Prevalence of Exclusive Breastfeeding Practices and Its Associated Factors in Maharashtra: A Spatial and Multivariate Analysis

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ABSTRACT

India is committed to achieving its National and Millennium Development Goal 4 of reduction in infant mortality. Government of India has been implemented initiative to promote breastfeeding through the national health program. WHO has recommended that every child should be exclusively breastfed (EBF) for the first six month of life, with partial breastfeeding continued until two years of age. The present study is to assess the prevalence of EBF and associated factors among mothers having children age 0-6 months in Maharashtra. Data were extracted from for Maharashtra from District Level Household and Facility Survey (DLHS-4), conducted during 2012-13. A sample of married women, aged 15-49 years, having children age 0-6 months were considered as unit of analysis. Median duration of EBF, full breastfeeding and any breastfeeding were computed using current status data on breastfeeding for the selected background characteristics and EBF prevalence was calculated using 24 hour recall method. The result shows that prevalence of EBF in the last 24 hours preceding the survey was low. The study showed that women residing in the rural setting had longer median duration of EBF and Illiterate women had longer median duration (2.89) than the women having higher education, also showed women who are in poorest quintile had longer median duration of EBF.

Keywords: exclusive breastfeeding, median duration, DLHS-4

Introduction

Mother's milk undoubtedly represents the best nourishment for the child during first months of life. There is a universal consensus about the fundamental importance for children's adequate growth and development and for their physical and mental health. The benefits of breastfeeding (BF) specially, exclusive breastfeeding (EBF), are well established [1, 2] particularly in poor environments where early introduction of other milk is of particular concern because of the risk of pathogens contamination and over dilution of milk leading to increased risks of morbidity and under nutrition [1]. No artificial feeding formula is capable of qualitatively replacing breast milk, its specific nutrients and protection against

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diseases [3]. During the first six months of life, when digestive systems are not yet mature, exclusive breastfeeding offers additional protection from illness by limiting exposure to contaminated foods and liquids. This is particularly important in poor environments where early introduction of formula/animal milk is of particular concern because of the risk of pathogens, contamination and over dilution of milk leading to increased risks of morbidity and under-nutrition. A pooled analysis of studies carried out in middle/low income countries showed that breastfeeding substantially lowered the risk of death from infectious diseases in the first two years of life [4] and optimal breastfeeding practices could prevent a substantial proportion of hospital admissions due to diarrhea and lower respiratory tract infection [5]. Breastfeeding has protective roles against obesity, hypertension, dyslipidemia, and type II diabetes mellitus during adulthood that would have long-term beneficial health effects at individual and population levels [6]. Given such evidences, the WHO has recommended that every child should be exclusively breastfed for the first six months of life with partial

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breastfeeding continued until two years of age [7]. When women understand the exclusive breastfeeding recommendations, they are more likely to practice exclusive breastfeeding [8]. The present study is to assess the prevalence of EBF and associated factors among mothers having children age 0-6 months in Maharashtra State. And median duration of EBF is computed using current status of breastfeeding. EBF prevalence was calculated using 24 hour recall method.

Material and Methods

Maharashtra data were extracted from District Level Household and Facility Survey-4, conducted during 2012-13.A sample of married women, aged 15-49 years, having children age less than 3 years were considered as unit of analysis [9].

Dependent variable: Dependent variable is Exclusive Breastfeeding (EBF) which is defined based on the WHO key infant feeding indicators and guide to DHS statistics (IIPS, 2007). EBF was defined as giving the infant who were currently breastfeeding and no other liquids or drink or solids – not even water except for oral rehydration salt (ORS), drops and syrup (vitamins, minerals and medicines). With the present study, the outcome variable, EBF was categorized as a dichotomous variable EBF: coded as 1; and Non-EBF: coded as 0.

Independent variables: Place of residence was classified into two categories: urban and rural areas. Mother age at birth from 15 to 49 years old were coded as: 15-19, 20-24, 25-29 and 30-49. Level of education of mother was also grouped into four categories: illiterate i.e., no education, literate, less than middle

school and middle school complete and higher. Religion variable was categorized into Hindu and non-Hindu. Social status was classified into two categories: SC/ST (relatively disadvantaged group includes schedule caste and scheduled tribe who are socially and economically marginalized) and others (relatively advantaged). Occupation of mother was defined as the working status of the mother and categorized into two categories: working and not working. The wealth index is an international composite indicator of more than 40 household assets variables (IIPS, 2007). It is categorized into poorest, poor, middle, rich and richest. Mother having antenatal care (ANC) visits are more likely to promote exclusive breastfeeding practices during the first six months. Antenatal visit by a mother were reorganized into three groups (No visit, 1-3, 4 or more visits). In relation to place of delivery, option were categorized into two categories namely institutional and non-institutional. The generic mode of delivery: normal or caesarean section were also considered. Birth order was also categorized into three categories: one, two and three or more birth order. Birth interval was categorized into three categories: No previous birth, less than 24 month and birth interval greater than or equal 24 months. An infant's size at birth was categorized based on mother's perception into very small, small, average, large and very large. This was later re-categorized into two group: small and or average & large. In infant's sex was grouped as reported in the survey – male or female.

Statistical Analysis: Median duration of EBF, were computed using current status data on breastfeeding for the selected background characteristics and EBF prevalence was calculated using 24 hour recall method.

$$\text{Median} = m_{i-1} \frac{(p_{i-1} - 0.5)}{(p_{i-1} - p_i)} x(w_i)$$

Where, p_i is the proportion breastfeeding, exclusively breastfeeding for the first group where the proportion is below 0.5, p_{i-1} is the proportion exclusively breastfeeding for the preceding group, m_{i-1} is the midpoint value for the preceding group, and w_i is the time width of the group taken as the difference between the midpoint value of the current group and the preceding group.

Moran's *I* was computed which is used to assess global spatial auto correlation for a given variable. Moran's *I* is defined as:

$$I = \frac{N}{\sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_{ij} (X_i - \bar{X})(X_j - \bar{X})}{\sum_i (X_i - \bar{X})^2}$$

where *N* is the number of spatial units indexed by *i* and *j*; *X* is the variable of interest; is the mean of X; and   is an element of a matrix of spatial weights.

Univariate LISA (Local Indicator of Spatial Association) cluster map were also computed to assess the spatial autocorrelation.

$$I_i = zi \sum_j w_{ij} z_j$$

where observation z_i, z_i are in deviations from the mean from i^{th} location to j^{th} location, and the summation over j such that only neighboring values j ε J_i are included. For ease of interpretation, the weights w_{ii} may be in row standardized form, though this not necessary, and by convention, $w_{ij}=0$.

For Multivariate Analysis, EBF was ranked as 4-5 months is good, 2-3 months as moderate and 0-1 months as poor among 1,114 infants less than 6 months, then we applied ordinal logistic regression technique. Order/Ordinal logistic regression or proportional odds model is a regression model for ordinal dependent variable which only applies to data that meet the proportional odds assumption. Suppose the proportions of mother who would answer "poor", "moderate" and "good" for EBF are respectively p_1, p_2, p_3. Then the logarithms of the odds of answering in certain ways are:

$$poor, \quad log \frac{p_1}{p_2 + p_3} \ , \quad 0$$

$$poor \ or \ moderate, \quad log \frac{p_1 + p_2}{p_3} \ , \quad 1$$

The maximum-likelihood estimates are computed by using iteratively reweighted least squares. The model is given below as

$$y^* = x\beta + \varepsilon$$

where y^* is the unobserved dependent variable; x is the vector of independent variables, ε is the error term, and β is the vector of regression coefficients which we wish to estimate.

Ethical Considerations

The study is based on data available in the public domain, therefore no ethical issue is involved.

Results and Discussion

Out of 7.394 respondents, majority (60.4%) of the mothers residing in rural area.The distribution also showed that 49.2% had middle school complete and 25.1% had higher schooling education. Majority of mothers 5585 (75.9%) were belongs to Hindu by religion and 15.7% are Muslim's, 34.3% were schedule caste or schedule tribe, and 82.2% of the respondent were working, 24.7% and 19.7% of mothers were from poorest and poorer of Asset index. About 61.7% of mothers visited more than three Antenatal visits. With regards to the place of delivery, 6766 (91.3%) delivered their youngest child at health institutions. The mode of delivery distribution indicated that most 7321 mothers (99%) had a normal vaginal delivery. 39.4% and 38.4% of mothers were one and two birth order respectively, male and female were almost equal proportion.(Table 1) Predictor variables birth interval and infant's size at birth were drop from all the table as shown insignificant.

Table 1: Socio-Demographic Characteristics of Breastfeeding Mother Based on Children Born to Women During Three Years Preceding the Survey in Maharashtra, India, DLHS-4(2012-13)

Characteristics(n=7,394)	Nominal Categories	Weighted sample	Weighted proportion	95% C.I.
Place of residence	Urban	2,931	39.6	[34.4-44.8]
	Rural	4,463	60.4	[55.2-65.6]
Educational status of mother	Illiterate	924	12.5	[11.4-13.8]
	Literate,<middle school	984	13.3	[12.4-14.6]
	Middle school complete	3,635	49.2	[47.3-50.8]
	Higher school	1,851	25.1	[23.3-26.6]
Religion	Hindu	5,585	75.9	[73.9-77.8]
	Muslim	1,183	15.7	[14.0-17.6]
	Others	626	8.4	[7.54-9.40]

Social status	SC/ST	2519	34.3	[32.7-35.8]
	Others	4875	65.8	[64.2-67.3]
Occupation of mother	Not working	1301	17.9	[16.4-19.4]
	Working	6093	82.2	[80.6-83.6]
Wealth Index	Poorest	1801	24.7	[22.9-26.6]
	Poorer	1448	19.7	[18.6-20.9]
	Middle	1484	19.9	[19.0-21.0]
	Richer	1410	18.9	[17.7-20.2]
	Richest	1251	16.8	[15.2-18.4]
Antenatal visits	No visit	1051	14.3	[13.1-15.6]
	1 – 3	1770	24.0	[22.9-25.2]
	≥ 4	4573	61.7	[60.1-63.3]
Place of delivery	Non institutional	628	8.7	[7.90-9.59]
	Institutional	6766	91.3	[90.4-92.1]
Mode of delivery	Vaginal delivery	7321	99	[98.7-99.2]
	Caesarean section delivery	73	1.0	[0.76-1.31]
Birth order	One	2917	39.4	[38.2-40.5]
	Two	2836	38.4	[37.5-39.3]
	Three and above	1641	22.2	[21.1-23.3]
Gender of infant	Male	3983	53.8	[52.7-55.0]
	Female	3411	46.2	[44.9-47.4]

Table 2: Bivariate Analysis of Socio-Demographic Variables (factors) Associated with the Interruption of Exclusive Breastfeeding Based on Last-Born Children Living with Mother Who Were Less Three years (0-35 months) in Maharashtra, India
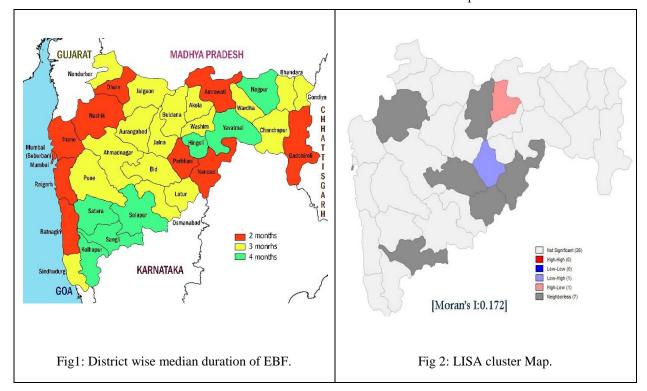
Characteristics (n=7,394)	Nominal Categories	Median Duration# EBF	EBF n (%)	Non-EBF n (%)	X^2
Place of	Urban	2.35	1129 (38.7)	1802 (61.3)	
residence	Rural	2.84	1844 (41.8)	2619 (58.3)	6.83*
Educational	Illiterate	2.89	404 (45.2)	520 (54.8)	
status of mother	Literate,<middle scho	2.20	401 (40.8)	583 (59.2)	
	Middle school complete	2.54	1446 (40.0)	2189(60.0)	10.32*
	Higher school	2.68	722 (39.2)	1129 (60.8)	
Religion	Hindu	2.62	2257 (40.8)	3328 (59.2)	
	Muslim	2.38	483 (41.0)	700 (59.0)	3.37
	Others	2.78	233 (37.1)	393 (62.9)	
Social status	SC/ST	2.84	1035 (41.5)	1484 (58.5)	1.42
	Others	2.84	1938 (40.1)	2937 (59.9)	
Occupation of	Not working	2.57	2515 (41.6)	3578 (58.4)	14.38*
mother	Working	2.81	458 (35.9)	843 (64.1)	
Wealth Index	Poorest	2.96	739 (41.8)	1062 (58.2)	
	Poorer	2.68	609 (42.5)	839 (57.5)	
	Middle	2.14	611 (41.5)	873 (58.5)	13.62*
	Richer	2.86	561 (39.8)	849 (60.2)	
	Richest	2.33	453 (36.3)	798 (63.7)	
Antenatal visits	No visit	3.12	467 (45.1)	584 (54.9)	
	1 – 3	3.66	709 (40.1)	1061 (59.9)	10.76*

	≥ 4	2.50	1797 (39.7)	2776 (60.3)	
Place of	Non institutional	4.76	255 (40.8)	373 (59.2)	0.024
delivery	Institutional	3.89	2718 (40.5)	4048 (59.5)	
Mode of	Vaginal delivery	2.59	2947 (40.6)	4374 (59.4)	
delivery	Caesarean section	2.36	26 (37.6)	47 (62.4)	0.27
Birth order	One	2.37	1202 (41.5)	1715 (58.5)	
	Two	2.76	1112 (39.5)	1724 (60.5)	2.33
	Three and above	2.84	659 (40.7)	982 (59.3)	
Gender of infant	Male	2.85	1565 (39.6)	2418 (60.4)	3.14
	Female	2.85	1408 (41.6)	2003 (58.4)	
Total		2.62	2973 (40.6)	4421 (59.4)	

 # represents the median duration after adjusting for study design and sample weight.
* statistically significant at 0.05 level of significance.

Table 2 represents the prevalence of exclusive breastfeeding were computed based on 7,394 (weighted sample) among last-born children born in the three years preceding the survey living with mothers. Median duration of EBF in rural areas was 2.84 months, 2.88 months for illiterate mothers, 2.77 months for other religion mothers, 2.81 for working mothers. Median duration of EBF was higher 2.96 months and 3.12 months for poorest and richest wealth index, 3.16 and 4.17 months for mothers who visited antenatal 1-3 times and mother who had delivery at non-institutional. And 2.84 months for 3 & above birth order child.

The prevalence of EBF in rural background was 41.8%, 45.2% of illiterate mothers. Among mothers who are belong to Hindu and Muslim by religion, were 41%. The EBF prevalence is higher 41.8% and 42.5% for poorest and poorer wealth index. And 45.1% of mothers who didn't visit antenatal care cheek-up, Mothers with birth order one 41.5% were EBF practicing mothers among less than three years children. In bi-variate analysis, the factors place of residence, education, occupation, asset index and antenatal visits of mother where found association with EBF at 0.05 level of alpha.

Fig1: District wise median duration of EBF.

[Moran's I:0.172]

Fig 2: LISA cluster Map.

Majority of district practices 3 months as the median duration of current EBF among last born children Born in the three years preceding the survey living with mother by districts of Maharashtra region, India (Figure 1). The global Moran's I statistics indicates significant spatial clustering at the district level (Moran's I: 0.172, p≤0.05) in Figure 2. From table 3 we see that, multivariate analysis was computed based on mothers having children age 0-6 months and found that from rural area (AOR 1.13; 95% CI 0.871-1.465) are more likely to provide EBF compared to mothers of urban area. For mothers education status, we would say that as compared to illiterate , less or middle educated mothers (AOR 1.043; 95% CI 0.679-1.603) are higher odds of EBF versus the combined moderate and poor exclusive breastfeeding are 2.85 greater, given that all of the other variables in the model are held constant. The infants whose mothers were from middle wealth index (AOR 1.19; CI 0.834-1.699), richer wealth index (AOR 1.466 95% CI 0.994-2.162) and richest wealth index (AOR 1.082 95% CI 0.713-1.641) are more likely to be EBF mothers as compared to poorest wealth index mothers. Keeping all factors constant mother who visited antenatal care 1 to 3 time (0.695 [0.473-1.02]) and ≥ 4 times visits (AOR 0.695 95% CI 0.49-0.984) were less likely to be EBF.

Table 3: Multivariate Analysis of Socio-Demographic Variables (factors) Associated With the Interruption of Exclusive Breastfeeding Based on Last-Born Children Living with Mother Who Were Less Than Six Month in Maharashtra, India

Characteristics (n=1,114)	Nominal Categories	Crude OR (95% CI)	Adjusted OR (95% CI)	p value
Place of residence	Urban (Ref.)	1.00	1.00	
	Rural	1.12 [0.897-1.397]	1.13 [0.871-1.465]	0.358
Educational status of mother	Illiterate (Ref.)	1.00	1.00	
	Literate, <middle school	0.998 [0.659-1.512]	1.043 [0.679-1.603]	0.846
	Middle school complete	0.96 [0.686-1.343]	0.944 [0.652-1.366]	0.76
	Higher school	0.768 [0.531-1.112]	0.717 [0.464-1.108]	0.134
Religion	Hindu (Ref.)	1.00	1.00	
	Muslim	1.006 [0.755-1.34]	0.982 [0.712-1.357]	0.914
	Others	1.2 [0.803-1.793]	1.236 [0.805-1.897]	0.332
Social status	SC/ST (Ref.)	1.00	1.00	
	Others	0.99 [0.789-1.241]	1.043 [0.799-1.361]	0.756
Occupation of mother	Not working	0.778 [0.557-1.086]	0.753 [0.524-1.08]	0.123
	Working (Ref.)	1.00	1.00	
Wealth Index	Poorest (Ref.)	1.00	1.00	
	Poorer	0.97 [0.702-1.34]	0.989 [0.711-1.377]	0.949
	Middle	1.029 [0.742-1.426]	1.19 [0.834-1.699]	0.337
	Richer	1.184 [0.844-1.66]	1.466 [0.994-2.162]	0.054
	Richest	0.833 [0.587-1.182]	1.082 [0.713-1.641]	0.713
Antenatal visits	No visit (Ref.)	1.00	1.00	
	1 – 3	0.706 [0.484-1.031]	0.695 [0.473-1.02]	0.063
	≥ 4	0.709 [0.507-0.992]	0.695 [0.49-0.984]	0.04*
Place of delivery	Non institutional	0.815 [0.567-1.172]	0.7 [0.475-1.03]	0.07
	Institutional (Ref.)	1.00	1.00	
Birth order	One (Ref.)	1.00	1.00	
	Two	1.214 [0.952-1.549]	1.205 [0.94-1.544]	0.142
	Three and above	1.08 [0.806-1.447]	1.027 [0.752-1.402]	0.866
Gender of infant	Male (Ref.)	1.00	1.00	
	Female	1.147 [0.923-1.426]	1.156 [0.929-1.439]	0.194

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Conclusion

 Feeding colostrum and especially exclusive breastfeeding protect against infant deaths. Despite the numerous recognized advantages of appropriate feeding practices, the rates of EBF continue to be low. The present study was to assess the prevalence of exclusive breastfeeding practices and associated factors among mothers in Maharashtra. The study showed that women residing in the rural setting had longer median duration of EBF, 2.84 in rural and 2.35 in urban. Illiterate women had longer median duration of EBF (2.89) than the women having higher education, women who are in poorest quintile had longer median duration of EBF (2.96), women who delivered their baby at home had also longer median duration (4.76), higher birth order having longer median duration of EBF (2.84). Importantly, studying inhabiting risk factors that determine the duration of EBF would serve as the basis for designing and implementing effective programs targeting individuals, families and communities increased risk for suboptimal feeding behaviours. In addition, it would evaluate the success of ongoing programs and of various other activities promoting breastfeeding. Further research is particularly needed to explore how traditional beliefs, practices, and indigenous knowledge on breastfeeding can be negotiated and modified to promote public health interventions.

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