalence of eczema, 130 (72.2%) infants were diagnosed with atopic dermatitis (AD) based on guardians' perceptions. The age of the infant at the time of diagnosis was 4-8 months for 69 (38.3%) infants, 5-6 months for 39 (21.7%) infants, and 1-2 months for 22 (12.2%) infants (Table 2).

Table 2: Gender and age distribution of infants.

Variables	N	Percentages
Baby's gender		
Female	72	40
Male	108	60
Baby's age (in months)		
1-2	22	12.2
4-8	45	25
5-6	123	68.3

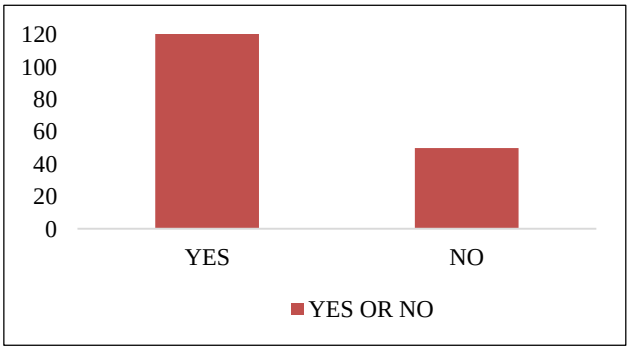

Figure 3: Prevalence of AD in infants.

Further, the question was asked if the infant was ever diagnosed with AD. Responses reported that 130 (72.2%) were diagnosed with AD, and 50 (27.8%) were not diagnosed with AD by the dermatologist. Out of the 50 infants, there were 28 (15.6%) females and 22 (12.2%) males, and among the 130 AD cases, there were 45 (25%) females and 85 (47.2%) males with a $p<0.05$ reporting a significant difference of AD onset among both genders. As per the age distribution for the 4-6 months old age group, 38 (21.1%) of infants didn't have eczema, and 85 (47.2%) had eczema, but no significant difference was found between the age group and AD prevalence (Figure 3 and Table 3).

Table 3: Gender and age distribution of infants based on AD diagnosis.

Variables	Eczema (Yes)	Eczema (No)	Chi-square	P value
Gender				
Female	45	28	8.46	0.003
Male	85	22		
Age (in months)				
1-2	3	19	3.98	0.139
3-4	12	33		
5-6	40	78		
4-6	69	38		

Guardians were asked about the means of infant nutrition. 54 (30%) infants were on exclusive breastfeeding (EBF), and 126 (70%) infants were non-EBF (Figure 4).

A chi-square test was performed to find the association of infant nutrition with the risk factors for AD. Multiple factors were studied, such as mother's vitamin intake, allergies in parents and infants other than AD, frequency of allergic reactions, hospitalization, and number of feeds. Results presented a significant relation between infant nutrition, such as EBF, and non-EBF intake with hospitalization of infants because of AD. Other factors were not significantly associated (Table 4).

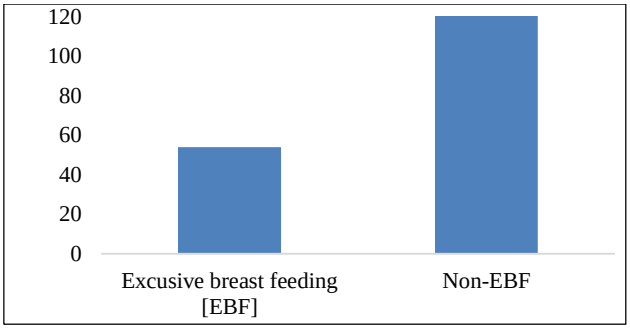

Figure 4: Distribution of infants based on infant nutrition.

Table 4: Association of infant nutrition with risk factors of AD.

Variables	Breast fed infants (n=54)	Formula fed infants (n=126)	Chi-square value	P value
Vitamin intake during pregnancy				
No	10	20	2.81	0.076
Yes	44	106		
Parental allergy history				
No	34	80	2.33	0.089
Yes	20	46		
Other allergies in parents				
Allergic rhinitis	10	20	6.61	0.085
Asthma	5	6		
Eczema	9	15		
Nothing	30	85		
Frequency of feed				
3-4 times	4	10	1.4	0.7
5-6 times	20	40		
7-8 times	20	35		
More than 8 times	10	41		
Other allergies in infants				
No	24	72	0.85	0.22
Yes	30	54		
Atopic in past months				
No	10	30	0.87	0.22
Yes	44	96		
Frequency of eczema				
1-2 times	15	30	4.65	0.19
3-4 times	20	30		
5-6 times	9	10		
More than 6 times	10	55		
Hospitalization because of eczema				
1-2 times	10	12	67.9	0
3-4 times	3	7		
5-6 times	4	10		
More than 6 times	37	97		
Dermatological consultation				
No	6	15	0.44	0.33
Yes	48	111		

DISCUSSION

Our study explored the prevalence and predictors of AD in Indian infants (residing in the Srikakulam region) up to 6 months old, with a particular focus on the potential protective effect of EBF. The findings provide valuable insights into this population and contribute to the ongoing discussion on breastfeeding and AD prevention. The prevalence of AD in our study was 67%, consistent with reports from other regions.

A similar study was conducted in the Makkah region of Saudi Arabia, where the data was collected from 200 infants aged up to 6 months. According to their results, the overall prevalence of AD was 53%, making 106 positive cases, out of which 43 were on EBF and 63 were on non-EBF. This study found a significant difference in the onset of AD based on infant feeding practices.[11] Results from the current study support the findings of the previous studies, whereas the overall prevalence in the current study was 72.5%, and out of 145 cases, 62 were on EBF, and 83 were non-EBF. These findings underscore the importance of promoting and supporting sustained EBF during the early months of life. The precise mechanisms by which breastfeeding might protect against AD are still under investigation. Potential explanations include the transfer of maternal antibodies and immune modulators.

Furthermore, this study focused on the risk factors of AD, early age as infancy, parental history of allergies, frequency of feedings, frequency of AD episodes and the frequency of hospitalisation because of AD studied among both infants who were on EBF and non-EBF. It was seen that non-EBF infants had more hospitalisation time than EBF infants. This concluded that EBF can reduce the severe cases of AD. A multinational survey study was conducted where the data from Europe and North America revealed that parental history of asthma and other allergies can result in the onset of AD in their offspring. In the current study, no such association was found.[12]

It has been seen that with age, the prevalence of AD decreases. As they get older, many children with AD may no longer experience their symptoms. Eventually, they may also acquire respiratory allergies such as asthma and rhino-conjunctivitis. Numerous cross-sectional and longitudinal investigations conducted in innumerable nations have substantiated the natural course of AD. In general, young children with AD tend to have more severe and persistent cases, especially if they have certain risk factors, such as genetics. However, in the current study, age was not significantly associated. This study only collected data from infants, so the variation in age groups can be studied in future research. This study found that the onset of AD was significantly higher among Indian male infants than female infants. A study conducted on 1005 infants in the US supports the findings of the current study as they also reported that the male gender is significantly associated with the onset of AD in the first six months of life.[13,14]

Given the potential protective effect of EBF observed in our study, several implications for public health interventions emerge. Promoting and supporting EBF practices, educational programs, lactation counselling, and community support groups can empower mothers to initiate and sustain EBF during the critical early months. Early identification and management of AD, implementing routine infant screening programs for AD risk factors and providing timely access to dermatological care can improve outcomes for affected infants. Tailoring interventions to specific populations: Our findings highlight the importance of culturally sensitive interventions that address local breastfeeding practices and the particular needs of the Indian population.

This study has few limitations. Recall bias is possible, and this study has a relatively small sample size. The data collection location can also limit the study, as in a hospital setting, mostly health-compromised infants are present. Future research with larger cohorts and longitudinal designs is needed to confirm the findings further and elucidate the underlying mechanisms of protection. Additionally, investigating the effectiveness of targeted interventions to promote EBF and prevent AD in this population would be of significant value.

CONCLUSION

This study highlights the uprising health problem of AD among Indian infants and concludes that male infants are more prone to getting AD in the early six months of life. It provides compelling evidence for the potential protective effect of EBF against AD in Indian infants. These findings encourage developing and implementing comprehensive public health strategies to promote optimal breastfeeding practices and potentially mitigate the burden of AD in this region. Further research is crucial to expand our understanding of this relationship and optimise interventions for mothers and infants.

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

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