Original Article

Partial breastfeeding protects Bedouin infants from infection and morbidity: prospective cohort study

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The benefits of exclusive breastfeeding for health in infants have been widely described. The goal of this study was to determine whether partial breastfeeding has protective effects against enteric infection and associated morbidity in population where early addition of supplementation is common. In this prospective study 238 Bedouin infants were followed from birth to age 18 months. Exclusive breastfeeding was protective against infection and morbidity at ages 0 to 3 months. In the age range of 4 to 6 months, partial versus non breastfeeding was associated with lower rates of infection with *Cryptosporidium spp* (Odds Ratio OR 0.34, 95% confidence interval CI 0.18; 0.65), and *Campylobacter spp* (OR 0.58, CI 0.35; 0.98), lower rates of ear infections (OR 0.47, CI 0.24; 0.90) and of asthma (OR 0.33, CI 0.13; 0.81). In older children (10-12 month age range) partial breastfeeding as compared to none, protected against infections with *Cryptosporidium spp* (OR 0.57, CI 0.36; 0.91) and *Giardia lamblia* (OR 0.92, CI 0.85; 0.99). In Bedouins, and possibly in other populations, even partial breastfeeding, especially at ages 4 to 6 months offers protection against infection. Thus, encouraging mothers to continue to at least partially breastfeed past age 3 months may help reduce infections and morbidity in infants.

Key Words: Bedouin, Breastfeeding, Enteric pathogens, Gastroenteritis, Primary health care

INTRODUCTION

Breastfeeding provides nutritional and immunological protection against respiratory and gastrointestinal infections in newborns. Breast milk and colostrum contain numerous components which contribute to this protective effect.[1] The protective effect of exclusive breastfeeding against infection and its associated morbidity has been broadly documented and reviewed.[2] Breastfeeding has been shown to protect infants against respiratory illness[3] and gastrointestinal infections[4,5] as well as deaths resulting from all causes, acute respiratory infections, and diarrhoea.[6]

In view of the overwhelming evidence for the benefits of exclusive breastfeeding for maternal and child health, the World Health Organization recommends that infants should be exclusively breastfed until six months of age. Thereafter, appropriate complementary feeding should start, with continued breastfeeding up to 2 years or beyond.[2] However, many mothers do not comply with these recommendations due to cultural beliefs and traditions[7] and maternal work conditions.[8] The result is that many infants worldwide are only partially breastfeed from an early age. Data on the protective effect of partial breastfeeding is scarce and is limited to information on respiratory illness,[9] ear infection,[5] and mortality.[10]

To examine the effect of partial breastfeeding, we investigated the associations between feeding patterns and infections, infectious diseases morbidity, and use of health care services in a cohort of Bedouin infants. This issue can be addressed by the data collected for the cohort, which included weekly feeding and morbidity information, and bi-weekly stool examination from birth to the age of 18 months. This study was carried out in the Negev area of southern Israel where the regional Bedouin population is in transition from a semi-nomadic to a settled semi-urban life style. Overcrowding, few years of education, low socioeconomic status, and high fertility rates are common among the Bedouin.[11]

MATERIALS AND METHODS

Participants were enrolled in the cohort study from December 1994 to March 1997. We recruited 251 newborn Bedouin infants and their families immediately after birth at the Soroka University Medical Center in Beer Sheva, of

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whom 238 completed the 18 month follow up. The families were all residents of a town situated about 35 km north from the city of Beer Sheva and were randomly selected for this study. Enrolment and follow up procedures have been described in detail elsewhere.[12]

Data collection

Feeding data. Data on infant feeding were collected from the time of enrolment until 18 months of age for all 238 infants. Each week, mothers were asked, if their child had been breastfed and to report the types of supplementation that had been given during the past week.

Stool analysis. Routine stool samples were obtained every two weeks. In addition, when a diarrhea episode occurred, stool samples were collected immediately and at weekly intervals until one week after the episode ended. Fecal samples underwent parasitological, viral, and bacterial testing to detect the presence of enteric pathogens. The parasites *Cryptosporidium spp* and *Giardia lamblia* were identified using ELISA (ProSpecT *Cryptosporidium* Microplate Assay, ProSpecT *Giardia* Microplate Assay, Alexon Trend, Ramsey, MN). Bacteriological testing was performed on all fecal swabs to identify *Campylobacter spp, Shigella spp,* and *Salmonella* by routine laboratory methods. All diarrhea samples and 10% of non diarrhea stool samples were tested by DNA hybridization with radioactive probes to identify the following *Escherichia coli* strains: *Diffuse Adherent E. coli* (*DAEC*), *Enteroaggregative E. coli* (*EAggEC*), *Enteropathogenic E. coli* (*EPEC*), *Enterohemorrhagic E. coli* (*EHEC*), and *Enteroinvasive E. coli (EIEC)*. The presence of rotavirus strains in these stools was detected by ELISA (reagents by Dako, Copenhagen, Denmark). The results of the stools tests for enteric agents were reported to the child's physician when the child had an episode of diarrhea. Otherwise, in consultations with treating physicians the decision was made not to report asymptomatic findings.

Morbidity data were collected weekly from maternal interviews. The interviewer completed, following a report of illness, a questionnaire on length, frequency, and intensity of various signs and symptoms. Each episode was counted once; however, the mother might have reported several signs and symptoms, and each of these was counted separately.

Data analysis

Months during which infants were breastfed, with or without addition of tea and boiled water, were categorized as Full Breastfeeding months (Full BF). Months during which mother's milk was given together with any other food were defined as the Partial Breastfeeding months (Part BF), and months in which regular food was given and no breastfeeding was reported were classified as Non Breastfeeding months (Non BF).

Rates of pathogens detected were calculated as a proportion of positive stools out of total tests performed for that pathogen. The weekly maternal reports of signs and symptoms were used to compute the reported rate of each of the signs and symptoms. Pathogen detection rates and reported morbidity were calculated for four age groups 0 to 3, 4 to 6, 7 to 9, and 10 to 12 months.

The relative rates of detection (RRD) of pathogens were used to compare the detection of selected pathogens between the three feeding categories within the same age grouping. For RRD and incidence rate ratios (IRR) of reported morbidity and health care services utilization used to compare between feeding groups, 95% confidence intervals (95% CI) were also computed. Probability values of <0.05 were considered statistically significant. Analyses were performed using EpiInfo Version 3.3.2,

Table 1. Detection rates of enteric agents and reported morbidity in the study cohort for three age groups. Enteric agents are reported as n positive results/N stools tested, and morbidity is reported as rates, namely n episodes/total child months of follow up.

Enteric agents	0 to 3 months		4 to 6 months		7 to 9 months		10-12 months	
	n/N	%	n/N	%	n/N	%	n/N	%
Cryptosporidium spp†	16/947	1.69	35/710	4.93	55/710	7.45	71/713	9.96
Giardia lamblia†	30/947	3.17	104/710	14.65	245/710	34.51	556/713	77.99
Rotavirus	11/615	1.79	11/447	2.46	17/359	4.74	13/357	3.64
Campylobacter spp†	27/946	2.85	57/708	8.05	138/710	19.44	206/713	28.89
Shigella spp	6/946	0.63	3/708	0.42	3/710	0.42	11/713	1.54
Salmonella†	3/946	0.32	0/708	0.00	5/710	0.70	7/713	0.98
DAEC	46/279	16.49	52/240	21.67	51/258	19.77	40/219	18.26
EAggEC	39/279	13.98	49/240	20.42	65/258	25.19	35/219	15.98
EPEC	6/279	2.15	11/240	4.58	15/258	5.81	9/219	4.11
Reported morbidity*								
Diarrhea†	46/952	4.83	59/713	8.27	71/714	9.94	69/714	9.66
Fever†	18/952	1.89	36/713	5.05	38/714	5.32	71/714	9.94
Vomiting	8/952	0.84	8/713	1.12	16/714	2.24	11/714	1.54
Ear infection†	22/952	2.31	34/713	4.77	53/714	7.42	49/714	6.86
Cold	29/952	3.05	21/713	2.95	26/714	3.64	20/714	2.80
Asthma	12/952	1.26	20/713	2.81	19/714	2.66	13/714	1.82
Primary Health Care Clinic visits	27/952	2.84	49/713	6.87	64/714	8.96	52/714	7.28
Day Hospitalization	0/952	0.00	3/713	0.42	3/714	0.42	2/714	0.28
Emergency room visits‡	3/952	0.32	4/713	0.56	4/714	0.56	8/714	1.12
Hospitalizations‡	1/952	0.11	1/713	0.14	2/714	0.28	6/714	0.84

†$p<0.001$, ‡ $p<0.05$. * For 79 children data was collected for additional months (20 months in total).

WinPepi, and SPSS 12.0.

The Institutional Review Boards at Soroka University Medical Center/Ben Gurion University of the Negev, Beer Sheva, Israel, and Columbia Presbyterian Medical Center, New York granted ethical approval for this study.

RESULTS

A total of 257 mothers were approached regarding enrolment of their newborns, six (2.3%) refused to participate. Of the remaining 251 children, 238 children (94.8%) completed the follow up. Household and family characteristics of the study population show that families come from a disadvantaged population in transition from seminomadic to a more settled lifestyle. The study children were born to large families averaging 6.1±2.4 persons with 3.4±2.5 siblings. Mothers and fathers had mean ages of 27.5±5.9 and 32.0±9.6, respectively, at the index child's birth and had on average 6.3±4.0 and 8.9±3.8 years of schooling, respectively. Only 10 mothers (4.2%) and 72 (30.3%) fathers reported being employed outside the home. Fifteen percent of the study children lived in huts or tents, the rest had an average of 2.6±1.5 persons per room, 7% had an outdoor water supply, 14% had outdoor toilets, and in 9% of homes animals shared the premises with the family.

Scheduled stool sampling was planned every two weeks from age 10 days to 18 months for each infant. Due to increased collection during episodes of diarrhea, the average number of stool specimens collected per child was 39.6 ± 2.2, ranging from 33 to 50 samples.

The detection rates of different pathogens are presented in Table 1. The most frequently detected pathogens were *Giardia lamblia*, *DAEC*, *EAggEC*, and *Campylobacter spp*. The trend of increased detection with age of *Cryptosporidium spp.*, *Giardia lamblia*, *Campylobacter spp.* and *Salmonella* were statistically significant. Other pathogens showed no clear pattern with age. Diarrhea, fever and ear infection were reported frequently among the infants, and also showed a significant increase in frequency by age as did emergency room visits and hospitalizations.

The feeding pattern of the Bedouin infants is seen in Figure 1. A sharp decline of full breastfeeding over time can be seen. The mean age at which the addition of boiled water and tea was initiated was 2.9±1.8 months, and addition of formulas and foods other than breast milk was at age 3.3±1.8 months.

Due to the low relative rates of detection (n<30) of several pathogens and few events in the categories of hospitalizations, emergency room and day hospitalizations, these were excluded from further analysis.

Rates of detection of selected enteric agents in the four age groups by infant feeding categories are shown in Table 2. In the very young (age 0 to 3 months) full breastfeeding was shown to be protective against infection with *Cryptosporidium spp*, *Campylobacter spp* (p<0.05) and was suggested to be protective against infection with *Giardia lamblia* and Rotavirus (p<0.10). With regards to morbidity, rates of diarrhoea, vomiting, ear infection, cold, asthma and primary health care visits were also significantly lower in fully breast fed infants (p<0.05). There was also a suggestion of reduction in frequency of fevers (p<0.01).

In the 4 to 6 month age groups, partial breastfeeding was shown to be protective (versus non-BF) for

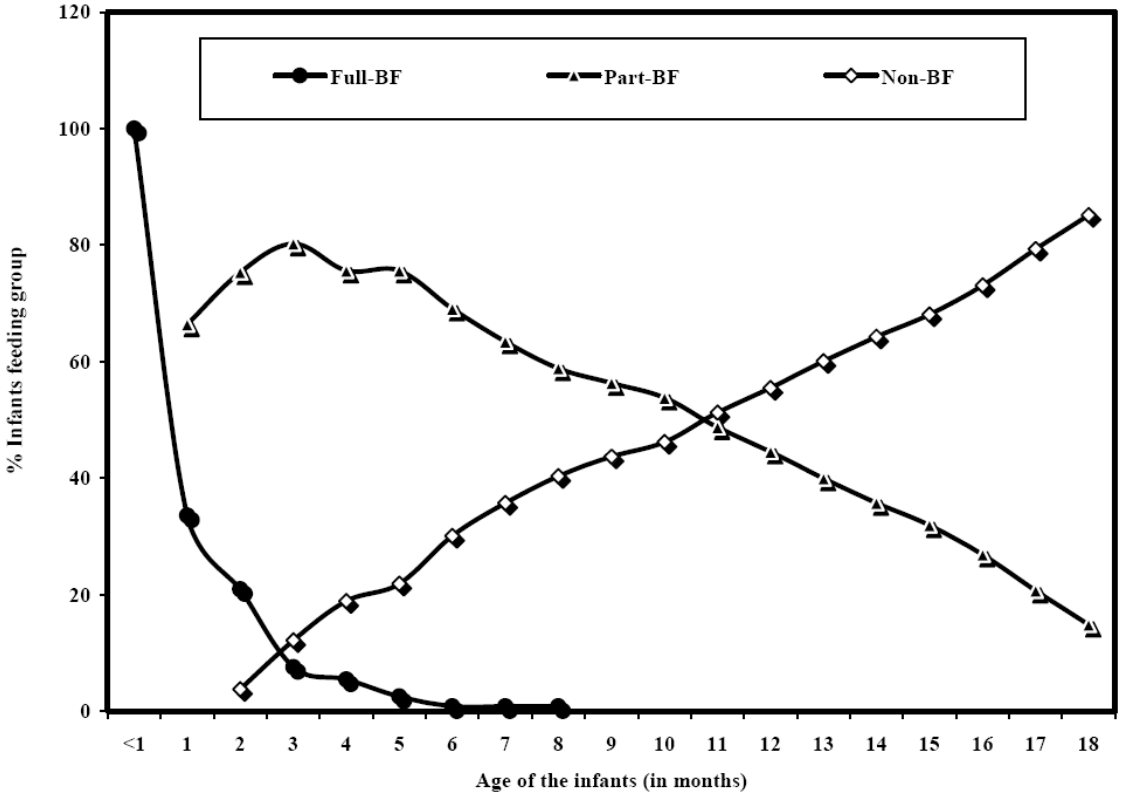

Figure 1. Feeding patterns in a cohort of 238 Bedouin infants by age.

Table 2. Detection rates in percent (n positive results/N stools tested*100) of selected pathogens and reported morbidity episodes (episodes/total child months of follow up*100) in the study cohort by three feeding type (Full BF, Part BF, and Non BF) and age group. *p* values were calculated using chi-square or Fisher exact test, as appropriate.

Age groups	0 to 3 months			4 to 6 months			7 to 9 months		10 to 12 months	
Pathogen	Full BF	Part BF	Non BF	Full BF	Part BF	Non BF	Part BF	Non BF	Part BF	Non BF
Cryptosporidium spp	0.29†	2.47†	2.78	0.00	3.46‡	10.12‡	6.00‡	10.42‡	7.26‡	12.64‡
Giardia lamblia	2.03§	4.06§	0.00	19.05	14.59	14.29	34.77	34.72	75.14‡	81.32‡
Rotavirus	0.47§	2.63§	0.00	7.14	2.33	2.25	4.64	5.04	4.19	3.07
Campylobacter spp	0.87†	3.89†	5.56	4.76	6.94‡	11.90‡	22.01	16.03	26.01	31.59
Shigella spp	0.29	0.71	2.78	0.00	0.39	0.60	0.00	0.70	1.45	1.65
DAEC	16.47†	5.31†	20.00	20.00	25.41	9.26	20.61	18.28	15.89	20.54
EAggEC	11.76	14.13	30.00	0.00	20.44	22.22	32.12	12.90	16.82	15.18
EPEC	1.18	2.17	10.00	0.00	4.97	3.70	4.85	7.53	3.74	4.46
Morbidity										
Diarrhoea	2.31†	6.15†	8.33	0.00	7.85	10.59	9.52	10.38	10.12	9.34
Vomiting	0.00†	1.41†	0.00	0.00	0.77¶	2.35¶	1.19‡	3.81‡	2.02	1.10
Fever	0.86§	2.64§	0.00	9.52	4.41	6.47	4.05¶	7.20¶	3.76	3.84
Ear infection	0.58†	3.16†	5.56	0.00	3.83‡	8.24‡	7.38	6.92	7.51	6.30
Cold	1.44†	4.22†‡	0.00‡	0.00	2.49	4.71	3.57	3.81	2.60	3.01
Asthma	0.00†	1.93†	2.78	9.52	1.72‡	5.29‡	1.67‡	4.15‡	1.73	1.92
Primary Health Care Clinic visits	0.00†	4.22†	8.33	0.00	6.32	9.41	9.05	8.65	7.23	7.40

† $p<0.05$ for difference within age group between Full BF and Part BF
‡ $p<0.05$ for difference within age group between Part BF and Non BF
§ $0.05<p<0.09$ for difference within age group between Full BF and Part BF
¶ $0.05<p<0.09$ for difference within age group between Part BF and Non BF

Table 3. Estimated protective effect of partial breastfeeding. Relative rates of detection (RRD) of selected pathogens and Incidence Rate Ratio (IRR) of reported morbidity in infants are presented comparing months with partially breastfeeding (Part BF) to months with no breastfeeding (Non BF) by age group.

Age groups	0 to 3 months		4 to 6 months		7 to 9 months		10 to 12 months	
Pathogen	**RRD**	**95%CI**	**RRD**	**95%CI**	**RRD**	**95%CI**	**RRD**	**95%CI**
Cryptosporidium spp	0.89	0.12;6.58	0.34†	0.18;0.65	0.58†	0.35;0.96	0.57†	0.36;0.91
Giardia lamblia	-	-	1.02	0.67;1.56	1.00	0.82;1.23	0.92†	0.85;0.99
Rotavirus	-	-	1.04	0.21;4.79	0.92	0.35;2.43	1.36	0.46;4.09
Campylobacter spp	0.70	0.17;2.86	0.58†	0.35;0.98	1.37	1.00;1.89	0.82	0.65;1.04
Shigella spp	0.26	0.03;2.22	0.65	0.06;7.09	-	-	0.88	0.27;2.85
DAEC	0.27†	0.07;0.96	2.7†	1.15;6.56	1.13	0.67;1.90	0.77	0.44;1.37
EAggEC	0.47	0.17;1.30	0.92	0.52;1.64	2.75	1.15;6.56	1.11	0.60;2.03
EPEC	0.22	0.03;1.72	1.34	0.30;6.03	1.34	0.30;6.03	0.84	0.23;3.09
Morbidity	**IRR**	**95%CI**	**IRR**	**95%CI**	**IRR**	**95%CI**	**IRR**	**95%CI**
Diarrhea	0.74	0.24;2.28	0.74	0.44;1.26	0.92	0.57;1.34	1.09	0.69;1.70
Vomiting	-	-	0.33	0.08;1.29	0.31†	0.11;1.89	1.85	0.55;6.25
Fever	-	-	0.68	0.34;1.37	0.56	0.30;1.04	0.98	0.47;2.05
Ear infection	0.57	0.14;2.36	0.47†	0.24;0.90	1.1	0.62;1.83	1.19	0.69;2.05
Cold	-	-	0.53	0.22;1.26	0.94	0.44;2.01	0.86	0.36;2.06
Asthma	0.70	0.09;5.24	0.33†	0.13;0.81	0.40	0.16;0.99	0.90	0.31;2.66
Primary Health Care Clinic visits	0.51	0.16;1.60	0.67	0.38;1.19	1.05	0.65;1.69	0.98	0.58;1.65

- indicates 0 cases in one of the BF groups † $p< 0.05$

Cryptosporidium spp, *Campylobacter spp*, ear infection and asthma ($p<0.05$) while there was a suggestion of protection against fever ($p<0.10$). In the 7 to 9 age group only *Cryptosporidium spp* had significantly lower rates of

detection in partially breast fed infants versus non, but partial breastfeeding was protective against vomiting and asthma ($p<0.05$) and was suggestive for fever ($p<0.10$). In the oldest age group examined, namely 9 to 12 month, the protective effect of partial versus non breastfeeding decreases with only *Cryptosporidium spp* and *Giardia lamblia* showing statistically significant reduction in infection rates.

To evaluate the extent of the protective effect of partial breastfeeding we examined the relative rates of detection (RRD) of pathogens and incidence rate ratios (IRR) of reported morbidity and use of health care services in the study infants by age groupings. (Table 3). No effect of Part-BF versus non-BF is found in newborns, as they are better protected by being fully breast fed. Infants from 4 months of age during months of partially breastfeeding had significantly lower rates of detection of *Cryptosporidium spp* in all age groupings, at 4-6 months of age we found lower rates of *Campylobacter spp*, at 10-12 months lower rates of *Giardia lamblia* were detected as compared to non breastfeeding months. Partial breastfeeding was found as protective in older children against: ear infection (4-6 months), fever and vomiting (7-9 months); as months in which children were fed regular food. No significant difference in IRR of reported illness was found between partially breastfeeding months and non breastfeeding months for the 10 to 12 month age range.

DISCUSSION

The objective of this study was to determine whether partial breastfeeding, which is commonly practiced in traditional societies and is initiated at an early age, protects infants against enteric infection and morbidity. The importance of this question lies in the fact that despite WHO recommendations for exclusive breastfeeding up to six months of age,[2] in many traditional societies mixed breastfeeding starts well below this age. In our study other foods were given to breast fed infants as early as one month of age. The mean age at which the addition of boiled water and tea initiated was 2.9 months, and the age of addition of formulas and foods other than breast milks was on average at 3.3 months. This pattern is very similar to that seen in other traditional societies.[13]

In this setting we examined the effect of partial breastfeeding on the detection of enteric pathogens as well as the manifestation of various signs and symptoms in infants. Like others[14] we found that *Cryptosporidium spp*, *Giardia lamblia*, and *Campylobacter spp* were more frequently detected when infants were not breastfed than in the presence of either exclusive or partial breastfeeding.

It has been previously shown that either exclusive or partial breastfeeding is capable of protecting infants against *Giardia lamblia* infection.[15] Phagocytes present in human colostrum were shown to be capable of ingesting *Giardia lamblia* tropozoites and to present microbicidal activity *in vitro*, suggesting that they may provide protection against giardiasis.[16] In addition, human milk demonstrated its ability to kill *Giardia lamblia* tropozoites *in vitro*, mediated by the release of free fatty acids from milk triglycerides by the action of bile salt stimulated lipase in the milk.[17] Other studies have demonstrated the presence of secretory IgA against *Giardia lamblia* in human milk[18] and that lack of anti *Giardia lamblia* antibodies in milk influences the age at which *Giardia lamblia* is first acquired.[19] Thus, both *in vitro* and *in vivo* results show the ability of components in human milk to defer or reduce rates of infection with *Giardia lamblia.*

While Sterling and others [20] did not find a statistically significant difference in rates of *Cryptosporidium* and *Campylobacter* infection between children whose mothers had high, moderate, and low titers of parasitic specific IgA antibodies, Pape, and colleagues[21] rarely found *Cryptosporidium* oocytes in stools of infants receiving only breast milk. In addition, breastfeeding was demonstrated to reduce *Cryptosporidium* diarrhea in infants in Guinea Bissau.[22] *Campylobacter* infection has been shown to be associated with bottle feeding[23] and breast milk containing IgA anti *Campylobacter* flagellin antibodies was associated with fewer *Campylobacter* infections in Mexican infants.[14] It appears, therefore, that most data support the conclusion that pathogen specific IgA antibodies, among other factors in human milk, are associated with reduced infection rates of enteric pathogens.

We found that in the first three months of life, the protective effect of exclusive breastfeeding is very strong. During months in which infants were fully breast fed; the lowest rates of diarrhoea, vomiting, ear infection, cold, asthma and primary health care clinics visits were found compared to partial breastfeeding. Bahl and others[10] have noted that the risk of mortality is lowest in exclusively breast fed infants, intermediate with partial breastfeeding and highest in non breastfed infants under six months of age. In another study, the risk of ear infection was inversely proportional to the quantity of breast milk in the mixed feeding groups.[5]

Once children reached 4 months of age, we found no statistically significant differences between Full-BF and Partial-BF, which may be due to fewer months of observations available. We did however find statistically significant effects for partial-BF as compared with non-BF. The strongest effect seems to be for the 4 to 6 month age range while some benefits remain in the 7 to 9 month age range. Others have also shown that the benefits of either exclusive or partial breastfeeding are strongest in the first six months of life.[4,24] Possible explanation for the lowered efficacy of protection provided by partial breastfeeding at older ages is that as children grow their food needs increase and the contribution of breast milk to the overall diet becomes smaller, with parallel reduction in the amounts of protective bioactive components. At the same time, children become more active, start to insert objects into their mouth and suck on objects within reach. With time, children's reach increases as they start to crawl and then walk. Thus, after six months of age, the combined effect of reduced intake of breast milk and the increased dose of environmental pathogens results in more frequent infection and higher rates of disease.

By using longitudinal data we were able to examine infection acquisition and infectious disease experiences in relation to feeding patterns that precede them. Because the data on breastfeeding and supplementations were collected weekly, there is a lower probability of misclassification of the breastfeeding status over the time of the

study. A possible limitation of the study is that both breastfeeding practices and morbidity were obtained by mother's reporting. However, we do not feel that maternal reporting was biased, as breastfeeding and morbidity are apparently unrelated. Another possible limitation is that within a 3 months age range a child can contribute months where he/she are fully, partially or not breastfed. Changing the category of feeding for a single child within a 3 months period will result in reduced differences and a lower probability of obtaining statistically significant results. As the experience of a child is highly determined by family background[25] and by his/her own predisposition, we feel that our results are biased towards the null. Thus we believe that we may have not been able to detect other attributes associated with partial breastfeeding. It should also be noted that repeated samples were used in the analysis, as described in the methods, thus the results of enteric agents for any given child are not independent one from the other. An addition limitation of our study may have resulted from the lack of data on treatment during diarrhea, but as the vast majority of positive findings were asymptomatic and therefore not reported, we feel that this does not create a significant bias in the analysis.

In summary, our findings indicate that in low socio economic populations and in societies where traditions and habits of early additions to breastfeeding occur, those infants who are breastfeed fully or partially are still better protected from infection and illness than those who are not breastfed. As a clear benefit of partial breastfeeding against infection with prevalent enteric agents and childhood morbidity was described, health care workers should encourage mothers to continue, even partial breastfeeding after 3 months of age.

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AUTHOR DISCLOSURES

Natalya Bilenko, Rohini Ghosh, Amalia Levy, Richard J Deckelbaum and Drora Fraser, no conflicts of interest.

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Original Article

Partial breastfeeding protects Bedouin infants from infection and morbidity: prospective cohort study

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部分的哺餵母乳可預防貝多因嬰兒的感染及罹病：前瞻性世代研究

完全哺餵母乳對嬰兒健康特有的好處已經被廣泛的敘述。這個研究的目的是去評估部分哺餵母乳在常見提早附加副食品的族群中，對於腸道感染及相關的罹病是否具有預防效果。在這個前瞻性研究中，238 名貝多因族嬰兒從出生追蹤至 18 個月齡。完全哺餵母乳對 0 至 3 個月的嬰兒可降低感染及罹病率。在年齡範圍 4 至 6 個月，部份哺餵母乳比起未哺餵者，有較低的隱孢子蟲(Cryptosporidium spp) (OR 0.34, 95%CI 0.18; 0.65)與腸道弧菌(Campylobacter spp)(OR 0.58, CI 0.35; 0.98)感染率以及較低的耳朵感染(OR 0.47, CI 0.24; 0.90)與氣喘發生率(OR 0.33, CI 0.13; 0.81)。對較大的嬰兒(10-12 月齡)，部分哺餵母乳比起未哺餵的，可降低隱孢子蟲病(OR 0.57, CI 0.36; 0.91)及梨形鞭毛蟲(OR 0.92, CI 0.85; 0.99)感染。在貝多因人，及可能在其他族群，即使部分哺餵母乳，尤其是在年齡 4 至 6 月的嬰兒，可提供預防感染的效果。因此，鼓勵母親至少繼續部分哺餵母乳 3 個月以上，可以幫助減少嬰兒的感染及罹病率。

關鍵字：貝多因人、哺餵母乳、腸道病原菌、腸胃道、初級健康照護