Infant feeding and risk of severe diarrhoea in Basrah city, Iraq: a case–control study

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A case–control study of the relationship between feeding mode and risk of hospitalized diarrhoea in infants (aged 2–11 months) in Basrah city was conducted between September 1983 and May 1984. A total of 597 cases were recruited from among infants admitted with diarrhoea to the major paediatric hospital in the city, while 723 controls were recruited from among healthy infants attending any of the seven maternal and child health clinics in Basrah. A variety of potentially confounding variables were controlled in the analysis. For infants aged 2–5 months, breast-feeding alone or breast-feeding plus food were the least risky feeding modes. Bottle-feeding was dangerous and bottle-feeding alone was associated with a risk of 55 among infants aged 2–3 months, and 37 among infants aged 4–5 months, relative to exclusive breast-feeding. For older infants (6–11 months), the risks of hospitalized diarrhoea were not significantly different among different partial breast-feeding modes, but non-breastfeeding was dangerous, especially exclusive bottle-feeding. Food intake was associated with a reduced risk of severe diarrhoea among bottle-fed infants but not with an increased risk among breast-fed infants. Among bottle-fed infants, no association was found between risk of severe diarrhoea and method of bottle-cleaning. Previous breast-feeding conferred no current protection.

Introduction

Diarrhoeal morbidity and mortality rates are high among infants and young children in developing countries. This is also true in Iraq (*1*, *9*).[a,b] Biological data suggest an important protective role for breast-feeding against diarrhoea, especially early in infancy (*7*, *12*). Two recent reviews on the epidemiological evidence for such protectiveness support this hypothesis (*5*).[c] Our knowledge of the relationship between infant feeding and diarrhoea is not, however, as detailed and comprehensive as it should be, partly owing to the complexity of the methodological problems inherent in measuring this associaton (*13*).

The use of case–control methods in studies of diarrhoeal diseases has, until recently, been limited to the investigation of diarrhoea outbreaks. However, during the last few years, these methods have been increasingly applied to the investigation of diarrhoea risk factors, and to the evaluation of the impact on diarrhoea of various interventions (*3*, *14*).[d,e]

The present study investigated the impact of infant feeding practices on the risk of hospitalized diarrhoea in infancy in Basrah city, Iraq, using a case–control methodology. The field work was conducted over a period of 9 months between September 1983 and May 1984.

Materials and methods

Basrah city, with about 750 000 inhabitants, is situated on the western bank of the Shatt-al-Arab waterway in southern Iraq. Health services in the city are mainly provided by the government health facilities, free of charge. All inpatient paediatric health services during the study period were provided by the Basrah Paediatric Hospital (BPH). There are seven maternal and child health clinics (MCHC) in Basrah city, providing preventive health care services only (immunization and monitoring of growth and development). Immunization against diphtheria, pertussis, tetanus, and poliomyelitis is compulsory in Iraq.

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Reprint No. **5032**

Bulletin of the World Health Organization, **67** (6): 701–706 (1989)

Cases. A case in this study was defined as an infant (below one year of age) who was admitted to the Basrah Paediatric Hospital during the study period because of diarrhoea with or without other signs or symptoms (e.g., vomiting, dehydration, fever, respiratory symptoms), with an onset of diarrhoea not more than five days before admission. Excluded from these were: (*a*) infants with a birthweight of less than 2500 grams; (*b*) infants of mothers who had severe illnesses during pregnancy, delivery, and/or puerperium, and required hospitalization; (*c*) infants with congenital malformation, chromosomal abnormalities, and chronic debilitating diseases; (*d*) infants residing outside Basrah city; and (*e*) infants, 3 months of age and older, with no history of being taken to an MCHC for immunization. On each day of the study period the hospital was visited by one of us (DAM), and case notes of all newly admitted infants were inspected. Infants with diarrhoea as their chief complaint were chosen as potential cases and those who satisfied the above criteria were selected for the study.

Controls. Controls were selected from infants brought to any of the seven MCHCs in Basrah city for immunization and/or routine check-up during the study period. They should not have had a history of admission to hospital because of diarrhoea in the month prior to the interview, and were excluded if admitted to hospital for diarrhoea during a period of one month following selection as a control. Excluded were infants who fell in categories (*a*) to (*d*) mentioned above.

Each MCHC was visited once during each of six five-week subperiods. The initial visit to each clinic was in a randomly selected week in the first five-week subperiod, after which the visits were made systematically (every fifth week). The visits were made on one of the three days each week when the MCHCs had infant welfare clinics, randomly choosing a different day each time. Every other infant entering the room to be seen by the nurse in charge was selected as a potential control.

Subject to the above definitions, cases could later become controls and vice versa. For all study subjects, informed consent was obtained from mothers after explaining the nature and purpose of the study.

Data collection and analysis

Data in this study were compiled from three sources:

— Interviews of infants' mothers conducted in Arabic (by DAM); precoded questionnaires were used and information gathered included socioeconomic characteristics of the family, infant feeding practices, and, for the cases, details of the symptoms of the presenting illness.

— Hospital records for information on clinical features, treatment, and prognosis of cases.

— Diagnostic laboratory tests on faecal specimens to detect enteropathogenic *Escherichia coli* (EPEC) and rotavirus. Laboratory procedures are reported elsewhere (*9*).

Odds ratios for estimating relative risks of hospitalized diarrhoea among various feeding mode groups, while controlling for the effects of confounding variables, were obtained using linear logistic regression analysis. Both SPSS (Statistical Package for Social Sciences) and PECAN (Parameter Estimation in Conditional Analysis), which employs the conditional maximum likelihood method to estimate the required parameters, were used for conducting the analysis.

The following variables were found to act as confounders and were therefore controlled for in the analysis:

— infant's age (in months);
— month of selection of the study subject;
— years of school education of the mother;
— place of residence (divided into affluent, intermediate, and poor);
— sex;
— ownership of a house;
— ownership of a car;
— type of house in which the family lives (brick, mud, or reed); and
— type of infant's drinking water (boiled vs unboiled).

The first four of these were found to be the most important confounding variables.

Interactions between the effect of infant feeding and of each infant's age and various socioeconomic variables on the diarrhoea were also considered. A statistically significant interaction between infant feeding and infant's age on risk of hospitalized diarrhoea was detected. Hence the results are presented within four age groups of infancy: 2–3, 4–5, 6–7, and 8–11 months. Infants in the first two months of life (infants of 0 and 1 month of age) were excluded from the analysis because they were few in number. No significant interactions were found between infant feeding and socioeconomic variables.

Various feeding modes are contrasted with exclusive breast-feeding for infants aged 2–5 months (the widely recommended feeding mode during that age span) and with breast-feeding and food for those aged 6–11 months (because of its nutritional desirability later in infancy).

Definitions of feeding modes

Feeding modes were divided according to the presence in the diet of breast-feeding (BF), bottle-feeding (BTL) and food (all items in the diet other than BF, BTL, water, water and sugar) into: exclusive breast-feeding