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A CLINICAL AND IMMUNOLOGICAL COMPARATIVE STUDY ON 522 BREAST-FED CHILDREN

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ABSTRACT

Until now, there have been various studies concerning bottle-fed and breast-fed children. Prevalence of allergic manifestations like eczema and asthma among bottle-fed children is much higher than healthy controls.

In this study, we found that respiratory infection for breast-fed children was 3.1%, whereas in bottle-fed children it was 25.1%;for gut disorders, 9.2% in breast-fed vs.13.1% for bottle-fed children; eczema 22.9% in breast fed and 33.3% in bottle-fed children; while asthma was 14.5% in breast-fed and 26% in bottle-fed children.

We conclude that prevalence of respiratory, allergic and GI tract infections are much higher in bottle-fed infants than in breast-fed ones. This is somewhat in contradiction to that of American and European reports.

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INTRODUCTION

To date, various articles and reports have been presented in the literature on satisfactory results of breast-feeding and the disorders consequent to bottle-feeding.[1]

Prevalence and incidence of allergic manifestations such as eczema and asthma in the atopic bottle-fed children are reported by Soothill (Lancet, 1976) to be higher than healthy controls breast-fed by their mothers.[1] In this relation, children with atopic manifestations treated with allergic diets such as egg and cow's milk were clinically manifested as allergics and upon omission of such foods from their diets, remission of clinical signs and symptoms was noted.

The thin intestinal mucosa of infants causes rapid transport of cow's milk macromolecules into the blood-stream; therefore IgE and IgG levels rise to the cow's milk proteins and contributes to the development of allergies and in turn will help the child contract allergies in later years.

The incidence of skin, respiratory and digestive tract infection among the bottle-fed infants and their frequent hopitalization and medical consultation have given rise to economic problems for their families.

Furthermore, import of powder-milk places a burden on foreign exchange expenditure of third-world countries.

On the basis of the afore-mentioned points, the

Table I. Allergic Manifestations in 154 Atopic Children.

Clinical findings	Number	Percent
Respiratory infection	140	90%
Gastrointestinal	20	12.9%
Skin manifestations	83	53.8%
Brochial asthma	91	61.%

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Table II. Clinical Data in 368 Non-atopic Children.

Clinical Findings	Number	Percent
Respiratory infection	59	16%
GI manifestations	39	10.5%
Eczema	67	18.2%
Bronchial asthma	40	10.8%

Table III. Allergic Manifestations in 96 Breast-fed Infants.

Clinical Findings	Number	Percent
Respiratory infection	3	3.2%
GI disorders	9	9.3%
Eczema	22	22.9%
Asthma	14	14.5%

plans for a study of bottle-fed infants and the comparison of their clinical consequences with breast-fed infants was implemented at the Allergy and Immunology Department of the Children's Medical Center.

MATERIALS AND METHODS

Prevalence of skin, pulmonary, and gastrointestinal abnormalities among two groups of patients totalling 522 cases was studied at the Allergy and Immunology Department of the Children's Medical Center.

In this study, questionnaires to register the past history of atopy in the patient or his family and past record of infection and immunodeficiency were obtained and then by physical examination, the children's somatic and intellectual growth were evaluated. Routine laboratory and immunological examinations such as CBC, eosinophil count, measurement of immunoglobulins by Manchini's RID method,[3] measurement of total IgE by ELISA, T-cell count by rosette formation, and B-cell count by SMIG were estimated. Also the patients who had recurrent infection were tested for chemotaxis by the method of Boyden and Chamber,[4] and opsonization by Levinsky's method.[5]

In addition, determination of IgG to main proteins of cow's milk such as x-lactoalbumin, b-lactoglobulin, BSA, and BGG were done by plate-agar double diffusion method. The patients were examined and followed-up once a week and the results obtained are as follows:

1- From the number of infants suffering from disease, 21 cases had been reported as breast-fed and 133 cases had been bottle-fed.

2- Out of the non-atopic infants, 75 cases were breast-fed and 293 cases bottle-fed.

3- Out of a total of 522 cases under study, 154 cases were atopic and 368 cases non-atopic.

4- Out of 522 children under study, 96 cases have been reported as breast-fed and the rest have been reported as bottle-fed or a combination of both.

5- Manifestations of allergy and signs of infection in 154 cases of atopic infants are shown in Table I.

6- Manifestations of allergy and infection in 358 cases of non-atopic infants is represented in Table II.

7- Manifestations of allergy plus signs of infection in 96 breast-fed infants are shown in Table III.

8- Manifestations of allergy and signs of infection in 426 cases of bottle-fed infants are shown in Table IV.

9- Decrease in secretory IgA concentration which is an important factor in mucosal defense has been demonstrated in Table V in bottle-fed infants (including atopic and non-atopic groups).

10- Considering that eosinophilia is a good marker in the allergic and atopic individuals, today considerable attention is focused on degranulation and secretion of these cells in production of Charcot-Leyden crystals and destruction of cilia via the proteins known as major basical protein (MBP). Also, the neural-damage by certain toxins secreted via the eosinophils and neurotoxin has been documented by different researchers. Thus we included a study on the patients' eosinophils, presented in Table VI.

11- Finally, in Table VII, prevalence of allergy and infections of skin, pulmonary and gastro-intestinal tracts, in two separate groups of breast-fed and bottle-fed infants have been compared.

DISCUSSION

Although there exists a contradiction in the American and European reports in relation to the effects of cows milk allergy and thus its superiority to mother's milk, according to our study, it is clear that bottle-fed infants have an increased susceptibility to respiratory infections such as bronchiolitis and respiratory syncytial virus (RSV) and incidence of such infections in breast-fed infants is much lower than control groups. Data show its rate varies from 14% in breast-fed infants to 26% in bottle-fed infants.

In addition to the above, respiratory infections such as pneumonia in breast-fed children is 3.1% and up to 25% in bottle-fed children.

Prevalence of gastrointestinal infections as gastroenteritis and recurrent diarrhea in breast-fed infants is only 9.2% and these recovered without any com-

Table IV. Allergic Manifestations in 426 Bottle-fed Infants.

Clinical Features	Number	Percent
Respiratory infection	107	25.1%
GI disorders	56	13.1%
Eczema	142	33.3%
Asthma	111	26%

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Table V. IgA Deficiency in Atopic and Non-atopic Children.

Group	Numbers	Percent
Atopic (low IgA)	74	74.7%
Non-Atopic	25	25.2%

plication noted. However, this rate is 13.1% in bottle-fed infants and occasionally the infection is longer and accompanied by malnutrition.

The most important finding in this study is the prevalence of dermatologic diseases like eczema and urticaria in 33% of bottle-fed infants in contrast to 22% of breast-fed infants.

Furthermoe, in patients with atopy, IgA deficiency causes increased incidence of allergy and eczema in subsequent years, and this is due to free-entry of allergen macromolecules into the circulation; also one of the factors contributing to increased incidence and susceptibility to allergy in atopic bottle-fed infants is cell-mediated immunodeficiency, deficiency or defect in T-cell function, decreased T-suppressor cell function and augmented T-helper cell activity. However, disorders of chemotaxis and phagocytosis had caused the bottle-fed infants and atopic cases with recurrent infections and apparent malnutrition to develop vicious cycle. In addition, deficiency in trace elements such as zinc, iron and vitamins also occur and are complementary to the vicious cycle, thus creating the infection-immunity-nutrition triangle in such a way that after omission of allergens and with a well-established nutritional status, the malnutrition will be corrected and infections will be under control if allergic manifestations subsided.

One of the interesting findings is the development of clinical manifestations in bottle-fed children who are dependent on bottle-feeding. As it is concluded from this study, firstly from the mental point of view, these children have changes in behavioral pattern; second, their teeth developed early decay; third, they became adapted to mouth-breathing; fourth, due to repeated aspiration of milk in their respiratory tract, they developed aspiration pneumonia; and fifth, hypertrophy of adenoid tissue is common in these children. Also recurrent otitis media was noticed in such patients. Relatively a set of these signs and symptoms produces an entity known as the "bottle-fed syndrome." Accordingly, other problems related to this study are as follows:

Table VI. Hypereosinophilia in two groups of Infants.

Group	Number	Percent
Atopic children	33	21/5%
Non-atopics	19	5%

Table VII. Comparison Between Bottle-fed and Breast-fed Infants.

Clinical data	Breast-fed	Percent	Bottle-fed	Percent
Respiratory infection	3 (96)	3.1%	107 (426)	25.1%
GI disorders	9 (96)	9.2%	56 (426)	13.1%
Eczema	22 (96)	22.9%	142 (426)	33.3%
Asthma	14 (96)	14.5%	111 (426)	26%

From the economical point of view, annually, a considerable amount of exchange for purchasing powder-milk is added to the national budget and in addition some other expenses such as consultation and hospitalisation of bottle-fed children who develop recurrent infections in the respiratory and gastro-intestinal tracts will be added to this budget, and due to malnutrition, additional medical consultation, supervision and nursing attention will be sought.

From the statistical point, prevalence of respiratory infections and asthma in bottle-fed infants was significantly higher, as shown in Tables I and VII, where in the first group, 420 cases contracted repiratory infections and asthma but in the breast-fed infants there were 218 cases.

In other words, the percentage of respiratory infections and asthma in bottle-fed children was 51.17% whereas in breast-fed infants, it was 17.7%, which is statistically significant.

Increased incidence of eosinophilia among atopic children as mentioned in Table VI is 12.5%, and in non-atopic children, it was 5%, and thus these numbers represent the augmented rate of allergic disorders in relation to MBP and other secretory proteins of eosinophils like ECP that not only cause damage to cilia but also have a neurotoxic effect and cause considerable cardiac damage.

Overall, esoinophilia has worsened the infection in the said patients (allergics) and this has been documented in our bottle-fed infants.

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