

ORIGINAL ARTICLE

SELECTION INTENSITY AMONG THE SANTHAL POPULATION OF WEST BENGAL IN DIFFERENT ECOLOGICAL NICHES

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***Abstract:** The aim of the study was to investigate the selection intensity index in Santhal population living in two ecological niches. Data from two groups of Santhal population were examined, one consisting of native Santhals from Birbhum, and the other consisting of Santhals who had migrated to North 24 Pargana from Birbhum. A total of 180 households were surveyed, including 48 post-reproductive women who had been married at some point in their lives. Using household censuses and detailed pedigree analysis focusing on pregnancy history, data on socio-demographics, fertility, mortality, and fetal losses were collected. The selection intensity index was calculated using both Crow's (1958) formula and Johnston and Kensinger's (1971) modified formula. The results showed that the selection intensity index using Crow's (1958) formula was 0.278 for migrants and 0.129 for native Santhals, respectively. Using Johnston and Kensinger's (1971) formula, the selection intensity index was 0.540 for migrants and 0.505 for native Santhals. In both cases, there was a significant difference in the selection intensity index between migrant and native Santhal populations ($z=0.05$), with the native population showing lower selection pressure. It can be inferred from the study that migration significantly impacts population survivability compared to non-migrating native populations.*

Keywords: Selection intensity, migration, Santhal, Birbhum district, North 24 Parganas.

Communicated: 25.11.2023

Revised: 2.12.2023

Accepted: 3.12.2023

1. INTRODUCTION

In many cases, the ecological scarcity instigates different type of migration that natural resources provide the capital for livelihood diversification [1, 2]. It has been found that short distance migration is more common than long distance migration among the poverty-stricken population in different parts of the world [3]. Several studies show that migratory activities may changes the demographic behavior of a

population [4, 5]. The demographic parameters are the major determinant in the maintenance of cultural complexity and population variation in different region [6].

In a given ecology, the fitness of a population can be measured in terms of its differential fertility and mortality. In 1958, Crow used fertility and mortality as a parameter to observe fitness of a population and proposed a model of selection intensity with an assumption that the heritability of fitness is complete [7]. It has been observed that the demographic indices i.e., fertility, mortality are affected by the changing socioeconomic, cultural, and environmental factors. Migration is one of the major factors for the changes in the socio-economic conditions, occupational, educational status, fertility and mortality of a population. Several studies conducted in different parts of the world including India have noted that the demographic events including differential fertility and mortality vary with some related factors i.e. physical environment, socio-cultural, religious, migration and ethnic factors [8-12]. Barrai and Fraccaro (1964) observed greater opportunity for selection in nomads compared to settled Lapps and those in urban places [4]. Reddy and Chopra (1990) examined the value of index of opportunity for selection is decreasing from socio-economically less developed to more developed groups [5]. Kapoor et al (1998) observed the differences in selection intensity among the migrant and settled Rang Bhotia tribe of high-altitude Central Himalayas [13]. In another study, Sengupta and Begum (1998) observed the variation of total selection intensity between and socio-economically backward and advanced group Muslim population in Assam [14].

Under this backdrop, the objective of the present study was to find out the opportunity for natural selection among the two groups of Santhal population of West Bengal inhabited in two different ecological niches.

2. MATERIAL AND METHODS

The data for the present study has been collected from Santhal population. The Santhal people are an Austroasiatic-speaking Munda ethnic group of the Indian subcontinent. They are the largest tribe in the Jharkhand and West Bengal in terms of population. According to census of India 2011, around 5.8% population is Santhal in West Bengal.

In the present investigation, Santhal population inhabited in two different ecological niches in the state of West Bengal was investigated. One of the groups was native and the other group was migrated from the native place to another ecological niches. The native group of Santhal population inhabited in Mouldanga village of Bolpur community developmental block in Birbhum district of West Bengal (23°40'04.41"N - 87°39'10.32"E). On the other hand, the migrated group of Santhal population shifted their abode from Mouldanga village to the Bergoom village of North 24 Parganas district of West Bengal. The village Bergoom where the migrated group presently settled was located under the Pairagachi community development block, North 24 Parganas district of West Bengal (22°51'58.91"N 88°41'51.99"E). The information and technology hub of Kolkata is located near to this part.

Data on socio-demographic profile e.g., occupation, education, age, sex, fertility, mortality, marital status, etc. has been collected on 180 households (90 native and 90 migrant) by using household census, in-depth interviews, and well tested schedule. A total of number of 48 (19 ancestral and 29 migrant) ever-married, post-reproductive (i.e. age \geq 45 years) women were taken into consideration for the present study. A detail

pedigree was drawn with more emphasis on pregnancy history to check the obtained data on fertility and mortality and fetal losses. Age, in few cases was estimated with reference to some local important events. All the statistical measures such as mean live birth, variance of mean live birth, mortality was done using Statistical Package for the Social Sciences (SPSS) version 16.0.

The Index of opportunity for selection (I_t) and its fertility (I_f) and mortality (I_m) components were calculated using Crow's formula (1958) [7] and Johnson and Kensinger formula (1971)[15].

Crow's formula (1958):

$$I = I_m + (I_f/P_s) \text{ where } I_m = P_d/P_s, I_f = V_f/(X)^2, P_s = (1 - P_d)$$

where I_t is the index of total selection intensity; I_m is the index of selection due to mortality; I_f is the index of selection due to fertility; P_s is the probability of survival up to reproductive age; P_d is the probability of deaths up to pre reproductive age (i.e. before 15 years), V_f is the variance in the number of live-births due to fertility; X is the mean number of live-births per woman of completed fertility (i.e., ≥ 45 years).

Johnson and Kensinger formula (1971):

$$I = I_{me} + I_{mc}/P_b + I_f/P_b \times P_s; \text{ where } I_{me} = (P_{ed}/P_b), P_b = (1 - P_{ed}), I_{mc} = (P_d/P_s), P_s = (1 - P_d) \text{ and } I_f = (V_f/X^2),$$

where I = index of total selection intensity, I_{me} = index of total selection due to prenatal mortality, P_{ed} = probability to die before birth, P_b = probability to survive till birth, I_{mc} = index of total selection due to postnatal mortality, P_d = probability to die before reaching reproductive age (i.e. before 15 years), P_s = probability to survive till reproductive age, I_f = index of total selection due to fertility, V_f = variance due to fertility and X = mean number of live births per women.

3. RESULTS AND DISCUSSION

There was a sharp difference in educational and occupational attainment between the two groups has been observed (Table 1). The educational attainment of the migrant group was higher than the native population might be due nearer habitation with Kolkata. The educational attainments were increasing among the migrated groups than the ancestral population. The migrant group were in daily communication with urban people. Many livelihood aspirations from the urban people were there to instigate the migrant Santhals to accept different fertility controlling behaviour and medicines which might be not available at native place. In these two ecological niches, the survivality might be different. The same table showed occupational differences between both groups. However, the ancestral Santhal women were bent toward home works while among the migrants, women of same group were not restricted only in home works but bowed towards education and earning processes that helped them better survival opportunities.

Table 2 shows the number of women who attained menopause among the migrant and native Santhal population was 29 and 19 respectively. These were reported from the same table that the reported pregnancies were 59 and 32 among the migrant and native Santhal population respectively. The mean number of live births per women who attain menopause was 1.69 and 1.26 among the migrant and native Santhals respectively.

Table 1: Socio-demographic characteristics of the studied population

Variable	Migrant	Native
<i>Total female population</i>	161(100.0)	117(100.0)
Participants belonging to age group of 0-19 years	57(35.40)	12(10.26)
Participants belonging to age group of 20-45 years	75(46.59)	86(73.50)
Participants belonging to age group of 46 and above	29(18.01)	19(16.24)
<i>Educational status(excluding 0-4 years of age group)</i>		
Non literate	15(9.93)	23(20.00)
Can sign only	35(23.18)	35(30.43)
Up to 4 th standard	32(21.19)	23(20.00)
From 5 th to 8 th standard	48(31.79)	24(20.89)
Above 9 th -12 th standard	18(11.92)	7(6.09)
13 th -15 th standard	3(1.99)	3(2.61)
Total participants	151(100.0)	115(100.0)
<i>Occupational attainment (14 years and above)</i>		
Home Maker	82(57.34)	67(70.53)
Student	37(25.87)	7(7.37)
Nurse	-	1(1.05)
Daily Labor	20(13.99)	16(16.84)
Business	-	2(2.10)
Farming	3(2.10)	2(2.10)
Retired	1(0.70)	-
Total participants	143(100.0)	95(100.0)

Figures in parenthesis indicate percentage

The proportion of survival (P_s) among the migrant and native Santhal population were 0.980 and 1.0 respectively (Table 2). The selection intensity index among the migrant and native Santhals was calculated as 0.278 and 0.129 respectively (Table 3). It was 0.540 for migrants and 0.505 for the natives by using Johnston and Kensinger's method [15] (Table 3). Kapoor and Patra [13] observed the values of I_m , I_f , and I_t among the Santhal population of West Bengal were 0.081, 0.302 and 0.407 respectively [16]. It was observed from several studies that migration played an important role in high fertility and high mortality [17]. From the table 2, it was found that the values of I_m , I_f and I_t were higher in migrant group

than the native group despite their higher socio-economic status and urban connection (in terms of education, occupation, medical facility etc). The components of prenatal mortality were higher among the native group (Table 2) while the components of fertility were higher among the migrant group (Table 2). Kapoor and Patra (1998) found the differences in the index of selection potential in the migratory and settled Rang Bhotia of Darma Valley of Pithoragarh district of Kumaon Himalayas [13].

Table 2: Components of calculating selection intensity among the studied population

Selection components	Migrant	Native
Number of women aged 45 years and above	29	19
Number of reported pregnancies	59	32
Number of live births	49	24
Number of premature deaths(<15 years)	1	0
Childhood mortality(death before 5 years of age)	1	0
Prenatal death	10	8
Mean number of live births per mother of 45 years and above (X)	1.69±0.850	1.26±0.453
Variance live birth(V_f)	0.723	0.205
Proportion of survival till 15 years age(P_s)	0.980	1
Proportion of child birth i.e. death before 15 Years of age (P_d)	0.020	0
Proportion of prenatal death (P_{ed})	0.170	0.250
Proportions of survivors to birth(P_b)	0.830	0.750
Index due to Childhood mortality(I_{mc})	0.020	0
Index of fertility($I_f = V_f/X^2$)	0.253	0.129
Index of mortality($I_m = P_d/P_s$)	0.020	0
Index of prenatal mortality($I_{mc} = P_{ed}/P_b$)	0.205	0.333

The present study also found significant differences in selection intensity among the migrant and native Santhal population who were living in different ecological niches (Table 3). Contrary to the earlier findings, the value of I_f was lesser among the studied population than other population of West Bengal [8, 18]. Malakar and Roy (2014) observed the differences in Selection intensity of two Santhal groups exposed to different environmental conditions of Birbhum district of West Bengal [18].

It was observed from the study that in both group of Santhal population, prenatal mortality (reproductive wastage) was predominant. Several studies, for example, Santhal and Munda [16], prenatal mortality is

quite high. The prenatal mortality index was also high in the migrant group compared to the native Santhal, but less than Lodhas of West Bengal [16].

Table 3: Opportunity for Natural Selection among studied population

Studied Population	Crow's Index(1958)				Johnston and Kensinger's Index (1971)			
	I_f	I_m	I_f/P_s	I_t^*	I_{me}	I_{mc}/P_b	$I_f/(P_b \cdot P_s)$	I_t^*
Migrant	0.253	0.020	0.258	0.278	0.205	0.024	0.311	0.540
Native	0.129	0.000	0.129	0.129	0.333	0.000	0.172	0.505

*z-value=0.05

It would be assumed from the study that a different ecological niche affects the total selection intensity differently through differential fertility and mortality. The higher value of total selection intensity index (I_t) among the migrant Santhal population in the present study might be due to the physiological factors and adaptation problems in new ecological niches. While the native Santhal were better adapted to their ancestral habitation. The study's limitations include a small sample size and insufficient data on social factors, necessitating further research to explore the impact of different ecological niches on both groups.

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