Opportunity for Natural Selection among the Migrant Santal Community of Bhubaneswar in Odisha, India

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ABSTRACT In this article, the selection intensity indices are calculated based on demographic information pertaining to fertility and mortality among the migrant Santals of Bhubaneswar, Odisha. The indices are calculated by original formula of Crow and modified formula of Johnston and Kensinger. From the analysis it is evident that the total selection intensity among the migrant Santals operates more through differential mortality than through differential fertility, which conforms, in general, to the findings reported among many other tribal groups in India.

INTRODUCTION

Selection intensity is a measure of the fitness of a population as expressed by the ongoing patterns of differential fertility and differential mortality combined in a particular manner. The index of opportunity for selection measures the maximum potential rate of change by selection, where zero indicates no change (Livingstone and Spuhler 1965). An indirect method for computing the index of total selection based on the maximum of differential fertility and differential mortality in a population was formulated by Crow (1958) and modified by Johnston and Kensinger (1971) incorporating the embryonic mortality component. Bio-demographic considerations like differential fertility and differential mortality vary not only with biogenetic factors but also with socio-cultural, religious, ethnic and environmental.

Many studies have been carried out in Indian and elsewhere to demonstrate the role of natural selection imposing characteristic fertility and mortality in various populations at different levels of technological advancements. Studies on Indian caste and tribal populations (Ghosh 1970; Reddy and Lakshmanadu 1979; Padmanabhan 1985; Khongsdier 1994; Patra and Kapoor 1997;

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Kapoor and Kshatriya 2000; Kapoor and Patra 2002; Kotal and Sengupta 2003; Reddy 2005; Gautam et al. 2009; Raju and Prakash 2009), which are generally characterized by poor nutrition, higher incidence of diseases and large family size, have supported observation. In a critical review of data among Indian populations, Reddy and Chopra (1990) have shown how and I_m gradually I_f decreases with improving socio-economic and technological status. Again they have found that 70% of the tribal population studied so far show larger mortality component and consistently lower I_m than I_f about which they felt better accessibility to public health is the reason. The rapid change in demographic scenario that make many tribal groups in India to migrate to rural and urban set ups may have some bearing on their fertility and mortality performances. However, no study from Odisha, especially on tribal groups, deals with such changing demographic dynamics and the resultant effect on opportunity for natural selection. View of these, in the present article an attempt is made to deal at micro-level with the intensity of natural selection in migrant Santals of Bhubaneswar, Odisha.

The Santals are one of the 62 scheduled tribes inhabiting in Odisha. They are distributed in all the districts of Odisha and their major concentration is found in the Keonjhar, Mayurbhanj, Koraput, Sundergarh, Kandhamal, and Kalahandi districts. This study is based on the migrant Santal population who are resettled in a slum settlement in Bhubaneswar known as Chunkoli. The Santals inhabiting this village are predominantly the migrants from Mayurbhanj and Keonjhar districts

of Odisha. They migrated mainly in search of employment and in a hope to live in a better condition than in their native place. Their migration to Bhubaneswar is a continuous process which is counting since the last four decades. The Santals of Chunkoli village still have strong and close marital, cultural and economic ties with their counterparts staying at the native places. In Chunkoli village, six clan groups of Santal community have been found. These people maintain clan exogamy but community endogamy. The literacy rate of ever married women of Santal's of Chunkoli is found to be 92%. The two Santal settlements in Chunkoli village have drinking water facilities. For their basic health care services they depend on public health centre at Capital Hospital, Unit-VI, Bhubaneswar, which is some 10-12km from their settlement. Even though majority of Santals avail modern medical facilities, a substantial number still resort to traditional faith healing and ethno medicine provided by Santali *"ojha"/ "jan"/(chela/sakha).* Majority of Santals still strongly believe in black magic. The status of immunization is poor among the Santals of Chunkoli where 35% of children (0-6 year) have taken immunization in last one year period. The primary occupation of Santals is daily laborer and a very few number are private company job holders.

The main objective of this paper is to find out the opportunity for natural selection among the migrant Santals through their differential fertility and differential mortality performances. Also, it further attempts to compare the present findings with those of already reported populations in India.

MATERIAL AND METHODS

For the present study, reproductive histories and family pedigrees were obtained from 110 migrant Santal households consisting of two hamlets (*sahi*) such as *Upar sahi* and *Tala sahi* of Chunkoli village in Bhubaneswar during the month of January-February 2011. The demographic data on fertility and mortality based on the reproductive histories were collected from 50 married women and the data presented here comprised of 15 ever married women who had completed 45 years. The fertility and mortality data were collected using the interview schedule method. During the data collection the questions were asked covering the issues relating to reproductive histories such as age at menarche, age at first and last conceptions, number of live births, total number of pregnancy, still birth, and abor-

tion; information related to child birth like, immunization during the antepartum period place of deliver (institution/ home). In the cases where the women informants were not aware of their age, it was estimated with reference to some important local events and also with the help of other persons in the household/village. Likewise, the information given by the mothers were also cross-checked and verified from their respective husbands or/and elderly women of the household. In the present study the original formula of Crow (1958) and modified formula of Johnston and Kensinger (1971) were adopted to understand how selection is operating among the studied Santal population.

RESULTS AND DISCUSSION

The indices of intensity of selection based on the methods of Crow as well as Johnston and Kensinger among the migrant Santal are presented in Table 1. Crow's total index of opportunity for natural selection is 1.2046. The components of fertility and mortality are 0.3299 and 0.7167 respectively. The contribution of mortality to the total index is greater than the contribution of fertility. The total index based on Johnston and Kensinger's (1.9810) higher than the index of Crow (1.2046), due to the additional contribution of prenatal mortality. The fertility component is 0.3299.

Table 1: Parameters used in calculating the index of total selection intensity according to Crow (1958) and Johnston and Kensinger (1971)

Parameters/Indices	Number/Value
No. of mothers aged 45 years and above	15
Number of reported pregnancies	96
Number of live births	71
Proportion of survivor to birth (P_b)	0.7396
Proportion of reproductive death (death before 15 years) (P_d)	0.48450
Proportion of survivors from birth to reproductive age (P_s)	0.6761
Proportion of embryonic death (P_{ed})	0.2604
Mean no. of live births per mother aged 45+years (x)	4.73
Variance (V_f)	7.38
Crow's Index	
Mortality component (I_m)	0.7167
Fertility component (I_f)	0.3299
Total Index (I_t)	1.2046
Johnston and Kensiger's Index	
Prenatal mortality component ((I_{me})	0.3521
Postnatal mortality component ((I_{mc})	0.9689
Fertility component (I_f)	0.3299
Total Index (I_t)	1.9810

The contribution of postnatal mortality (0.9689) is significantly higher than the prenatal mortality (0.3521). This trend conforms to findings of studies on many other Indian tribal populations (Reddy and Chopra 1990).

In comparison to other available populations, the total selection intensity (by Crow's 1958 method) among the Santals is found to be higher than others. The total selection intensity range is 0.388 in Halba of Madhya Pradesh (Basu et al. 1988) to 1.190 in Gangu of West Bengal (Bhattacharya 1985, cf. Reddy and Chopra 1990). The mortality component among the Santal was found to be higher than others and the fertility component falls in the middle of the range. The total selection intensity (according to Johnston and Kensinger 1971) among the Santal is found to be higher than others. The total selection intensity ranges from 0.410 in Habla of Madhya Pradesh (Basu et al. 1988) to 0.979 in Raji of Uttaranchal (Patra and Kapoor 2009). The embryonic mortality (I_{me}) is higher than others, which ranges from 0.063 in Raji (Patra and Kapoor 2009) to 0.209 in Halba (Basu et al. 1988) and also the child mortality (I_{mc}) component is higher than others. Thus, it can be said that the total selection intensity in Santal is operating more through differential mortality than differential fertility. It can be concluded from the findings that determinants of mortality among the Santal is a matter of concern and it requires to be identified and should be targeted for reduction. Improvement in basic health infrastructure and facilities at urban habitats of migrant tribals may change the scenario. More studies on demographic dynamics of migrant tribal populations in the changing ecological and healthcare situations are needed to arrive at meaningful conclusions.

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