

Breastfeeding as a Protective Effect Against Childhood Leukemia and Lymphoma

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Abstract

Background: Over the past several years, breastfeeding has been associated with many benefits as well as protective effects against many diseases. There is limited evidence for the relationship between breastfeeding and the incidence of leukemia.

Objectives: In this study, we evaluate the correlation of childhood leukemia and lymphoma with breastfeeding duration in children in southern Iran.

Patients and methods: Through this case control study, we compared 123 patients with leukemia and lymphoma to a control group of 137 healthy children. Statistical analysis was done using the Chi-square test and t-test as well as logistic regression methods. A P-value of less than 0.05 was considered significant.

Results: Our findings showed that breastfeeding duration had no significant difference between cases and controls. However, the rural living percentage in patients with leukemia and lymphoma was higher than in the control group (39.8% versus 14.6% [$P < 0.001$ and $OR = 3.87$]) and parents' exposure to chemical materials during the war between Iran and Iraq was higher in sick patients (6.5% versus 0% [$OR = 20.2\%$]).

Conclusions: The current study showed that breastfeeding duration has no protective effect against childhood leukemia and lymphoma. In addition, we suggest that some factors such as living in a rural area, smoking during pregnancy, parents' exposure to chemical materials and low socioeconomic status can increase the incidence rate of childhood leukemia and lymphoma.

Keywords: Breastfeeding, Leukemia, Lymphoma

1. Background

Leukemia is the most prevalent childhood malignancy and represents 30% of all cancers in children (1, 2). Acute lymphoblastic leukemia (ALL) is the most common type of childhood leukemia (3). Lymphoma is the third most common cancer in children living in America, and includes two important groups: Hodgkin lymphoma (HL) and non-Hodgkin lymphoma (NHL). The exact etiology of childhood leukemia and lymphoma has not been determined. However, several reports have shown that many risk factors including genetic abnormalities (such as Down's syndrome, Fanconi's anemia, ataxia telangiectasia and Bloom's syndrome), infections, radiation and exposure to some chemicals have been associated with these malignancies (4, 5). In recent years, some studies have suggested that breastfeeding has a protective effect against leukemia and lymphoma in children as well

as childhood infections. Indeed, human breast milk can boost the immune system as it contains many protective agents such as maternal antibodies, anti-inflammatory factors and immune cells that protect children from many infections and diseases (6-8). An infant's diet of breast milk can be effective against many diseases such as diabetes, cardio-vascular diseases, obesity, and even cancer (9). However, the relationship between breastfeeding and childhood leukemia and lymphoma is not clear.

2. Objectives

Although some studies suggest that breastfeeding has protective effects against Hodgkin lymphoma and other types of neoplasm such as ALL and AML, there are controversies among existing data about this relationship. In this study, we evaluate the correlation of childhood leukemia

and lymphoma with breastfeeding duration in children in southern Iran.

3. Patients and methods

In this case control study we evaluated 134 patients with leukemia and lymphoma aged less than 18 years who were referred to an outpatient clinic or were hospitalized in the referral hospital in Shiraz, southern Iran from February 2011 to February 2012. The questionnaire included the following data: name, age, sex, residence, and leukocyte count at diagnosis, type of cancer, duration of breastfeeding or formula, tobacco consumption by parents during pregnancy, ABO and Rh blood groups, birth order, parents' exposure to chemical materials during the war between Iran and Iraq, and mother's education. All patients and parents signed the consent form and the project study was approved by the office of vice chancellor for research affairs of the university. Compiled data were gathered and analyzed by SPSS software (No.13) and statistical analysis was done by Chi-square and t-tests. In addition, a logistic regression model was made. A P-value of less than 0.05 was considered significant. Eleven patients were omitted from this study due to parents' inability to answer some questions.

4. Results

Two hundred and sixty children were studied. Of the children, 123 were patients with leukemia and lymphoma, and 137 were healthy children who served as the control group. The mean age of the experimental and control groups were 6.6 ± 4 years and 6.8 ± 4.2 years, respectively. For considering breastfeeding duration, we divided our patients into 4 study groups: 1) never breastfed, 2) breastfed for less than one month, 3) breastfed for one to six months, and 4) breastfed for six to twelve months. There was no significant difference between the patient and control groups (14.6% breastfed in patient group vs. 17.5% in control group in regards to six to twelve months of breastfeeding [$P = 0.641$]). The comparison of demographic parameters and other characteristics between the two groups is summarized in [Table 1](#).

5. Discussion

Today, the exact etiology of childhood leukemia and lymphoma and the protective effect of breastfeeding against cancer are still unclear. Many epidemiological studies have suggested an association of breastfeeding with a reduced risk of lymphoblastic leukemia and other

cancers (10, 11). However, in a study done in 2011, Waly et al. (12) mentioned that breastfeeding duration did have not any protective effect against childhood ALL in Omani children. In contrast, findings from the large CCG epidemiologic studies of childhood AML and ALL showed a risk reduction among breastfed infants, particularly those breastfed for more than 6 months (13). A case study by Davis et al. (10) revealed that breastfeeding for more than 6 months had a protective effect for HL but not for AML and ALL. Conversely, a study by Martin et al. showed that breastfeeding slightly increased the incidence of ALL, HL and neuroblastoma. However, they mentioned that increasing breastfeeding duration can decrease the risk of ALL and lymphoma by about 5% (14). The results of the current study indicated that there was no significant relation between breastfeeding duration and childhood leukemia and lymphoma. Our findings show that a rural life increases the risk of childhood leukemia and lymphoma in comparison to an urban life; this factor has not been mentioned in previous studies, and it may be a reflection of lower socioeconomic levels in villages. The study conducted by Altinkaynak et al. (15) on leukemic children in Turkey showed similar results in that the mother being older (over 35 years old) and the mother's smoking habits were not risk factors of leukemia and lymphoma. However, in several studies a mother's higher age (16) and smoking (17) have been shown as risk factors. As previously mentioned in this paper, low family income and low education levels for the mother increase the risk of leukemia in children. Also, children who are born later in the birth sequence (third, fourth or higher) are more susceptible to leukemia and lymphoma. Previous studies such as the one done by Perez-Saldivar et al. (18) on Mexican children also found the same results; it was indicated that the risk of leukemia increased in larger families ($OR = 1.22$). Altinkaynak et al. (15) conducted a study on Turkish children and concluded that the socioeconomic level in the leukemia patient group was lower than that of the control group ($P < 0.001$, which agrees with our results. However, there is controversy with this issue, and some researchers such as Bener et al. (19) have concluded that the mean family income is higher in the patient group. Through an ecological study in the USA in 2005, Buffler et al. (20) also concluded that a higher socioeconomic level is a risk factor for leukemia in childhood. Bener et al. (11) stated that a lower maternal age and low maternal education can increase the risk of ALL and HD. Notably, decreasing the duration of breastfeeding in educated mothers decreases the positive effect of this factor in their children. In the study of Saldivar et al. regarding the effect of parental smoking on Mexican children, it was reported that in children whose father had been in contact with carcinogenic ma-

Table 1. Risk of Childhood Leukemia and Lymphoma Associated With Demographic, Maternal and Birth-Related Characteristics

	Patient (Number)	Control (Number)	Odds Ratio	P Value	Confidence Interval (95%)
ABO blood group					
O	51	66	0.697	0.119	0.428 - 1.145
A	28	32	0.967	0.732	0.542 - 1.724
B	25	21	1.409	0.570	0.743 - 2.671
AB	12	15	0.879	0.730	0.394 - 1.959
Birth Order					
First	44	74	0.416	0.0007	0.287 - 0.780
Second	24	40	0.587	0.05	0.329 - 1.048
Third	25	14	3.000	< 0.004	1.106 - 4.540
Fourth or More	30	9	5.60	< 0.001	2.079 - 10.122
RH blood group					
Negative	6	7	1.05	0.967	0.343 - 3.213
Positive	117	130			
Maternal education					
Illiterate	37	3	19.2	< 0.001	0.02 - 0.119
Secondary education	66	28	14.5	< 0.001	2.61 - 7.78
Diploma	14	36	0.360	< 0.001	5.74 - 64.2
University degree	6	70	0.049	< 0.004	0.183 - 0.707
Family monthly income					
< 2000000 Rls	49	4	22.01	< 0.001	7.64 - 63.42
2000000 - 5000000 Rls	64	60	1.39	0.603	0.853 - 2.269
> 5000000 Rls	10	73	0.077	< 0.001	0.037 - 0.160
Maternal age					
< 18	6	10	0.651	0.580	0.229 - 1.847
18 - 30	84	72	1.944	0.013	1.17 - 3.22
30 - 35	23	38	0.599	0.116	0.332 - 1.078
35 - 40	10	16	0.669	0.456	0.291 - 1.535
Parents' exposure to chemical material during war	8	1	9.53	0.027	1.17 - 77.3
Urban environment	20	49	3.87	< 0.001	
Mother's smoking during pregnancy	8	4	2.313	0.28	0.678 - 7.88
Mother's exposure to smoke	45	28	2.24	< 0.005	1.29 - 3.9

terials there was a higher risk of acute leukemia in childhood. For example, 55.4% of the sick children had fathers who smoked during their mother's pregnancy, but in the control group this percentage was 45.6% (OR = 1.5) (20). This result is similar to our findings. Regarding the relation between breastfeeding and childhood leukemia and lymphoma, the presence of confounding factors should be considered in future studies. In conclusion, the current study showed that breastfeeding duration has no protec-

tive effect against childhood leukemia and lymphoma. In addition, we suggest that some factors such as rural living, smoking during pregnancy, parents' exposure to chemical materials during war and low socioeconomic status can increase the incidence rate of leukemia and lymphoma in children.

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Footnote

Authors' Contribution: Mehran Karimi contributed to the study design, concept, and editing the final version. Mahmoud Haghghat edited the manuscript. Zahra Dialameh contributed to the drafting the manuscript. Leila Tahmasbi, Shirin Parand and Marzieh Bardestani contributed to data collection.

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