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Breast feeding and protection against neonatal sepsis in a high risk population

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Abstract

Protection against neonatal sepsis by breast feeding was investigated in a developing community. A case-control study was carried out with 42 cases from a hospital and 270 controls, matched for age and socioeconomic conditions from the community. Exclusive breast feeding was extremely rare, most babies being partially breast fed and a few being given formula feed or animal milk.

A highly significant odds ratio of 18 was obtained, showing that even partial breast feeding protects against neonatal sepsis in such a population.

Neonatal sepsis is a major cause of morbidity and mortality among young infants. In developed countries the incidence of neonatal sepsis is about 3/1000 live births.[1 2] A comparable figure for Pakistan is not available, but it should be higher as infections are the main cause of neonatal mortality there. A study from Mayo Hospital, Lahore, showed that cases of neonatal sepsis comprised 30% of the total neonates admitted with infections.[3] Mortality in neonatal septicaemia remains high, 45% being reported from Saudi Arabia[4] and 12% from Sweden.[5] In an ongoing longitudinal study of children in Lahore, Pakistan, the initial estimates suggest that of the total deaths in the neonatal period 12% are the result of neonatal sepsis (unpublished data). In this population, breast feeding is not usually initiated before 48–120 hours after birth and certain other food and fluids are fed instead.[6] These foods and fluids are often contaminated with bacteria, mainly Gram negative (I Alderberth and K Khalil, personal communication).

A study from Sweden suggested that breast milk protects against neonatal septicaemia and meningitis caused by Gram negative bacteria.[7] We undertook a case-control study in a high risk population in Lahore, Pakistan to find out if breast feeding can protect against neonatal sepsis.

Patients and methods

STUDY GROUPS

A matched case-control study was carried out with 42 cases of neonatal sepsis that had been admitted to hospital and 270 controls selected from the community in Lahore, Pakistan.

The cases (3–28 days old) were consecutive patients admitted to hospital with a diagnosis of septicaemia from January to August 1987. Nine cases were 3–7 days old when admitted and had become ill at the ages of 3, 3, 3, 4, 4, 5, 5, 6, and 7 days. The other 33 had become ill and were admitted when they were aged 8–28 days. Those included were severely ill term neonates admitted to the nursery of the Mayo Hospital, Lahore, with a clinical diagnosis of septicaemia based on three or more of the following features: hypothermia or hyperpyrexia, hypotonia, lethargy, refusal to feed, and jaundice or signs of meningeal irritation, or both. Neonates with severe infectious diseases such as pyoderma, diarrhoea, or radiologically diagnosed bronchopneumonia were excluded, as were premature infants, twins, babies with congenital malformations, and asphyxiated neonates. The provisional diagnosis was always confirmed by the senior consultants. Because antibiotic treatment had often been instituted before admission and the cultures that had been done were not of a high enough quality to ensure scientific reliability, the results of the blood cultures have not been considered.

The controls were identified within the community and were of the same socioeconomic group as the cases. The controls were neonates without apparent infection, identified from the community birth registers within one to two weeks after a case had been admitted (with a maximum difference in the date at birth of seven days), controlling for differences in the mode of feeding in relation to the season of the year.[8] We aimed to select eight controls for each case matching for area of living and date of birth to within seven days. The number of controls found, however, was less than expected. The mean number of controls for each case was 6·4 (range 4–8), as it was not always possible to find eight infants with matching birth dates. We did not regard hospital patients as suitable controls as only extremely ill infants are referred or directly admitted. Most of them have been ill for several days or have various anomalies that would militate against them being breast fed.

The mothers were interviewed by trained health workers who were unaware of the objective of the study, using the same standardised questionnaire for both cases and controls. Risk factors such as sex, birth order, place of delivery, qualification of birth attendant, interval between rupture of membranes and delivery, and techniques of cord care, were recorded. A detailed retrospective history of feeding, starting from the day of birth (including frequency of breast feeding) was also recorded. The pattern that evolved was classified into three groups: exclusive breast feeding; partial breast feeding—that is, those who started breast feeding after or in addition to giving any other foods

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and fluids such as water or fresh animal milk; and no breast feeding—these infants were given commercial formula feeds or fresh animal milk.

The frequency of nursing during day and night was recorded both for cases and controls, but was difficult to evaluate for the cases because of their severe disease. As a result of this, the amount of breast milk received by the partially breast fed infants is unknown.

STATISTICAL ANALYSIS

Statistical evaluation was by unmatched analysis for case-control studies, and odds ratios were calculated. Unmatched analysis was used because of the unequal number of controls/case, Mantel and Haenszel's χ^2 with one degree of freedom was used for calculation of the significance of differences. Woolf's limits were applied when estimating 95% confidence intervals (CI).[9] A test for homogeneity was done after stratifying the various risk factors.[10]

Results

No significant differences were found between the cases and controls for age, sex, birth order, place of delivery, qualification of birth attendant, interval between rupture of membranes and delivery, sterilisation of instruments used, or handling, cutting, and further care of the cord (table 1). The mode of feeding, however, differed between the cases and controls. The only exclusively breast fed baby, in the control group, was included in the study. In the partially breast fed group there were 19 cases and 253 controls (table 2). In the group that was given no breast milk there were 23 cases and 17 controls. The incidence of breast feeding was less among the cases than the controls, with an odds ratio of 18. The odds ratio did not vary significantly when the data were stratified for sex, birth order, place of delivery, and qualification of the birth attendant, or instruments used (data not shown).

Table 1 Comparison of variables in which there was no significant difference between cases of neonatal sepsis and controls. Values are given as number (%)

	Cases of neonatal sepsis (n=42)	*Controls (n=270)*
Age (0–28 days):		
Mean	14·8	15·7
Median	14	16
Sex:		
Male	24 (57)	149 (55)
Female	18 (43)	121 (45)
Median birth order (1–10)	3	3
Place of delivery:		
Hospital	14 (33)	90 (33)
Home	28 (67)	180 (67)
Birth attendant:		
Doctor	12 (29)	92 (34)
Qualified midwife	22 (52)	154 (57)
Untrained midwife	8 (19)	24 (9)
Mode of delivery:		
Spontaneous	40 (95)	248 (92)
Forceps	1 (2)	14 (5)
Caesarean	1 (2)	8 (3)
Time between rupture of membranes and delivery:		
0–24 Hours	41 (98)	260 (96)
>24 Hours	1 (2)	10 (4)
Instruments used for delivery:		
Sterilised	24 (57)	124 (46)
Unsterilised	18 (43)	146 (54)
Tying of cord:		
Clamp	10 (24)	65 (24)
Sterilised thread	7 (17)	72 (27)
Unsterilised thread	25 (60)	133 (49)
Care of cord:		
Spirit/gentian voilet	5 (12)	33 (12)
Antibiotics	14 (33)	96 (36)
Oil or butter	15 (36)	108 (40)
Ash	0	2 (1)
Nothing	8 (19)	31 (12)

Table 2 Occurrence of sepsis and mode of feeding

	No (%) of cases of neonatal sepsis	*No (%) of controls*	χ^2	*p Value*
Animal milk or formula	23 (55)	17 (6)	71·8	<0·001**
Partial breast feeding	19 (45)	253 (94)*		
Total	42	270		

*The single exclusively breast fed infant was included here.
*Odds ratio 18 (95% CI 7·9 to 37·7 using Wolf's limits).

Discussion

This study indicates that protection against neonatal sepsis is given even with partial breast feeding among neonates in a poor community with a high mortality from neonatal sepsis.

In these severely ill infants the diagnosis was usually obvious and there were few differential diagnoses. This was especially true because no case of early neonatal sepsis, which can be difficult to diagnose, was seen in this study. It is possible that early cases of neonatal sepsis died at home before they had time to reach hospital.

The septicaemic infants were not less likely to be breast fed than the controls. This is based on our findings that in the study area 98% of those that are going to be breast fed have started breast feeding on or before day 3 and all are being breast fed by day 5.[6] In 39 of the 42 cases, the onset of septicaemia was after day 4, and only three presented on day 3.

Not only was exclusive breast feeding uncommon in the community that we studied but colostrum was rarely fed. Instead, various other—often infected—foods and fluids were given. This may explain why the intestinal tracts of neonates in the study area were colonised with aerobic Gram negative bacteria significantly earlier than those of Swedish infants.[11] In addition, the early aerobic gut flora of Pakistani infants contained bacteria of more genera compared with those of Swedish infants. Klebsiella, enterobacter and citrobacter were also significantly more common among the non-breast fed Pakistani infants than among those that had early breast feeding. This early exposure to various bacterial strains might result in an unstable and potentially pathogenic gut flora that causes early infections such as neonatal sepsis and diarrhoea, which are common in this community. It is possible that the early microbial exposure and lack of feeding with colostrum could cause the severe cases.

Although the events at the time of delivery like mode of delivery, and risk factors such as sex, birth order, place of delivery, qualification of birth attendant, interval between rupture of membranes and delivery, and techniques of

cord care were evenly distributed among both cases and controls, there was a significant difference between the groups in the mode of feeding. The study includes unequal numbers of controls for each case because of the preset matching criteria that were used. There is no reason to believe that cases with more controls are different from those with fewer controls with regard to background measures of importance. We have not tested this statistically because the lowest number of controls selected for any one case was four. If exactly four of the controls were selected for each case, the total number of controls would be 168. Theoretically, all the deleted controls (n=102) could belong to the partial breast fed group (table 2). Seventeen of the controls would then still not be breast fed, but 'only' 151, or 89%, would be partially breast fed. In this extreme situation the odds ratio is 10·8 ($p<0·001$) and the conclusion of the study would thus not be influenced.

Of the total cases, 45% were partially breast fed compared with 94% of the controls, so this study shows that even partial breast feeding can protect infants from neonatal sepsis. Possibly exclusive breast feeding would provide even better protection. In developing countries, therefore, exclusive breast feeding (including early colostrum feeding) should be promoted by teaching birth attendants and giving information to the family.

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