BREAST-FEEDING PATTERN AND ITS IMPACT ON POST-PARTUM NON-SUSCEPTIBLE PERIOD OF CURRENTLY MARRIED WOMEN(15-49) IN AN INDIAN STATE USING MULTIVARIATE HAZARD MODEL AND LIFE TABLE TECHNIQUES

BY

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Abstract

Breast-feeding to the young infants have been proved to be the healthiest food throughout the world. A number of studies have established the role of breast-feeding in reducing the child mortality, fertility, breast cancer to mothers and its impact on post partum amenorrhoea(PPA). WHO propagates in favor of breastfeeding regularly. These effects also depend upon the duration of breast-feeding with/without supplementary foods. So we should study the various socio-economic characteristics which influence the duration of breast-feeding. In this context our mission is two-fold. Using National Family Health Survey (NFHS-2), 1998-99 data for an Indian State, namely West Bengal we intend to study differentials in early initiation of breastfeeding and in providing the first milk from the breast and breast-feeding pattern among women belonging to various socio-cultural groups. Secondly, we determine the differentials in post-partum amenorrohoea (PPA) among those women and find out the role of biological and socio-cultural variables on resumption of post-partum menstruation using multivariate Cox's proportional hazards model. The analysis takes care the behavior of PPA for those mothers who experienced return of menses while breast-feeding and/or were amenorrheic and breast-feeding stopped.

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INTRODUCTION

Young infants have been proved to be served best by the breast-feeding as the healthiest food. Analyses of the data linking breast-feeding and child survival have been proved to have convincing evidence on the benefits due to breast-feeding. Apart from the nutritionally and hygienically ideal properties, breast milk consists of important immunological factors which provide protection against infections of the gastrointestinal tract, allergies, obesity and certain metabolic and others diseases like, breast cancers to mothers. The timing and type of supplementary foods introduced in an infant's diet also have significant effects on child's nutritional status. A number of studies have established the role of breast-feeding in reducing fertility in noncontracepting populations. Breast-feeding is believed to be the major determinant of prolonged post-partum amenorrhoea (PPA) and an ovulation in societies where nursing is nearly universal, prolonged and of high intensity. Huffman and co-workers have reviewed studies from both the developed and developing world, which have investigated how patterns of breast-feeding affect the onset of post-partum menses. This investigation revealed that the period of lactational amenorrhea and an ovulation are dependent, either directly or indirectly, on the type of nursing practiced by mothers. The duration of breast-feeding and PPA also vary according to the women's background viz., age at birth, education, family income, social status, religion and caste, and sex of the offspring.

DATA AND METHODOLOGY

In the present study, the duration of breast-feeding and post-partum amonorrohea are analyzed from the data collected from the survey: National Family and Health Survey(NHFS-2) 98-99.A brief description of the survey is given below:

The National Family Health Survey, West Bengal 1998-99

India's first National Family Health Survey(NFHS-1)was conducted in 1992-93.The Ministry of Health and Family Welfare(MOHFW)subsequently designated the International Institute for Population Sciences(IIPS), Mumbai, as the nodal agency to initiate a second survey(NFHS-2),which was conducted in 1998-99.An important objective of (NFHS-2) is to provide state-level and national-level information on fertility, family planning, infant and

child mortality, reproductive health, child health, nutrition of women and children, and the quality of health and family welfare services. Another important objective is to examine this information in the context of related socioeconomic and cultural factors.

NFHS-2 used three types of questionnaires: the Household questionnaire, the Woman Questionnaire, the Village Questionnaire.

The Woman Questionnaire collected information from ever-married women age 15-49 who were usual residents of the sample household. This questionnaire included questions relating to respondent's background, the details of births which had occurred to her during the last three years, and practice of contraception. The Child Questionnaire was designed to record details of antenatal care, details of delivery, breastfeeding, and post partum amenorrhoea, immunization and health care for the two most recent births occurred to each eligible woman during three years preceding the survey.

In the survey the questions posed to the women, each respondent gave the length of total breast-feeding or time of weaning. The breast-feeding status (weaned or not weaned on the reference date of the survey) for the most recent birth was also noted. Women who 'did not breastfeed' were assigned zero month.

Sample Design: For the state West Bengal there were three sampling domains: rural areas, urban areas excluding Kolkata and Kolkata. Within each of the sampling domains, a systematic, multi-stage stratified sampling design was used.

Duration of PPA was defined as the period from birth until the occurrence of a bleeding episode identified as 'normal' by the woman herself. PPA status (terminated or still amenorrheic on reference data) for the most recent birth were also noted.

For estimation of breast-feeding and PPA life tables have been constructed from women's reported duration of breast-feeding (PPA) in open and last closed birth intervals and from women's breast-feeding status (PPA status) at the time of interview. Observations included refer to children born during three years preceding the reference date of the survey were taken into account in constructing life tables.

Because of the interrelationship between many of the variables under study, the use of life tables alone does not show which factors are independently affecting the duration of PPA. Factors other than simple lactational status that might have an additional independent effect on the return of menses can be identified through the application of a multivariate hazards model, a nonlinear regression technique which builds on a product-limit life table

(Cox, 1972). The value of this technique is that it permits a regression analysis of censored data and provide an estimate to the relative magnitudes of the hazards to which different sub-groups are subject.

Many authors used hazards models taking breast-feeding as a fixed or a time dependent covariate to study the effect of breast-feeding on PPA. Investigation of association between breast-feeding and the resumption of menses and the impact of various biological and social covariates thereon, using data from retrospective surveys in two Indian states were undertaken by Nath et. al (1993) and Singh et. al (1993) by treating breastfeeding to be a time-dependent covariate. They introduced a dichotomous time-dependent variable which is equal to one if the woman is breastfeeding at time t. The relative risk of onset of menstruation at any time t when the child was breastfed compared to when the child was weaned is assumed to be constant. It is shown that at any given point the role of return to menses is reduced to about half if the woman is breastfeeding at that time compared to the rate of woman not breastfeeding at that time. It may be noted that almost all women fully breast-feed their babies for at least first few months. Thereafter mothers start giving their babies some food supplement and when the child attains the age of one, generally mother continue breast-feeding along with solid food products until the cessation of lactation occurs. Thus, it is expected that the influence of breastfeeding on the risk of onset of menstruation is likely to be high at the beginning and it should decrease with time and negligible after certain time. Therefore, we have considered two variables $B_1(t)$ and $B_2(t)$, as defined below to see the effect of breast-feeding on the return of menstruation in the intervals $0 < t < 8$ months and $8 \leq t < 12$ months. By analyzing data using various statistical tools it is seen that the impact of breastfeeding status on resumption of menstruation after 12 months is almost negligible. Therefore, for PPA durations exceeding 12 months are censored at T = 12 months. The hazards function denoted by h (t, z), the instantaneous failure rate of PPA at time t for a female, is represented

$$h(t, z) = h_0(t)\exp\{\beta_1 Z_1 + \beta_2 Z_2 + ... + \beta_k Z_k + \nu_1 B_1(t) + \nu_2 B_2(t)\}$$

where $h_0(t)$ is the time-varying baseline hazards function calculated for a specified reference group, and $Z = (z_1, z_2, \ldots z_k)$, is a set of fixed explanatory variables. $B_1(t)$ and $B_2(t)$ are dichotomous variables defined as follows :

$$B_1(t) = \begin{cases} 1, \text{ if the woman is breast feeding at time t, } 0 < t < 8 \\ 0, \text{ otherwise} \end{cases}$$

$$B_2(t) = \begin{cases} 1, \text{ if the woman is breast feeding at time t, } 8 \leq t < 12 \\ 0, \text{otherwise} \end{cases}$$

t being measured since the time of birth of the child. β_1, β_2, … β_k, ν_1 and ν_2 are unknown regression coefficient to be estimated. Indicator variables $B_1(t)$ and $B_2(t)$ examine whether or not breastfeeding status at a given time influences the return of menses at that time. The hazards function allows estimation of the relative risks of the other groups in relation to the baseline group by the exponent of the regression coefficients, exp (.). Each element of the coefficients exp (.) represents the effect of the covariate on the hazards function for the reference group. When there is no covariate present the exp (.) term reduces to unity. Values greater than unity indicate an increase in the relative risk of resumption of menses for this group, compared with the reference group, whereas values less than unity indicate a decrease in the risk.

FINDINGS

Infant Feeding Practices

The early initiation of breastfeeding is important since it benefits both the mother and the child. Suckling induces milk formation. Suckling at the breast soon after birth results release of hormone oxytocin which helps the uterus to contract and reduces the loss of blood and facilitates expulsion of placenta. Colostrum, the thick yellowish milk produced in the first few days after birth is rich in vitamins, antibodies and macronutrients. It provides natural immunity against infections and protects the infant from micro nutritional deficiency diseases such as anemia and keratomalacia. Supplemental feeding or water to the neonate reduces milk intake and can also cause infections, and often resulting diarrhea. Percentage of last born children under age 3 years who started breastfeeding within one hour and one day of both and the percentage of children who received colostrum are given in Table1.

The table-1 shows, only one third of the children began breastfeeding within one hour of birth and no more than 49 percent of women in any group initiated breastfeeding

within one hour of birth and about half of the children began during their first 24 hours of life. Though the percentage of mothers that initiated breastfeeding within one day of birth does not vary much between levels of various background characteristics of the mother/child, however, it may be noticed that the percentage initiated breastfeeding early is more in standard of living index (SLI) in medium groups and SC/ST and it may be noticed that only 38 percent of the women started breast-feeding within one day than mothers of other social groups, women age less than 30(or birth order 3 or more) initiated breastfeeding within one day of birth than the women age more than 30 (or birth order 1 to 2) and women belonging SLI of medium is more than low and high.

Furthermore, as many as 78 percent of the women who breastfed had squeezed the first milk from the breast before they began nursing their babies. The custom of squeezing the first milk is more common among women in rural areas and for 'Hindu other than Scheduled Cast/Scheduled Tribes (SC/ST)' and Muslims. The percentage of mothers squeezed the first milk from the breast is sort of high for mothers who are illiterate or literate, < primary complete (78.7 percent) as for mothers who have at least completed high school (78.9 percent). The percentage of mothers squeezed the first milk from the breast is high whose women of having children of birth-order 1 is (81 percent) as for whose birth-order 3+ is (77.8 percent).

Timing of Introduction of Supplementary Foods

The introduction of supplementary foods before four months of age put infants at the risk of malnutrition because other liquids and solid or mushy foods at an early age also increases children exposure to pathogens and consequently puts them at a greater risk of getting diarrhea. The timing of introduction of food supplements also has an impact on the length of the mother's post-partum amenorrhoea since supplementation reduces infants dependence on breast milk and the frequency of suckling.

From Table 2, it has been observed that more than forty percent of infants under two months of age are given water or other supplements. The percentage of infants exclusively breastfed is only 59.5 percent at age 0-1 which drops off to 45.2 percent at age 2-3 months and 29.5 percent at age 4-5 months. On average, about seventy five percent of children under 4 months receive full breastfeeding. The proportion of children receiving breast milk and

supplements increases from 17 percent for children age 0-1 months to 98 percent for children age 12-13 months and declines thereafter as children are weaned from the breast and their food consumption no longer supplements breast milk.

Ninety seven percent of mothers are still breastfeeding their children (Table 3). It can be seen that 95 percent of mothers breastfeed their child for at least first six months. The chance of stopping breastfeeding during 12-35 months breastfeed up to 12 months is 20 percent.

The Table 5 presents the percent distribution of children under age 3 years and currently not breastfeeding, according to the reason of stopping breastfeeding separately for each age at weaning interval. The main reason of stopping before age of 4-5 months were less milk (28.6 percent), followed by child refused 14.3% and other reasons. The above stated reasons and occurrence of pregnancy were the main reasons for stopping at ages 12-23 months and 24-35 months. Though only 11 percent women stop breastfeeding before child attains age 1 year, the percent can be reduced by educating women that she should not stop breastfeeding if she or her child is sick especially during the post-natal period, number of feeds should be given to child at different ages and through the promotion of acceptance of family planning methods after delivery.

Post-partum Amenorrhoea

The proportions of women still amenorrheic by number of months elapsed since are presented in Table 6. The proportion of women amenorrheic drops off rapidly as the number months since birth increases from 0 to 9 but this percentage drops off slowly at longer durations. About half of the (46 percent) total women return to menstruation after six months and about 60 percent return to menses after 9 months. The proportion still breastfeeding is much higher than the proportion amenorrheic at each specific durations and consequently the average duration of breastfeeding is much longer than the average duration of PPA. Therefore the risk of resumption of menstruation is due not only to breastfeeding but also other factors such as age, education, household income, social group etc.

The median duration of PPA for women is about 6.5 months (Table 5). The average duration of PPA for females having Birth order 1 is only one half that of females having Birth order 3 or more. The average period is invariant with the sex of the child. The figures reveal that higher the level of education, the smaller the duration of PPA. Among women

with education at least higher school, the duration is smaller by more than two months than women with education below primary or no education. An inverse relationship is observed between monthly income of household and duration of PPA. It is considerably long for females belonging to SLI of Low as compared to women belonging to SLI of Medium and High .The median duration of PPA is short for females belonging to Hindu other than SC/ST and other religions than Hindu SC/ST women and Muslim women.

Results from multivariate hazards analysis considering breast-feeding as a time-dependent dichotomous covariate are presented in Table 7. Breastfeeding status influences the risk of return to menses differently at different durations of PPA. The relative risk of return of menses at time t of women who are breastfeeding at time t compared to women who are not breastfeeding at that time is 0.43 if $0 < t < 8$ months and 0.99 if $8 < t < 12$ months. Thus, breastfeeding during first eight months significantly influences the duration of PPA as at time point during the interval the rate of return to menses is reduced by 57 percent if the woman is breastfeeding at that time compared to the rate of women not breastfeeding at that time. The effect of current breastfeeding status of woman on risk of return to menses at any given time exceeding eight months is negligible. Women may have briefer average breastfeeding when child is given other food supplements. This may be one of the major causes of very small impact of breastfeeding status on hazard rate of resuming menses beyond eight months. Fixed variables included in the model also have significant net effects. The women of having children of birth order 1 compared to women of birth order 2 to 3 have significantly the lower risk of return to menses and women of having children of birth order 3+ compared to women of birth order 2 to 3 have significantly higher rate of return menses women belonging to SLI of medium and high compared to women belonging to SLI of low have significantly lower risk of return to menses. Women with education level primary school complete and above have no significant effect of duration of PPA compared to that of women with no education or nominal education.

REMARKS

The importance of breastfeeding, more particularly, exclusive breastfeeding, danger of much substitutes etc are routinely propagated to the antenatal, natal and post natal mothers. Because of most of the deliveries are institutional, so there is a good scope of promoting all aspects of breastfeeding more vigorously. Health workers including the attendants of institutions should be oriented. The reason for stopping breast-feeding much earlier than the widely propagated time is not expected if the program is seriously propagated. The women facing problems such as insufficient milk, nipple or breast problems, illness/weakness of mother of children are often not addressed either at home level or at institutional level during post-natal care. However, the study shows about half of the total mothers resume the period within 6 months and two-third within 9 months. Thus it emphasizes the need of contraceptive method to be adopted immediately after the postpartum period to avoid unwanted pregnancies.

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Table 1: Among last born children under three years of age, the percentage who started breastfeeding within one hour and one day of birth and the percentage received the first milk, according to selected background characteristics.

Background characteristics	Percent started breastfeeding within first one hour of birth	Percent started brestfeeding within 1 day of birth	Percent received colostrum	Number of children
All	33.4	48.63	78.2	1108
Residence				
Urban	28.3	48.8	79.5	395
Rural	34.1	48.5	78.0	713
Mother's education	36.0	49.9	78.7	643
Illiterate or literate, < primary school complete				
Primary school complete or middle school complete	31.2	48.3	76.3	304
High school complete or above	18.0	48.3	78.9	161
Social group*				
Hindu Scheduled Caste/Scheduled Tribe (SC/ST)	39.8	56.6	81.1	321
Hindu other than SC/ST	30.0	48.6	77.7	493
Muslim	30.6	40.5	75.7	294
Sex				
Male	33.6	48.9	80.0	588
Female	33.1	48.2	76.1	520
Birth order				
1	29.4	47.4	81.3	402
2-3	35.3	50.8	76.1	503
3+	35.0	45.2	77.8	203
Mother's occupation				
Domestic	33.7	48.7	79.2	479
Worker	36.2	49.5	77.5	469
Standard Of Living Index				
Low	36.9	53.7	80.0	259
Medium	49.6	66.7	81.4	66
High	37.5	44.6	75.0	44
Mother's age				
Less than 25 years	34.2	51.1	78.8	581
25-34 years	31.4	46.0	78.8	476
35 years or more	40.5	40.5	74.7	51

*** Note** : Findings for a small number of women belonging to religions other than Hindu and Muslim are not shown separately.

Table 2 : Percent distribution of last born living children under age 3 by breastfeeding status, according to child's age in months.

Age in months	Percentage of living children who are :					
	Not breast feeding	Exclusively breast feeding	Breast feeding and :		Total percent	No. of living children
			Plain water only	Supplements		
0-1	0.0	59.5	23.8	16.7	100.0	27
2-3	0.0	45.2	14.8	40.0	100.0	74
4-5	3.9	29.5	9.3	57.4	100.0	89
6-7	2.2	17.6	12.1	68.1	100.0	71
8-9	6.7	4.5	11.2	77.5	100.0	66
10-11	.0	7.7	5.1	87.2	100.0	51
12-13	2.1	.0	.0	97.9	100.0	60
14-15	3.1	1.6	.0	95.3	100.0	78
16-17	3.9	.0	3.1	93.0	100.0	83
18-19	2.4	.0	.0	97.6	100.0	59
20-21	9.9	4.4	1.1	84.6	100.0	63
22-23	3.4	.0	.0	96.6	100.0	39
24-25	6.0	.0	1.2	92.8	100.0	57
26-27	14.8	.0	.0	85.2	100.0	79
28-29	17.2	.0	.0	82.2	100.0	79
30-31	10.7	.0	.0	79.6	100.0	55
32-33	20.4	.0	.0	79.6	100.0	41
34-35	14.0	.0	.0	86.0	100.0	42

Table 3: Life table estimates of proportion of women still breastfeeding

	Proportion breast-feeding at least								**Number of children**
	3	6	9	12	18	24	30	36	
	Months								
Proportion	.97	.95	.94	.93	.91	.87	.83	.82	1097

Table4 : Proportion of women ever breastfed and durations of breast feeding and postpartum amenorrhoea by women's socio- demographic characteristics

Background characteristics	Proportion ever breast fed	Post partum amenorrhoea Median(in months)	Number of living Children
All	.97	6.5	1174
Residence			
Urban	.93	3.6	422
Rural	.99	8.7	752
Education			
Illiterate or literate < primary school complete	.98	8.7	682
Primary school complete or Middle school complete	.96	5.7	322
High school and above	.96	3.2	178
Social group			
Hindu Scheduled Caste/Scheduled Tribe	.94	8.3	335
Hindu other than			
SC/ST	.94	4.6	521
Muslim	.98	8.4	318
Sex of child			
Male	.96	6.7	617
Female	.97	6.3	557
Birth-Order 1	.95	4.6	438
2-3	.98	7.4	522
3+	.97	12.1	214
Occupation			
Domestic	.99	7.9	71
Worker	.97	6.4	1103
Standard Of Living Index			
Low	.98	9.9	506
Medium	.98	5.6	500
High	.93	2.9	146
Age			
Less than 25 years	.97	6.6	623
35 years or more	.94	7.8	54

Note : The median duration of any breastfeeding is shown as greater than equal to 36 months for groups in which the exact median cannot be calculated because of the proportion of breastfeeding children does not drop below 50 percent in any age group for children under 36 months of age.

Table 5: Of children under three years of age and alive on date of survey, Percentage stopped breastfeeding according to reasons separtely for each age at weaning

Age at weaning (in months)	Reasons for weaning							Total
	Illness/ weakness of mother/ child	Nipple / breast problem	Insufficient milk	Child refused	Weaning age	Became pregnant	Others	
0-3	.0	.0	.0	.0	.0	.0	100.0	100.0
4-5	.0	.0	28.6	14.3	.0	.0	57.1	100.0
6-11	6.3	6.3	6.3	6.3	.0	.0	75.0	100.0
12-23	13.0	.0	17.4	25.4	6.3	23.8	15.9	100.0
24-35	4.8	6.3	17.5	25.4	6.3	23.8	15.9	100.0

Note : For weaning age interval (x, x+n) the children aged more than x+n at the time of survey were considered.

Table 6 : Life table estimates of proportion of women still in postpartum amenorrhoea

	Proportion still amenorrheic at							Number of children
	3	6	9	12	15	18	24	
	month following child birth							
Proportion	.71	.54	.40	.35	.18	.16	.08	1096

Table 7 : Estimates of hazards of post-partum menorrhoea with current status of breast feeding as time dependent co-variate

Covariates	**β**	**Exp(β)**	**SE**
Fixed Birth-Order (rc : birth-order 2-3) 1	-.2498 **	.7790	.1066
Fixed Birth-Order (rc : birth-order 2-3) 3+	.3501 *	1.4192	.0774
Education (rc : illiterate or below primary) Primary comple or middle school complete	.0493(ns)	1.0505	0.0830
High school and above	.2229(ns)	1.2496	.1477
SLI **(**rc : Medium and High) LOW	-.4105 *	.6633	0.0783
Time dependent $B_1(t)$	-.8362 *	0.4334	.2086
$B_2(t)$	-.0049(ns)	.9951	.5832

Statistical Significance : * $p < 0.01$, ** $p < 0.05$.
ns: Not significant