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POSTPARTUM AMENORRHOEA IN RURAL EASTERN UTTAR PRADESH, INDIA

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Summary. This paper calculates the mean duration of the postpartum amenorrhoea (PPA) and examines its demographic, and socioeconomic correlates in rural north India, using data collected through 'retrospective' (last but one child) as well as 'current status' (last child) reporting of the duration of PPA.

The mean duration of PPA was higher in the current status than in the retrospective data; the difference being statistically significant. However, for the same mothers who gave PPA information in both the data sets, the difference in mean duration of PPA was not statistically significant. The correlates were identical in both the data sets. The current status data were more complete in terms of the coverage, and perhaps less distorted by reporting errors caused by recall lapse.

A positive relationship of the mean duration of PPA was found with longer breast-feeding, higher parity and age of mother at the birth of the child, and the survival status of the child. An inverse relationship was found with higher education of a woman, higher education of her husband and higher socioeconomic status of her household, these variables possibly acting as proxies for women's better nutritional status.

Introduction

Davis & Blake (1956) identified eleven key variables which affect human fertility directly. These were termed intermediate variables, and grouped into three categories: intercourse, conception, and gestation variables. All other demographic, geographic or socioeconomic factors, known as independent or explanatory variables, influence fertility through the intermediate variables. This framework has remained current with only minor modifications (e.g. Bongaarts, 1978). Postpartum amenorrhoea (PPA) is one conception variable which influences fertility directly.

In societies where fertility is not regulated by the use of contraception or otherwise, PPA influences the interbirth intervals; longer intervals may lead to reduced fertility (Henry, 1961; Potter *et al.*, 1965). Postpartum amenorrhoea is the period after a

pregnancy during which conception does not occur. For measurement purposes, however, the duration of PPA is taken to be the period between the end of a pregnancy resulting in a live birth or a stillbirth and the resumption of menstruation, although conception may sometimes occur prior to menstruation.

Empirical studies examining the duration of PPA have been conducted with a view to explaining the fertility behaviour (specifically its effect on birth intervals, in conjunction with or without breast-feeding) or in its own right, to explain the measurable demographic, geographic or socioeconomic correlates of the duration of PPA. The duration of PPA has been found to be positively related with the age of the mother (Ford & Huffman, 1988; Salway *et al*., 1993; Sriniwasan, Pathak & Pandey, 1989), her parity (Ahamed, Kabir & Moslehuddin, 1988; Ford & Huffman, 1988; Liestol, Rosenberg & Walløe, 1988; Salway *et al*., 1993), and her nutritional status (Ahamed *et al*., 1988; Delvoye & Robyn, 1980; Hennart & Ruchababisha, 1983; Huffman *et al*., 1987b). A few studies have shown an inverse relationship between the duration of PPA and education of women (Ahamed *et al*., 1988; Ford & Huffman, 1988; Huffman *et al*., 1987a; Singh & Singh, 1989; Sriniwasan *et al*., 1989). A shorter duration of PPA has been reported among literate women. The education of the husband has also been found to have an impact on the duration of PPA (Ahamed *et al*., 1988).

The duration of PPA has been shown to vary according to the caste (Sriniwasan *et al*., 1989), and religion (Brewis & Regmi, 1993; Huffman *et al*., 1987a) of the women. Huffman *et al*. (1987b) reported a lower mean duration for Muslim than Hindu women in Bangladesh.

Among the geographical variables, duration of PPA has been found to vary according to urban–rural residence (Ahamed *et al*., 1988; Hennart & Ruchababisha, 1983; Sriniwasan *et al*., 1989), and region of residence of the mother (Haque *et al*., 1989). Social status of a woman and her age at menarche also affect the duration of PPA (Liestol *et al*., 1988; Singh, 1993). Some historical studies have shown a decline in the mean duration of PPA over time (Liestol *et al*., 1988; Salway *et al*., 1993).

In this paper the known differentials of the mean duration of PPA, with some explanatory variables, have been confirmed and some new differentials have been investigated. Also, the variation in the level and differentials in the duration of PPA are measured from both the retrospective and current status reporting of the duration of PPA. The retrospective reporting in this survey refers to asking the mother the duration of her PPA subsequent to the birth of her last but one child; current status reporting entails noting the mother's menstruation status at the survey date and, if found menstruating, recording the duration of her PPA following the birth of her last child.

Survey background

Geographical setting

The data for this study were collected in 1995 in five villages around Varanasi, a district in the state of Uttar Pradesh, India. Uttar Pradesh is the most populous state in India and constitutes 16·4% of the total population of the country. Varanasi lies in Eastern Uttar Pradesh which is a well defined region in the middle Gangatic Plain. This

region shares 29·2% of the state's total land area, and about 38% of its population (Census of India, 1991). The population growth rate as well as the fertility and mortality rates for the region during 1981–91 were above the state's average. The density of population in 1991 was 614 persons per km^2 for the region and 473 persons for Uttar Pradesh.

The culture of Eastern Uttar Pradesh is a product of a mixed heritage of Hindu and Muslim influences. Most of the people in the area have deep-rooted traditional values and their way of thinking and living is governed by religious and cultural norms. The language of the people is Hindi, although a large percentage of the Muslim population speaks Urdu. About 88% of the population of Eastern Uttar Pradesh lives in rural areas, compared to 80% for Uttar Pradesh and 74% for India. The occupational structure of Eastern Uttar Pradesh is heavily skewed in favour of agriculture.

The project

The project was designed to study the inter-relationship of three variables—breast-feeding, postpartum amenorrhoea (PPA) and birth intervals—all of which have an influence on fertility. Data collection was undertaken in five villages which were randomly selected and completely enumerated. The survey schedule included questions on the household composition, facilities, and belongings. Marriage, migration, fertility, morbidity, and morality that had occurred in the households during specific periods were recorded. A separate section in the schedule sought additional information on births, particularly the last and the last but one birth that occurred to couples in the households during the 7 years preceding the survey date (March 1995). Married women aged under 50 years, and living with their husbands at the survey date, provided the fertility, breast-feeding, PPA, birth interval, and family planning information.

The survey collected information from 1022 households, 1060 mothers about their last birth, and 767 mothers about their last but one birth. Information on the duration of PPA following the last and the last but one birth was collected by asking a direct question of female respondents: 'Following the birth of the child, after how many months did menstruation resume?' For the last born child, some mothers did not resume menstruation by the survey date. Their PPA duration was therefore censored.

Variables

The duration of PPA was measured in completed months and is used as the dependent variable. The independent variables, all measured at the survey date, are grouped into three categories: demographic, socioeconomic and cultural variables.

Demographic variables. The variables included are: breast-feeding, age of mother, age of mother at the birth of the child, age at return marriage, parity of mother, age of child, survival status of child, and sex of child.

Full breast-feeding and breast-feeding combined with supplementary feeding were recorded in completed months. The maternal age variables were all measured in completed years. Age at return marriage is the age at which a couple start living together for consummation after a ceremony known as *Gauna*, which may be

performed after several years of marriage. Child's age is measured in completed months. Survival status is classified as alive if the last but one child or the last child was alive at the time of the next event (i.e. at the birth of the next child or at the survey date respectively), and dead if the child was dead before the occurrence of the next event.

Socioeconomic variables. These include type of household, status of house, main occupation, economic status and social status of the household, education of the wife, and education of the husband.

Except for education, the variables in this group were computed at the household level. A household was defined as a group of persons who resided together and took food from a common kitchen, inclusive of persons who lived outside the village but claimed to be of the household. The inclusion of the household level variables in the rural context of the study area is considered appropriate as the behaviour of an individual is influenced not only by her/his characteristics, but also by those of the household to which she/he belongs. People in the household take part in economic and social activities together, share the joys of social living, have strong feelings of mutual obligation during a crisis and identify their interest with the household welfare.

Household type is defined as nuclear (one couple and their children) or joint (more than one couple and their children). House type is classified as *kaccha* (made of mud), *pukka* (brick), or mixed. Occupation is that which mostly contributed to the income of the household. Economic status was defined according to the value of a composite income index (CII) which took into account information on several variables included in the survey: CII = total income of the household/effective size of the household. The total income (in rupees) of the household was derived by adding its monthly income from all possible sources, i.e. agriculture, service, household industries, and business. The effective size of the household was calculated by considering each person aged 15 years and over as one unit, and those less than 15 years old as half a unit. Low, middle and high economic status is based on the average monthly income per earning unit of the household: low (CII $<$ 300), middle (300 $<$ 500), high (CII $\geqslant$ 500).

Social status of the household was quantified by taking into account the following available facilities in the household: (i) total income in excess of Rs 3000 per month; (ii) land possession in excess of 3·125 acres; (iii) residential accommodation more than one *pukka* room per eligible couple; (iv) regular use of milk and vegetables; (v) education at graduate level of at least one member of the household; and (vi) possession of at least two of the following facilities: drinking water (well/hand pump/pumping set), entertainment source (radio/telvision/video), transport (bicycle/scooter/car/jeep), luxury items (fan/cooler/fridge/heater), agricultural equipment (ox/plough/tractor), kitchen facilities (gas stove/bio-gas stove), other facilities (electricity/toilet). The social status of the household is defined as low, middle or high if one, two, three or four or more facilities respectively are available in the household.

Both education variables are categorized according to the years of schooling: (i) illiterate (no schooling), (ii) primary (1–5 years), (iii) middle (6–8 years), (iv) high (9–10 years), and (v) inter + (11 years and over).

Cultural variables. The two variables included are religion (Hindu or Muslim) and caste. Caste forms a cultural classification in India and plays an important role in

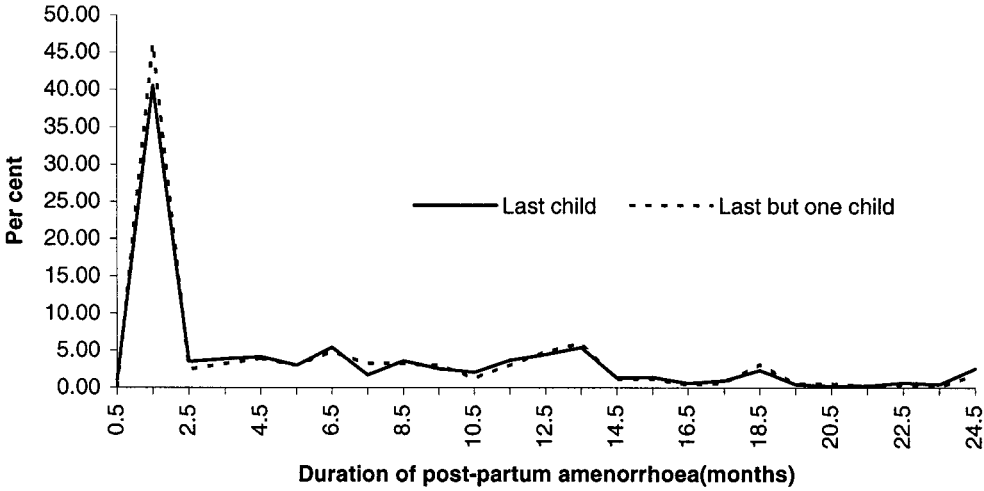

Fig. 1. Percentage distribution of duration of postpartum amenorrhoea.

examining the characteristics of the population. In this survey, 87% of the households were Hindu and the remainder were Muslim. The Hindu households consisted of about 35 castes. These were stratified into four groups on the basis of their homogeneity in the pattern of living, performing social activities, and their relative position in the rural society. Muslim households, being small in number (13%), were not divided into categories. The caste groups, therefore, are: (i) high (landlords, relatively well educated living in joint family system, economically well off); (ii) middle (mostly agriculturists); (iii) business (mostly landless, involved in business of any kind); (iv) scheduled (relatively less educated, economically poor, labourers); (v) Muslims.

Distribution of the duration of PPA

Figure 1 shows the distribution of the duration of PPA for mothers of the last and the last but one birth cohorts. Following a peak at 1-month duration, the PPA distribution showed heaping at durations of multiples of 6 months. Forty-six per cent of all women in the survey reported 1 month as the duration of PPA. How much of this early peak at 1 month is due to the confusion between postpartum bleeding and first menses can not be ascertained from the present data. Disaggregating this distribution by socioeconomic characteristics maintained this heaping pattern, although for some categories of women the heaping at 1 month was somewhat reduced (only 30% of older and higher parity women reported a PPA duration of 1 month). Nearly 50% of all mothers reported a PPA duration of 0–3 months. A similar pattern of heaping has been observed in studies conducted in India (Singh, 1993), Bangladesh (Rahman, 1992), and the West African countries of Benin, Cameroon and Cote d'Ivoire (Ofosu, 1989) and Ghana (Amenuvegbe, 1994). The reasons for this heaping are misreporting of the duration (Rahman, 1992; Singh, 1993), lack of differentiation between postpartum bleeding and resumption of menstruation (cited in Ofosu, 1989), culturally prescribed norms (Bracher & Santow, 1981), prevalence of contraceptive use

Table 1. Two-way analysis of PPA with other variables

Variable	All cases ($n=1060$) Last child			All cases ($n=767$) Last but one child			All non-censored cases Last child ($n=957$)		
	df	χ^2	p	df	χ^2	p	df	χ^2	p
FBF	9	30·3	0·001	9	25·6	0·002	9	26·8	0·001
CBF	9	108·4	0·001	9	39·1	0·001	9	89·6	0·001
PARITY	9	48·3	0·001	9	48·4	0·001	9	43·6	0·001
AGECH	9	97·7	0·001	9	25·4*	0·003	9	77·2	0·001
AGEMOTH	6	62·2	0·001	6	30·2	0·001	6	63·6	0·001
AGEMOTC	6	47·3	0·001	6	25·4	0·001	6	46·5	0·001
AGERM	6	21·8	0·001	6	13·1	0·041	6	21·8	0·001
EDUH	9	19·0	0·025	9	35·5	0·001	9	15·8	0·071
EDUW	6	26·9	0·001	6	40·1	0·001	6	26·4	0·001
RELIGION	3	7·9	0·047	3	7·5	0·057	3	13·2	0·004
CASTE	12	17·2	0·143	12	26·5	0·009	12	19·7	0·072
HHTYPE	3	10·9	0·012	3	11·9	0·008	3	8·1	0·045
OCCHH	6	16·4	0·012	6	4·9	0·560	6	11·8	0·067
HOUSE	6	9·1	0·170	6	17·5	0·008	6	9·9	0·129
ECONHH	6	1·9	0·926	6	7·6	0·269	6	2·4	0·880
SOCIALHH	6	13·7	0·033	6	13·1	0·041	6	9·7	0·137
SEX	3	6·1	0·108	3	5·3	0·153	3	5·2	0·157
CHALIVE	3	4·5	0·210	3	9·0*	0·029	3	4·4*	0·222

*Expected frequency in some cells is less than 5.
Variables: FBF, full breast-feeding; CBF, combined breast-feeding and supplementary feeding; AGEMOTH, age of mother; AGEMOTC, age of mother at birth of child; AGERM, age of woman at return marriage; PARITY, parity of mother; ACECH, age of child; CHALIVE, survival status of child; SEX, sex of child; HHTYPE, type of household; HOUSE, type of house; OCCHH, main occupation of household; ECONHH, economic status of household; SOCIALHH, social status of household; EDUCW, education of wife; EDUCH, education of husband; RELIGION, religion; CASTE, caste.

(Knodel, 1985; Laukaran & Winikoff, 1985), and selection bias (Trussell *et al*., 1992). Trussell *et al*. (1992), in studying the World Fertility Survey data of several countries, mentioned that heaping in the duration of PPA is less likely to be real, because resumption of menstruation is not under the voluntary control of women.

Methodology

Bivariate and multivariate statistical techniques have been used to study the predictor variable PPA in relation to the explanatory variables. For the bivariate analysis, the duration of PPA is grouped into monthly intervals of 0–2, 3–5, 6–8, and 9+ months. The variable full breast-feeding is coded as 0–2, 3–5, 6–8, and 9+ months. All other variables are grouped into categories as shown in Table 3. The censored cases of the breast-feeding variables have been allocated a duration equivalent to the age of the child at the survey date.

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Table 2. Univariate analysis of the risk of menstruating—last and last but one child using the proportional hazard model on selected variables

	Last child ($n=1060$, censored 103)				Last but one child ($n=767$)			
Model	−2 Log L with covariates	Model χ^2	df	p	−2 Log L with covariates	Model χ^2	df	p
Null	11,816·2				8929·3			
FBF	11,809·6	6·6	3	0·086	8916·4	12·9	3	0·005
CBF	11,808·1	8·1	3	0·044	8891·4	37·9	3	0·000
PARITY	11,776·1	40·1	3	0·000	8901·7	27·6	3	0·000
AGEMOTH	11,791·8	24·4	2	0·000	8902·9	26·4	2	0·000
AGEMOTC	11,784·9	31·3	2	0·000	8910·6	18·7	2	0·000
AGERM	11,803·4	12·8	2	0·002	8921·3	8·0	2	0·018
EDUH	11,792·1	24·1	3	0·000	8897·3	32·0	3	0·000
EDUW	11,794·5	21·7	2	0·000	8898·0	31·3	2	0·000
RELIGION	11,813·4	2·8	1	0·093	8929·2	0·1	1	0·802
CASTE	11,799·4	16·8	4	0·002	8913·5	15·8	4	0·003
HHTYPE	11,810·2	6·1	1	0·014	8921·3	8·0	1	0·005
OCCHH	11,801·8	14·4	2	0·000	8924·7	4·6	2	0·099
HOUSE	11,809·5	6·7	2	0·035	8912·4	16·9	2	0·000
ECONHH	11,815·7	0·5	2	0·769	8924·1	5·2	2	0·073
SOCIALHH	11,809·3	6·9	2	0·032	8914·6	14·7	2	0·001
SEX	11,816·0	0·2	1	0·626	8929·2	0·1	1	0·757
CHALIVE	11,815·7	0·5	1	0·469	8922·4	6·9	1	0·008
AGECH	11,810·7	5·5	3	0·136	8912·3	17·0	3	0·000

The mean duration of PPA is calculated from ungrouped duration distribution after making it a continuous variable (by adding 0·5 to each reported duration in completed months).

The association of the duration of PPA with all the variables included in this study is first checked by the chi-square statistic in a two-way tabulation of each variable with the duration of PPA (Table 1). Chi-square has also been used to test the goodness of fit of the model as well as the significance of the explanatory variables.

Survival analysis (life table) is used to examine the duration probabilities of the resumption of menstruation according to the characteristics of the mothers and children. The survival analysis calculates the probability distribution of mothers who continue to be amenorrhoeic at specific PPA durations since the birth of the child. Various summary measures based on this distribution are also calculated.

Univariate proportional hazard model analysis is used to measure the effect of each variable on the duration-specific probabilities of the resumption of menstruation (hazard function) in the absence of the control for other variables (Table 2). A multivariate proportional hazard model analysis is then undertaken to measure the effect of each category of each variable on the hazard function while controlling for the effects of other variables (and their categories) included in the model.

Analysis is carried out separately for PPA distribution following the birth of the

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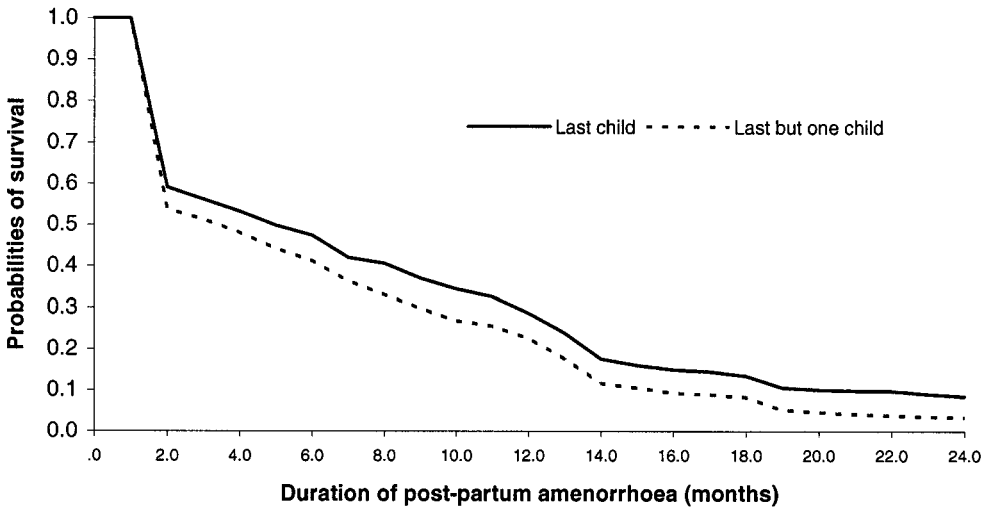

Fig. 2. Survival curves based on life table analysis.

last and the last but one child. Some explanatory variables which were interrelated were excluded from the multivariate hazard modelling.

Results

Mean duration of PPA

Considerable variation in the mean or median as the summary measures of the duration of PPA may exist due to the nature of heaping in the distribution of PPA, and how the censored cases are treated in the calculation of the summary measures.

The mean duration of PPA, following the birth of the last child was 7·2 months excluding the censored cases and 7·7 months when censored cases were allocated a duration equivalent to the open birth interval (duration between the date of the last birth and the date of the survey). The survival analysis provides yet another value of the summary measures as it controls for the duration of the distribution of all mothers in the survey (same distinction as the age distribution of deaths in a life table against the age distribution of deaths in the actual population). In the present analysis, summary measures based on the survival analysis are used. The median and trimean durations of PPA were 5·0 and 6·1 months in respect of the last child, and 3·4 and 4·9 months in respect of the last but one child respectively. Recent studies in India have revealed a median duration of PPA of 9·2 and 10·2 months in rural areas of Uttar Pradesh and Bihar states respectively (NFHS, 1994) and between 5·59 to 8·6 months in rural Eastern Uttar Pradesh (Nath, Land & Singh, 1994; Singh, 1993). The equivalent figure based on data from the present survey is between 7·2 and 8·0 months, depending upon the treatment of the censored cases.

The two survival curves of the distribution of PPA differed from each other significantly (Fig. 2). The survival analysis indicated that the chance of resumption of

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menstruation at 3 months duration was 44% following the birth of the last child, and 49% for the last but one child.

PPA in relation to breast-feeding

A significant positive association has been established between the duration of breast-feeding and PPA (Guz & Hobcraft, 1991; Habicht *et al*., 1985; Jain & Bongaarts, 1981; Potter *et al*., 1965). This study confirms this relationship (Table 1), and shows a clear upward duration of PPA by an increase in the duration of breast-feeding (Fig. 3). The mean duration of PPA (trimean) in respect of the last child increased from a minimum of 3·9 months in the low full breast-feeding category of 0–2 months to a maximum of 9·0 months in the category of 9 months and over. Similarly, the mean duration of PPA (3·9 months) in respect of the last child was minimum for mothers who continued breast-feeding with other supplements for 0–11 months. It was maximum (8·4 months) for mothers whose continued breast-feeding exceeded 36 months. A similar breast-feeding and PPA relationship was observed for the last but one child.

Figure 3 also shows a higher mean duration of PPA in respect of the last child than for the last but one child for each category of the breast-feeding variable. Further support to the PPA and breast-feeding relationship comes from the univariate proportional hazard model analysis (Table 2), as well as the multivariate proportional hazard model analysis (Table 3). The risk ratios for higher durations of breast-feeding are significantly lower than the reference category of 0–2 months of breast-feeding, indicating an increase in the duration of PPA by an increase in the duration of breast-feeding after controlling for the effects of the other variables in the model.

PPA in relation to parity and age variables

Age at return marriage, age and parity of mother are events that determine the reproductive exposure span of a mother up to the date of the survey. Table 1 shows that the age related variables and parity are all significantly related with the duration distribution of PPA in respect of both the last child and the last but one child. The mean duration of PPA decreased with the rise in the age at return marriage; it increased as mothers got older, were of higher parity, and older at the birth of the child.

Following the birth of the last child, the mean duration of PPA was 4·7 months for mothers aged 16–24 years, whereas it was 8·7 months for mothers aged 36 years and over. Similarly, the mean duration of PPA in respect of the last child increased from a minimum of 3·6 months for mothers of parity 1–2 to a maximum of 10·8 months for mothers of parity 7 and above. The mean duration of PPA subsequent to the birth of the last but one child showed a similar differential. The multivariate proportional hazard model analysis, however, nullified the effects of age of mother and age at return marriage, and only the age of the mother at the birth of the child and her parity, maintained their significant influences on the PPA hazard function (Table 3).

PPA in relation to sex, survival status and age of the child

The sex of the child did not show any significant relationship with the duration of PPA. However, the mean duration of PPA was higher following the birth of a male

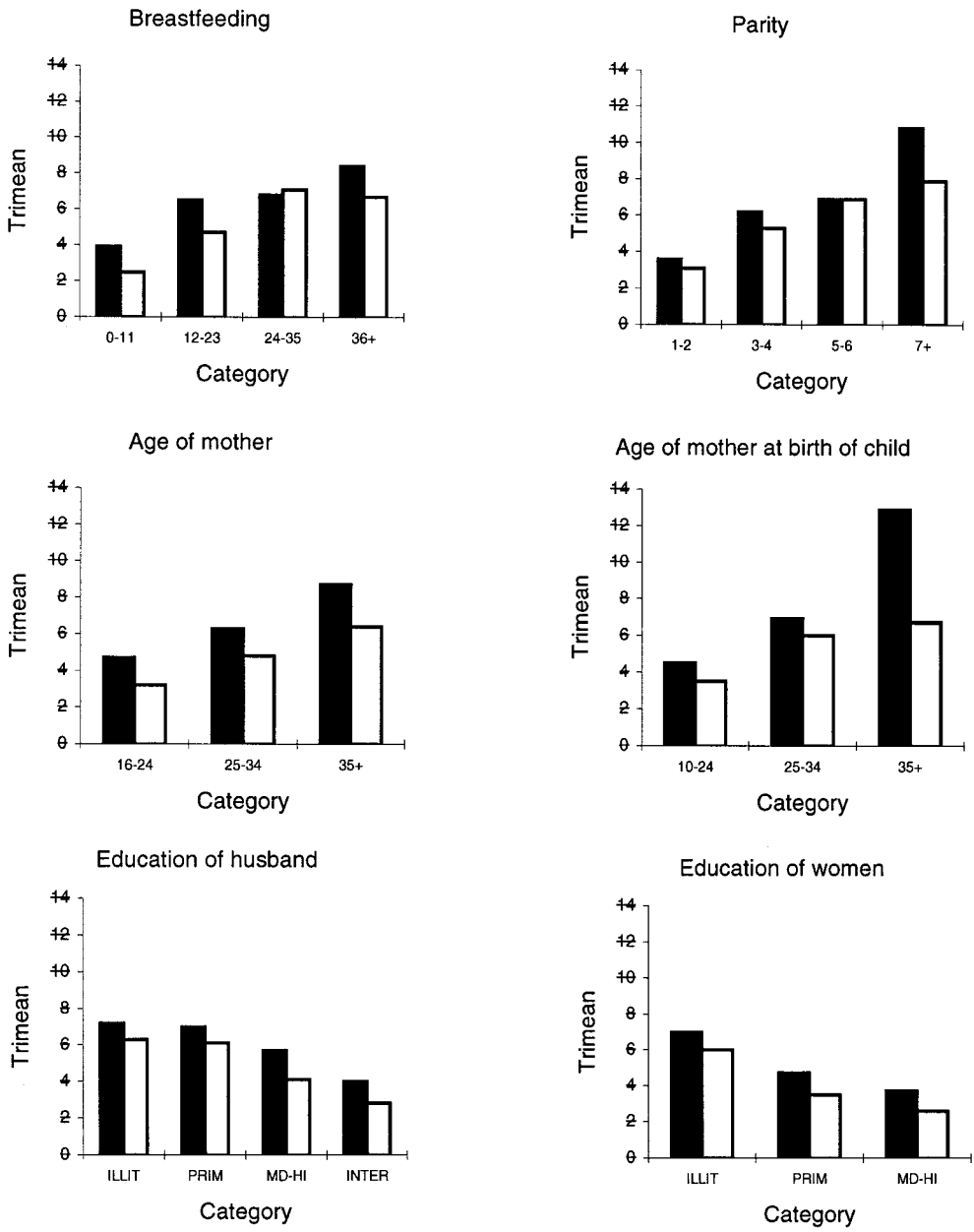

Fig. 3a. Mean duration of postpartum amenorrhoea by characteristics of women.

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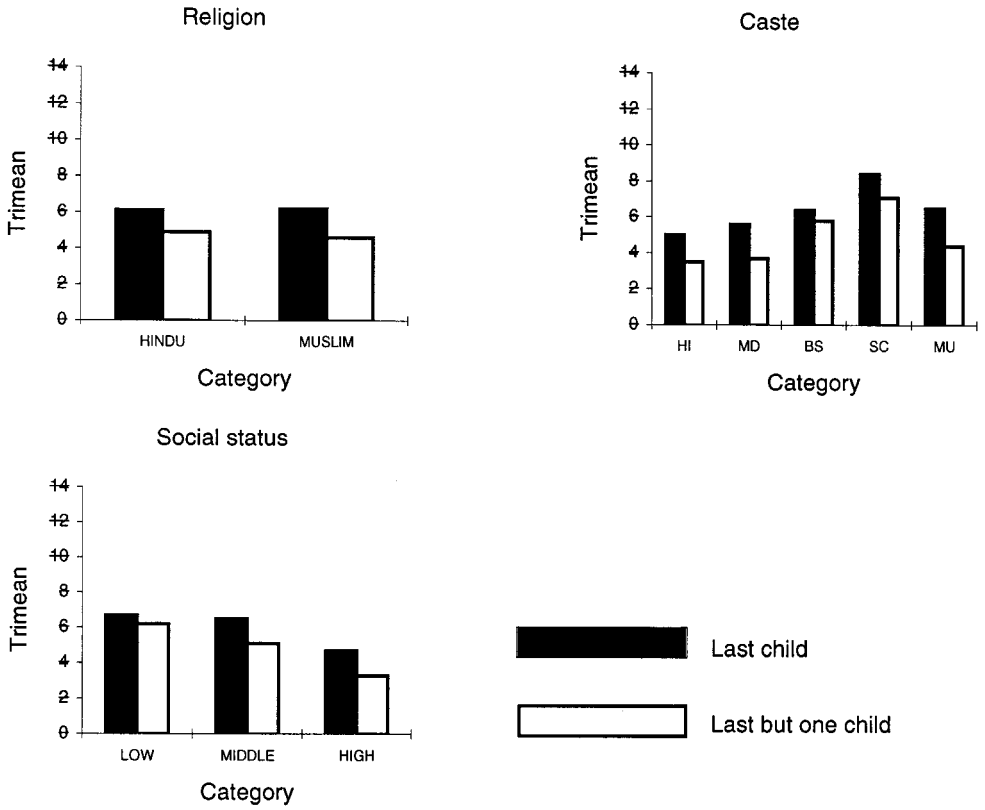

Fig. 3b. Mean duration of postpartum amenorrhoea by characteristics of women.

child than a female child. This may have been related to the longer duration of breast-feeding of the male infant; but when the breast-feeding variable was controlled along with other variables in the multiple proportional hazard model analysis, the effect of the sex variable on the PPA hazard function was insignificant.

The survival status of the child could influence PPA by reducing the duration of the breast-feeding for children who had died by the next event, or lengthening it for children who were alive at the next event. For the last but one child only, survival status showed a significant relationship with PPA (Tables 1 and 2). This relationship was maintained in the multiple proportional hazard model analysis. The mean duration of PPA was longer for children who were alive at the next event.

The effect of the age of the child at the survey date on PPA is also expected to be through the breast-feeding influence. The older the child, the longer he/she would have been breast-fed, and the longer should be the duration of PPA. This is confirmed by the survival analysis, where the mean duration of PPA increased for older children. However, the multivariate analysis showed that the risk ratios increased (statistically significantly) with advancing age of the child in the case of the last child, and decreased in the case of the last but one child (an inconsistent result compared to the survival analysis findings).

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PPA in relation to socioeconomic variables

The effect of the socioeconomic variables on the duration of PPA is probably manifested through the better health and nutrition of mothers of higher socioeconomic status. This may result in better quality and quantity of milk available to the new-born, and if the mother feeds the baby for longer the duration of her PPA would be extended (Lunn *et al*., 1980; Prema *et al*., 1981; Ramachandran, 1989). Lesthaeghe & Page (1980) however, have suggested an earlier resumption of PPA among the healthy mothers.

Seven socioeconomic variables were used in this study. The education variables showed an inverse association with the duration of PPA (Tables 1 and 2). The mean duration of PPA decreased with higher education of both husband and wife (Fig. 3). The trimean duration of PPA in respect of the last born child was 7·0 months among illiterate mothers, and 3·7 months for those who had middle level or higher education. A similar differential was found by the education of the husband. In the multivariate proportional hazard model analysis, the risk ratios escalated with the increase in education of husband and wife, indicating their lowering impact on the duration of PPA. However, statistically significant risk ratios were found in the case of the last but one child only, and for husband's education exceeding intermediate level and mother's education exceeding middle level.

The other five household level variables showed their individual effects on the duration of PPA. Mothers who lived in nuclear households, agricultural households, *pukka* or mixed houses, and households with higher social status experienced shorter mean durations of PPA than mothers in other categories of these variables. The economic status of the household did not show any relationship with the duration of PPA. However, in the multivariate analysis, the statistically significant effect was noticeable in respect of the last child only and for mothers who lived in better housing (*pukka* and mixed construction): a depressant effect on the duration of PPA, and those who came from service occupations of the household head and an elongated effect on the duration of the PPA. In general, it appears that the household level variables do not influence the duration of PPA greatly.

PPA in relation to cultural variables

The religion and caste of mothers seem to have little impact on the duration of PPA in the study area. The mean duration (trimean) was 6·1 months for Hindu and 6·2 months for Muslim mohers in respect of the last child, and about 1 month lower for the last but one child. Furthermore, it was higher for Hindu mothers. The lower caste Hindu mothers have longer durations of PPA than mothers of the higher castes. The multivariate analysis, however, reveals no significant relationship of these two variables with the PPA hazard function.

Retrospective and current status PPA data

The duration of PPA (mean, median or trimean), and its demographic, and socioeconomic correlates were calculated from both the retrospective and current status duration data. While the differentials in the duration of PPA by characteristics of woman or child were identical in these two types of data, the level of the duration of PPA was quite different. The mean duration of PPA was 7·7 months in respect of the

Table 3. Proportional hazard model analysis—postpartum amenorrhoea

		Last child			Last but one child		
Variable	Group	*n*	Risk ratio	*p*	*n*	Risk ratio	*p*
CBF	0–11	309	—	—	123	—	—
	12–23	354	0·663	0·0046	386	0·744	0·0065
	24–35	241	0·679	0·0076	189	0·524	0·0001
	36+	156	0·624	0·0022	69	0·510	0·0001
PARITY	1–2	313	—	—	296	—	—
	3–4	348	0·790	0·0246	262	0·825	0·0789
	5–6	239	0·839	0·1795	124	0·783	0·1029
	7+	160	0·704	0·0273	85	0·668	0·0342
AGEMOT	16–24	283	—	—	165	—	—
	25–34	422	0·964	0·7627	397	1·070	0·5714
	35+	355	0·9465	0·7480	205	0·940	0·7026
AGEMOC	10–24	450	—	—	423	—	—
	25–34	507	0·956	0·6972	303	0·924	0·4831
	35+	103	0·726	0·0788	41	1·084	0·7280
AGERM	9–14	206	—	—	146	—	—
	15–17	570	1·026	0·7768	420	0·973	0·7937
	18+	284	1·180	0·1365	201	0·985	0·9044
EDUH	Illiterate	313	—	—	245	—	—
	Primary	217	0·965	0·7196	171	1·014	0·8966
	Mid–high	268	1·022	0·8320	199	1·086	0·4687
	Inter+	262	1·138	0·2976	152	1·306	0·0632
EDUW	Illiterate	703	—	—	532	—	—
	Primary	158	1·176	0·1181	109	1·145	0·2545
	Middle+	199	0·981	0·8726	126	1·321	0·0503
RELIGION	Hindu	946	—	—	672	—	—
	Muslim	114	1·063	0·8637	95	1·090	0·7771
CASTE	High	221	—	—	125	—	—
	Middle	389	1·054	0·6104	290	1·215	0·1292
	Business	155	1·008	0·9506	112	1·068	0·6715
	Scheduled	187	0·827	0·1477	150	0·952	0·7420
	Muslims	108	0·879	0·7305	90	1·201	0·5833
HHTYPE	Joint	502	—	—	402	—	—
	Nuclear	558	1·000	0·9983	365	0·948	0·5606
OCCHH	Agriculture	122	—	—	78	—	—
	Service	334	0·786	0·0600	269	1·019	0·8971
	Domestic	604	0·985	0·8946	420	1·168	0·2514
HOUSE	Kaccha	242	—	—	183	—	—
	Pukka	338	1·274	0·0197	243	1·155	0·1952
	Mixed	480	1·227	0·0650	331	1·162	0·2116
ECONHH	Low	270	—	—	218	—	—
	Middle	442	0·929	0·4034	341	0·864	0·1219
	High	348	0·840	0·1048	208	0·877	0·2742

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Table 3. *Continued*

Variable	Group	Last child			Last but one child		
		n	Risk ratio	*p*	*n*	Risk ratio	*p*
SOCIALHH	Low	318	—	—	255	—	—
	Middle	433	0·889	0·2246	323	0·999	0·9897
	High	309	0·921	0·5423	189	1·028	0·8582
SEX	Male	588	—	—	422	—	—
	Female	472	1·031	0·6577	345	1·052	0·5006
CHALIVE	Alive	1012	—	—	729	—	—
	Dead	48	1·247	0·1758	38	1·964	0·0002
AGECH	0–11	245	—	—	2	—	—
	12–23	208	1·701	0·0020	27	0·765	0·7217
	24–35	142	1·714	0·0020	116	0·785	0·7403
	36+	465	1·537	0·0083	622	0·599	0·4829
n		1060			767		
Censored		103			0		
−2 Log L (Null)		11,816·2			8929·3		
−2 Log L (Model)		11,717·0			8799·5		
Model χ^2		99·2			129·7		
df		36			36		
p		0·0001			0·0001		

last child (current status data) and 6·7 months for the last but one child (retrospective data). The survival analysis technique, which took into account the censoring of the cases also revealed a higher median (5·0) and trimean (6·1) of the duration of PPA for the last child than for the last but one child (median 3·4 and trimean 4·1 months). Inclusion of a variable, indicating whether the child was the last or the last but one, in the proportional hazard model analysis revealed a significant difference between the risk ratios for the last and the last but one child (not shown in this paper), which confirmed that even after the control for the demographic and socioeconomic covariates, the PPA distributions for the birth of the last and the last but one child were different. Why should there be a higher mean duration of PPA subsequent to the birth of the last child (i.e. based on current status data)?

In order to explore this further, the mean duration of PPA subsequent to the birth of the last but one and the last child of the same mother was calculated. Information was available from 725 mothers, who reported a median duration of PPA of 3·5 months following the birth of the last but one child, and 4·8 months following the birth of the last child (both figures based on survival analysis). The hazard model analysis (not shown in the paper) revealed no statistical difference between the risk ratios for the last and the last but one child of these mothers.

It is clear therefore, that the significant difference between the risk ratios for this variable for all mothers is contributed by women who reported the duration of PPA

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following the birth of the last child only. These women totalled 335, of which 136 (40·6%) were of parity one, and had a mean number of 3·2 children ever born. Ideally, the 199 (335 − 136) women who had given birth to two or more children should have reported the duration of PPA for the last but one child but failed to do so in this survey. The 335 women reported a longer median duration of PPA following the birth of the last child (5·3 months) than the 725 mothers who reported the duration of PPA for the last (4·8 months) and the last but one child (3·4 months).

The current status data had better coverage but had censored cases. The retrospective data had no censoring but had missed information for some mothers. In both types of data, the reporting of the duration of PPA might be influenced by not remembering it correctly. The recall lapse may be higher for births which occurred a long time ago, i.e. in retrospective reporting. On balance, it appears that the current status data are better for providing estimates of the median duration of PPA than the retrospective data.

Conclusion

This study, like many others, revealed a pattern of heaping at multiples of 6 months in the reported duration of PPA. For nearly half of the mothers PPA ended during the first 3 months following the birth of the last as well as the last but one child. A very high degree of heaping was noted at 1 month duration. It was not clear whether this heaping was the result of the confusion between postpartum bleeding and the resumption of menses. This needs further investigation. In the case of the last child, 10% of the mothers had not resumed menstruation by the survey date. These cases were censored.

The duration of PPA increased with longer durations of breast-feeding, higher parity and age of mother at the birth of the child, and if the child survived to the next event (a birth or the survey date in respect of the last but one or the last child respectively). An inverse association of the duration of PPA was found with education of husband/wife, and for women living in *pukka* houses and higher socioeconomic status households. If these women are assumed to be better nourished, this finding supports the hypothesis that better nutrition leads to an early resumption of menstruation. Age at return marriage caste and religion did not explain any differentials in PPA.

This study provided an opportunity to examine the duration of PPA in respect of the last but one child (retrospective data) and the last child (current status data) which had 10% censoring. There is a debate in the literature as to which of these two types of data gives better estimates of the mean duration of PPA. The mean duration of PPA was longer for the current status data (PPA following the birth of the last child) than in the retrospective data (PPA following the birth of the last but one child).

A shorter duration of PPA in respect of the last but one child than for the last child appears to be due to the nature of the data: retrospective versus current status. The retrospective data missed information on some mothers who provided information about their last child in the current status data. Additionally, if there was a change in the duration of PPA with time (as a result of improved nutrition, for example), the current status data would catch that change, whereas the retrospective data would not

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(Trussell *et al*., 1992). The reporting bias may occur in both types of data, but may be higher in the retrospective data due to the longer recall period. Thus, on balance it appears that the current status data provide a better source than the retrospective data for the analysis of PPA levels and differentials.

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