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Factors Determining the Closed Birth Interval in Rural Manipur

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ABSTRACT To investigate the significant determinants on closed birth interval of rural Manipuri women, Cox's proportional hazards model is applied. Among the eighteen explanatory variables of interest, infant mortality, number of son(s) by wife, duration of breast feeding and Hindu religion have high significance ($P<0.001$). And age at marriage of wife and sex of the previous child have significant ($P<0.05$) impact on the dynamics of closed birth interval.

INTRODUCTION

Although the world population growth rate has decreased from a high of 2 per cent per year around 1970 to 1.4 per cent in 2001, this still means the addition of 75 to 80 million persons per year to this planet and now it has crossed 6.3 billion (Hagman 2001). By 2050 it is anticipated to swell to 9.3 billion and nearly nine of every ten people will be living in a developing country, one out of six in India alone, covering 16 per cent of the world population on 2.4 per cent of the land mass which will replace China as the most populous nation. With only 2.4 per cent out of the world landmass, India covers 16 per cent of the world's population and has crossed one billion in the Census 2001 (Becker 2001). The death rate in the developing countries also started declining rapidly but simultaneous decline in the birth rate to keep population growth rate under control did not follow at equal pace. Thus, the unprecedented growth of the population caused by the gap between birth rate and death rate over a long period has posed several challengers for overall development (Abhiman 2006). Even though India celebrates its 63rd independence day, it is disheartening to note that India's fertility rate and infant mortality rate have remained at very high levels. In this context, National Family Health Survey (NFHS) cites that the IMR is still very high, 78.5 infants deaths per 1000 birth and under five mortality rate is 109.3 per 1000 children born during 5 years proceeding. Unfortunately, IMR exceeds 112 in Orissa and 100 in Uttar Pradesh (UP). These rates are higher in rural area (IIPS 1995).

India is still nowhere near a satisfactory solution of its population problem in pite of so much emphasis given on different family planning, family welfare and reproductive and child health programmes. At this crucial juncture, a scientific investigation of fertility becomes of paramount importance for the population control, since it is influenced by a series of factors like socio economic, demographic, behavioral, social customs etc. In order to investigate the nature of human fertility there is a number of methods and one of them is the study of birth interval. The number of births of a woman would certainly occur during the effective reproductive period of her life span. And the nature and pattern of birth interval of a population may highlight the salient features of fertility of that population. It appears to be of manifold nature and vary within and between societies or communities. Nevertheless, in the absence or near absence of deliberate birth control, a common notion is that the longer the birth interval, then the lower the fertility under certain very general conditions. Thus, the problem of studying birth interval is similar to the problem of studying the number of births that occur to a woman in a period of time.

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Objective

The objective of the study is to determine the determinants of closed birth interval of rural Manipuri women with adjusted effects of various demographic, behavioral, physiological and socio-economic factors. It is also to obtain the best set of covariates determining the closed birth interval in the study population.

MATERIALS AND METHODS

The study area is rural area of Manipur valley which is comprised of four districts namely Imphal East, Imphal West, Thoubal and Bishnupur districts respectively. The study design is cross sectional by setting on community base. The study subject is based on eligible women, comprised of 740, who fulfill the following conditions-(i) she must have had at least two pregnancies in her life time and (ii) her most recent pregnancies must have resulted in two live births. Stratified random sampling with proportional allocation is used as sampling technique in each constituency of all the districts. A pre tested semi- structural interview schedule is used as tool for getting information through the personal method to fulfill the objectives.

The endogenous variable is closed birth interval (i.e., interval between two consecutive live births) denoted by CBI. In this analysis, the considered CBI is the interval between the last but one live birth and last live birth. The last closed birth interval is exactly recorded through birth records given by Doctors, Nurses, Midwives etc. The exogenous variables are age at marriage of husband-AMH, age at marriage of wife-AMW, desire number of daughter(s) by husband-DDH, desire number of daughter(s) by wife-DDW, desire number of son(s) by husband-DSH, desire number of son(s) by wife-DSW, educational level of husband-EDH, educational level of wife-EDW, death of previous child during infancy-DPC (1, if yes, 0 if otherwise), income of the family-INC, duration of breast feeding (in month)-LAC, religion-RELH (1, if Hindu, 0 if otherwise), religion-RELI (1, if Islam, 0 if otherwise), sex of the previous child-SEX (1, if male, 0 if otherwise) and use of contraceptive devices-UCD (1, if used, 0 if otherwise).

For the purpose of analysis, a well-known model $h(t, Z) = h_o(t)\ exp(\beta', Z)$, introduced by Cox in 1972 so called Cox's proportional hazard model is carried out. The simple form of the model is $h(t, Z) = h_o(t)\psi(Z)$, where ho(t) is the baseline failure rate or typical hazard and $\psi(Z)$ is a parametric link function bringing in the covariates. It satisfies $\psi(0) = 1$ *and* $\psi(Z) > 0$ for all Z. The commonly used form of ψ is

$$\psi(Z) = \psi(Z, \beta) = \exp(\beta', Z)$$

known as the "log linear form". Thus for the individual with covariate vector Z, the hazard function h(t, Z) can be represented as,

$$h(t, Z) = h_o(t) exp(\beta', Z)$$

so that the ratio: $h(t, Z)/h_o(t) = \exp(\beta', Z)$ represents the relative risk of failure. Further, *l*og $[h(t, Z)/h_o(t)] = (\beta', Z)$ is the usual of a linear regression model and hence the name "log linear model". Since the regression coefficients are constants and covariates are fixed, then the hazards h(t, Z) and $h_o(t)$ are proportional and hence the name Proportional Hazards.

The results are expressed in terms of β coefficient, standard error (SE), p-value and relative risk (exp-β) with 95% confidence interval (CI). Since the present work is based on primary data of complete type (no censoring), the interval is recorded for each eligible woman. Thus, the single value is utilized as status variable in the analysis. For continuous co-variates, the parameter β denotes the effect of a unit change in the independent covariate on the log of the hazard rate after adjustment of the other covariates. For categorical covariates, β represents deviation of a specified group from the hazard of the reference group of the covariates. The exponential of the coefficient, exp (β) also allows us to express the hazard of a specific group as a proportion of the base line hazard.

RESULTS

When we control the effects of other factors at a time, we get fifteen regression coeff.(β) of ten exogenous variables. These values are quantified by p-value of test statistic and adjusted odd ratio (exp (β) or so called relative risk). Income of family is statistically significant and other four that is, death of previous child during infancy, desired number of son(s) by wife and duration of breast feeding are highly significant factors influencing the birth interval. The death of previous child during infancy shows a significant contribution in reducing closed birth interval. The mortality status explores that it has more risk in shortening birth interval than when the child is alive. The high risk is 264% as its RR-value say, 3.6407 with 95% CI, 2.2530-5.8832 (Table 1). In the present analysis, son preference by wife also influenced the birth interval. It has more contribution of being short than that of her counterpart. The value of its RR is 1.4054 (with 95% CI, 1.1101-1.7794). It means that each one son increases the desired number of sons by wife, it gives 40% more risk of shortening birth interval leading to high fertility level in the study population. It is worthwhile to mention that duration of breast-feeding has less hazard thereof in the sense that the increase in the lactation lengthens the duration of closed birth interval ($P<0.001$). The finding suggests that one month increase in duration of the breast-feeding can lead to 4% increase in the duration of birth interval ($\exp(\beta)=0.9649$ with 95% CI =0.9598-0.9700). It may therefore be noted that a 24% risk of shortening birth interval can be prevented when the mother practices breast feeding for at least six months.

For identifying the most important factor among the exogenous variables of interest influencing birth interval, a stepwise method of PH-model is again applied in table 2. Six factors such as age at marriage of wife, death of previous child during infancy, desire number of son(s) by wife, duration of breast feeding, Hindu religion and sex of the previous child are identified. In the first step, lactation that is duration of breast- feeding has the highest impact on birth interval dynamics. It has 20% reduced risk of short birth interval if there is six months increase of duration of breast-feeding ($\exp(\beta)$= 0.9659 with 95% CI, 0.9611-0.9708). Next to lactation, death of previous child during infancy is identified to be the most influential factor in step 2 on the variation of birth interval. If the previous child has died, 3.6150 times more risk is exhibited than those with a child alive for at least one year. Really, it has 262% more hazard of shortening birth interval which is evidenced by RR-value, 3.6150 with 95% CI, 2.2996-5.6828. Religion differential is also found to be the significant contribution in the variation of birth interval in 3rd step. Hindu and similar groups (RELH) have longer birth interval than that of Islam and Christian. The RR-value 0.7772 (with 95% CI, 0.6478-0.9325) indicates that 22% has more risk of short birth interval in Islam couples. The desire number of sons especially by wife has direct linkage with short birth interval which is highly significant at 0.01 probability level. It has 34% more risk in son preference than that of daughter (RR=1.3451 with 95% CI, 1.0954-1.6517). This hazard of ill-behavior does not exist in case of husband. The couple having at least a son could have longer follow up duration of birth interval after adjusted the effects of AMW, DPC, DSW, LAC and RELH. The finding is again quantified by the fact that the couples having at least a daughter have 14% higher risk of short follow-up interval than those having at least a son and finally age at marriage of wife has direct significant impact on the length of birth interval in the sense that in each one year increases in age at marriage, 2% high risk of shortening birth interval is observed. These six exogenous variables are only influencing factors on the duration of birth interval in the present study.

Table 1: Cox's regression analysis (adjusted) of closed birth interval

Factors	*β -coeff. (SE)*	*P-values*	*Exp (β) with 95% CI*
AMH	0.0079(0.0093)	0.3938	1.0080: 0.9897-1.0265
AMW	0.0628(0.0396)	0.1132	1.0648: 0.9852-1.1509
DDH	-0.0428(0.0854)	0.6159	0.9581: 0.8104-1.1326
DDW	0.0227(0.0803)	0.7772	1.0230: 0.8740-1.1974
DSH	-0.1002(0.1133)	0.3764	0.9046: 0.7245-1.1296
DSW	0.3403**(0.1204)	0.0047	1.4054: 1.1101-1.7794
EDH	0.0052(0.0121)	0.6662	1.0052: 0.9816-1.0294
EDW	0.0174(0.0107)	0.1049	1.0175: 0.9964-1.0391
DPC	1.2922**(0.2449)	0.0000	3.6407: 2.2530-5.8832
INC	-0.0048*(0.0020)	0.0162	0.9952: 0.9914-0.9991
LAC	-0.0357**(0.0027)	0.0000	0.9649: 0.9598-0.9700
RELH	-0.2239(0.1231)	0.0689	0.7994: 0.6281-1.0175
RELI	0.1674(0.1813)	0.3557	1.1823: 0.8287-1.6866
SEX	-0.1320(0.0875)	0.1314	0.8763: 0.7382-1.0403
UCD	0.0919(0.0818)	0.2612	1.0963: 0.9339-1.2870

* Significance at 5% probability level, ** Significance at 1% probability level

Table 2: Cox's regression analysis (Stepwise method) of closed birth interval

Steps	*Factors*	*β -coeff. (SE)*		*P-values*	*Exp (β) with 95% CI*
1.	LAC	-0.0342***	(0.0025)	0.0000	0.9664: 0.9616-0.9711
2	DPC	1.2977***	(0.2300)	0.0000	3.6608: 2.3322-5.7464
	LAC	-0.0344***	(0.0025)	0.0000	0.9662: 0.9614-0.9710
3	DPC	1.3235***	(0.2304)	0.0000	3.7567: 2.3916-5.9010
	LAC	-0.0349***	(0.0025)	0.0000	0.9657: 0.9609-0.9705
	RELH	-0.2421**	(0.0916)	0.0082	0.7850: 0.6560-0.9394
4	DPC	1.3086****	(0.2305)	0.0000	3.7009: 2.3556-5.8144
	DSW	0.2419*	(0.1025)	0.0182	1.2737: 1.0420-1.5570
	LAC	-0.0350***	(0.0025)	0.0000	0.9656: 0.9608-0.9704
	RELH	-0.2181*	(0.0923)	0.0181	0.8040: 0.6709-0.9635
5	AMW	0.0209*	(0.0088)	0.0169	1.0211: 1.0038-1.0388
	DPC	1.3156***	(0.2304)	0.0000	3.7270: 2.3725-5.8548
	DSW	0.2689**	(0.1042)	0.0099	1.3085: 1.0668-1.6049
	LAC	-0.0348***	(0.0026)	0.0000	0.9658: 0.9610-0.9707
	RELH	-0.2406**	(0.0927)	0.0094	0.7861: 0.6556-0.9427
6	AMW	0.0193*	(0.0088)	0.0292	1.0194: 1.0020-1.0372
	DPC	1.2851***	(0.2308)	0.0000	3.6150: 2.2996-5.6828
	DSW	0.2965*	(0.1048)	0.0047	1.3451: 1.0954-1.6517
	LAC	-0.0346***	(0.0026)	0.0000	0.9659: 0.9611-0.9708
	RELH	-0.2520**	(0.0929)	0.0067	0.7772: 0.6478-0.9325
	SEX	-0.1532*	(0.0755)	0.0426	0.8580: 0.7399-0.9949

* Significance at 5% probability level, ** Significance at 1% probability level, *** Significance at 0.01% probability level

DISCUSSION

Regardless of all co-variates, the couples who marry late have a tendency towards quick child bearing and try to compensate their earlier lost reproductive period in order to have a desired number of children as the reproductive period is short, it results into a short birth interval (Chandra 2005). One of the major causes of short birth interval is due to educational level. Higher the educational level, shorter the birth interval and thus age at marriage of woman is significant in stepwise method. It is also supported by Nath et al. (1994), Dissanyake (2000), Singh (2002).

The death of previous child during infancy shortens the duration of birth interval through emotional feeling of the couple. It is very highly significant even after the adjusted effects of AMW, DSW, LAC, RELH and SEX. The possible cause is that the behavior of child replacement effect involves a deliberate decision by the couples to compensate the dead child which results into short birth interval. Perhaps the couples unintentionally have their next conception quickly as infant's death ends breast feeding practice which result in the women returning to menses and resuming ovulation sooner. This view is incorporated with the findings of Udjo (1997), Gyimah (2002). Even after adjustment of five factors- AMW, DPC, LAC, RELH and SEX, desired number of son(s) by wife has a very significant impact on the regulation of birth interval. Couples prefer to go in for more number of children in order to achieve the desired number of sons. Perhaps, whenever there is a female child and if the couples intend to go in for more birth it exerts a psychological and emotional pressure to have the next birth of the desired sex quickly and hence leading to shortening the birth interval. One of the most debatable findings here is that the wife's desired number of son(s) has more significant impact on the duration of birth interval than that of their husband counterpart. NFHS-3 shows that 29 per cent of women and 35 per cent of men want more sons than daughters, compared with only 4 per cent of women and 3 per cent of men who want more daughters than sons. However, most men and women would like to have at least one son and at least one daughter. If the couples can achieve the desired number of children, the birth interval is considerably longer by keeping AMW, DPC, DSW, LAC and RELH. Thus desire number of son(s) by wife and sex of the previous child could not be ignored to determine the nature and pattern of closed birth interval in the study population. And these findings are also supported by Bumpass (1985), Singh (2002).

On the other hand, duration of breast feeding (LAC) is found to be the most influential factor on birth interval dynamics. One of the possible ways is that the duration of breast feeding can lengthen the post partum amenorrhea. Breast feeding seems to have suppressed the ovulatory cycle and acts as a major form of protection against conception. This view is in agreement with the finding of Ronsmans (1996). Dissanyake (2000) suggests that this is not only due to direct hormonal and other biological effects but also the effect of lactation on ovulation is further enhanced by the prolonged sexual abstinence observed during the nursing period. NFHS-3 reveals that mothers in Manipur breastfeed for an average of 33 months which is longer than the minimum of 24 months recommended by WHO for most children.

Religious differences cause a considerable impact on the dynamics of birth interval in the present analysis. Here the significance is observed in Hindu group. It is mainly caused by the fact that the Islamic religion is under reference category. In the study population, most Islamic couples do not practice post partum sexual abstinence. The length of such abstinence can exceed the length of post partum amenorrhea. This may help women in delaying their next conception. The Population Reports (2003) supports this view. On the other hand, Islamic couples have low status in educational level which associates with less use of contraceptive devices. It is again in agreement with findings of Dang (1995), Petro-Nustas (1999). Jibonkumar (2006) shows prevalence of highest percentage of use of contraceptive devices among the Meiteis (Hindu), is mainly due to attainment of higher educational status and having more awareness of family planning. On the other hand, the contrast is observed for the Pangals (Muslim). At the same time they still adhere to the orthodox belief in the religious restriction on the use of contraceptive devices. Moreover in such a small state with multicolour tribes, nobody wants to abolish their long ancestry.

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