J. Hum. Ecol., 8 (1) : 43-49 (1997)
DOI: 10.31901/24566608.1997/08.01.06

Foetal and Infant Mortality in Two Tribes of Rajmahal Hills, Bihar

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KEY WORDS Foetal. Infant. Mortality. Pahariya. Santal. Rajmahal Hills. Demography.

ABSTRACT A survey of 227 families of Santals and 494 of Pahariyas (208 of Saurias, 184 of Mals and 102 of Kumarbhags) was carried out to evaluate the consequences of genetic load in terms of foetal and infant deaths. Significantly higher percentage of foetal loss was observed in the Pahariyas (22.5%) in comparison to the Santals (16.5%). This loss was recorded highest during 5-19 weeks of the pregnancies in both the tribes. Maximum infant loss occured during 0-7 days and 8-27 days. Among the demographic factors, only age of the mother had profound effects in foetal and infant deaths.

INTRODUCTION

Alarming high mortality rate among the Pahariya, an under-previledged tribal community of Rajmahal hills, Bihar, has been reported. Deforestation and ecodegradation were suggested as the main reasons for this state of affair because these two affected their economical and nutritional status even for decades (Choudhary, 1988; Moitra and Choudhary, 1991; Adhikary and Choudhary, 1995). The genetic cause of such a massive dwindling is hitherto unexplored. It is quite possible that this tribal community has much higher genetic load (in the form of lethal, semi-lethal, detrimental and sterility causing genes) and might be responsible for higher rate of abortion and death at early childhood. Although it is very difficult to quantify this load, its consequences may be evaluated in terms of foetal and infant deaths and sterility.

The foetal and neonatal mortality rates (perinatal mortality rate) continue to be as high as 60-120/1000 in India, as compared to the developed countries where it is below 10/1000 (Santhanakrishnan, et al., 1986; Gopaul et al., 1987; Mohapatra, 1984 and Mir, 1986). According to 1989 Census, the average infant deaths rate in Bihar state is 91/1000 (Bhasin et al., 1994). Critical periods of infant mortality were observed during 1st week and 28 days after delivery (Simons et al., 1978 and Mahadevan et al., 1986).

No hospital or community based data is available on foetal and infant mortality in Bihar or on Pahariya tribe of Rajmahal hills. In view of the paucity of data among the Pahariyas who were at the verge of extinction, the study of foetal and infant mortality rates among them are of interest. Therefore, the aim of the present study is to identify the genetic factors which predict foetal and infant death in the Pahariya.

MATERIAL AND METHOD

Three sub-tribes of the Pahariyas : the Saurias, the Mals and the Kumarbhags were selected for the present study and for comparison the Santal tribe was also surveyed. The population sample was taken from Rajmahal hills, total 721 women (208 of the Saurias, 184 of the Mals and 102 of the Kumarbhags and 227 of the Santals) aged between 15 and 45 years and 644 men aged between 20 and 50 years were interviewed, but only the female responses were used in this study.

A total 4634 pregnancies of the Pahariyas and 2105 of the Santals were recorded. Out of 1035 foetal deaths in the Pahariyas, 914 died during 5-19 weeks, 48 during 20-27 weeks and 73 died during 28 weeks on wards. Among the Santals a total 347 foetal losses were recorded, out of which 290 died during 5-19 weeks, 27 during 20-27 weeks and 30 during 28 weeks onwards.

Total infant deaths among the Pahariyas were 671, out of which 302 died during 0-7 days, 89 during 8-27 days and 280 died during 28 days - 1 year. Among the Santals out of 223 infant deaths, 72 died during 0-7 days, 25 during 8-27 days and 126 during 28 days-1 year.

Information about the present age of the mothers, age at marriages, the weiting period, *i.e.*, gap in time between her marriage and first conception and her age at various succeeding conceptions, mortality, fertility and sex ratio etc. were collected.

RESULTS

The percentage of gross foetal loss in the Santals and the three sub-tribes of the Pahatiyas are presented in table 1. This loss was recorded 16.5% in the Santals and 22.5% in the Pahariyas. The differences being significant (P>0.05). Maximum loss occured during the period of 5-19 weeks and it was 13.8% in the Santals and 20.6% in the Pahariyas. Among the three sub-tribes of the Pahariyas, the foetal loss during 5-19 weeks was lowest in the Saurias (17.7%). But in the Mals and the Kumarbhags this loss was more or less similar and higher than the Saurias (21.2% in Mals and 22.8% in Kumarbhags). As far as foetal loss during 20-27 weeks and late 28 weeks were concerned, no significant differences were observed among the three sub-tribes of the Pahariyas and the Santals.

Table 1: Foetal loss (%) in Santals and three sub-tribes of the Pahariyas of Rajmahal Hills, Bihar

Populations	*Total no. of pregnancies*	*Foetal loss rate (per 100)*			
		Total	*Early 5-19 weeks*	*Intermediate 20-27 weeks*	*Late 28 weeks - 1 year*
Santals	2105	16.5 (347)	13.8 (290)	1.3 (27)	1.4 (30)
Pahariyas					
i) Saurias	2044	20.2 (413)	17.7 (362)	0.9 (18)	1.6 (33)
ii) Mals	1944	23.9 (465)	21.2 (412)	1.2 (23)	1.5 (30)
iii) Kumarbhags	616*	25.4 (157)	22.8 (140)	1.0 (7)	1.6 (10)

* Kumarbhags has small population size, so total number of pregnancies is very small

Table 2: Infant mortality rate by sex in Santals and three sub-tribes of the Pahariyas of Rajmahal Hills, Bihar

Populations		*Total no. of births and sex*	*Percentage of death and sex*	*Infant deaths*		
				Neonatal deaths		*Postnatal deaths*
				0 - 7 days	*8 - 27 days*	*28 days - 1 year*
Santals	M	907	13.6 (123)	4.3 (39)	1.5 (14)	7.7 (70)
	F	851	11.8 (100)	3.6 (30)	1.4 (11)	6.7 (56)
	M+F	1758	12.7 (223)	4.1 (72)	1.4 (25)	7.2 (126)
Pahariyas						
Saurias	M	772	19.4 (162)	8.8 (73)	2.5 (21)	8.2 (68)
	F	798	17.3 (138)	7.2 (57)	2.1 (17)	8.0 (64)
	M+ F	1631	18.4 (300)	7.9 (80)	2.4 (38)	8.1 (132)
Mals	M	772	19.7 (152)	9.2 (71)	2.6 (20)	7.9 (61)
	F	731	16.2 (118)	7.1 (52)	2.2 (16)	6.8 (50)
	M + F	1503	18.2 (270)	8.2 (123)	2.4 (36)	7.4 (111)
Kumar-	M	265	22.6 (59)	11.3 (29)	3.8 (10)	7.5 (20)
bhags	F	194	21.8 (42)	10.3 (20)	2.6 (5)	8.8 (17)
	M+F	459	22.3 (101)	10.9 (49)	3.3 (15)	8.1 (37)
Total No.	M	1870	20.0 (373)	9.3 (173)	2.7 (51)	7.9 (149)
Pahariyas	F	1723	17.2 (298)	7.5 (129)	2.2 (38)	7.6 (131)
	M+F	3593	18.7 (671)	8.4 (302)	2.5 (89)	7.9 (280)

Table 3: Foetal deaths (%) by demographic factors in two tribes of Rajmahal Hills, Bihar

Demographic factors	*Foetal deaths (%)*											
	5 - 19 weeks				*20 - 27 weeks*				*28 weeks onwards*			
	St	*S*	*M*	*K*	*St*	*S*	*M*	*K*	*St*	*S*	*M*	*K*
Birth Order												
1	3.3	5.8	5.7	12.9	.4	.5	.2	.8	.7	.6	.6	
2 - 3	3.6	4.3	2.6	3.2	.2	.2	.3	.2	.4	.3	.3	.3
4 - 5	4.2	3.6	4.7	2.7	.3	.2	.2	.3	.2	.2	.3	
6 +	2.7	4.0	5.9	4.6	.3	.2	.2	.3	.1	.3	.4	.4
Birth Intervals												
1 yr	4.2	6.9	7.7	14.2	.6	.3	.5	.4	.7	.8	.2	.6
2 - 3 yrs	4.7	5.2	6.8	4.1	.42	.3	.3	.2	.3	.2	.6	.6
3 - 4 yrs	4.9	5.6	6.7	4.5	.3	.3	.4	.4	.4	.7	.7	.4
Maternal Age at the Time of Pregnancy												
19 yrs	9.7	16.2	13.8	16.3	.9	.1	.6	.7	.8	.4	.7	
20 - 29 yrs	1.3	.4	4.3	2.7	.2	.3	.2	.00	.1	.2	.1	.1
30 - 39 yrs	1.2	.2	2.7	1.8	.07	.2	.2	00	.3	.2	.1	.2
40 +	1.6	.9	.4	2.0	.15	.3	.2	.3	.3	.8	.9	.6

St = Santals S = Saurias M = Mals K = Kumarbhags

The percentage of infant deaths was also significantly higher (P>0.05) in the Pahariyas (18.7%) in comparison to the Santals (12.7%). This loss was mainly due to death of the babies during 0-7 days and 28 days-1 year after their birth. Deaths during 0-7 days also significantly low in the Santals (4.1%), followed by the Saurias (7.9%), the Mals (8.18%) and the Kumarbhags (10.9%). Significant difference between Santals and the three sub-tribes of the Pahariyas was observed. Among the three subtribes of the Pahariyas significant difference was observed in Kumarbhags with the Saurias and the Mals. During the period of 8-27 days and 28 days-1 year the infant mortalities were found more or less similar in three sub-tribes of the Pahariyas and ranged between 2.4% to 3.3% and 7.4% to 8.06%, respectively as well as in the Santals (1.4% and 7.2%, respectively).

The week wise analysis of foetal wastage in the Pahariyas and the Santals and also in three sub-tribes of Pahariyas are presented in figures 1 and 2. Foetal loss in Santals was observed highest in 6th, 15th and 16th weeks where as in the Pahariyas highest losses were recorded in 14th to 16th weeks. The foetal losses among the three sub-tribes of the Pahariyas were lowest in 6th, 9th, 11th and 19th weeks in the Mals, 6th, 8th and 5th weeks in Kumarbhags and 9th, and 11th weeks in the Saurias.

As far as demographic factors are concerned, the loss of male child during 0-7 days was slightly higher in comparison to that of the female child in three sub-tribes of the Pahariyas and also in the Santals. No significant difference being observed. The highest percentage of abortions in the 1st birth order was recorded only in the Kumarbhags (12.9%) and the difference being significant (P>0.05) with respect to remaining birth orders during 5-19 weeks. In remaining populations no such effect was noted during this period. The effect of birth order was again visible in 28 weeks onwards, where in almost all the four groups of the tribe, higher rates of abortions were oberved in case of first birth order. The birth interval had also affected the Kumarbhags where highest mortality was recorded (14.2%) in case of one year birth spacing and no effects were observed in remaining populations and also in remaining periods. Most of the abortions were recorded during 5-19 weeks and 20-27 weeks among the mothers having age below 19 years. During 28 weeks onwards, the rate of abortions was higher among

the mothers of highest and lowest age groups.

For infant deaths, the birth intervals and age of the mothers at the time of the birth of the child affected the early neonatal and neonatal periods (Table 4). Deaths recorded in one year birth interval and mothers of below 19 years of age were significantly higher (P>0.05) in comparison to remaining birth intervals. The highest early neonatal mortality was recorded among the Kumarbhags (7.1% and lowest in the Mals (1.7%), when birth interval was 1 year. In lower aged mothers infant death rate was highest in Kumarbhags (6.4%) followed by the Mals (4.6%). The Santals and the Saurias had more or less similar situation.

Table 4: Infant deaths (%) by demographic factors in two tribes of Rajmahal Hills, Bihar

Demographic factors	*Infant Deaths (%)*											
	0 - 7 days				*8 - 27 days*				*28 days-1 yr*			
	St	*S*	*M*	*K*	*St*	*S*	*M*	*K*	*St*	*S*	*M*	*K*
Birth Order												
1	1.1	2.7	3.7	6.5	.8	1.5	1.8	2.7	4.2	6.8	4.2	6.8
2 - 3	1.2	1.2	.5	1.7	.2	.4	-	.1	1.2	-	2.1	.2
4 - 5	1.2	.4	2.2	.7	.2	.1	.1	-	.7	-	-	2.1
6 +	.6	3.6	1.8	2.0	.4	.4	.5	.5	1.1	1.3	.6	.66
Birth Intervals												
1 yr	3.2	3.7	1.7	7.1	.7	1.0	.8	1.7	5.2	4.7	2.7	2.7
2 - 3 yrs	-	2.5	3.8	1.2	-	.4	.2	.2	.8	1.2	-	-
3 - 4 yrs	.9	1.7	2.7	2.6	.7	1.0	1.4	1.4	1.2	2.2	4.7	5.4
Age of the Mothers at Birth of Child												
19 yrs	3.7	3.2	4.6	6.4	.8	1.2	1.7	1.2	4.6	6.2	7.4	3.2
20 - 29 yrs	.4	1.2	1.3	2.7	-	.2	-	.7	-	-	-	4.2
30 - 39 yrs	-	.6	1.2	-	-	-	-	-	-	-	-	-
40 +	-	2.7	1.1	1.8	.6	1.0	.7	1.4	1.6	1.9	-	.66

St = Santals S = Saurias M = Mals K = Kumarbhags

As far as birth order was concerned the highest early neonatal deaths recorded in the 1st birth order in Kumrbhags (6.5%) and difference being significant (P>0.05) with remaining populations. Infants death during 8-27 days showed no effect, but post neonatal period was again affected and more or less similar pattern was observed as in early neonatal period.

DISCUSSION

According to Wright (1970b) each and every stage of development of a foetus and its metabolic processes is controlled and influenced to greater or lesser extent by genes. It is not surprising that any mutation in these genes do not permit the "load bearing" embryo to pass successfully through the "phenocritic period" of embryogenesis. Implantation of fertilised eggs, their successful cleavage, organogenesis, etc., are a few of these such periods in mammals. Mutational load is sometimes so severe that the individual cannot survive and death may occur very early in embryonic development or at latter stages which may lead to miscarriage. The high early foetal mortality recorded in the Pahariyas might be due to genetic factors. As the three sub-tribes of the Pahariyas and the Santals belong the same socio-economic condition, nutritional status and ecological niche, the week-wise variation in mortality also supports the role of genetic factor in foetal deaths. Evidences of direct effects of genetic factors to foetal loss is lacking except for the role of chromosomal anomalies (Warburton and Fresera, 1964). It is a well realised fact that 40% of our health problems are of genetic origin (Lederberg, 1971). Furthermore, it is reported that the marriage distance in the present population is

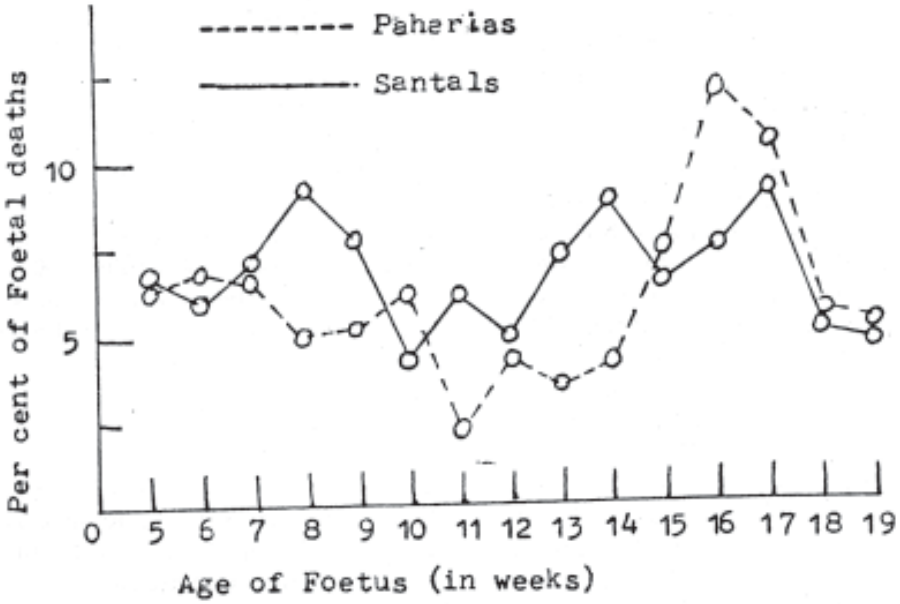
Paherias
Santals
Per cent of Foetal deaths
10
5
0 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Age of Foetus (in weeks)

Fig. 1.

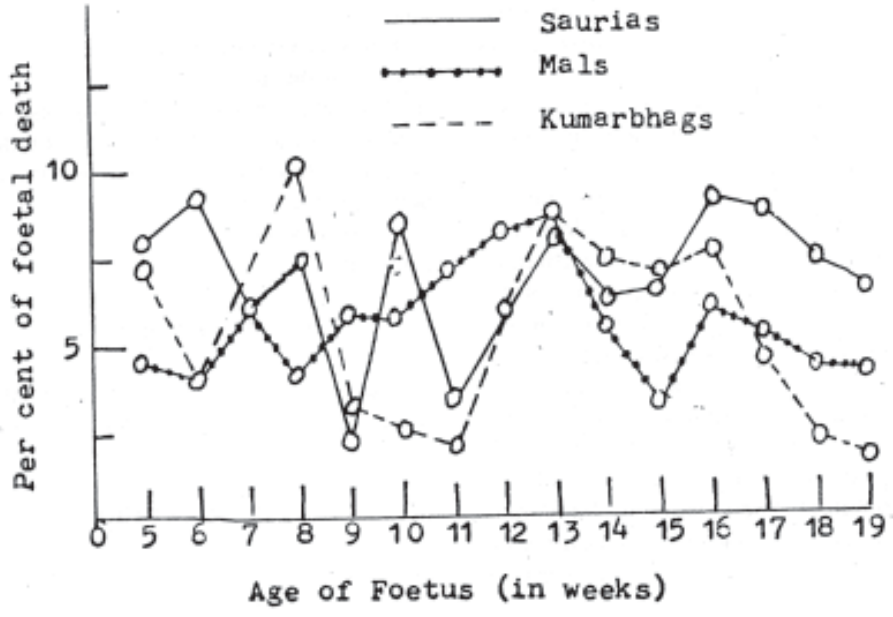
Saurias
Mals
Kumarbhags
Per cent of foetal death
10
5
0 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Age of Foetus (in weeks)

Fig. 2.

very short (even sometimes two kilometers), hence chances of consanguinity/inbreeding are high (Ansari and Sinha, 1978), leading to increased genetic load among them. Abortions may also occur due to abnormal uterine activities and death of the foetus (Stevenson and Warnock, 1955), various maternal-foetal incompatibilities and hormonal imbalances (Matsunaga, 1956; Levine, 1958). Our present findings are in confirmity with the poor rural and urban communities of Tamil Nadu where foetal deaths were recorded 18.3%, 1.6% and 2.0% during early, intermediate and late stages, respectively in rural area and these values were 17.0%, 1.8% and 2.4%, respectively in urban area (Rao and Imberaj, 1977).

The nutritional status of the mother has also profound impact on mortality. But maternal nutrition provides the necessary nutrients for the growth and development of the foetus, the genetic profile gives direction of the utilization of these nutrients in relation to growth and development. Hence the effect of nutritional status of the mother more likely is quantitative while the genetic factors have qualitative effects on foetus.

Due to chronic malnutrition in expectant mothers the risk of deaths of foetus as well as mothers may be increased because lesser nutrients are available for the foetus and maintenance of the health of the mothers (Winikoff, 1978). It increases the frequency of birth injuries and reduce the overall efficiencies of the reproductive processes. It is obvious that the loss during latter stage of foetus in the present case might be influenced more by maternal nutritional status. The Pahariyas had a comparatively more strenuous life at the top of the hills due to long stretches of walking and/or climbing over the hills, as compared to the Santals who lived at the foot of the hills, such hard physical work during pregnancy may also affect the mortality.

Infant deaths within the first week are caused mostly by maternal factors related to delivery such as extreme age, multiparity, short-birth intervals and malnutrition (Puffer and Serrano, 1975; De Vanzo Butz and Habicht, 1983). Our present finding shos that among the demographic factors, only age of the mothers affected the foetal as well as infant deaths in three sub-tribes of the Pahariyas and the Santals. The reason for this may be that the mothers of younger age are physiologically matured to bear a child but not physically (Trussel, 1988; Madise, 1995). Higher mortality for children born to women at older ages may result from declining efficiency of the reproductive system. Birth order of a child has a similar relationship with mortality as that of maternal age, but no definite pattern was observed in the present case. The higher rate of mortality during 1st week of life may also be due to tetanus neonatorum –a result of unscientific way of cutting the umbilical cord with a household knife or a unsterilized blade or a sickle etc. Asphyxia, partial starving of the baby for the first three days are also be responsible for child deaths. Indently, such practices are more among the three sub-tribes of the Pahariyas.

Infant death during postnatal period may be due to various problems including weaning of the baby with inadequate and imporper supplementation of food. During this period the baby is exposed freely to the outside world. The sudden exposure subjects the baby to risk of contact with sick and unhealthy persons and environment.

ACKNOWLEDGEMENT

Financial assistance to Dr. R.P. Choudhary from UGC, New Delhi is thankfully acknowledged.

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