
HEALTH, GROWTH AND THROAT MICROFLORA IN RELATION TO TYPE OF FEEDING AMONG INFANTS

By

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ABSTRACT

Introduction: WHO can now say with full confidence that breastfeeding reduces child mortality and has health benefits that extend into adulthood. On a population basis, exclusive breastfeeding for the first six months of life is the recommended way of feeding infants.

Aim of the study: to evaluate if full breast-feeding confer the greatest protection, and are declining proportions of breast milk in the infant's diet correlated with increasing illness prevalence.

Patients and Methods: Prospective study that was performed on 94 infants (6 months old) presented to Al Hussein and Sayed Galal University hospitals. Patients were divided in three groups Group I: 28 exclusively breast-fed infants, Group II: 49 infants on mixed - breast and formula-feeding and Group III: 17 exclusively formula-fed infants. Every infant was followed-up every 2 months along the second half of first year of his life and all changes that take place in all aspects of his health regarding (feeding, growth, fever, cough, diarrhea, vomiting, otitis media, pneumonia, hospital admission) were recorded. And Laboratory investigations CBC, Throat cultures at age 6 mo. were done.

Results: exclusively breast-fed infants had less number of episodes of fever, cough, diarrhea, vomiting, and otitis media than mixed and formula feeding infants. Hemoglobin level at 6 month of artificial fed infants was more than mixed and breast feeding. Pathogenic organisms identified in throat cultures of artificial fed infants were more than that of mixed fed infants.

Conclusion: Exclusive breast-feeding has protective effect against infant illness e.g fever, diarrhea, cough/wheeze, vomiting, otitis media and pneumonia episodes, overweight and underweight.

Keywords: Health, throat microflora, feeding, infant.

INTRODUCTION

Over the past decades, evidence for the health advantages of breastfeeding and recommendations for practice have continued to increase. WHO can now say with full confidence that breastfeeding reduces child mortality and has health benefits that extend into adulthood. On a population basis, exclusive breastfeeding for the first six months of life is the recommended way of feeding infants, followed by continued breastfeeding with appropriate complementary foods for up to two years or beyond. (Kalantari N, et al., 2013).

Breast milk is a unique source of food for babies which contains all necessary nutrients that will ensure the infant's health, growth and development (Ip S, et al. 2007). This source of food cannot be replaced with any other diet, as breast milk contains numerous antioxidants, protecting babies against harm caused by pathogens (Lonnerdal B, et al. 2000). Breastfeeding has direct clinical benefits for the infant as well as potential-long term benefits that are realized after the breastfeeding period. The direct benefits of human milk include improvement in gastrointestinal function and host defense, and lower rates of acute illnesses (fever , vomiting,

diarrhea, respiratory tract illness, acute and recurrent otitis media, and urinary tract infection.) during the time of breastfeeding (Ip S, et al., 2007).

The mucous membranes of the mouth and pharynx are often sterile at birth, but may be contaminated by passage through the birth canal. Within 4-12 hours after birth, Viridans streptococci become established as the most prominent members of the resident flora and remain so for life. They probably originate in the respiratory tracts of the mother and attendants (Boix-Amorós A, et al., 2016). The genus Streptococcus is one of the dominant bacterial groups found in human milk and various species, including Streptococcus salivarius, are frequently found in the infant oral cavity. (Danielsson Niemi L, et al., 2009).

AIM OF THE WORK

To evaluate if an inverse relationship exists between breastfeeding and infant illnesses and medical visits in Al Hussein and Sayed Galal university hospitals. Pattern of growth (under weight or obesity) in relation to feeding among infants.

PATIENTS AND METHODS

The study was conducted on 94 infants, aged 6mo. during the

period from December 2018 to October 2019. Randomly selected from pediatric outpatient clinic in Al Hussein or Sayed Galal university hospitals. they divided into Group I: 28 exclusively breast-fed infants (up to 6mo.) Group II: 49 infants on mixed - breast and formula-feeding Group III: 17 exclusively formula-fed infants.

Every infant was followed-up and assessed every 2 months along the second half of first year of his life and all changes that take place in all aspects of his health regarding (feeding, growth, fever, cough, diarrhea, vomiting, otitis media, pneumonia, hospital admission) were recorded and Laboratory investigations as (CBC, Throat cultures at age of 6 mo.).

Inclusion criteria:

- Age: 6 to 12 months old.
- Both sexes included.
- Full-term ,Apparently healthy.
- Birth weight ≥ 2000 g.

Exclusion criteria:

- Age: <6 or >12 months old.
- Preterm.
- Severely ill or has any congenital anomalies.

• A special sheet is designed for every mother and her infant. Includes:

1. Information about aspects in the first visit, social, dietetic. And in follow up visits every 2mon. in the second half of first year. The sheet includes information about aspects illness (fever, diarrhea, cough/wheeze, vomiting, otitis media, pneumonia, hospital admission).

2. Growth Assessment:

This is done during regular visits of infants to pediatric outpatient clinic in Al Hussein and Sayed Galal university hospitals for medical advice and regular following up for infant's health.

- Weight.
- Length.
- Head Circumference.

3. Clinical examination including: General examination and Local examination. (Chest, Abdominal, Heart and C.N.S).

4. Laboratory investigations which are divided into:

- Complete blood count (CBC):
- Throat cultures at the age 6 mon.

Ethical consideration:

- Written Parent consent for the study was obtained before the study.
- Approval of the local ethical committee in the pediatrics department, college and university were obtained before the study.
- The authors declared no potential conflict of interest with respect to the research & publication of this article.
- All the data of the patient & results of the study are confidential & the patient has the right to keep it.
- The authors received no financial support for the research & publications of the article.

RESULTS

Table (1): Demographic data of studied groups

		Group I		Group II		Group III		Total	P value
		No.	%	No.	%	No.	%		
Sex	Male	15	53.5	24	50	7	38.8	46	0.6
	Female	13	46.5	24	50	11	61.2	48	
Maternal age	<25	7	25	12	25	7	39	26	0.35
	25-35	18	64.2	23	48	6	33.3	47	
	>35	3	10.8	13	27	5	27.7	21	
Socio-economic Status	Low	16	57.2	24	50	6	33.3	46	0.02
	Intermediate	12	42.8	21	43.8	7	38.8	40	
	High	0	0	3	6.2	5	27.7	8	

There was no statistically significant difference between groups regarding sex distribution (P = 0.6)., no statistically significant difference between groups regarding maternal age (P= 0.35) and regarding socio-economic status (P = 0.02).there was statistically significant difference between groups.

Table (2): Frequency of symptoms among studied groups:

	Age(month)	Group I		Group II		Group III		P value
		Mean	SD	Mean	SD	Mean	SD	
Fever	8 th	1.54	0.63	1.54	0.58	1.94	0.93	0.08
	10 th	1.36	0.48	1.54	0.58	2.39	0.6	0.00
	12 th	1.32	0.54	1.27	0.49	2	0.68	0.00
Diarrhea	8 th	0.89	0.78	1.25	0.56	1.78	0.64	0.00
	10 th	1.21	0.63	1.38	0.53	2.1	0.75	0.00
	12 th	1	0.66	1.15	0.46	1.83	0.61	0.00
Cough	8 th	0.75	0.7	1.21	0.54	2.1	0.75	0.00
	10 th	1.04	0.69	1.38	0.53	1.89	0.75	0.00
	12 th	0.71	0.53	1.17	0.51	1.56	0.61	0.00
Vomiting	8 th	1.82	0.81	1.42	0.64	1.44	0.51	0.04
	10 th	1.36	0.62	1.42	0.71	1.72	0.82	0.2
	12 th	1.39	0.73	1.35	0.56	2	0.68	0.001

Fever, diarrhea, cough and vomiting episodes were

significantly lower among Group I (exclusive breast feeding)

Table (3): Frequency of diseases among studied groups:

	Age (Month)	Group I		Group II		Group III		P value
		Mean	SD	Mean	SD	Mean	SD	
Otitis media	8 th	0.33	0.48	0.29	0.45	0.4	0.18	0.01
	10 th	0.06	0.23	0.17	0.37	0.29	0.46	0.13
	12 th	0.14	0.35	0.23	0.42	0.39	0.5	0.16
Pneumonia	8 th	0.4	0.18	0.25	0.43	0.28	0.46	0.04
	10 th	0.11	0.3	0.25	0.43	0.33	0.48	0.16
	12 th	0.07	0.26	0.0	0.0	0.17	0.38	0.02

Otitis media episodes were significantly lower among Group I (exclusive breast feeding) in 6-8 months infants (P = 0.01) and pneumonia episodes were

significantly lower among Group I (exclusive breast feeding) in 6-8 months infants (P = 0.04) and 10-12 months infants (P = 0.02).

Table (4): Frequency of Hospital admission between groups:

	Age Month	Group I		Group II		Group III		P value
		SD	Mean	SD	Mean	SD	Mean	
Hospital admission	8 th	0.07	0.26	0.15	0.35	0.11	0.32	0.6
	10 th	0.14	0.35	0.23	0.42	0.28	0.46	0.5
	12 th	0.04	0.19	0.17	0.37	0.39	0.5	0.007

Hospital admission was significantly lower among Group I (exclusive breast feeding)in 12 months infants(P = 0.007).

Table (5): Wight Z score between groups:

		Group I		Group II		Group III		P value
		No.	%	No.	%	No.	%	
Weight at 6 months	Between-2 & -3SD	3	10.8	8	16.6	4	22.3	0.36
	Between 0 & -2 SD	14	50	16	33.4	5	27.7	
	Between 0 & 2 SD	10	35.7	15	31.3	5	27.7	
	Between 2 & 3 SD	1	3.5	9	18.7	4	22.3	
Weight at 8 months	Between-2 & -3SD	2	7.2	4	8.3	3	16.6	0.13
	Between 0 & -2 SD	11	39.3	12	25	1	5.5	
	Between 0 & 2 SD	14	50	23	48	10	55.5	
	Between 2 & 3 SD	1	3.5	9	18.7	4	22.4	
Weight at 10 months	Between -2 & -3 SD	0	0	3	6.3	2	11.1	0.12
	Between 0 & -2 SD	12	42.8	13	27	2	11.1	
	Between 0 & 2 SD	15	53.7	24	50	10	55.5	
	Between 2 & 3 SD	1	3.5	8	16.7	4	22.3	
Weight at 12 months	Between -2 & -3 SD	0	0	0	0	1	5.5	0.09
	Between 0 & -2 SD	4	14.3	13	27	3	16.7	
	Between 0 & 2 SD	23	82.2	29	60.5	10	55.5	
	Between 2 & 3 SD	1	3.5	6	12.5	4	22.3	

This table shows that there is no significant difference between the three studied groups.

Table (6): Length Z score between groups:

		Group I		Group II		Group III		P value
		No.	%	No.	%	No.	%	
length at 6 months	Between -2 & -3 SD	3	10.7	2	4.2	0	0	0.2
	Between 0 & -2 SD	17	60.8	21	43.8	10	55.5	
	Between 0 & 2 SD	8	28.5	25	52	8	44.5	
	Between 2 & 3 SD	0	0	0	0	0	0	
length at 8 months	Between -2 & -3 SD	2	7.2	3	6.3	0	0	0.35
	Between 0 & -2 SD	20	71.4	26	54.2	10	55.5	
	Between 0 & 2 SD	6	21.4	19	39.5	8	44.5	
	Between 2 & 3 SD	0	0	0	0	0	0	
length at 10 months	Between -2 & -3 SD	2	7.2	3	6.3	0	0	0.12
	Between 0 & -2 SD	20	71.4	23	47.9	8	44.5	
	Between 0 & 2 SD	6	21.4	22	45.8	10	55.5	
	Between 2 & 3 SD	0	0	0	0	0	0	
length at 12 months	Between -2 & -3 SD	2	7.2	3	6.3	0	0	0.08
	Between 0 & -2 SD	21	75	25	52	8	44.5	
	Between 0 & 2 SD	5	17.8	20	41.7	10	55.5	
	Between 2 & 3 SD	0	0	0	0	0	0	

This table shows that there is no significant difference between the three studied groups.

Table (7): Head circumference Z score between groups:

		Group I		Group II		Group III		P value
		No.	%	No.	%	No.	%	
H.C at 6 months	Between -2 & -3 SD	1	3.5	1	2.1	0	0	0.56
	Between 0 & -2 SD	17	60.7	19	39.5	9	50	
	Between 0 & 2 SD	10	35.8	27	56.3	9	50	
	Between 2 & 3 SD	0	0	1	2.1	0	0	
H.C at 8 months	Between -2 & -3 SD	1	3.5	1	2.1	0	0	0.03
	Between 0 & -2 SD	18	64.3	14	29.2	7	38.8	
	Between 0 & 2 SD	9	32.2	33	68.7	11	61.2	
	Between 2 & 3 SD	0	0	0	0	0	0	
H.C at 10 months	Between -2 & -3 SD	1	3.5	2	4.1	0	0	0.01
	Between 0 & -2 SD	17	60.7	10	20.9	7	38.8	
	Between 0 & 2 SD	10	35.8	36	75	11	61.2	
	Between 2 & 3 SD	0	0	0	0	0	0	
H.C at 12 months	Between -2 & -3 SD	1	3.5	2	4.1	0	0	0.02
	Between 0 & -2 SD	18	64.2	13	27	7	38.8	
	Between 0 & 2 SD	9	32.3	33	68.9	11	61.2	
	Between 2 & 3 SD	0	0	0	0	0	0	

This table shows that there is no significant difference between the three studied groups.

Table (8): Hemoglobin level at 6 month between groups:

	Group I		Group II		Group III		P value
	Mean	±SD	Mean	±SD	Mean	±SD	
Hemoglobin	10.38	1.64	11.34	1.53	12.0	0.73	0.001

This difference had high statistical significance ($P = 0.001$).

Table (9): Throat swab culture results between groups:

Throat swab culture results	Group I		Group II		Group III		P value
	No.	%	No.	%	No.	%	
No growth	26	92.8	18	37.5	0	0	0.000
Streptococcus Viridans	2	7.2	15	31.3	0	0	
Enterobacter	0	0	8	16.6	7	39	
Enterobacter, Streptococcus Viridans	0	0	2	4.2	1	5.5	
Staphylococcus Aureus	0	0	4	8.3	1	5.5	
Streptococcus Viridans, Candida	0	0	0	0	1	5.5	
Staphylococcus Aureus, Candida	0	0	0	0	1	5.5	
Haemophilus Influenzae	0	0	0	0	1	5.5	
Klebsiella	0	0	0	0	1	5.5	
Streptococcus Viridans, Corynebacteriae	0	0	0	0	1	5.5	
Streptococcus Viridans, Staphylococcus Aureus	0	0	1	2.1	4	22.5	

This difference in throat culture results between groups had very high statistical significance ($P = 0.000$). Group

I: 92.8% had no growth and pathogenic organisms more at formula feeding infants.

DISCUSSION

Appropriate feeding practices play a pivotal role in ensuring optimum growth, development and health during infancy. WHO recommends EBF (feeding of infant solely with human milk without any additional food or beverage including water) for the first 6 months, followed by the introduction of appropriate CFs at the same time as breastfeeding continues until 2 years of age or beyond (WHO, 2002).

Our study shows 29.7% of mothers choose exclusive breast feeding, 51% of mothers choose mixed feeding and 19.2% of mothers choose formula fed during the first six months.

64.2% of group I (exclusive breast feeding) had their mothers between 25 and 35, 10.8% had their mothers older than 35, 33.3% of group III (Exclusively formula fed) had their mothers between 25 and 35, 27.7% had their mothers older than 35. With regard to maternal age, older mothers are less likely to breastfeed than younger ones in our population. These results are consistent with the literature (Kitano N., et al., 2015).

There is a significant association (P value 0.02) between

low Socio-economic status and choices of exclusive breast feeding these results are consistent with (P.H. Smith, et al., 2012).

Our study shows that there is a statistical significance difference regarding fever, diarrhea, cough and vomiting between breast fed group and other two studied groups at 8th , 10th, 12th months of age. These findings are in agreement with other study done by Koyanagi A, et al., 2009.

The same finding was reported by Duijts L, et al., 2010 who reported that reduced gastrointestinal infection occurs with breast feeding.

This is in accordance with study done by Oddy et al., 2003 who reported a correlation between breastfeeding and reduced upper and lower respiratory infections.

Otitis media episodes were significantly more in artificial fed infants than breast fed infants between 6-8 months.

Froom et al., 2001 concluded that there is reduced rate of otitis media among children who were breastfed in early life.

Episodes of pneumonia were significantly more in artificial fed infants than breast feeding and

mixed feeding at 8th, 10th, 12th months of age. These findings were consistent with the findings of **Gupta GR, 2012** who stated that exclusive breastfeeding during the first six months of life and continued breastfeeding until 24 months of age, are critical for reducing the burden of pneumonia among infants and young children.

There was statistical significance of hospital admission of artificial fed infants aged 10-12 months more than breast feeding and mixed.

These findings were consistent with the findings of **Ladomenou et al., 2010** who reported that there was reduced frequency of hospital admission in exclusive breast feeding.

Most of breast-fed infant weights at age of 6, 8, 10, 12 months were between (2SD and -2SD) more than mixed feeding and artificial fed infants.

Obesity and Underweighting were more at artificial fed infants than mixed and breast feeding. This was in agreement with **Bhutta ZA, et al., 2008**.

Our results showed that there was no statistical significance between groups and no relation between type of feeding, length and head circumference. These

findings were consistent with the study of **Arusei RJ, et al., 2011**.

There was statistical significant increase in haemoglobin level of artificial fed infants at 6th mo. more than mixed and breast feeding. These findings are in agreement with **Rivera JA, et al., 2003**.

In our study, there was very high statistical significance ($P = 0.000$) between different groups as regard throat cultures.

92.8% of breast-fed infants had no growth in throat cultures. *Streptococcus viridans* which is one of normal throat microflora were 7.2% in breast-fed, 37.5% in mixed feeding, and 39% in formula-feeding. These findings were consistent with the findings of **Hokama T, et al. 2006**.

In the present study, pathogenic organisms were detected in formula-fed infants as 39% had *Enterobacter*, 5.5% had *Staphylococcus Aureus* & *Candida*, 5.5% had *Haemophilus Influenzae*, 5.5% had *Streptococcus Viridans* & *Corynebacteriae* and 5.5% had *Klebsiella*. These findings are in accordance with the study done by **van Rossem, et al., 2011**.

CONCLUSION

Exclusive breast-feeding has protective effect against infant

illness e.g fever, diarrhea, cough/wheeze, vomiting, otitis media and pneumonia episodes, overweight and underweight. Hemoglobin level at 6 month of artificial feeding more than mixed and breast feeding. Pathogenic organisms identified in throat cultures of artificial feeding infants.

RECOMMENDATION

1. Initiation of breast feeding as early as possible.
2. Continuation of exclusive breast feeding until 6 months old.
3. Encouraging breast feeding on demand, day and night.
4. Decision makers and health professionals have to play a role in order to achieve the WHO and UNICEF recommendations regarding breastfeeding, that should be adopted by the hospital staff, especially those related to skin to skin with early initiation of breastfeeding, the positioning and attachment, the Code, the milk expression, giving written information about where the mothers can get advice about breastfeeding for follow up and discussion with the mothers about hazards of formula milk.

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علاقة الحالة الصحية والنمو وبكتيريا الحلق بنوع التغذية بين الرضع

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المقدمة: على مدى العقود الماضية، تواصلت الأدلة على تواجد الميزات الصحية للرضاعة الطبيعية والتوصيات في زيادة ممارسة الرضاعة الطبيعية. يمكن لمنظمة الصحة العالمية أن تقول بثقة تامة إن الرضاعة الطبيعية تقلل من وفيات الأطفال ولها فوائد صحية تمتد إلى مرحلة البلوغ، تعتبر الرضاعة الطبيعية الحصرية للأشهر الستة الأولى من العمر هي الطريقة الموصى بها لإطعام الأطفال، تليها الرضاعة الطبيعية المستمرة مع الأطعمة التكميلية المناسبة لمدة تصل إلى عامين أو أكثر فلبن الام يحتوي على جميع العناصر الغذائية مثل المواد البروتينية، الدهنية، الكربوهيدراتية، الاملاح، والمعادن والفيتامينات. كما يحتوي على اجسام المناعة المضادة للميكروبات لحماية الطفل من الامراض.

الهدف من البحث: بيان اذا ما كان هناك علاقة عكسية بين الرضاعة الطبيعية وأمراض الرضع والزيارات الطبية في مستشفيات الحسين وسيد جلال. دراسة تائير طرق الرضاعة على معدلات النمو في الطفل الوزن - الطول - محيط الراس.

مادة البحث وخطوات العمل: وقد أجريت الدراسة على 94 رضيعًا، وكانت أعمارهم 6 أشهر. مقسمة إلى:

المجموعة الأولى: 28 رضيعًا يرضعون رضاعة طبيعية فقط

المجموعة الثانية: 49 رضيعًا يرضعون - الرضاعة الطبيعية واللبن الصناعي.

المجموعة الثالثة: 17 رضيعًا تغذوا اللبن الصناعي فقط.

تمت متابعة كل رضيع كل شهرين على مدار النصف الثاني من السنة الأولى من حياته وجميع التغييرات التي تحدث في جميع جوانب صحته فيما يتعلق (التغذية، النمو، الحمى، السعال، الإسهال، القيء، التهاب الأذن الوسطى، الالتهاب الرئوي، يتم تسجيل دخول المستشفى وعمل فحوصات معملية (صورة دم كاملة، مسحات للحلق في سن 6 أشهر).

وقد أظهرت هذه الدراسة النتائج الآتية:

1. وجود انخفاض ملحوظ في نسبة الإصابة بالسخونية للأطفال الذين يرضعون رضاعة طبيعية مقارنة بالرضاعة لبن صناعي او رضاعة طبيعية ولبن صناعي.

2. وجود انخفاض ملحوظ في نسبة الإصابة بالقيء والاسهال والسعال والتهاب الاذن الوسطى والالتهاب الرئوي للأطفال الذين يرضعون رضاعة طبيعية مقارنة بالرضاعة لبن صناعي او رضاعة طبيعية ولبن صناعي.

3. مستوى الهيموغلوبين في لاطفال الذين يرضعون لبن صناعي أكثر من الرضاعة الطبيعية ورضاعة طبيعية ولبن صناعي.

4. الميكروبات المسببة للأمراض تم تحديدها في مسحات الحلق لاطفال الذين يرضعون لبن صناعي.

خلاصة البحث:

استنتجا مما سبق نجد الرضاعة الطبيعية لها حماية ضد أمراض الأطفال مثل الحمى، والإسهال، والسعال، والقيء، والتهاب الأذن الوسطى، وحالات الالتهاب الرئوي. كما لوحظ التأثير الوقائي للرضاعة الطبيعية من زيادة الوزن ونقص الوزن.