Factors influencing exclusive breastfeeding (EBF) in Empowered Action Group (EAG) states and Assam

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ABSTRACT

Background and objectives: Exclusive breast feeding (EBF) has important protective effects on the survival of infants and decreasing risk for many early-life diseases of children. The purpose of this study was to find the patterns or factors associated with exclusive breast feeding and its variation among 8 Empowered Action Group (EAG) states and Assam.

Materials and methods: The study utilized a secondary data source namely “Annual Health Survey (AHS) - 3” which covered nearly 4.3 million people from 8 EAG states and Assam. Exploratory factor analysis and Pearson's correlation coefficient were employed to identify the patterns or factors associated with exclusive breast feeding among 8 EAG states and Assam. One-way analysis of variance was used to determine how the factors which are significantly associated with EBF varied across the 9 states.

Results: The Exploratory Factor Analysis identified 5 factors namely demographic characteristics, mortality, age at marriage, population and fertility. Among these, demographic characteristics, mortality and age at marriage were significantly negatively correlated with the variable percentage of children (aged 6–35 months) exclusively breast fed for at least six months. One way analysis of variance showed that these 3 factors varied significantly across the 9 states.

Conclusion: In the light of high child mortality in these states, the finding of this study seems to be highly relevant for the health-care policy makers. The study points out at some indicators relating to demographic characteristics, child mortality and female age at marriage upon whose reduction is likely to bring about an improvement in exclusive breast feeding practice in the 9 concerned socio-economically backward states of India.

1. Introduction

Exclusive breast feeding (EBF) is defined as “an infant receiving only breast milk from his/her mother or a wet nurse, or expressed breast milk and no other liquids, or solids, with the exception of drops or syrups consisting of vitamins, minerals supplements, or medicines.”¹ The most effective and natural way of providing nourishment, ensuring health of infants is through breast feeding. EBF up to 6 months offers several benefits to the infant as well as to the mother. For infants, it enhances the chances of survival, boosts the immunity and promotes overall growth and development. For mothers, it reduces the risk of diabetes and cancers of breast, uterus, ovary etc. It also naturally promotes spacing between child births.^{2–7} According to recent figures put forward by the World Health Organization, globally about 40% of

children are exclusively breast fed till they attain six months.² In India the approximately 55% of the children receive exclusive breast feeding till the age of six months.⁷

2. Objectives of the study

1. To identify the patterns associated with EBF practices among 0–6 month old infants in Empower Action Group (EAG) states of India (Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Orissa, Rajasthan, Uttar Pradesh and Uttaranchal) and Assam
2. To determine how these factors vary across eight EAG states and Assam.

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Fig. 1. States where Annual Health Survey was conducted.

3. Material and methods

The study involved a secondary data source namely Annual Health Survey (AHS)-3 to achieve the above stated objectives. The AHS-3 was conducted in 2012–2013 and it covered 284 districts from 8 EAG states and Assam. The district level aggregate data was used for the work in which contains 145 variables.

EAG states and Assam are socio-economically backward states of India. The aim of EAG was to prepare development programmes in the target states. The EAG states and Assam comprise approximately 50% of the India's population and exhibit phenomenally poor maternal and child health indicators.⁸

3.1. Annual Health Survey (AHS)

AHS is the one of the large scale demographic surveys conducted across the 284 districts of the 9 target states (Fig. 1). The first AHS was conducted in the year 2010–11, followed by second AHS in 2011–12 and finally in 2012–13 the third AHS was conducted.⁹ In the AHS-3, approximately 4.3 million people from 8 EAG states and Assam were surveyed.

3.2. Statistical analysis

This study used an exploratory factor analysis to identify the patterns or factors associated with exclusive breast feeding among 8 EAG states and Assam.¹⁰ Initially all the 145 variables in AHS-3 were included in the exploratory factor analysis, and a total of 23 factors were identified. However, a large amount of cross-loading was observed. This led to difficulties in assigning a meaningful name to the identified factors. Therefore, with repeated discussions among the authors, irrelevant variables were culled out and only a set of 39 important variables were retained in the exploratory factor analysis. The factor analysis was carried out by using “Kaiser-Meyer-Olkin measure of sampling adequacy ($KMO > 0.5$)” as a criterion to check sample adequacy and “Bartlett's test for Sphericity” as a criterion to check whether the correlation matrix is an identity matrix. “Principal Component Analysis (PCA)” was applied for extracting factors and the matrix used was Correlation matrix. In PCA technique, factor score is obtained as a linear combination of its underlying variables. Only the factors which meet the following criterion were retained: (a) “Kaiser's” criterion (Eigen value > 1) (b) should possess at least three variables and (c) correlation between variables (item loading) more than 0.6. “Varimax orthogonal rotation” was used for factor rotation and regression method was employed to save the generated scores of the factors.

In the next step, Pearson's correlation coefficient was computed between each of the identified factors and variable “children (aged

Fig. 2. Scree plot.

6–35 months) exclusively breast fed for at least six months (%)”. One-way ANOVA was used to determine how the factors vary across the eight EAG states and Assam. This analysis was performed only for the variables which were significantly correlated with EBF. All the statistical analyses were carried out in Stata 13.1 (1985–2013 StataCorp LP).

4. Results

The identified 39 variables from AHS-3 were subjected to exploratory factor analysis. It was observed that $KMO = 0.763$ (good) and all KMO values of individual items were > 0.502 , which is higher than the acceptable limit of 0.5. Bartlett's test of sphericity $\chi^2_{(741)} = 14687.338$, $p < 0.001$, indicated that correlation between items were sufficient larger for PCA. A total of 5 components had eigenvalues over Kaiser's condition of 1 and they cumulatively explained 73.81% of the variance. The scree plot is presented in Fig. 2. It showed ambiguity in terms of retaining 2, 5, 7 and 10 components.

Exploratory factor analysis identified five factors. Table 1 provides the variables included in the study with descriptive statistics and Table 2 provides the details of identified factors with corresponding names and underlying variables.

Factor 1 was named as demographic characteristics, factor 2 as Child Mortality, factor 3 was named as Age at marriage, factor 4 as Population and factor 5 as Fertility. These five factors include 21 variables out of 39 subjected to factor analysis. The remaining variables had factor loading less than 0.6.

Table 3 presents the Pearson's correlation coefficient between the factors and EBF. It was found that three factors namely demographic characteristics, mortality and age at marriage were significantly correlated with EBF.

From one way analysis of variance, it was observed that all the three factors which were significantly associated with EBF among 0–6 months infants differed significantly across the 8 EAG states and Assam ($p < 0.001$).

5. Discussion

Breast feeding is an important activity in the child and mother's life. Breast milk is a rich source of nutrients and energy which cannot be compensated by external food sources, especially during the first six months of the child's life.^{2–4} Exclusive Breast Feeding (EBF) up to six months of child's life promotes overall physical and mental wellbeing of the child.⁷ It also offers numerous health benefits to feeding mother.^{5,6} According to World Health Organization (WHO) estimates, about 45% of deaths of children globally are caused by undernutrition. It is also estimated that, if all the children are breast fed until two years, it would

Table 1
Variables included in the study.

Variable	Mean	SD
Total Population	143800.00	431715.00
Currently Married Women (aged 15–49 years)	25888.95	76401.29
Children 12–23 months	5387.00	16926.00
Average Household Size	4.93	0.56
Population below age 15 years (%)	33.05	4.36
Dependency Ratio	70.87	11.76
Currently Married Illiterate Women aged 15–49 years (%)	43.12	15.87
Sex Ratio (All ages)	957.97	65.97
Marriages among Females below legal age (18 years) (%)	9.08	7.34
Mean age at Marriage# - Female	21.07	1.03
Work Participation Rate (15 years and above)	46.77	8.40
Prevalence of any type of Disability (Per 100,000 Population)	1864.22	583.44
Number of Injured Persons by type of Treatment received (Per 100,000 Population)	254.84	209.53
Persons suffering from Acute Illness (Per 100,000 Population)	10271.10	5921.63
Having diagnosed for Chronic Illness (Per 100,000 Population)	8563.75	4653.73
Crude Birth Rate (CBR)	23.74	3.82
Natural Growth Rate	16.28	3.48
Total Fertility Rate	2.98	0.67
Women aged 20–24 reporting birth of order 2 & above (%)	45.34	8.84
Women aged 15–19 years who were already mothers or pregnant at the time of survey (%)	41.61	8.74
Median age at first live birth of Women aged 15–49 years	22.21	0.84
Live Births taking place after an interval of 36 months (%)	46.11	7.86
Mean number of children surviving to Women aged 15–49 years	2.66	0.32
Pregnancy to Women aged 15–49 years resulting in abortion (%)	4.93	3.10
Family planning practices (Aged 15–49 Years)	59.61	11.55
Mothers who received any Antenatal Check-up (%)	90.03	6.82
Institutional Delivery (%)	64.70	17.26
Mothers who did not receive any Post-natal Check-up (%)	20.16	10.88
Mothers who availed financial assistance for Government Institutional delivery under JSY (%)	90.23	7.01
Children aged 12–23 months Fully Immunized (%)	65.27	14.39
Children with birth weight less than 2.5 kg. (%)	25.01	8.82
Children (aged 6–35 months) exclusively breastfed for at least six months (%) ^a	33.70	14.59
Women who are aware of HIV/AIDS (%)	76.62	15.20
Women who are aware of RTI/STI (%)	75.19	17.50
Women who are aware of HAF/ORS/ORT/ZINC (%)	97.63	3.23
Women who are aware of danger signs of ARI/Pneumonia (%)	90.10	14.64
Crude Death Rate (CDR)	7.46	1.48
Infant Mortality Rate (IMR)	56.04	14.00
Neo-natal Mortality Rate	38.20	11.23
Under Five Mortality Rate (U5MR)	75.00	20.00

^a Represents the primary outcome variable.

Table 2
Factors identified by exploratory factor analysis with factor names.

Factor 1 – Demographic characteristics
Average Household Size
Population below age 15 years (%)
Dependency Ratio
Natural Growth Rate
Total Fertility Rate
Mean number of children surviving to women aged 15–49 years
Mothers who received any Antenatal Check-up (%)
Women who are aware of danger signs of ARI/Pneumonia (%)
Factor 2 - Mortality
Crude Death Rate (CDR)
Infant Mortality Rate (IMR)
Neo-natal Mortality Rate
Under Five Mortality Rate (U5MR)
Factor 3 - Age at marriage
Marriages among Females below legal age (18 years) (%)
Mean age at Marriage - Female
Median age at first live birth of Women aged 15–49 years
Factor 4 - Population
Total Population
Currently Married Women (aged 15–49 years)
Children 12–23 months
Factor 5 - Fertility
Sex Ratio (All ages)
Women aged 20–24 reporting birth of order 2 & above (%)
Women aged 15–19 years who were already mothers or pregnant at the time of survey (%)

Table 3
Pearson's correlation coefficient between the factors and the variable children (aged 6–35 months) exclusively breast fed for at least six month.

		Correlation coefficient	P value
Children (aged 6–35 months) exclusively breastfed for at least six months (%)	Demographic Characteristics	– 0.254	< 0.001 ^a
	Mortality	– 0.187	0.001 ^a
	Age at marriage	– 0.290	< 0.001 ^a
	Population	0.060	0.310
	Fertility	0.051	0.384

^a Showing that there is statistically significant correlation between the factors and exclusively breastfed for at least six months infants (%).

result in saving of 820000 children's lives.² Therefore many international organizations such as WHO, United Nations Children's Fund (UNICEF), Centre for Disease Control and Prevention (CDC) etc are promoting interventions for promoting breast feeding.

The aim of this study was to identify the factors associated with EBF among 0–6 month old infants in the eight EAG states and Assam using the data from Annual Health Survey (AHS) – 3. These nine states include nearly 50% of the total population of India, account for 61% of births, 71% deaths of infants, 72% deaths of children under five years of age and 62% maternal deaths.⁹ As breast feeding is known to improve both child and maternal health outcomes, identification of factors affecting exclusive breast feeding in these states helps in planning

effective interventions/policies to improve the prevailing conditions.

In the present study, exploratory factor analysis was employed to identify the factors affecting EBF in 8 EAG states and Assam which were covered in AHS-3. Conventionally multiple linear regression is adopted to determine the factors affecting a variable. The approach of identifying the factors and then correlating them with EBF was adopted in this study because of following reasons: (1) The data used in this study is at aggregate (district) level (2) The units of measurement of variables in AHS-3 were not uniform – different variables were measured in different units (3) There could be multicollinearity among the independent variables.

Factor analysis identified five factors namely demographic characteristics, mortality, age at marriage, population and fertility. Among these, demographic characteristics, mortality and age at marriage were significantly correlated with the variable percentage of children (aged 6–35 months) exclusively breast fed for at least six months. The association of exclusive breastfeeding with variables such as age, income, employment and primiparity was described by Saffari et al. who inferred that EBF was correlated with the above variables.¹¹ Dhakal et al. found that “marital status, literacy, place of delivery, knowledge of exclusive breast feeding and access to radio” were the key variables associated with exclusive breast feeding in the Democratic Republic of Congo.¹² Yalcin et al. found that the factors that “secondary and above maternal education, mothers within the ages of 25–34 years, rural residence, richer household wealth quantile, 4 + antenatal care visit, delivering in a health facility, singleton births, female infants, early initiation” had a positive association with EBF.¹³ In an analysis of the national survey data from 1992 to 2003 in India by Chandiok et al., it was observed that “mothers living in urban areas, older mothers (aged ≥ 35 years), more literate mothers, belonging to a higher standard of living index, preceding birth interval less than two years, and in those who had antenatal/natal care” exhibited reduced EBF.¹⁴

Our study underlines the correlation of breastfeeding with childhood mortalities in the community. In a study conducted by Gizaw et al., examining the overall effect of child feeding practices on childhood diarrhea, it was concluded that diarrhea occurrence was associated with delay in initiation of breast feeding for children aged less than 6 months and in older children who didn't exclusively breastfeed in the first 6 months of life.¹⁵ Batrick et al. reported in a study that racial/ethnic disparities in breast feeding have important social, economic, and health implications, and the number of cases having otitis media, diarrheal diseases, gastrointestinal infections and child deaths were more in children with sub-optimal breast feeding.¹⁶ Bentley et al. describe an increased risk of admission to hospital with gastroenteritis in children who are formula-fed only and concluded that exclusive breast feeding minimized the risk.¹⁷

It is important to note that the sign of the correlation coefficient was negative for the three factors which were significantly correlated with EBF. This implies that reduction in demographic variables such as average household size, dependency ratio, proportion of population below 15 years, natural growth rate, total fertility rate and others may result in an increase in the proportion of children who are exclusively breast fed for at least six months of their life. Similarly, reduction in child mortality indicators and marriages among females below legal age may also promote an increase in the proportion of children who are exclusively breast fed for at least six months of their life.

5.1. Strengths of the study

There are several studies on factors affecting EBF available in literature. To our knowledge, this study is the first attempt of its kind to examine the factors associated with EBF in eight EAG states and Assam. The strength of this study lies in terms of use of district level secondary data, and the factor analysis method to figure out patterns associated with EBF among 0–6 months infants.

5.2. Limitation

Variables such as income, education, employment etc. which could be significantly associated with EBF were not included in the study because those variables were not available in AHS – 3. This can be considered as the major source of bias in the study.

6. Conclusion

There is limited published data regarding EBF determinants in India. The present study identifies the patterns or factors associated with EBF practices among 0–6 month old infants in EAG states and Assam using the secondary district level data from AHS-3. The study points out at some indicators relating to demographic characteristics, child mortality and female age at marriage upon whose reduction, it is likely to bring about an improvement in exclusive breast feeding practice in the 9 concerned socio-economically backward states of India. This study is helpful for policy makers and NGOs for future planning and the implementation of interventions, helpful for nurses and other allied health workers to recognize and to use the variables associated with EBF to guide the care offered to women and their families.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cegh.2019.06.008>.

Conflict of interest

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