

Relationship between breast-feeding duration and acute respiratory infections in infants

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ABSTRACT

Objective: To study the relationship of breast-feeding duration on the frequency of respiratory tract infections in infants during the first 2 years of life.

Methods: A retrospective study where the files of infants randomly selected from Shamasan Primary Health Care Center were analyzed for different related factors and frequencies of respiratory infections.

Results: The mean duration of lactation was shorter than in previous national reports (5.1 ± 3.4 months). The frequencies of respiratory infections were high in the first 2 years reaching an average of 9.2 ± 4.1 attacks per infant. The lower respiratory tract suffered more frequent attacks than the upper averaging a rate of 5.6 ± 2.6 attacks per infant compared to 3.7 ± 2.2 attacks per infant. The

multiple regression models pointed out to highly significant predictors for respiratory infection rates: Lactation duration ($p < 0.001$) for the 2 years rates, child rank ($p < 0.001$) for the first year rates and family income ($p < 0.001$) for the 2nd year rates.

Conclusion: The lactation duration has an important relation to the frequency of respiratory infections in infancy. Every effort should be made to encourage and support longer duration of breast-feeding.

Keywords: Breast-feeding duration, respiratory infections, infancy period.

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The fact that breast-feeding protects against several types of infections has been described in several studies.¹ Protection against infections during lactation involved acute and chronic diarrhea, respiratory tract infections (RTI), otitis media, urinary tract infections and wheezing illness.² The main factors responsible for this protection are the presence of secretory IgA antibodies and several bactericidal agents such as lactoferrin in human milk. The transfer of cytokines and growth factor with milk adds to an active stimulation of the infant's immune system.³ There is also evidence for an enhanced protection lasting for years after lactation.⁴ Thus breast feeding may, in addition to the well-

known passive protection against infection during lactation, have a stimulating effect on the infant immune system with possible long-term positive effects. This protection involves diarrhea, RTI's, otitis media, Hemophilus influenza B, and wheezing illness.⁵ Some investigators suggest that there may also be a similar effect on allergic and autoimmune diseases.^{6,7} Furthermore, breast milk, the valuable natural resource helps prevent infants' diseases and thus saves considerable health costs.^{8,9} On the other hand, acute respiratory infections are considered the most important factor of children's death all over the world mostly affecting infants in the first 2 years of age.¹⁰ A variety of responsible organisms, viral and

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bacterial are responsible for both upper and lower respiratory tract affections.^{11,12} In Saudi Arabia, the results of 2 large surveys performed by the Ministry of Health (MOH) and published in the last 10 years, indicate that around 90% of babies in the country are breast fed after delivery. The estimated duration of breast-feeding in months was around 13 months.^{13,14} Further, a study involving acute respiratory infections reported from the Primary Health Care (PHC) centers in 5 regions of the kingdom showed that these infections represented approximately 50% of all diseases in that age group with an average attack rate of 6-8 per child per year. The vast majority of physicians (98%) in the centers recommended laboratory or x-ray studies to confirm the diagnosis, inflicting a considerable cost on the national health care system.¹⁵ The aim of this study is to test the relationship between the duration of breast-feeding and the frequency of acute respiratory infections in the first 2 years of life in one of the PHC centers in Abha City, Southern Saudi Arabia.

Methods. The study is a retrospective one, involving the analysis of the medical records of 100 infants born during the last 5 years. Their family files were selected randomly from the different sectors of the catchment area of Shamasan PHC center. The sample chosen was proportionate to the number of inhabitants in each sector. A simple random sample was followed to choose only one infant from each family. The criteria of selection were: the mother should be aged between 18 and 40 years at the time of delivery, be a non working, non divorced, mother and a sole wife. Moreover, the infant should be of a normal birth weight, free from any congenital abnormalities and not registered in the at risk infant records in his first 2 years of age. Data concerning the duration of pregnancy, type of delivery whether normal or abnormal, the sex of the infant, the mothers age at the time of delivery, the child rank among siblings and the duration of lactation were recorded. The duration of lactation was considered as the period during which breast-feeding was regularly practiced even with the introduction of other foods until the complete cessation of breast-feeding. Temporary withholding breast-feeding was subtracted from the total duration provided it was resumed in a regular manner. Unfortunately, the environmental and housing conditions were grossly lacking from the files and they were not included. The records of the chosen infant were scrutinized for the visits to the sick baby clinic in his first 2 years. The initial diagnosis of an acute RTI was recorded while the revisits for that same diagnosis were omitted. The recorded physician's diagnosis was then classified into upper and lower RTI considering infections above the larynx as upper ones. The collected data was then statistically analyzed using the linear multiple regression method. The dependent

Table 1 - Some socio-economic characteristics of the studied sample (n=100).

	Mean \pm standard deviation	Median
Mother age (years)	27.6 + 5.0	27.5
Child rank	4.0 + 2.0	4.0
Family income (in 1000 SR/month)	4.3 + 1.7	4.0
Lactation duration (months)	5.1 + 3.4	5.0
	Number	Percentage
Infant Sex		
Male	51	51
Female	49	49
Pregnancy duration		
9 months	92	92
7-8 months	8	8
Type of delivery		
Normal	93	93
Artificial	2	2

factors were in, each model, the different frequency rates of RTI. The independent factors were the sex of the child, the duration of pregnancy, the type of delivery, the rank of the child, the family income, the mother's age at the time of delivery and the lactation duration.

Results. Table 1 describes some socioeconomic characteristics of the studied sample. Table 2 demonstrates the results of different linear multiple regression models, where the dependent factor was one of the attack rates involving upper or lower respiratory tract during the first or second years of age. At first sight, it is seen that in all models lactation duration was a highly significant independent factor affecting the respiratory tract attack rates. In all these models the relation was a negative one. The child rank was also a highly significant factor for all types of respiratory tract infections during the first year with a positive relation. During the 2nd year, the family income showed a significantly negative relationship together with the lactation duration on the different attack rates. On the whole, the 2 years attack rates of all respiratory tract infections was significantly related to duration of lactation, family income and child rank. Most models showed quite good levels of prediction as they fit between 23% and 52% of cases with a highly significant F in all models.

Discussion. In Saudi Arabia, as in most developing countries, acute respiratory infections are responsible for approximately 50% of infant deaths.¹⁵ There have been many reports based on scientific researches indicating the prophylactic effect of

Table 2 - Results of the linear multiple regression models showing significant predictors for the different types of respiratory tract infection in the studied sample (number = 100).

Dependent Factors	Significant Factors	B	R ²	F
Model 1: First year upper RTI rate	Lactation duration** Child rank**	-0.117 0.256	0.227	3.851**
Model 2: First year lower RTI rate	Lactation duration**	-0.316	1.512	13.766**
Model 3: Second year upper RTI rate	Lactation duration** Family income**	-0.141 -0.258	0.275	4.983**
Model 4: Second year upper RTI rate	Lactation duration**	-0.173	0.284	4.983**
Model 5: First year total RTI rate	Lactation duration** Child rank**	-0.432 0.384	0.525	14.504**
Model 6: Second year total RTI rate	Lactation duration Family income**	-0.314 -0.418	0.379	8.005**
Model 7: Total 2 years RTI rate	Lactation duration** Family income** Child rank**	-0.682 -0.496 0.668	0.480	12.145**
** - p<0.01; RTI - respiratory tract infection				

breast-feeding on the frequency and duration of RTIs.¹ This study was undertaken to verify the effect of breast-feeding duration on the frequency of RTIs in the first 2 years of life. The sample of this study can be considered a normally distributed sample where the sexes of the infants were almost equal, mostly having normal duration of pregnancy and normal delivery. The mother's age at the time of delivery as well as the child rank were normally distributed. Moreover, it seems from the relatively low average family income, that this sample represents the main users of the PHC services. The lactation duration extended from 0 to around 12 months, averaging approximately 5 months which seems to differ considerably from the national surveys conducted by the MOH where it was around 13 months.^{13,14} This might be due to a declining trend in the habits of breast-feeding, as the last mentioned survey was published in 1996. The average number of acute respiratory infections in this study was 9.2±4.1 during the first 2 years of life, which is very close to the average number in previous reports in Saudi Arabia.¹⁵ A decline is to be noted however, in the average frequency from the first to 2nd year of life, probably due to the developing immunity of the infant. On the other hand, the greater frequency of the lower RTIs might be real, or due to an under reporting of some milder forms of upper infections. The significant predictors emerging from the multiple regression models are the lactation duration and the child rank in the first year of life. This trend was also verified by other studies where family crowding was a significant factor especially when

compounded with short breast-feeding period's.¹⁶⁻¹⁸ A Scandinavian study, however, failed to prove these factors, probably due to different ecological factors.¹⁹ In the 2nd year of life, significant predictors were again lactation duration and the family income. The income might reflect the nutritional status of the infant as at that time most infants are already given other foods or completely weaned. The infant immunity would depend largely on the food, which is expected to be inadequate with a low family income. An extreme example of this situation has been described in black infants of South Africa.¹⁹

The low RTIs frequencies depended solely, in these models, on the lactation duration probably in part due to the inhibiting effect breast-feeding has on suppressing the growth of virulent pathogens. These are known to produce lower respiratory tract infections, while still in the infants' throat.¹¹ It is thus highly recommended to enhance breast-feeding for a long suitable duration through health education and mothers support in the PHC centers for its nutritional and prophylactic effects against the RTIs.

References

1. WHO. Effect of breast-feeding on infant and child mortality due to infectious diseases in less developed countries. A pooled analysis. WHO collaborative study team on the role of breast-feeding on the prevention of infant mortality. *Lancet* 2000; 25: 355: 1104-1109.
2. Cushing AH, Samet JM, Lambert WE, Skipper BJ, Hunt WC, Young SA et al. Breast-feeding reduces risk of respiratory illness in infants. *Am J Epidemiol* 1998; 147: 863-870.
3. Newburg DS. Human milk glycoconjugates that inhibit pathogens. *Curr Med Chem* 1996; 2: 117-127.

4. Villalpando S, Hamosh M. Early and late effects of breast-feeding does breast-feeding really matter? *Biol Neonate* 1998; 74: 177-191.
5. Hanson LA. Breast-feeding provides passive and likely long-lasting active immunity. *Ann Allergy Asthma Immunol* 1999; 82: 478-481.
6. Saariinen UM, Kajosaari M. Breast-feeding as prophylaxis against atopic diseases: Prospective follow up study until 17 years old. *Lancet* 1995; 346: 1065-1069.
7. Cummins AG, Thompson FM. Postnatal changes in mucosal immune response: a physiological perspective of breast feeding and weaning. *Immunol Cell Biol* 1997; 75: 419-429.
8. Ball TM, Wright AL. Health care costs of formula feeding in the first year of life. *Pediatrics* 1999; 103: 870-872.
9. Riordan JM. The cost of not breast-feeding a commentary. *J Hum Lact* 1997; 13: 93-97.
10. Berman S. Epidemiology of acute respiratory infections in children in developing world. *Rev Infect Dis* 1991; 13 suppl 6: 454-462.
11. Hokama T, Yara A, Hirayama K, Takamine F. Isolation of respiratory bacterial pathogens from the throat of healthy infants fed by different methods. *J Trop Pediatr* 1999; 45: 173-176.
12. Imaz MS, Sequeira MD, Videla C, Veronessi I, Cociglio R. Clinical and epidemiological characteristics of respiratory syncytial virus subgroups A and B infections in Santa Fe, Argentina. *J Med Virol* 2000; 61: 76-80.
13. Ministry of Health. Saudi Arabia Child Health Survey. Breast-feeding practices. Al-Mazrou Y, Farid S, editors. Riyadh, (KSA); MOH: 1991. p. 139-165.
14. Ministry of Health. Saudi Arabia Family Health Survey. Breast-feeding and supplementation. Khoja TA, Farid SM, editors. Riyadh (KSA); MOH: 1996.p. 60-63.
15. Ministry of Health, Saudi Arabia. National Protocol for diagnosis and treatment of acute respiratory infections among children in health centers and small hospitals. Khoja T, Elmohamad K, Elhawas M, Elkorashy M, editors. Riyadh (KSA); MOH; 1997. p. 1-7.
16. Douglas RM, Woodward A, Miles H, Buetow S, Morris D. A prospective study of proneness to acute respiratory illness in the first 2 years of life. *Int J Epidemiol* 1994; 23: 816-826.
17. Graham NW, Woodward A, Ryan P, Douglas RM. Acute respiratory illness in Adelaide children II: the relationship of mental stress, social support and family functioning. *Int J Epidemiol* 1990; 19: 937-944.
18. Ballard TJ, Neuman G. The effect of malnutrition, parental literacy and household crowding on acute lower respiratory infections in young Kenyan children. *J Trop Pediatr* 1995; 41: 8-13.
19. Rubin DH, Levantl JM, Krasilinkoff PA, Kuo H. Relationship between infant feeding and infectious diseases. A prospective study during the first year of life. *Pediatrics* 1999; 85: 464-471.
20. Delpont SD, Baker PJ, Bergh A. Growth, feeding practice and infections in black infants. *S Afr Med J* 1997; 87: 57-61.