

Basu, Salil; Kshatriya, Gautam, K. : Fertility and mortality trends in the Kharia tribals of Orissa. Social Change. March-June 1997. 27(1 & 2).p. 114-128.

Fertility and Mortality trends in the Kharia Tribals of Orissa

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The demographic features and health care practices in Dudh Kharias of Sundargarh district of Orissa have been, discussed. The Kharias have higher fertility rate and infant mortality rate compared to the national average.

INDIA IS A VAST country with a population of more than 844 million. The tribal populations of India constitute a significant proportion of India's total population. There are more than 400 tribal population groups constituting around 8 percent of India's total population. Most of these tribal populations across the country are faced with similar health conditions accentuated by widespread poverty, illiteracy, malnutrition, poor environmental and personal hygiene and poor maternal and child health care practices.

Present study examines demographic features and health care practices among the Dudh Kharias of Sundargarh district of Orissa. Demographic analysis on 451 Kharia nuclear families belonging to Subdega and Bargaon blocks of Sundargarh district is conducted employing, indirect estimation technique. The results of the Study indicate that total fertility of the Kharias is higher than Indian National population. Crude Birth Rate (CBR) is found to be 38.5 per thousand as against 29.5 per thousand for India (SRS, 1993a). Crude Death Rate (CDR) for the Kharias is computed as 11.80 per thousand as against National average of 9.8 per thousand (SRS, 1993a).

The sex ratio among the Dudh Kharias has been found to be 1098 as against 972 for Scheduled Tribes of India (Census of India).

The current population growth rate of 2.67 percent for the Kharias is much higher than Indian National population which stands at 2.05 percent and is closer to the growth rate of Scheduled Tribes of India recorded as 2.57 percent. Similarly, Infant Mortality Rate (IMR) shows a staggering high figure of 102.4 per thousand live births as against 80 per thousand live births for Indian National population. However, Kharia's life expectancy based on q5 values is 52.03 years which is comparable to (58.6) Indian National population (Census of India, 1991).

Literacy rate of 46 percent among the Kharias is much higher than its corresponding figure of 25.9 percent in Indian tribal population (Census of India, 1991).

Prevailing health care practices reveal dismal picture as far as health status is concerned with the exception of few health indicators. Nevertheless, an overall demographic and health profile indicates that the Kharias are in the process of transition, and developing at a faster rate as compared to other tribal groups of Orissa.

Introduction

Sundargarh is one of the thirteen districts of Orissa with a population of 1.34 million (Census of India, 1981a). It lies in the northern region of the State between 21 35'N and 22 32'N latitude and between 83 32'E and 85 22' east longitude. Out of the total population of 1,337,871 about 51.26 percent of the district population consists of tribals. Kharias with a population of 88,000 has been notified as a primitive tribal group of Orissa (Government of India, 1989).

The Kharia tribe is mainly split into three social groups namely, the Pahari Kharia or hill Kharia, the Dhelki Kharia and the Dudh Kharia. All the three social groups of the Kharia are endogamous and their social organisation is based on totemistic exogamous clans. The hill Kharias are the most primitive of the three, depending mainly on hunting and food gathering. The Dhelki Kharias represent more advanced culture with the habit of plough cultivation. The Dudh Kharias represent most advanced culture of all the three subsisting on settled agriculture. They are mostly Christian converts. Besides agriculture, they are engaged in agriculture labour, mining, quarrying and other developmental work. Many of the educated persons have also entered in various cadres of the State Government and in teaching profession. Their staple food is rice which they consume in different forms and in various concoction.

Although Dudh Kharias are comparatively more developed among the three recognized social groupings of Kharias, a number of cases of diarrhoea, respiratory infection, Malaria, skin disease, vitamin deficiency have been seen among these people and there is wide spread malnutrition from time to time.

This paper examines demographic features and health care practices among the Dudh Kharias of Sundargarh district, Orissa. The trends are discussed in the light of prevailing socio-economic, and cultural traditions. An attempt is also made to compare fertility and mortality estimates with those for other Indian tribal populations and Indian National population derived from 1991 census.

Material and Methods

In the present investigation 451 Dudh Kharia nuclear families from randomly selected villages of Borgan and Subdega blocks of district Sundargarh, Orissa, India were studied. Villages were chosen on the basis of predominant distribution of the tribal groups under study, followed by a random selection of the households.

The fertility and mortality data were collected using a semi-structured questionnaire and by drawing extended genealogies. Reproductive performance data were collected by pregnancy by pregnancy enumeration. The collected information was further cross checked from elderly members of the household and sometimes from the village elders also. The data have been further divided into age specific events. Average parity has been calculated in each 5 year age interval for the women in the child bearing age. Thus, the mean parity of the women at the end of child bearing age (age interval, 45+) may be designated as the total fertility.

Since most of our information is based on oral histories without much substantiation by written evidence, indirect estimation technique has also been employed for calculating total fertility rate. The fertility levels as calculated by indirect estimation method (United Nations, 1967) suggests that the ratio of the average parity of women at the end of child bearing age to the average parity of a younger group (women in the age interval, 25-29) is closely related to the relative mean parity of women early and late in their twenties.

The relationship is represented as

$$T.F./P3 = P3/P2$$

Which may be rewritten as

$$T.F. = (P3) / P2$$

Where T.F. = Total fertility

P2 = Mean parity of women in the age interval, 20-24.

P3 = Mean parity of women in the age interval, 25-29.

Further, Various fertility indicators viz. Age Specific Fertility Rate (ASFR), Age Specific Marital Fertility Rate (ASMFR), General Fertility Rate (GFR), General Marital Fertility Rate (GMFR), Total Fertility Rate (TFR), Total Marital Fertility

Rate (TMFR) and Crude Birth Rate (CBR); and mortality indicators viz. Crude Death Rate (CDR) and Infant Mortality Rate (IMR) have been calculated following the standard definitions (Census of India, 1981b).

In the absence of exact age at death in the present investigation regarding offspring mortality, we have used indirect estimation procedure (Brass and Coale, 1968, Brass, 1975) to assess mortality parameters. This method translates proportion of surviving and proportion of dead among the children ever born to women in different age groups into conventional measures of mortality. Brass demonstrated that the proportion of children dead to the women in the 5 year age intervals in the child bearing age is, with a set of adjustment factors, equivalent to the probability of dying by exact age x , comparable to q_x in the life table function. The adjustment factors consist of scalar multiplying factors which can be selected on the basis of mean age of child bearing (m) and the ratios of mean parity for the first three 5 year age intervals of the women in the child bearing age.

Results and Discussion

The fertility records of Kharia mothers in various child bearing age groups (Table 1) indicate a total fertility of 5.01 estimated from the average parity of women in the age group 45+. However, the indirect estimation of total fertility calculated from $(P_3) / P_2$ has been found to be 5.39 which differs little from the observed fertility rate for the women in the age group of 45+.

Table 1 : Estimation of fertility and mean age at child bearing from age specific average parities among the Kharias

Age interval	No. of women	Number of births			Mean parity		
		M	F	T	M	F	T
15-19	87	--	--	--	--	--	--
20-24	37	16	17	33	0.43	0.46	0.89
25-29	64	68	72	140	1.06	1.13	2.19
30-34	76	120	133	253	1.58	1.75	3.33
35-39	61	133	139	272	2.18	2.28	4.46
40-44	32	72	82	154	2.25	2.56	4.81
45+	94	240	231	471	2.55	2.46	5.01
Total	451	649	674	1.323	1.44	1.49	2.93

Estimated Total Fertility = $(P_{(3)}^2 / P_{(2)}) = 5.39$

MEAN AGE AT CHILD BEARING = $m = 29.49$ (AFTER U.N., 1983)

ASFR'S, ASMFR'S, GFR'S, GMFR'S, TFR'S, TMFR'S and CBR for the Kharias and Orissa State have been presented in Table 2. The total fertility rate of Kharias is higher than that for Orissa State and Indian national population of 3.8 (SRS, 1993b), but is in accordance with high tribal fertility rates reported for various Indian tribal populations (Bhowmik et al. 1975, Sharma, 1978, Sinha and Pal, 1983, Ray and Roth, 1984, Singh et al 1987, Basu et al 1988, Basu and Kshatriya, 1989, Satish et al 1991).

Table 2 : Fertility Indices among the Dudh Kharias as compared to the State of Orissa

Age Group	ASFR		ASMFR	
	Kharias	Orissa	Kharias	Orissa
15-19	0.011	0.016	0.167	0.208
20-24	0.237	0.152	0.295	0.273
25-29	0.325	0.165	0.362	0.182
30-34	0.310	0.084	0.314	0.089
35-39	0.106	0.024	0.121	0.026
40-44	0.061	0.005	0.061	0.005
45-49	0.017	0.006	0.020	0.006
GFR/GMFR	164	84	223	175
TFR/TMFR	5.34	2.30	6.70	3.90
CBR	38.5	35.07	--	--

Moreover, the Kharias also reveal higher rates with respect to various fertility indicators when compared with Orissa State (Table 2). The GFR of 164 for the Dudh Kharias is much higher than that for Indian National population at 1991 which is recorded as 123.9 for rural-urban, combined. Similarly, crude birth rate (CBR) is found to be 38.5 per thousand as against 29.5 per thousand for India. Crude Death Rate (CDR) for Kharias is computed as 11.80 per thousand as against national average of 9.8 per thousand and the current population growth rate of 2.67 percent for Kharias is a little higher than Indian national population which stands at 2.05 percent. Similarly, infant mortality rate (IMR) shows a high figure of 102.4 per thousand live births as against 80 per thousand live births for Indian live births as against 80 per thousand live births for Indian National population (SRS, 1993 a&b).

Table 3 : Estimation of proportion dead by age and sex specific mortality among the Kharias

Age interval	Age a	No. of women	K*	Age & sex specific child				Mortality	
				Males		Females		Both sexes	
				D**	q _a ***	D**	q _a ***	D**	q _a ***

15-19	1	87	1.153	--	--	--	--	--	--
20-24	2	37	1.091	0.125	0.136	--	--	0.061	0.067
25-29	3	64	1.037	0.088	0.091	-0.055	0.057	0.071	0.074
30-34	5	76	1.034	0.142	0.147	0.128	0.132	0.134	0.139
35-39	10	61	1.037	0.165	0.171	0.144	0.149	0.154	0.160
40-44	15	52	1.017	0.166	0.169	0.158	0.161	0.162	0.165
45-49	20	94	1.017	0.192	0.195	0.165	0.168	0.178	0.181
e ₀ ° based on q ₅ values				(51.02)		(52.95)			(52.03)

* Multipliers for age (a), Brass (1975); Ages 1-5 based on P₂/P₃, Ages 10-20 based on M = 29.49

** Proportion of children dead

** Probability of dying by age (a)

The distribution of age and sex specific mortality among kharias (Table 3) together with multiplying factors K(a) and the resultant q(a) values show the life expectancy at birth. These estimates are based on q₅ values and interpolated from Brass one parameter model life table (Carrier and Hobcraft, 1971). Kharia's life expectancy at birth is 52.03 years. While this figure is comparable to (58.6 yrs) Indian National population (Census of India, 1991), it is much higher than the life expectancy at birth of 36.9 years for Juangs of Orissa (Ray & Roth, 1984), 41.09 years for Bastar tribes (Basu & Kshatriya, 1989) and 44.28 year for Kutia Kondhs of Orissa (Satish et al 1991). Comparison of offspring mortality by maternal age of Kharias with those of Orissa and Bastar tribes shows significant differences (Table 4) in general, at all ages, with the exception of offspring mortality in the maternal age 20-24 years, where the inter-group comparison shows non-significant differences. This clearly indicates that Kharia women reveal appreciably low offspring mortality which decend with age when compared with other tribal population.

Table 4 : Inter-group comparison for offspring mortality to the women for various child bearing age groups, based on standardized normal deviate

Age > Interval	Paired Populations				
	Kharia vs Kutia	Kharia vs Muria	Kharia vs Madia	Kharia vs Bhatra	Kharia vs Halba
20-24	1.176	1.187	0.642	0.532	1.968
25-29	1.860	3.002*	3.587*	1.617	4.004*
30-34	1.691	3.329*	2.914*	2.031	2.877*
35-39	2.535*	2.976*	2.801*	2.404*	2.304

40-44	2.159	2.733*	1.905	2.107	2.595*
45+	4.795*	4.286*	4.732*	4.175*	4.374*

* The 'Z' values are significant at 1 percent level

Table 5 presents age at menarche and marriage among Kharia women. It can be observed that 56.67 percent of Kharia girls attain menarche between the age 14 and 16 and 51.09 percent of Kharia girls get married between the age 20 and 25. The average age at menarche and marriage for Kharia girls comes out to be 14.41 yrs and 21.41 yrs respectively. Age at marriage among the Kharias is higher than its corresponding figure of 20 years for tribal population of India (Sinha 1986). Similarly, the delayed onset of menarche as compared to 13.21 yrs for Oriya women (Sharma, 1990) can presumably be attributed to their socioeconomic status.

Table 5 : Age at menarche and marriage among the Kharia women

Age Interval	No. of Women	%	No of women	%
I Age at menarche	7	2.59	--	--
a. 10-12	88	32.59	--	--
b. 12-14	153	56.67	--	--
c. 14-16	22	8.15	--	--
d. 16-18				
II Age at marriage	--	--	116	36.14
a. 15-20	--	--	164	51.09
b. 20-25	--	--	36	11.21
c. 25-30	--	--	5	1.56
d. 30-35				
Total	270	100.00	321	100.00

Table 6 shows the distribution of family types in the Kharias. It can be observed that nuclear families with a frequency of 69.28 percent preponderates in the Kharias as compared to joint family with a frequency of 30.72 percent, the Kharias of Sundargarh are strictly monogamous. Table 7 presents individual land holding pattern in the Kharias. More than 70 percent of the Kharia families have less than 5 acres of land and another 21 percent of the Kharia families have land holding between 5 and 10 acres. Thus, in the present study more than 92 percent of tribal population have less than 10 acres of land. The average land holding comes out to be 4.46 acre per family. The small land holding among the Kharia goes very well with the high prevalence of nuclear families.

Table 6 : Distribution of Family Types in the Kharias

Type of Family	Number of Families
Nuclear	221 (69.28)
Joint	98 (30.72)
TOTAL	319 (100.00)

Figures within paranthesis represent percentage.

Table 7 : Land Holding pattern in the Kharias

Land Holding (In Acres)	Number of Families	%
0-5	230	71.43
5-10	67	20.81
10-15	16	4.97
15-20	9	2.79
TOTAL	322	100.00

Literacy rate as evident from Table 8 turns out to be 46 percent among the Kharias. Literacy rate is much higher than its corresponding figure of 25.9 percent in Indian tribal population and is similar to the figure of 52.2 percent for Indian National population (Census of India 1991).

Table 8 : Literacy rate among the Kharias

Literacy	Male	Female	Both Sexes
Literates	475 (51.52)	416 (41.07)	891 (46.05)
Non-literates	447 (48.48)	597 (58.93)	1044 (53.95)
Total	922 (100.00)	1044 (100.00)	1935 (100.00)

It can thus be seen that the Kharias with a high literacy rate, a high frequency of nuclear families, a small landholding and most of them being aware of modern methods of irrigation are hardly distinguishable from the surrounding non-tribal populations.

In the context of their health seeking behaviour, it was found that nearly 77 percent of the respondent families had visited primary health centre at one time or another (Table 9) and among these 72.58 percent of the families were satisfied with the services provided at Primary Health Centre (PHC). However, their first preference to seek remedies from any illness still remains to be their traditional systems of medicine, where they invariably contact a Vaid (a traditional medicine man) for getting treatment.

Table 9 : Utilization of Health Services by the Kharias

Respondents	Number	Percentage	Number	Percentage
Ever visited PHC	248	76.78	--	--
Never visited PHC	75	23.22	--	--
Satisfied by services	--	--	180	72.58
Unsatisfied by services	--	--	68	27.42
Total	323	100.00	248	100.00

In the present study, 188 couples were interviewed regarding the practice of Family Planning methods. It was found that each couple was aware of different Family Planning methods and the incentives associated with them. It may be mentioned here that the Kharias of district Sundargarh are Christian converts and have a deep influence of Christian missionaries on their life style. Out of 188 couples, only 16 percent of them were currently using any Family Planning method (Table 10). As far as their attitudes towards family size is concerned, 44.19 percent of respondent preferred to have four children while 32.56 percent preferred three children. Similarly, regarding their belief about childbirth, 61.9 percent of the respondents believed that children were the gift of God.

Table 10 : Eligible Couples Currently Using Any FP Methods

Family Planning Methods	No. of Couples	Percentage
Current users	30	15.96
Non-users	158	84.04
Total	188	100.00

Table 11 : Food Habits and status of TT immunisation during pregnancy among the Kharia women

Food intake/vaccination	Number of women	Percentage	Number of women	Percentage
Take some food	155	84.24	--	--
Take less food	19	10.33	--	--
Take more food	9	4.89	--	--
Take restricted diet	1	0.54	--	--
Immunised against TT	--	--	126	67.38
Not immunised	--	--	61	32.62
Total	184	100.00	187	100.00

Even though Kharias are quite literate, maternal care during and after pregnancy is not satisfactory. It was observed that 84 percent of pregnant women take

essentially the same diet as they were taking before pregnancy (Table 11). Infact, 10 percent of the women reduced their food intake because of the simple fear of recurrent vomiting. It was observed that 11.70 percent of women consumed alcohol during pregnancy and almost all the pregnant women continued with their usual activities till the last trimester. In the present study 67 percent of the pregnant women were found to be immunised against Tetanus Toxoid indicating their willingness to accept the Government programmes on motivation (Table 11). But this healthy trend withers out when the observation is made on the place of delivery in this group. Over 94 percent of the deliveries are conducted at home (Table 12) attended by elderly ladies of the household. Hospital services are secured only in difficult cases.

Table 12 : Place of delivery among the Kharia tribal population

Place	Number	Percentage
At home	177	94.15
At phc/pvt.hosp/chc/distt.hosp.	11	5.85
Total	188	100.00

Placental cord is cut with the help of a blade in 91.62 percent of cases. Astonishingly, the Kharias customarily apply cow's urine, pig's fat or both on the placental cord of the newborn. In the present investigation too, the above material was used and applied on the placental cord of 66.25 percent newborns of the Kharias on whom the information was collected.

Table 13 presents childcare practices among the Kharias. It can be seen from the table that 36 percent of the infants get their first feed as mother's milk without colostrum. Only in 8 percent of the cases do the mother give their feed to the infants alongwith colostrum. Thus, infants are deprived of the most essential nutrition in the form of colostrum. In nearly 37 percent of cases, infants get their first feed in the form of goat's milk, milk powder, glucose, sugar solution, simple water etc. As far as initiation of the first supplementary diet is concerned, 64 percent of the newly born infants get their first supplementary diet between 6 and 12 months.

Table 13 : Child care practices among the Kharias of Sundargarh

Child care practices	Number	%	Number	%	Number	%
I. First feed given to infants	14	8.05	--	--	--	--
a. Mother's milk with colostrum	63	36.21	--	--	--	--
b. Mother's milk without colostrum	15	8.62	--	--	--	--
c. Honey	18	10.34	--	--	--	--

d. Cow's milk	64	36.78	--	--	--	--
e. Any other						
II. Age at first suppl diet	--	--	20	11.98	--	--
a. 6 months	--	--	107	64.07	--	--
b. 6-12 months	--	--	40	23.95	--	--
c. After 1 year						
III. Duration of breast feed	--	--	--	--	21	12.65
a. 1 year	--	--	--	--	56	33.74
b. 2 year	--	--	--	--	72	43.37
c. 3 year	--	--	--	--	17	10.24
d. Still feeding						
Total	174	100.0	167	100.0	166	100.0

Similarly, 43 percent of newborn are breastfed up to a minimum period of three years. There is a tendency among the Kharias to keep an infant on breast feed as long as possible. Infact, only 13 percent of newborns leave their mothers milk by the end of their first year of life. The long duration of breast feeding in the Kharias can be reasoned out from the fact that the Kharia women are basically involved in household activities and in those income generating resources which do not require them to leave their kids at home.

Table 14 : Status of child immunization among the Kharias

Vaccination	Number	%	Number	%	Number	%
I. BCG	131	69.31	--	--	--	--
a. Yes	58	30.69	--	--	--	--
b. No						
II. POLIO	--	--	140	74.07	--	--
a. Yes	--	--	49	25.93	--	--
b. No						
II. DPT	--	--	--	--	--	--
a. Yes	--	--	--	--	135	71.43
b. No					54	28.57
Total	189	100.00	189	100.00	189	100.00

Table 14 presents the status of child immunization among the Kharias. This is by far the most important observation on the Kharias, clearly indicating that this group is very highly motivated for child immunisation programme.

Incidentally Subdega block of Sundergarh district is the oldest ICDS (Integrated Child Development Scheme) block in India. It can be observed that nearly 70 percent of the children are immunized against BCG, DPT and Polio. However, a large percentage (47.14) of children are immunized within the village indicating their willingness to accept the immunization programme, provided the camps are organised within the village.

Analysis of data on sex specific mortality using Brass multipliers (Brass, 1975) in general shows similar mortality increase along with the age in both the sexes. Using q_5 values to estimate average life expectancy from Brass Tables, it has been observed that Kharia females show a higher life expectancy (52.95yrs.) as compared to males (51.02yrs). Sex ratio of Kharias (1098/1000) lends further support to the above observation.

Although reversed sexual mortality differentials have been reported for Indian National population (Census of India, 1981c), Juangs of Orissa (Ray & Roth, 1984) and Kutia Kondhs of Orissa (Satish et al 1991); the observed trend in the present study does not feature off-cited sexual mortality differential. Infact, Rao et al (1986) reported a sex ratio of 1001 and a higher percentage of surviving female population of over 50 years (8.3%), against 7 percent of males along the tribal population of Bastar district, MP. Further, Basu and Kshatriya (1989) also observed a similar trend for various tribal population of Bastar district (MP). Similarly, regarding survivorship trends of Indian population, it has been reported in Indian National census. "The higher e for males compared to females seems to have been reversed during decade 1971-81" and "Female mortality is falling at a faster rate than male" (Census of India, 1981c).

Thus, in studying the Kharias two things are clearly observable. While the Kharias are more, literate, prefer nuclear families, have small landholding, more mobile as far as opportunities are concerned, positive in their attitudes towards many Government programmes (specially the immunization programme), more aware under the influence of Christian missionaries, reveal higher life expectancy at birth, yet, their knowledge and attitudes regarding competitive economy, personal hygiene, modern medicine, family size, child birth, maternal care during and after pregnancy, child care practices are not quite satisfactory. Nevertheless, based on the above observations it can be said that the Kharias are in the process of transition and fast acculturating with neighbouring non-tribal groups with modern based value system, and their demographic profile is strongly associated with the prevalent health care practices as well as their socioeconomic and cultural traditions.

References

1. Basu, S.K., Kshatriya, G.K. and Jindal, A; (1988). Fertility and mortality differentials among the population groups of Bastar district, Madhya Pradesh, India. *Hum. Biol.*, 60:407-416.
2. Basu, S.K. and Kshatriya, G. (1989). Fertility and mortality in tribal population of Bastar district Madhya Pradesh, India. *Biol. Soc. (Eng.)*, 6:100-112.

3. Bhowmik, K.L. Chowdhury, M.K., Das, P. and Chowdhuri, K.K.; (1971). Fertility of Zemi women in Nagaland. Institute of Social Studies, Calcutta.
4. Brass, W and Coale, A. (1968). Methods of analysis and estimation.pp.88-139.In The Demography of tropical Africa. W. Brass et al. (Eds.) Princeton University Press. Princeton.
5. Brass, W. (1975). Methods for Estimating Fertility and Mortality from Limited and Defective Data. Laboratory for Population statistics, occasional publication, Carolina Population Center, Chapel Hill.
6. Carrier, N. and Hobcraft, J. (1971). Demographic Estimation for Developing Societies. Population Investigation Committee, London.
7. Census of India: Series-I, 1984: India paper 2. General Population and Population of Scheduled Castes and Scheduled Tribes. Controller of Publications, Delhi, (1981a).
8. Census of India: Series-I, 1983: India Paper-2 Key Population Statistics Based on Five Percent sample Data p.II Controller of Publications, Delhi (1981b).
9. Census of India: Series-I, 1984: Population Projections for India 1981-2001, p.24 Controller of Publications, Delhi (1981c).
10. Census of India. Controller of Publications; Govt. of India, Delhi (1991).
11. Govt. of India: Report of the working group on Development and Welfare of Scheduled Tribes during Eighth Five year Plan (1990-95). Ministry of Welfare, New Delhi (1989).
12. Rao, D.H., Mathur, YN., Radhasah, G. and Rao, N.P. (1986). Health and nutritional status of tribals in M.P Hyderabad: NIN.
13. Ray, A.K. and Roth, E.A. (1984). Demography of the Juang tribal population of Orissa. Am.J. Phy Anthrop. 65: 387-393.
14. Sample Registration system Vol.XXXVI (1991). Registrar General of India, Ministry of Home Affairs.
15. Satish Kumar, Ch., Khan, A.S., Kshatriya, G.K. and Basu, S.K. (1991). Estimates of fertility and mortality in Kutia Kondhs of Phulbani district, Orissa.

16. Sharma. K. (1978). Fertility and Mortality in Kondhs: A tribal community of Orissa. *Man in India*, 58:77-88.
17. Singh, A.K., Sinha, S.K., Singh, S.N., Jayaswal, N. and Jabbi, M.K. (1987). The myth of the healthy tribal. *Social Change* 17: 3-23.
18. Sinha, D and Pal, B.C. (1983). Population dynamics among the Toto of West Bengal: A positive response to culture contact. *J.Biosoc.Sci.* 15:237-245.
19. Sinha, U.P. (1986). Ethno-demographic study of tribal population in India. International Institute of Population Sciences, Bombay.
20. Sharma, K. (1990) Age at menarche in northern Indian females and a review of Indian data. *Ann.Hum.Biol.* 17: 159-162.
21. United Nations Manual IV: Methods of Estimating Basic Demographic Measures from incomplete Data. *Population Studies*, No.42, Department of Economic and Social Affairs, New York (1967).