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Estimates of Fertility and Mortality Differentials Among the Lotha Nagas of Nagaland

Benrithung Murry, M. P. Sachdeva and A. K. Kalla

Department of Anthropology, University of Delhi, Delhi 110007, India

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ABSTRACT Data were collected from 546 ever married Lothas, a scheduled tribe population of Wokha district of Nagaland, with a view to understand their reproductive performance and the factors affecting fertility. The CBR, GFR, TFR and GRR of the Lothas are found to be 28.35, 192.05, 7.15 and 3.88, respectively. Variables such as education, use of BCM and age at menarche are not found to have contributed significantly to fertility. Socio-cultural factors seem to have played an important role in determining fertility. Of all deaths prenatal mortality was highest (56.62%) of what about 60% are found to be cases of induced abortion. The least fertile age groups of the Lothas are found to be at greater genetic risks to the prenates. It is also found that mortality decreased with proper vaccination and better income level.

INTRODUCTION

The estimation of fertility and mortality rates of any population occupies the core of population studies. Fertility is a positive force through which the populations expand, counteracting the force of attrition caused by mortality (Bhende and Kannitkar, 1992). Many biological characteristics such as heredity, health and disease, menarche, menopause and biological age have considerable influence on fertility potential of a population. Similarly, some socio-cultural variables like education, occupation, and economy, mating pattern and birth control methods have their respective spheres of influence on fertility. Mortality refers to the events of death occurring in a population. The study and estimation of mortality rates plays an important role in determining the pace of population growth. Mortality is a fundamental factor influencing population and is useful for determining the current demographic structure as well as in understanding the prospects of potential changes in the future (Keyfitz and Flieger, 1971). Mortality rates differ from population to population depending upon various biological and socio-cultural factors such as age and sex composition, mating pattern, health and care, disease, nutrition, education etc.

The Lothas are a heterogeneous scheduled tribe population occupying Wokha district of Nagaland. According to 1991 census, the Lotha population is 82,612 scattered over an area of 1,628 sq. km. with a population density of 51 persons per sq. km. In the present study, fecundity and fertility of Lotha women and the various biosocial factors affecting their fertility have been considered. An attempt has also been made to discuss mortality patterns of the Lothas using mortality rates, reproductive wastages and factors influencing death rates.

MATERIALS AND METHODS

The unit for demographic data was ever-married women. A house-to-house collection of demographic data was conducted by interviewing 546 Lotha women. The schedule included variable such as age and sex, fertility, mortality, migration, healthcare, use of birth control measures, occupation and other relevant information. The data on the reproductive performance of the ever-married females were obtained which included age at menarche and menopause, pregnancy status, live births and reproductive wastage. Data pertaining to socio-cultural beliefs and practices regulating fertility were also collected from aged people in the study area. In the absence of any written records of births, ages, deaths, etc. estimations of age were made with reference to local events. Information on mortality was obtained by investigating prenatal and neonatal deaths, stillbirths, infant deaths and early and late child deaths. Interviews were also conducted on occupational status, mother's health, mother and child's vaccination and concept of healthcare. In the absence of any written records of births, ages, deaths, etc. Estima-tions of age were made with reference to local events.

Table 1: Distribution of some fertility rates among Lotha women and women of rural Nagaland and rural India.

Rural Population	*Crude Birth Rate (CBR)*	*General Fertility Rate (GFR)*	*Total Fertility Rate (TFR)*	*Gross Reproduction Rate (GRR)*	*Reference*
Lotha Naga	28.35	192.05	7.15	3.88	Present study
Rural Nagaland	29.41	163.04	6.01	Not available	Census, 1991
Rural India	30.00	144.00	3.80	Not available	SRS, 1998

RESULTS AND DISCUSSION

Fertility Rates

In the Lotha Naga population, the CBR (28.35) is lower than that of the population of rural Nagaland (29.41) and rural India (30.00), respectively. But the GFR and TFR respectively among the Lothas is found to be higher than that of the populations of rural Nagaland and rural India (Table 1). The higher fertility rates indicate that the fertility among the Lothas seems to be more uninhibited than the rest of the two populations considered for comparison. As reflected from GRR of the Lothas one woman is going to be replaced by as many as four daughters, which are bound to increase the fertility of the population as manifold. From population planners point of view this is a significant observation and they need to pay attention to it so that the population does not grow so fast.

Table 2 shows that the Lothas follow the expected pattern of variation of ASFR with the increasing age cohort from 15 to 19 years till 45 to 49 years with age cohort 25 to 29 years showing the highest ASFR (300.00) and the ASFR gradually declining both with the increase and decrease in the age cohort. Thus the Lotha women at 25 to 29 years have emerged to be the most fertile and the women at 44+ years have emerged to be the least fertile.

Table 2: Distribution of age specific fertility rates women (ASFR) among Lotha

Age (group) (in years)	*No. of live birth*	*No. of women*	*ASFR*
15-19	5	21	238.09
20-24	9	32	281.25
25-29	21	70	300.00
30-34	21	96	218.75
35-39	18	93	193.55
40-44	11	72	152.78
44+	3	69	43.48
Total	88	453	1427.90

Reproductive Performance

As it is expected the mean live conceptions and mean live births of sons and daughters respectively has gradually increased with age of mothers from age cohort 15-19 years and continued till the age cohort 44+ years excepting a slight decrease in the age cohort 25 to 29 years. The total mean conception of the Lotha women is found to be 5.25 while the total mean live birth among them is 4.67 (Table 3).

Factors Affecting Fertility

Multivariate Analysis of Factors Influencing Fertility: Fertility of women varies from population to population. The variations observed in the fertility rate of a population are related not

Table 3: Age cohort wise distribution of conceptions and live births among Lotha women (based on the present age)

Age group (in years)	*No. of women*	*Conception*		*Live Birth*					
		No.	*Mean*	*Son*	*Mean*	*Daughter*	*Mean*	*Total*	*Mean*
15-19	21	43	2.05	24	1.14	17	0.80	41	1.95
20-24	32	109	3.71	50	1.56	51	1.59	101	3.16
25-29	70	231	3.30	114	1.62	97	1.38	211	3.01
30-34	96	414	4.31	210	2.18	179	1.86	389	4.01
35-39	93	511	5.49	248	2.67	226	2.43	474	5.11
40-44	72	438	6.08	213	2.96	182	2.53	395	5.49
44+	162	1120	6.91	485	2.99	453	2.80	938	5.79
Total	546	2866	5.25	1344	2.46	1205	2.21	2549	4.67

only to the biological factors but also to some socio-economic variables (Freedman, 1975). With a view to explain the fertility variance among the Lotha Nagas the contribution of various biological and socio-economic factors in determining fertility has been studied under multivariate analysis. The number of live births is taken as the dependent variable, while the independent variables comprise (1) Present age of mother, (2) Age at menarche, (3) Age at marriage, (4) Age at first conception, (5) Per capita annual income (PCAI), (6) Birth control measures (BCM), (7) Education and (8) Occupation.

From table 4, it can be inferred that up to 28.56% variance of number of live births is explained by age at first conception, 7.11% by occupation, 5.23% by PCAI, 2.49% by present age of mother, 1.05% by age at marriage, 0.87% by education, 0.66% by use of BCM and 0.55% by age at menarche. Further, five of the above contributions are found to be statistically significant, whereas those of education, use of BCM and age at menarche are not found to have contributed significantly to fertility. However, 53.48% variance of fertility is influenced by other factors that cannot be explained by the independent variable presently selected for stepwise regression analysis.

Thus special efforts are to be made by the family welfare planners to make the use of BCM effective by advocating its practice right after marriage to enable adequate spacing of children where in a population like the Lotha Nagas, the people are invariably resorting to BCM after they have had many children. Advocacy of a small family norm with adequate birth control measures, invocation of the benefits of a small family size and motivation to undertake appropriate birth control methods have to be made cohesively by population planners, clinicians and NGOs to bring down fertility among the Lothas. Such awareness should also be incorporated in the educational institutions for realization by the masses. Besides the above mentioned factors affecting fertility, identification and rectification of the other factors comprising 53.48% variance of fertility is needed to make the Lotha Naga population restrict its exceptionally fast state of growth.

Table 4: Stepwise regression analysis of factors influencing fertility among the Lotha Nagas

Step No.	*Variable selected as per importance*	*Significance of the factor (P value)*	*Contribution of R Square (% of the order of variance explained)*
1	Age at 1st conception	28.56	< 0.0000
2	Occupation	35.67	< 0.0000
3	PCAI	40.90	< 0.0000
4	Present age of mother	43.39	< 0.0000
5	Age at marriage	44.44	< 0.0149
6	Education	45.31	< 0.1350
7	Use of BCM	45.97	< 0.2497
8	Age at menarche	46.52	< 0.3106

Impact of Socio-cultural Factors on Fertility: Prior to British administration in the Naga Hills, war was the norm and peace the exceptional state of affairs in the Naga Hills (Mills, 1922). The abolition of head hunting by the British Crown and the spread of Christianity by the American missionaries at the close of the 19th century have subdued war and killings among the Naga tribes. As a result the Lothas believed that more population would bring more manpower and more strength to the clan, the village and the tribe as a whole. Today, most of the Lothas are educated and they no longer hold on to this view, but their cultural adherence of having more family members could not be extirpated though many couples prefer to adopt family planning. On the other hand, the teaching of conservative Christian ideologies about procreation as a fulfillment of God's will have developed a moral restrain for adopting family planning among the Lothas. Only quite a few couples overcome these cultural and religious constrains and choose to adopt a small family norm.

Mortality Rates

In Table 5 the CDR and IMR of the Lotha population have been compared with those of rural Nagaland and rural India. It is found that both the CDR (8.37) and the IMR (57.47) among the Lothas are lower than that of the populations of rural Nagaland and rural India respectively. Much lower IMR indicates better child health care among the Lothas.

Table 5: Distribution of crude death rate (CDR) and infant mortality rate (IMR) of the Lothas, rural Nagaland and rural India

Rural Population	*CDR*	*IMR*	*Reference*
Lotha Naga	8.37	57.47	Present study
Rural Nagaland	9.12	69.43	Census, 1991
Rural India	9.70	78.00	SRS, 1998

Table 6: Age cohort wise distribution of prenatal deaths and post natal offspring mortality among the Lotha women

Age group (in years)	*Prenatal death*		*Neonatal death*		*Infant death*		*Early child death*		*Late child (4-9 yrs) death*		*Total deaths*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
15-19	1	0.18	2	0.36	0	0	0	0	0	0	3	0.54
20-24	3	0.54	5	0.89	2	0.36	0	0	0	0	10	1.79
25-29	13	2.32	11	1.96	5	0.89	1	0.18	2	0.36	32	5.71
30-34	30	5.36	12	2.14	13	2.32	4	0.71	1	0.18	60	10.71
35-39	49	8.75	19	3.39	11	1.96	7	1.25	6	1.07	92	16.43
40-44	58	10.36	20	3.57	16	2.86	18	3.21	4	0.71	116	20.71
44+	163	29.11	31	5.54	23	4.11	21	3.75	9	1.61	247	44.11
Total	317	56.62	100	17.85	70	12.5	51	9.1	22	3.93	560	100

Table 7: Order of pregnancy wise distribution of prenatal deaths and postnatal offspring mortality among Lotha women

Order of pregnancy	*Prenatal death*		*Neonatal death*		*Infant death*		*Early child Death (4-9 years)*		*Late child death*		*Total deaths*	
	No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
1st	29	5.17	15	2.67	8	1.43	2	0.36	3	0.54	57	10.18
2nd	27	4.82	17	3.04	7	1.25	8	1.43	5	0.89	64	11.43
3rd	37	6.61	9	1.61	10	1.79	5	0.89	3	0.54	64	11.43
4th	39	6.96	11	1.96	7	1.25	9	1.61	2	0.36	68	12.14
5th	48	8.57	8	1.43	6	1.07	6	1.07	4	0.71	72	12.86
6th	39	6.96	13	2.32	11	1.96	0	0	0	0	63	11.25
7th	38	6.79	5	0.89	6	1.07	7	1.25	2	0.36	58	10.36
8th	33	5.89	10	1.79	5	0.89	5	0.89	1	0.17	54	9.64
9th	18	3.21	7	1.25	6	1.07	6	1.07	2	0.36	39	6.96
10th	9	1.61	5	0.89	4	0.71	3	0.54	0	0	21	3.75
Total	317	56.62	100	17.85	70	12.5	51	9.1	22	3.93	560	100

Reproductive Wastage

The age cohort wise distribution of deaths starting from pre-natal deaths to deaths of children up to 9 years is given in Table 6. It is seen that among all deaths the number of prenatal deaths was the highest (56.62%). The percentages of neonatal deaths, infant deaths, early child deaths and late child deaths are found in decreasing order of 17.85%, 12.5%, 9.1% and 3.9% respectively. The table also revealed that the offspring morality decreases with the successive increase in the age of the child indicating that most children die in younger age.

In Table 7 the distribution of prenatal and post natal deaths are given according to the order of pregnancy. The table shows that prenatal death was highest in fifth pregnancy (8.57%) followed by the seventh (6.79%) and least in the tenth pregnancy (1.61%). In the case of post natal mortality neonatal deaths was highest in second pregnancy (3.04%) infant deaths was highest in sixth pregnancy (1.96%), early child deaths in fourth pregnancy (1.61%) and late child deaths in second pregnancy (0.89%). Thus, no specific trends in offspring mortality vis-à-vis order of pregnancy could be discernable. However, data of all the pregnancies pooled together showed that mortality was highest for fifth pregnancy (12.86%) closely followed by the fourth (12.14%). Thus taking prenatal and postnatal deaths up to 9 years of age, the greatest risk to the live of the child is found to be at fourth and fifth pregnancy.

Factors Affecting Mortality

Mother's Age at Conception: Table 8 reveals that 11.06% of all pregnancies among Lotha women are wasted at prenatal stage. The highest 44 years (26.32%) followed by age cohort 40 to 44 years (18.22%) and 35 to 39 years (16.06%). Table shows that there is a decline in prenatal

mortality in Lotha women from age group 15 to 19 years up to age group 25 to 29 years after which, prenatal mortality increased with mother's age at conception. As revealed in several other studies, among Lotha women too mothers between 20 to 29 years are found to suffer much lesser prenatal mortality than the mothers below 20 years or mothers above 29 years.

Table 8: Distribution of prenatal deaths vis-à-vis mother's age at conception among the Lotha women

Age (in years)	*No. of conception*	*Prenatal mortality*	*%*
15-19	101	13	12.87
20-24	391	32	8.18
25-29	676	38	5.62
30-34	781	79	10.12
35-39	629	101	16.06
40-44	269	49	18.22
44+	19	5	26.32
Total	2866	317	11.06

From table 9 it is observed that 4.08% of all conceptions among the Lotha women suffered from spontaneous prenatal morality while 6.98% of all conceptions are cases of induced prenatal mortality. In the case of spontaneous prenatal mortality with respect to mother's age cohort, the lowest percentage of prenatal deaths is found in the age cohort 25 to 29 years (2.96%) followed by an increase in both the successive decrease and the successive increase in the mother's age cohort with the highest percentage occurring at ages 15 to 19 years (12.87%). Thus, it appears that the least fertile age group of Lotha women offers the greater genetic risk to the prenates as seen in most of the population. However, in the case of induced prenatal mortality the percentages of prenatal deaths is seen to have gradually increased with the successive increase in the mother's age with the highest percentage occurring in the age cohort 44+ years (15.79%) and the least percentage being found in the age cohort 15 to 19 years (0.00%).

Neonatal and Infant Mortality

The distribution of neonatal and infant mortality vis-à-vis mother's age at conception is shown in table 10. It is found that of all live births only 3.92% of neonatal deaths and 2.75% of infant deaths took place among Lotha women. It is also seen that in both cases of neonatal and infant mortality, the maximum percentage occurred among mothers belonging to 20 to 24 years at the time of conception after which the mortalities declined with the successive increase in mothers' age. No women experienced either neonatal or infant morality after 44 years of age.

Place of Delivery: The distribution of neonatal and infant mortality vis-à-vis place of delivery is given in table 11. It is seen that with respect to the numbers of live births the percentage of neonatal mortality (4.16%) and infant mortality (2.91%) among children born at home are higher than the neonatal mortality (2.28%) and infant mortality (1.63%) among children born in the hospital. A very few individuals were born during the fieldwork but neither neonatal mortality nor infant mortality was reported among them.

Birth Attendant: From table 12 it is observed that the percentages of neonatal mortality and infant mortality with respect to live births were highest (5.67% and 3.81%, respectively) in the case of deliveries conducted by untrained persons and was lowest in the case of deliveries conducted by doctors and nurses. Thus the life expectancy of the Lothas at post natal period is found to be higher in the case of deliveries conducted by trained personnel than those conducted by untrained individuals.

Table 9: Distribution of causes of prenatal deaths based on mother's age at conception

Age group (in years)	*No. of conception*	*Prenatal mortality*	*Causes of prenatal death*			
			Spontaneous	*%*	*Induced*	*%*
15-19	101	13	13	12.87	0	0.00
20-24	391	32	24	6.14	8	2.05
25-29	676	38	20	2.96	18	2.66
30-34	781	79	24	3.07	55	7.04
35-39	629	101	25	3.97	76	12.08
40-44	269	49	9	3.04	40	13.51
44+	19	5	2	10.53	3	15.79
Total	2866	317	117	4.08	200	6.98

Table 10: Distribution of neonatal and infant mortality vis-à-vis mothers age at conception

Age group (in years)	*No. of live births*	*Neonatal mortality*		*Infant mortality*	
		No.	*%*	*No.*	*%*
15-19	93	4	4.30	3	3.23
20-24	361	19	5.26	12	3.32
25-29	621	29	4.67	18	2.90
30-34	700	28	4.00	19	2.71
35-39	550	15	2.73	15	2.73
40-44	211	5	2.37	3	1.42
44+	13	0	0	0	0
Total	2549	100	3.92	70	2.75

Table 11: Distribution of neonatal and infant mortality vis-à-vis place of delivery

Place of delivery	*No. of live births*	*Neonatal mortality*		*Infant mortality*	
		No.	*%*	*No.*	*%*
Home	2237	93	4.16	65	2.91
Hospital	307	7	2.28	5	1.63
Field	5	0	0	0	0
Total	2549	100	3.92	70	2.75

Type of Delivery: For convenience, the type of delivery has been classified into two types, viz. (i) normal and (ii) caesarian. An attempt has been made to study the influence of the type of delivery on neonatal and infant mortality.

Table 13 reveals that the percentage of neonatal mortality (3.93%) is slightly higher in normal type of delivery than that of Caesarian type (3.65%). But in the case of infant mortality the percentage in the normal type of delivery (2.68%) is comparatively much lower than that of caesarian delivery (4.88%). But since the number of caesarian type is very less than the normal type the difference may be due to sample size fluctuation.

Child Vaccination: Vaccination plays an important role in determining body resistance against various diseases. It attenuates the activities of certain microbes and provides temporary or permanent immunity to a bacterial or viral disease by stimulating the body to produce antibodies to a specific bacterium or virus. An attempt has been made to study the vaccination status of the Lothas.

As is evident from table 14 the infant mortality, early child mortality and late child mortality successively increased as the vaccination status changes from complete vaccination to incomplete vaccination to no vaccination. However, in the case of neonatal mortality, the percentage of deaths among children having complete vaccination and incomplete vaccination are found to be quite similar but much higher than in the case of no vaccination.

Economic Status: In order to understand the mortality pattern of the Lothas with respect to their economic status the population was divided into three economic groups based on their per capita annual income (PCAI).

Table 15 shows that the per capita annual income of the Lothas has considerable impact on their mortality status both at prenatal and postnatal life. It is very obvious from the table that mortality decreased with better income level. It may be assumed that pregnant women with lower income have more stress and unwillingness of rearing children leading to higher induced prenatal mortality.

Further, women and children belonging to lower income groups could not get proper health-care facilities which may be one of the reasons for higher prenatal and postnatal mortality.

To sum up the mortality pattern of the Lotha Nagas, it is found that the Lothas have over the years achieved a better child health care than the rest of rural Nagaland and rural Indian populations respectively with lesser crude death rate (8.37) and lesser infant mortality rate (57.47). Like any other rural population prenatal mortality is found to be lowest during the most fertile period

Table 12: Distribution of neonatal and infant mortality vis-à-vis birth attendants of Lotha women

Type of attendant	*No. of live births*	*Neonatal mortality*		*Infant mortality*	
		No.	*%*	*No.*	*%*
Doctors / nurses	361	8	2.22	7	1.94
Dai / mid wives	1715	68	3.97	45	2.62
Untrained persons	473	24	5.07	18	3.81
Total	2549	100	3.92	70	2.75

Table 13: Distribution of neonatal and infant mortality vis-à-vis type of delivery

Type of delivery	*No. of live births*	*Neonatal mortality*		*Infant mortality*	
		No.	*%*	*No.*	*%*
Normal	2467	97	3.93	66	2.68
Caesarian	82	3	3.65	4	4.88
Total	2549	100	3.92	70	2.75

Table 14: Distribution of child vaccination vis-à-vis postnatal offspring mortality of the Lothas

Vaccination of child	*No. of live births*	*Neonatal mortality*		*Infant mortality*		*Early child mortality*		*Late child mortality*	
		No.	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Complete vaccination	987	37	3.75	20	2.03	11	1.12	5	0.51
Incomplete vaccination	1203	43	3.57	35	2.91	26	2.16	11	0.91
No vaccination	359	20	5.57	15	4.17	14	3.90	6	1.67
Total	2549	100	3.92	70	2.75	51	20.00	22	0.86

Table 15: Distribution of prenatal and postnatal deaths vis-à-vis different economic groups among the Lothas

Income group (PCAI)	*No. of conceptions*	*Prenatal mortality*		*No. of live births*	*Neonatal mortality*		*Infant mortality (1-9 years)*		*Child mortality*	
		No.	*%*		*No.*	*%*	*No.*	*%*	*No.*	*%*
Below Rs.8,000	1001	125	12.49	876	41	4.68	30	3.42	34	3.88
Rs.8,000 - Rs.16,000	1626	171	10.52	1455	54	3.71	37	2.54	36	2.47
Above Rs.16,000	239	21	8.79	218	5	2.29	3	1.37	3	1.37
Total	2866	317	11.06	2549	100	3.92	70	2.75	73	2.86

of Lotha women, followed by an increase both with the successive increase and successive decrease in the mother's age cohort. Cases of induced prenatal mortality (6.98%) are found to be higher than that of spontaneous prenatal mortality which is lesser by 2.9%. Neonatal mortality and infant mortality with respect to mother's age at conception are found to be similar to the universal pattern showing a gradual decrease in the percentage of such deaths with the successive increase in the mother's age cohort except in the case of age cohort 15 to 19 years. Children born in their homes are found to have experienced greater percentage of prenatal and infant mortalities than those children who were born in the hospital. Neonatal and infant mortalities are found to be higher in the case of deliveries conducted by untrained persons than that of the deliveries conducted by doctors and nurses. The type of delivery is found to have no significant impact on the mortality status of the Lothas. With respect to child vaccination, the infant mortality, early child mortality and late child mortality successively increased as the vaccination status changes from complete vaccination to incomplete vaccination to no vaccination. Further, there

appears an inverse relationship between mortality at all the above stages and the economic status of the Lotha Nagas.

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