PREDICTORS OF EXCLUSIVE BREASTFEEDING IN EARLY INFANCY: OPERATIONAL IMPLICATIONS

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ABSTRACT

Objectives*: To evaluate the independent predictors of exclusive breastfeeding in early infancy.*

Design*: Cross sectional multivariate comparison of different breastfeeding categories.*

Setting*: Urban teaching hospital Outpatient Department.*

Subjects*: Mothers of 501 children between the age group of 0-6 months were questioned in detail on a standardized pretested proforma about various sociodemographic, parental, infant, feeding related, antenatal and perinatal characteristics likely to affect breastfeeding practices. Mother's height and weight and infant's weight were also recorded.*

Results*: The exclusive breastfeeding, predominant breastfeeding, bottle feeding, ever breastfed and timely first suckling rates were 44.9%, 67.8%, 31.5%, 99.4% and 10.4%, respectively. Amongst the 29 factors subjected to univariate analyses, 16 clinically relevant or significant (p <0.1) variables were included for multiple logistic regression models. The significant (p <0.05) positive independent association for exclusive and partial breastfeeding were (OR) infant's present weight (1.45 to 9.64); breast milk as first feed (1.53 to 2.22); and lower age of child (1.02 to 1.05). Additional important predictors for exelusive breastfeeding versus total top feeding) were (OR) breastfeeding propagation (1.34 and 2.99); less educated mother (1.09 and 1.23); normal vaginal delivery (1.60) and taller mother (1.21).*

Conclusions: *Breastfeeding propagation plays a key role in promoting exclusive breastfeeding. Other independent negative predictors represent a high risk subset for whom intensive propagation is desirable since these factors by themselves may not be amenable to intervention.*

Keywords: *Exclusive breastfeeding, Predictors, Infant.*

Exclusive breastfeeding is essential for the proper growth and development of the young infant, and it protects the child from several common morbidities and mortalities., The contribution of breastfeeding to infant's health is especially important in the context of developing countries like India. It is, therefore, essential that breastfeeding is practiced vigorously in infancy.

In the early 1970's a decline in breastfeeding was documented in almost every country that was evaluated in the developing world(l). Recent studies(2-4) in India have also shown a declining trend of breastfeeding especially in the urban slums(3). It is important to determine the possible factors for these declining trends so that operational guidelines can be formulated for breastfeeding promotion.

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In this context, the available data from India has the following lacunas: (i) various workers have employed dif ferent definitions for breastfeeding(2-13) since an international consensus on breastfeeding definitions has been achieve only recently(14); *(ii)* Currently, the stress is on promotion of exclusive breastfeeding in the first 4 to 6 months of life(15). However, the earlier studies(2-13) have concentrated on factors associ ated with any type of breastfeeding rather than exclusive breastfeeding; and *(iii)* Data in the available reports(2-13) has been analyzed in a simple univariate manner without accounting for con founding factors. Recently, only a few properly conducted and statistically analyzed studies(16-24), mostly from abroad, have attempted to answer these questions. The data from abroad may not be applicable locally since the factors responsible for early termination of breastfeeding have intra and inter regional variations.

The present study was, therefore, designed to eliminate the aforementioned lacunas while determining the factors associated with termination of exclusive and partial breastfeeding in early infancy in Delhi.

Material and Methods

The investigation was conducted in the Pediatric Out Patient Department of Lok Nayak Jai Prakash Narain Hospital, New Delhi from August 1993 to July 1994. The study comprised of 501 children aged 0-6 months with nearly 80-85 subjects evaluated at each monthly interval.

Mothers of these children were interviewed on a standardized pretested proforma regarding the breastfeeding practices and various demographic, socioeconomic and other factors likely to influence the breastfeeding practices. These proformas were pretested on 20 cases before finalization. In addition to a structured approach, open ended questions were also asked. Each proforma was filled over 10 to 15 minutes. Mother's were subsequently weighted on a spring scale to the nearest 100 g and their standing height was measured upto the nearest cm. Babies were then weighed on a Seca Beam Balance with a sensitivity of 5 g.

Various potential variables included in the proforma were on the basis of earlier experience of other workers. The variables evaluated included: *(i) Maternal characteristics:* age, education, socioeconomic status, employment status, outcome of previous pregnancies (including number of live, dead, stillbirths and abortions), interval between preceding births, previous breast feeding experiences, any present pregnancy, use of hormonal contraception and mother's weight and height; *(ii) Family characteristics:* father's age, father's occupation, father's education, family type, religion, total family income, per capita family income, household items like television, radio, and refrigerator; *(iii) Antenatal and perinatal factors:* intention to breastfeed before delivery, breastfeeding propagated or not by health worker, mode of delivery, type of first feed, time of first feed, and use of prelacteal feeds and colostrum; *(iv) Baby's characteristics:* feeding status, breastfeeding pattern, type of feed, frequency of breastfeed, age of supplementation, and age of cessation; and *(vi) Miscellaneous factors:*

household help, and influence of husband, relatives and friends.

A separate section included questions regarding all kinds of feeds (sweetened water, vitamins, mineral supplements, medicines, fruit juices, milk based feeds, solids or semisolids, ORS, ghutti) given to the child in the past 24 hours. This information was used to calculate various breastfeeding indicators as per the international consensus recommended by the World Health Organization(14).

All attempts were made to ask these . questions from mothers of healthy infants who were attending the hospital for routine check ups and immunizations. However, to complete the sample size, children with minor ailments (for example, diarrhea, upper respiratory tract infections) were also included. In such infants, care was taken to enquire into the feeding practices prior to the onset of current illness.

Data was entered in the computer and analyzed with SPSS software. Univariate analyses to differentiate breastfed, partially breastfed and top fed infants included Chi square test, Student T test, and analysis of variance, wherever appropriate. To determine the univariate associations, four separate sets of analyses were conducted to individually examine each factor's impact on feeding status, either exclusive breastfeeding (E), partial breastfeeding (P), or top feeding (T). The first analytic set involved comparison across *all the three breastfeeding* (EPT) *Status.* The definitions adopted for the feeding mode were as per the WHO recommendations(14). *Exclusive breastfeeding* (which included: predominant breastfeeding also) was defined as the infant receiving only breast milk (including expressed milk or from wet nurse and allowed the infant to receive small amount of water, vitamins, minerals, medicines and ORS but did not allow the child to receive non-human milk and food based fluids). *Partial breastfeeding* was defined as the infant receiving non-human milk or food based fluids besides receiving breastfeeds. *Total top feeding* was defined as the infant not receiving any breast milk and only getting non-human milk and/or food based fluids. The second set examined the effect of these variables on exclusive breastfeeding versus non exclusive *(partial and top)* (E *vs* P+T). It was important to determine the factors which specifically influence continuation of exclusive breastfeeding in order to plan future interventional programs to promote exclusive breastfeeding. The third analyses compared any *(exclusive and partial) breastfeeding versus total top feeding* (E+P *vs* T). This enabled a comparison of the current study with other studies done in the past which have mainly concentrated on determining those factors which influence cessation of any breastfeeding. Finally, in the fourth set of analysis, *exclusive breastfeeding was compared with total top feeding* (E *vs* T). The rationale behind this analysis was to examine and identify the variables that most differentiate between these contrasting methods of infant feeding.

Significant factors on univariate analyses were included in the multiple logistic regression model to find out the independent predictors of breast-feeding. The status of breastfeeding was the dependent variable, whereas the factors

evaluated were the independent variables. Since the multiple logistic regression model requires a dichotomous dependent variable (feeding pattern in this case), the following three dichotomous categorizations were created: (i) exclusive breastfeeding (E) versus non-exclusive breastfeeding (P+T); *(ii)* .any breastfeeding (E+P) versus total top feeding (T); and *(iii)* exclusive (E) versus total top feeding (T). For all the three categories of dependent variables enumerated above, multiple logistic regression analysis was run with the same selected independent variables mentioned earlier. Subsequently for the calculation of Odd's ratios' (OR) and *95%* confidence intervals (95% CI), reduced models were derived from the global models, were included and the confounders excluded to get an exact idea of the magnitude of relationships, if any. These reduced models were again run for all the three categories of dependent variables (E *vs* P+T, E+P *vs* T and E *vs* T).

Results

There were, 80 to 87 subjects in each monthly interval (80, 87, 87, 81, 86 and 80 infants, respectively in each monthly interval from 0 to 6 mo). Two hundred and thirteen children (42.5%) had minor morbidity at the time of interview. *Exclusive breastfeeding* till 6 months age was practiced by 307 children (61.3%). Some (13.6%) of these infants had also received drops, syrups (vitamins/mineral/medicines) but did not consume anything else in the past 24 hours(14). There were 158 children (31.5%) who were partially breastfed. These children were receiving other milk besides breast milk by either bottle or Katori-chammach, or both. There were 36 children (7.2%) who were receiving no breastfeeds and were totally top fed.

The calculated rates of various breastfeeding indicators as per WHO recommendations(14) are summarized in *Table I.* An analysis of the age stratified data in this context yielded interesting information. With increasing age, the exclusive and predominant breastfeeding rates declined whereas the bottle feeding rose marginally. There was no appreciable change in the ever breastfed and timely first suckling rates; almost all infants were ever breastfed while only one-tenth had been suckled in time.

TABLE I – Calculated Rates of Breastfeeding Indicators

Indicator	Age group (mo)	Numerator	Denominator	Rate (%)
Exculisve breastfeeding	0 to <4	145	323	44.9
Predominant breastfeeding	0 to <4	219	323	67.8
Bottle feeding	Upto 6	158	501	31.5
Ever breastfed	Upto 6	498	501	99.4
Timely first suckling	Upto 6	52	501	10.4

The reasons given as an open-ended response by mothers for supplementation of breast milk and cessation of breastfeeding are shown in *(Table II)*. Amongst the 214 responses in 158 mothers who had supplemented breast milk, the commonest stated reason *(523%)* was insufficient breast milk production which was inferred from the baby's crying. Most were not aware that each time that the baby cried, it did not necessarily mean that the infant was hungry. Many mothers wanted to habituate the baby (12.2%) because they were either advised by their mother-in-laws or felt themselves that this would make subsequent non-feeding from the breast much easier. Amongst the 50 responses in 36 mothers who had stopped breastfeeding, the most important reason cited was breast rejection by the baby (28%). None of them had sought professional help for this problem. Insufficient milk (16%) and lactation failure (12%) were other important reasons. Many of the mothers who gave insufficient breast milk production as a reason also gave breast rejection by baby as a subsequent reason. According to these mothers their babies had been put on supplemental feeds due to inadequate output perceived by the mother and subsequently, the child had preferred taking top feeds and had thus rejected the breast.

Table III lists the 29 variables subjected to univariate analyses and the documented significant ($p < 0.05$) associations. Different variables emerged as significant predictors of breastfeeding depending on the comparison group analyzed, namely, E *vs* P+T, or E+P *vs* T, or E *vs* T.

TABLE II- *Stated Reasons for Supplementation of Breast milk and Cessation of Breastfeeding.*

Reason	Number of response (%)
Supplementation of breast milk (n=214)[@]	
Insufficient milk	112(52.3)
Habituate	26 (12.2)
Work	20 (9.3)
Maternal illness	16 (7.5)
Relative's advice	14 (6.5)
Child's illness	7 (3.3)
Breast discomfort	5 (2.3)
Breast rejection	5 (2.3)
Others[a]	9 (4.2)
Reasons for cessation of breastfeeding (n = 50)[#]	
Breast rejection	14(28)
Insufficient milk	8 (16)
Maternal illness	8 (16)
Lactation failure	6(12)
Child's illness	4 (8)
Relative's advice	2 (4)
Work	1 (2)
Others[b]	5 (10)

@-Two reasons were given by 56 mothers and a single reason by 102 mothers.
a—Others included sibling ill health in 2, advice by doctor in 3, convenience of mother in 3 and baby not gaining weight in 1.
#—Two reasons were given by 14 mothers and a single reason by 22 mothers.
b—Others included death of biological mother in 2, baby not gaining weight in 2 and cleft palate in 1.

Considering the statistical significant ($p < 0.1$) on univariate analyses and clinical importance, the following 16 variables were included for the multiple logistic regression analyses: age of mother (years), age of infant (days), per

TABLE III—*Variables Subjected to Univariate Analyses and the Significant Associations*

Socio-demographic Variables	
Rural/urban residence	Nuclear/joint family
Religion*	Television
Radio	Refrigerator
Per capita income	
Parental/Delivery Variables	
Father's age	Father's education[$]
Mother's age[#]	Mother's education
Mother's height[@, $, *]	Mother's weight[@, #, $, *]
Working mother	Propagation of breastfeeding[@, #, $, *]
Delivery mode[#]	Household help
Parity[@, #]	Previous abortion/still birth
Birth interval	
Infant Variables	
Infant's age[@, #, $, *]	Sex
Present weight[@, #, $, *]	Birth weight[@, #, $, *]
Infant Feeding Variables	
Feeding pattern[@, $, *]	Type of first feed[@, $, *]
Time of first feed[@, #]	Prelacteal feeds[@, #, *]
Feeding colostrum[@, #, $, *]	

There were only 14 mothers who were working.
Birth weight was available for only 233 children.
Significant associations—@: E *vs* P *vs* T; #: E *vs* P+T; $: E+P *vs* T; *: E *vs* T.

capita income (Rs.), religion (Hindu *vs* non-Hindu), education of mother (class), education of father (class), height of mother (cm), weight of mother (kg), parity (live births + stillbirths + dead children), whether breastfeeding propagated (yes/no), type of first feed (breast milk *vs* others), time of first feed, whether prelacteal feed given (yes/no), whether colostrum given (yes/no), mode of delivery (normal vaginal delivery *vs* others) and breastfeeding pattern (demand *vs* others).

Table IV depicts the OR's and 95% CI of the significant ($p < 0.05$) independent associations derived from the reduced multiple logistic regression models. A separate set of analyses was conducted with birth weight as a variable for the 233 cases in which data on this aspect was available. The conclusions with the inclusion of this variable in the model were essentially similar to those summarized in *Table IV,* except that lower birth weight was an additional significant independent predictor of non-exclusive breastfeeding (E *vs* P+T; OR 2.1 and 95% CI 1.13 to 3.95).

The significant positive independent

TABLE IV – *Comparison of Odd's Ratios' (95% confidence intervals) for the significant (p<0.05) Independent Predictors on Multiple Logistic Regression Analysis.*

Independent predictors	Odd's ratios'(95% confidence intervals)		
	E vs P + T	E+P vs T	E vs T
Breastfeeding propagation	1.34(1.04-1.72)	NS	2.99(1.54-5.80)
Infant's age#	1.02 (1.01-3.68)	1.04(1.03-1.06)	1.05(1.03-1.07)
Infant's present weight	1.45(1.12-1.60)	6.37(3.75-10.8)	9.64(4.50-20.7)
Normal vaginal delivery	1.60(1.05-2.40)	NS	NS
Maternal education#	1.09(1.04-1.14)	NS	1.23(1.07-1.40)
Breastmilk as first feed	1.53(1.11-1.21)	1.64(1.05-2.56)	2.22(1.24-3.96)
Maternal height	NS	NS	1.21(1.05-1.84)

E-Exclusive breastfeeding; P-Partial breastfeeding; T-Total top feeding.
NS – Not significant.
#-Significant negative predictors in contrast to other association which are in the positive direction.

associations in *all* the three categorizations in the order of decreasing magnitude (OR) were infant's present weight (1.45 to 9.64); breast milk as first feed (1.53 to 2.22); and lower age of child (1.02 to 1.05). Additional important predictors for exclusive breastfeeding (E *vs* P+T and/or E *vs* T) were breastfeeding propagation (1.34 and 2.99); less educated mother (1.09 and 1.23); normal vaginal delivery (1.60) and taller mother (1.21).

Discussion

Factors associated with early termination of breastfeeding have been sought by several international and Indian workers. However, currently for optimal health and development of the young infant, exclusive breastfeeding is being propagated vigorously. In this context, confounder controlled studies evaluating factors responsible for termination of exclusive breastfeeding, even from abroad, are scanty(17,22-24), and probably none are available from India. Further, there can be wide regional variations in the associated factors which have important operational implications for interventional purposes. The present study from Delhi, was, therefore, designed to evaluate factors associated with early termination of exclusive as well as any breastfeeding after controlling for all possible confounders. This opportunity was also utilized to find out the prevalence of recommended breastfeeding indicators(14) in an urban hospital based population.

The prevalence of exclusive and any breastfeeding in the present study compare favorably with the best reports in the country(2-l3,25,26). Other Indian studies depicting the breastfeeding indicators as per uniform recommendations by the WHO are scanty(26). The exclu-

sive breastfeeding rate in the present study is much better than this (45% *vs* 15%) report(26). The favorable practices in this study are largely due to the policy of active propagation of breast-feeding adopted by the Newborn Unit in the past few years. However, the optimal target of universal exclusive Breastfeeding till 4 to 6 months of age has yet to be achieved. Further, the timely first suckling (10.4%) and bottle feeding (31.5%) rates *(Table I)* are disconcerting which need urgent remedial measures.

It is obvious from the current study and the few available multivariate studies(17,22-24) on exclusive breastfeeding associations that the predictors vary with the breastfeeding definitions adopted. This may have implications for propagation of exclusive breastfeeding as opposed to any breastfeeding.

Unfortunately, like the univariate analysis, the literature for independent associations of exclusive breastfeeding is scanty(17,22-24). In conformity with the earlier similar reports, normal vaginal delivery(24) was positively associated and giving prelacteal feeds(22) was negatively associated with exclusive breastfeeding. However, in contrast, older mother(17) and more educated mothers(17,23) were positively related to exclusive breastfeeding as compared to younger and less educated mothers in this study. This difference stems from the fact that the earlier reports were from developed countries. Demand feeding(24), early initiation of first feed(24), higher family income(17) and married mothers(24) were earlier positive association not substantiated in this study. These could be a reflection of regional variations and the differences in the logistic model formulation.

The strongest independent association in the present study was with the present weight of the infant which showed a dose response effect (OR's were: E *vs* P+T : 1.45, E+P *vs* T: 6.37, E *vs* T : 9.64). This variable is not a determinant of the breastfeeding on the infant growth. A salutary effect of breastfeeding, particularly exclusive breastfeeding, on growth is well documented. Additionally, the use of this variable for interventional purposes is limited. The reverse explanation, namely, supplemention for enhanced weight gain in smaller babies is unlikely since this reason was stated only by 3 respondents (*Table 11).*

Breastfeeding propagation emerged as an important association (OR's 1.34 and 2.99) for exclusive breastfeeding. Surprisingly this effect was lost for any type of breastfeeding. This could be related to the fact that breastfeeding is a natural instinct whereas in the current scenario especially in the urban setup exclusive breastfeeding requires propagation. Relevant educational messages through every possible source must, therefore, form the central core of any programme to effectively promote exclusive breastfeeding below 6 months of age. Unfortunately, even in this study breastfeeding propagation was actively practiced only by the committed medical personnel (341 of the 344 cases who had been propagated breastfeeding) and reinforced at subsequent contacts during immunization sessions. There is thus an urgent need to involve the paramedical personnel and lay public for breastfeeding propagation programmes. Such propagation can be effectively

operationalized through immunization, antenatal and postnatal related contacts with the infant-mother dyad(15).

Other independent predictors of adverse exclusive breastfeeding practices in the present study were older infant, shorter mother, non-normal vaginal delivery, more educated mother, infants not receiving first feed from the breast and lower birth weight infants. For some of these factors (infant's age, shorter mother, mode of delivery, birth weight and maternal education status) no intervention is possible to improve these factors for the current infant-mother dyad. The type of first feed is probably a reflector of the mother's confidence and intention to breastfeed. However, for interventional purposes, exclusive breastfeeding propagation should be more intensively targeted to this high risk group.

In general, the various reasons for supplementation of breast milk and cessation of breastfeeding *(Table II)* in the present investigation-were in conformity with the earlier available Indian data in this context(2-13). The cited reasons from such qualitative analyses can be profitably amalgamated in the breastfeeding propagation programmes to allay the common misconceptions. For example, important remedial messages should relate to supplementation for perceived breast milk insufficiency inferred from a crying baby and cessation of breastfeeding with minor illnesses. The role of family decision maker (for example, mother in law) should not be ignored in this context.

It is concluded that breastfeeding propagation plays a key role in promoting exclusive breastfeeding. Other independent negative predictors represent a high risk subset for whom intensive propagation is desirable since these factors by themselves are not amenable to intervention for the current infant mother dyad. The strong positive association of infant's weight is a reflection of the favorable impact of breastfeeding on growth and is not a determinant of the breastfeeding mode. The urgent need for propagation of exclusive breastfeeding is substantiated in this study.

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