Infant feeding and Hospitalization during the first six months of life

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Abstract

Objective: To compare the frequency of hospitalization during the first six months of life between breast-fed and bottle-fed infants.

Method: A descriptive cross-sectional study was conducted over twelve months, in hospital-based outpatient clinics. Mother-infant pairs, seen at the clinics during the study period, were enrolled. Infants were between the ages of 6-24 months and had been brought for routine check-ups, vaccinations or common childhood ailments. Subjects were recruited from babies with no congenital anomalies or chronic illnesses. Study team recorded necessary information about feeding practices, previous illnesses and hospitalizations on a structured questionnaire. Hospitalization rates in 3 groups of infants with different feeding methods i.e. predominant breast-feeding, partial breast-feeding, and bottle-feeding were compared. Results were analyzed using SPSS software, ANOVA was used for comparison of means between groups, and a p-value <0.05 was regarded as significant.

Results: A total of 606 mother-infant dyads were enrolled, of which 73% infants were on predominant breast-feeding at 6 months of age. The rate of all-cause hospitalization before six months of age was: 6.3%, 22.2% and 27.2 % in infants with predominant breast-feeding, partial breast-feeding and bottle-feeding, respectively, ($p<0.001$). Figures for admission due to infectious cause were 6%, 17.6% and 25.6%, respectively, ($p<0.001$). Adjusted Odds ratio between bottle-fed and breast-fed babies was 5.3 for all-cause hospitalization, and 6.1 for hospitalization due to infectious illnesses.

Conclusion: Our findings show that protective effect of breast-feeding is not limited to developing countries; it extends to young infants living in urbanized environments equipped with adequate sanitation and clean water supply (JPMA 57:599;2007).

Introduction

Feeding practices during the first 6 months of life have a profound effect on infant health in the developing world and thus remain as a major issue for public health consideration. Association of breast-feeding with a decline in morbidity and mortality in breast-fed infants has been accepted as an indisputable fact in the under-developed countries, where access to safe drinking water is limited, basic amenities unavailable, and sanitation either inadequate or non-existent.[1-6] It is estimated that an increase in breast feeding worldwide by 40% would reduce deaths from respiratory infection by 50% in children less than 18 months of age[7]; however it is not clear whether this statement holds true in satisfactory living conditions as well. Although most research from developed countries accepts the protective role of breast feeding for the first six months of life some reports are controversial.[8-12]

We have attempted to study the protective effect of breast-feeding by comparing the frequency of hospitalization due to acute infectious illnesses between young breast-fed and bottle-fed infants in Tehran, an

urbanized city in the Middle East with safe drinking water, adequate sanitation and prevailing environmental conditions different from developing nations, yet with lifestyle and infant feeding practices essentially dissimilar from the industrialized countries.

Subjects and Methods

We enrolled six-hundred and six mother-infant pairs in the study. Subjects were recruited from infants between the ages of 6-24 months seen at hospital based clinics for developmental check-up, routine immunizations or common childhood ailments during the study period of one year. All babies were singletons; twins were excluded from the study. Infants with congenital anomalies, underlying diseases or risk factors that would either affect the feeding methods or make the infant prone to repeated admissions in the hospital were not enrolled. The study team comprising of one pediatrician and trained personnel collected socio-demographic data and other relevant statistics, including peri-natal history, feeding practices and history of hospital admissions during the first six months of life, and documented the information on a structured questionnaire. To exclude the effect of different seasons on admission rate, data was collected all the year round.

WHO classification was used to define the method of feeding: Predominant breastfeeding was defined as an infant being fed breast milk along with some other non-milk fluids, for example water or "sugar water", but not animal milk or infant formula. Infants who were offered both breast milk and animal milk or infant formula were categorized as "partially breastfed", when no breast milk was given the infant was termed "bottle fed". Outcome variables were: hospital admission due to infectious cause between the ages of 1-6 months of life, and also all-cause hospital admission during the same period. To exclude admissions due to peri-natal causes, neonatal hospital admissions during the first 28 days of life were not considered as an outcome variable. Frequency of hospitalization was adjusted for confounding variables that included infant's sex, mode of delivery, birth-weight, exposure to tobacco smoke, mother's age, parity, education, occupation, and father's education.

All data was analyzed using SPSS software. Analysis of variance was done for comparison of means between groups and Tukey test was used for multiple comparisons. Categorical data was analyzed by chi square test. A p-value of <0.05% was considered significant. Multiple logistic regression analysis was done to adjust for confounders.

Results

Six-hundred and six mother-infant pairs were enrolled in the study. The percentage of infants who were on predominant breast-feeding, (group A), was 81.4% at 3 months (no = 493) and 73% at 6 months of age (no = 442). There were 10.2% infants on partial breastfeeding, (group B), at 3 and 11.9% at 6 months. The last group was of bottle fed infants (C) and had 8.4% babies at 3 months and 15.2% at 6 months. Of 69 all cause hospital admissions between one and six months of age, 58 babies were admitted because of infectious illnesses, 36 for gastrointestinal tract infections, 17 for respiratory tract infections, 2 for urinary tract infections, 2 for meningitis, and 1 for sepsis. The rest had needed admission for non-infectious causes. Mean age at admission was 4.4 months. Particulars of the three groups are given in table1 and the specifics of infants hospitalized during the first 6 months of life with those who were not hospitalized, are compared in table 2. Univariate analysis of all-cause hospitalization with the feeding status at 6 months revealed that 6.3% of infants in group A, 22.2% in group B, and 27.2% in group C had been hospitalized, (p<0.001);

Table 1. Comparison of variables in three groups of infants [with predominant breast-feeding (A), partial breast-feed (B), and bottle-feeding (C), at 6 months].

No.	Variable	A No = 442	B No = 72	C No = 92	p-value
1	Birth wt, kg. mean(SD)	3.2 (0.483)	2.9 (0.581)	3 (0.574)	0.002
2	First Child %	59	75	69.6	0.011
3	Caesarean Delivery (%)	52.7	76.4	64.1	0.000
5	Male sex (%)	49.3	56.9	56.5	0.271
6	Neonatal hospitalization (%)	18.4	29.2	25	0.134
7	Father smoker (%)	28.4	22.1	30.3	0.480
8	Mother'Age, yrs. mean(SD)	27 (4.91)	26.9 (5.08)	26.3 (5.51)	0.531
9	Working mother (%)	16.1	33.3	15.2	0.001
10	Mother's education, yrs. mean(SD)	10.8 (4.32)	10.7 (4.89)	10.5 (4.19)	0.81
11	Father's education, yrs. mean(SD)	11.3 (4.23)	11.3 (4.55)	11 (4.16)	0.835
12	Child care attendance (%)	1.6	4.2	2.2	0.335

Table 2. Comparison of variables between infants hospitalized between 1-6 months of age with infants not admitted to hospital during the same period.

No.	Variable	No hospitalization no= 537	All cause admission no= 69	Admitted with infection no=58	p-value
1	Birth wt. kg. mean (SD)	3.16 (0.48)	3.09 (0.68)	3.11(0.66)	0.297
2	First Child (%)	62.6	62.3	60.3	0.738
3	Caesarean Delivery (%)	56.6	62.3	58.6	0.241
5	Male sex (%)	51	53.6	51.7	0.708
6	Neonatal hospitalization (%)	21.1	17.4	18.9	0.196
7	Father smoker (%)	28.5	23.4	24.1	0.393
8	Mother'age, yrs. mean (SD)	27.1 (4.99)	25.26 (5.01)	25.4 (4.8)	0.01
9	Working mother (%)	19.2	8.7	6.9	0.06
10	Mother's education, yrs. mean (SD)	10.99 (4.35)	9.14 (4.18)	9.2 (4.0)	0.005
11	Father's education, yrs. mean (SD)	11.45 (4.25)	10.5 (4.19)	10.2 (4.3)	0.088
12	Child care attendance (%)	2.3	0	0	0.211

Table 3. Adjusted Odd's ratio and 95% confidence interval for infant hospitalization with 3 different methods of feeding.

No.	Feeding methods	Variable	OR	95% CI
1.	Bottle-feeding vs. predominant breast-feeding	All-cause hospitalization	5.3	2.9-9.8
2.	Partial breast-feeding vs. predominant breast-feeding	All-cause hospitalization	4.2	2.1-8.4
3.	Bottle-feeding vs. predominant breast-feeding	Hospitalization due to infection	6.1	3.2-11.6
4.	Partial breast-feeding vs. predominant breast-feeding	Hospitalization due to infection	3.9	1.8-8.4

figures for admission due to infectious cause were 6%, 17.6% and 25%, respectively, ($p<0.001$). Logistic regression was done to adjust for confounders, and the difference in hospital admissions in the three groups was still significant, the Odd's ratio for all-cause and infectious disease hospitalization is given in Table 3.

Discussion

Early weaning from breast milk is associated with increased cost of health care due to increased risk of infant morbidity and mortality.[13,14] It has been estimated that for each one thousand non-breastfed infants, there is an additional number of 2033 pediatric visits, 212 days of hospitalization, and 606 medical prescriptions for the treatment of diarrhoea, and respiratory diseases compared to children exclusively breastfed for at least three months.[15]

Various studies have reported inverse relationships with breast feeding and poor health outcomes but some researchers have suggested that much of this effect is attributable to confounding and disappears after statistical adjustments.[16] A systematic review has questioned the beneficial effects of human milk in reducing infection rates in preterm infants;[17] but another report contends that the incidence of any infection and sepsis/meningitis are significantly reduced in human milk-fed "very low birth-weight", (VLBW), infants compared with exclusively formula-fed VLBW infants.[18] Schanler et al report that the incidence of necrotizing enterocolitis and late-onset sepsis was less in premature infants who were fed fortified human milk (FHM) in comparison with those who were fed exclusively preterm formula and recommend that FHM feeding should be promoted actively in premature infants.[19]

While a meta-analysis by Bachrach and colleagues found that breast-feeding has a protective effect against hospitalization from infection, Chen et al reported that breast-feeding protected children from hospitalization due to non-gastrointestinal infections, but not due to gastro-enteritis. In January 2001 Kramer and colleagues noted that although breast-feeding protected against gastroenteritis, it did not protect against respiratory tract infections or hospitalization due to infection.[11,20,21]

A pooled analysis of studies, (from Brazil, The Gambia, Ghana, Pakistan, the Philippines, and Senegal), assessing the protective effect of breast-feeding, revealed that in the first 6 months of life, protection against diarrhea was substantially greater than against deaths due to acute respiratory infections.[5] In another multi-center study it was shown that infants who had not been breastfed had a 10-fold higher risk of dying of any cause and a 3-fold higher risk of being hospitalized for any cause when compared with those who had been predominantly breastfed.[1]

In view of the conflicting evidence, we undertook to

evaluate the effect of breast-feeding on the risk for hospitalization from infection during the first 6 months of infancy, in the capital city of a transitional country.

Most researchers from the advanced countries have studied the protective effect of exclusive breast feeding, although Parcio et al from Spain have used the expression "full breastfeeding", defined as exclusive (no other liquid or solid) or almost exclusive (infrequent vitamins, water, juice, or ritualistic feeds).[22] The World Health Organization definition for exclusive breast feeding was not relevant in our subjects as we realized that almost all infants received at-least water or "sugar water" in addition to breast milk so we preferred to describe 'almost exclusive breastfeeding' as "predominant" breast feeding, which is the recommended WHO terminology. Moreover, indicators based on maternal recall for exclusive breast feeding have been shown as inadequate and even misleading; studies conducted rigorously report many infants who are predominantly breastfed have been classified as exclusively breastfed during demographic surveys. Likewise, it has been shown that the risks of hospitalization associated with being predominantly breastfed were not significantly different from those associated with being exclusively breastfed.[1,23,24]

In studies about infections in young infants, especially respiratory illnesses, maternal smoking is a major factor that has to be accounted for; since all 606 mothers in our study were non-smokers we did not have to address this problem.

Because our study was based on maternal recall regarding events during the first 6 months of life, which is a major limitation, we took measures to minimize recall errors. We limited the age of infants studied to 6-24 months of age, we did a complete physical examination to rule out underlying illnesses, we disregarded infections treated as outpatients, and we only considered hospital admission as the outcome measure.

Pardo et al have analysed the association of breast-feeding with all admission causes and with fever of unknown origin (FUO) in hospitalized children aged less than 24 months. Significant negative trends were noted in univariate analyses between the length of breast-feeding and both all admission causes and FUO, although the statistical significance was lost after adjusting for confounding variables. However adjusted mean length of breast-feeding was shorter in hospitalized children < or = 6 months old; they concluded that breast-feeding time is shorter in hospitalized children for both all admission causes and FUO.[25] Our statistics show that even after adjusting for the confounders, bottle-fed children had higher rates of admission before 6 months of age as compared to partially breast-fed infants, who, in turn, were hospitalized more frequently than predominantly breast-fed babies.

Benefits of breast-feeding continue in the weaning period as documented in some studies including one from Yemen which documented that mortality was lower in weaning children who continued to receive breast-milk than in bottle-fed weaning children.[3]

Conclusion

Our findings confirm the fact that not only is breast feeding protective under poor sanitary conditions, as revealed in studies from the developing nations, it also plays a major role in transitional countries, by preventing morbidity in young infants, decreasing hospitalization rates and the resulting health expenditure.

Counseling and helping mothers to continue to breastfeed their infants during the early months of life enhances the health of children, and remains a crucial step in preventive paediatrics.

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