Measuring Selection Intensities Among Kolam Population: Manifested through Differential Fertility and Differential Mortality

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Abstract

The objective of the study is to understand the selection intensities among Kolam, a particularly vulnerable tribal group (PVTG) of Adilabad district of Telangana State, India. Two prominent methods were employed to understand the intensities by using Crow’s index and modified formula as given by Johnston and Kensinger’s method. The intensities are computed on the basis of the reproductive history of mother with completed fertility and the results were compared with the available works on populations belonging to Andhra Pradesh, Telangana and India. The Crow’s total index ($I_I$) value was found to be 0.3863. The mortality ($I_m$) component was found to be 0.2151 while fertility ($I_f$) component was found to be 0.1712. The contribution of mortality component is greater than that of fertility component among the present studied population using Crow’s index. According to Johnston and Kensinger, the total index ($I_I$) was found to be 0.6017. Fertility component was found to be 0.2368, prenatal mortality component ($I_me$) and postnatal mortality component ($I_me/P_b$) where observed to be 0.0675 and 0.0933 respectively. Therefore, it is clear from the results that postnatal mortality contributes more than prenatal mortality for selection, i.e., Johnston and Kensinger’s Index (0.6017) contributes more towards selection intensity than Crow’s index (0.3863). Natural selection takes place when there is variability of fitness observed through the differences in fertility and mortality in any population.

Key Words

Natural Selection
Crow’s Index
Johnston &Kensinger’s Index
Fertility
Mortality
Prenatal
Postnatal

1. Introduction

The concept of ‘Natural Selection’ was developed and explained by Charles Robert Darwin in his epoch making master piece, ‘The Origin of Species’ in 1859 [1]. The essential barrier to selection can be traced from reproductive isolation which hinders to speciation [1,2,3].

Thus natural selection refers to difference in survival or fertility among different individuals with different genotypes and it is because of selection that populations become progressively more adapted to their environment.

The ability of a genotype to survive and reproduce is reflected in the average number of offspring born to individuals with that genotype and this number is called the genotype’s fitness or Darwinian fitness. However, random drift overcomes selection onto new fitness [3,4] by shifting balance[5]. Natural Selection is responsible for the stability of the genetic composition of a population [6].

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Selection intensity is a measure of the fitness of a population as expressed by the ongoing patterns of differential fertility and mortality, assuming that the heritability of fitness is complete [7]. It was pointed out that despite global mortality reductions and diminished constraints; there is a great need for studying selective factors in advanced and primitive societies, to understand the past and future trends of human populations [8]. A number of works [9,10,11] exist on natural selection in human populations. Index was devised in such a way that facilitates quantitative estimation of selective pressure provided the reproductive pattern of a population is known [12].

This index ‘J’ refers to the total amount of selection and consists of two components – mortality (I_m) and fertility (I_f). It measures the proportion by which fitness would increase with birth and death rates, if they were all selective and the heritability of fitness were complete [13]. Further, it was suggested that index of total selection (J) might be considered as an index of “opportunity for selection” [14].

The index of opportunity for selection measures the maximum potential rate of change by selection where ‘zero’ indicates no change [15]. An indirect method based on the maximum amount of differential fertility and mortality in a population was formulated by Crow [12] and modified to measure the maximum potential rate for prenatal life [16]. However, in reality, the genetic component in differential fertility and mortality is relatively small, due to the interplay of a host of environmental and behavioural factors [17, 18, 19].

In populations of America, Europe and Africa it was recommended that most of the ethnic groups are characterized by high fertility with less individual and early mortality [14, 20, 21, 22]. However, factors like social, cultural, religious, ethnic, biogenetics also responsible for differential fertility and mortality among the populations [23]. Many studies were conducted by different scholars [18,24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38] on selection intensities; inter and intra religious variations of the index and its components were observed among different populations of Meghalaya [39]; between rural and urban populations [40, 41, 42, 43], socio-economically backward and advanced groups [44]; economic condition [45,46,47]; education and social status [48, 49]; due to genetics and evolutionary implications [50] while [51] attributed that relatively improved health care facilities, nutrition, socio-economic conditions and biogenetic factors are responsible for differential fertility (I_f) and differential mortality (I_m) among Khond tribal population belonging to Eastern Ghats of Visakhapatnam district to understand the population fitness.

Accordingly it was reported that Pardhans showed greatest selection intensity of (1.1811) followed by the Kolams (0.8564) and Raj Gonds (0.7240) who are habiting in same environmental conditions and attributed that the selection intensity is operating through pre-reproductive mortality and infertility [52]. However, RajGond and Pradhans are considered as scheduled tribe while Kolam is identified as particularly vulnerable tribal group (PVTG) whose selection intensity differs due to the contributions made by differential fertility and differential mortality based on varying demographic, socio-cultural factors.

The aim of the study is to explore the selection intensities of women contributing to fertility and their proportions of survivors to birth, effective population size and variation in reproductive success among Kolam group.

2. Material and Methods

The data for the present research was collected from 168 households selected from the interior forests and hilly tracts villages of Utnoor, Narnoor, and Jainoormandals of Adilabad district. Adilabad is 318 kms. from Hyderabad, a major town in Telangana State. Out of the total scheduled tribe population of Adilabad, 0.90% accounts to Kolam tribe [53]. As per Reorganization Act, 2014, stated that the Kolam population accounts to 0.004% when compared with the total scheduled tribe population [54]. Their spatial distribution is characterized by a tendency of clustering and concentration in pockets which have suffered from isolation. Kolam is identified as a particularly vulnerable tribal group (PVTG) who call themselves as “Mannervarlu”. They possess own dialect “Kolami”. The word “Kola” means stick or bamboo in their dialect and as such call themselves as ‘Kolavar’. Bamboo occupies an important place in cultural and religious lives of the people. They trace their descent to Bheema and Hidimbi, the well-known characters of the epic Mahabharata.

Kolam maintains symbiotic relationship and have identical clan systems and associated cultural practices with Gond, Pardhan and Thoti tribes. Kolam people practice agriculture as primary occupation and collect minor forest produce from the forest. Kolam living along ethno-cultural diversity may have significant influence on natural selection potential.
The total Kolam population in Adilabad district is 45,437 during 2010-2011 [55]. The mandals selected for the study are covered under ITDA (Integrated Tribal Development Area) of Uttnoor, Jainoor and Narnoormandals. About 25% of the mandals in the scheduled area have been selected randomly taking into consideration the numerical predominance of the tribal population under study in the tribal sub-plan area. The households were selected after an extensive field visit to the villages. To achieve this goal, quantitative research design was used to ease interaction with the people directly about their culture and the practices followed from birth to death.

However, the researcher in order to increase the reliability has conducted informal observations and participated in different cultural events, like birth ceremony, women visiting the hill, women observing distant pollution, and child birth. These events during field work gave a chance to understand the cultural and social meanings attributed by the people.

Demographic data have been collected from 55 ever married women aged 40 and above on fertility and mortality. Informed consent was obtained from ITDA office, Uttnoor; village head and women while collecting the data. The data includes age, sex, socio-cultural characteristics, fertility and mortality at prenatal and postnatal stages by using a pretested schedule and by following interview technique.

Reproductive performance of women was collected based on the pregnancies which were cross-checked from elderly members of the household. Assuming that some phenotypic variation in reproduction has a genetic basis and fitness is heritable; an index was proposed [7]. This index of opportunity for selection was computed using internationally accepted indirect method of postnatal mortality and modified formula [16].

Crow’s Index (1958)
\[ I = I_{mc} + I_{mc}/P_s + I/P_s X P_s \]
\[ I_{mc} = P_{ed}/P_b \]
\[ P_b = 1 - P_{ed} \]
\[ I_{mc} = P_{ed}/P_s \]
\[ P_s = 1 - P_d \]
\[ I_t = V/X^2 \]

Where, \( I = \text{Index of total selection intensity} \)
\( I_{mc} = \text{index of total selection due to prenatal mortality} \)
\( P_{ed} = \text{probability to die before birth} \)
\( P_b = \text{probability to survive till birth} \)
\( I_{mc} = \text{index of total selection due to postnatal mortality} \)
\( P_d = \text{probability to die before reaching reproductive age} \)
\( P_s = \text{probability to survive till reproductive age} \)
\( I_t = \text{index of total selection due to fertility} \)
\( V = \text{Variance due to fertility} \)
\( X = \text{Mean number of live births} \)

3. Results and Discussion

The parameters used in calculating the total selection intensity in the study tribal population are presented in Table 1 & 2. From Table 1, it is found that the socio-cultural factors that influence fertility and mortality among Kolam. The mean age at menarche was found to be 12.56 ± 0.77 and mean age at marriage as 16.52 ± 1.85 leading to early conceptions among women. The mean educational attainment of women is found to be 1.25 ± 0.74 which is extremely low. The data pertaining to differential fertility and mortality has been analyzed by using the methodologies of [7, 16]. It is clear from the table 2, that out of 307 pregnancies among Kolam, the average live births per mother (X) of 40 years and above is 4.04 whereas the frequency of premature death (P_d) is 0.1531. The proportion of surviving children up to reproductive age is 0.7231 and that of embryonic deaths is 0.048.

Table 3 shows the values of the selection intensity indices. The Crow’s total value of the Kolam tribe of Narnoor, Uttnoor, and Jainoormandals of Adilabad district was found to be 0.3863. The mortality component was 0.2151 while the fertility component was found to be 0.1712. The percentage of the fertility component is observed to be 44.4 percent while the percentage of mortality component is 55.6 percent. The contribution of mortality in total index is greater than fertility among Kolam people.

According to Johnston and Kensinger’s modified formula, the total index (I_t) was found to be 0.6017. Fertility component was found to be 0.2368; prenatal mortality component (I_{mc}) and postnatal mortality component (I_{mc}/P_b) were observed to be 0.0675 and
0.0933 respectively. The percentage of fertility component (73.3%) exceeds the percentage of prenatal mortality component (11.2%). Further the percentage of postnatal mortality (15.5%) is slightly more than prenatal mortality. Therefore, it is clear from the results that prenatal and postnatal mortality together contributes for Johnston and Kensinger’s Index.

However, the findings of the present study, according to Crow’s Index shows that the total index \(I_1\) the contribution of mortality component is more in selection process (55.6%) than that of fertility component (44.4%). According to Johnston & Kensinger’s Index, the contribution of fertility component is more in selection process (73.3%) than that of the mortality component (26.7% of prenatal and postnatal mortality together). Further, the postnatal mortality component \(0.0933\) is more when compared with prenatal mortality component \(0.0675\). The total index for the opportunity of natural selection according to Crow’s Index \(0.3863\) is less than Johnston & Kensinger’s Index \(0.6017\).

Further, the results were compared with other population groups using Crow’s index. The values obtained from differential fertility and mortality during their reproductive age shows disparity with respect to their reproductive success for natural selection. Table 4 shows the state wise comparison of mean live birth, fertility component \(I_1\), mortality component \(I_m\) and total index \(I\) of the present population with other ethnic groups of India. From the table, it is evident that the highest number of live births per mother of 40 years and above is observed among the Jaintias of Assam \(8.10\) followed by Toto of West Bengal \(7.63\) and lowest among the SankarKoch of Meghalaya \(2.25\). Highest mortality component \(I_m\) was found among Mannedora of Andhra Pradesh \(0.82\) followed by Pahira (North) \(0.81\) of West Bengal and lowest among Yanadi, Plains I \(0.05\) of Andhra Pradesh. The fertility component \(I_1\) was observed to be highest among Yerukula II \(1.05\) of Andhra Pradesh and lowest among Bhoska \(0.058\) of Uttar Pradesh. It is also clear that the total index was highest among Kota I of Tamilnadu \(2.250\) followed by Chencu II \(1.45\) of Andhra Pradesh and lowest among Chakesang \(0.23\) of Nagaland. There is substantial variation in fertility as well in mortality when compared with Hill Kolam \(0.284 & 0.346\) and ManneKolam \(0.306 & 0.540\). The index of selection among Kolam is found to be 0.870 \([52]\) which is high when compared with the present study \(0.386\). This marked variation in the present study indicates that the contribution of fertility and mortality decreased in the process of selection. The results of the Kolam sample corroborate with the results of Manzaimali \[50,56\]; and Mala I \[28\]. The index of selection manifested through fertility \(I_1\) among Kolam shows 0.1219 which is found to be almost similar with the listed ethnic groups, Jiantias of Assam and Rajaka of Andhra Pradesh; with Ezava of Kerala, Kaibarta and DibongiyaDeori of Assam. The total index \(I\) shown by Kolam is 0.386 which substantiate with the results exhibited by the ethnic groups, Bhil \[57\] of Rajasthan; Bodh \[48\] of Jammu & Kashmir; Kinnaura \[58\]of Himachal Pradesh. The total index \(I_1\) is almost similar with the other groups, KoppalaVelama \[59\] of Andhra Pradesh, slightly similar with Sonowal II \[60\] of Assam.

The intensities among the caste groups of India shows (Table 5), the total selection index \(I_1\) were highest among Mala II \(1.687\) followed by Madiga I \(1.545\) of Andhra Pradesh and among scheduled caste \(1.344\) of Kerala. The total selection index \(I_1\) is found to be least among Oraon \(0.094\) followed by DibongiyaDeori \(0.174\) and Manipuri Meities \(0.207\) of Assam. The range of index of fertility \(I_1\) among caste populations is 0.10 among Manipuri Meities that predominantly settled in the central valley of Manipur \[49\] to 1.20 among Christians of Kerala \[61\]. However, among ethnic groups, it ranged from 0.05 among Bhoska of Uttar Pradesh \[62\] to 1.05 among Yerukula II of Andhra Pradesh \[38\]. Similarly, the index of mortality \(I_m\) among caste populations ranged from 0.012 among Christians of Kerala \[61\] to 1.062 among Mala II, a scheduled caste living in rural areas \[63\]. The mortality index ranged from 0.048 among Gangte (Town) \[64\] to 0.82 among Manne Dora of Andhra Pradesh \[65\]. Comparatively, the range of index of fertility as well as mortality is more among caste groups than ethnic groups. From the Table 3 and Fig. 1 & 2, different ethnic groups listed belong to South India, North India, North-Eastern region, Eastern and Western parts of India and to the Central region. The selection is manifested through fertility among the tribes belonging to northern, western and central parts of India and through mortality among the tribal groups belonging to south, north-east and eastern parts. It is noted that index of selection manifested through fertility is due to the demographic transition among the stated population(s).

Similarly from the Table 4 and Fig. 3 & 4, various caste groups belong to South India, North India, North-East India, western and eastern parts of India. The selection is manifested through fertility among north and south Indian caste groups and through mortality for the caste groups belonging to north-eastern region, central and eastern parts of India. Index of fertility among majority of the caste groups can be...
attributed to better economic conditions and awareness towards the availability of modern medical care.

Table 1: Socio-Cultural factors influencing Fertility and Mortality among Kolam group

| Socio-Cultural Factors                          | Mean (n=168) | Standard Deviation |
|------------------------------------------------|--------------|--------------------|
| Age at Menarche                                | 12.56        | 0.77               |
| Age at Marriage                                | 16.52        | 1.85               |
| Age at First Conception                        | 18.89        | 2.25               |
| Age at Menopause                               | 44.44        | 4.94               |
| Ever pregnant                                  | 1.98         | 0.15               |
| Educational status among women                 | 1.25         | 0.74               |

Table 2: Parameters used for calculating the Total Selection Intensity among Kolams of Adilabad district

| Parameter(s)                                      | Kolam                  |
|--------------------------------------------------|------------------------|
| Number of women aged 40 years and above           | 55                     |
| Number of reported pregnancies                    | 307                    |
| Mean conceptions                                 | 5.58                   |
| Number of live births                            | 222                    |
| Mean live births                                 | 4.04                   |
| Variance of live births                          | 1.99                   |
| Number of surviving children                     | 158                    |
| Number of survivors to birth                     | 213                    |
| Proportion of survivors to births (P_b)          | 0.7231                 |
| Number of embryonic deaths                       | 15                     |
| Number of premature deaths (< 14 years)           | 34                     |
| Proportion of child deaths (before 14 years of age (P_d)) | 0.1531                |
| Proportion of embryonic deaths (P_ed)             | 0.048                  |
| Total breeding population size (N)                | 164                    |
| Effective population size (Ne)                    | 331.95                 |
| Number of males aged between 15-59 years          | 241                    |
| Number of females aged between 15-44 years        | 234                    |

Table 3: Values of Selection Intensity Indices among Kolam (According to Crow’s Index (1935) and Johnston and Kensinger (1971))

| Indices                                            | Value of Indices for Kolam |
|----------------------------------------------------|----------------------------|
| According to Crow’s Index (1958)                    |                           |
| Mortality Component (I_m)                          | 0.2151                    |
| Fertility Component (I_f / P_s)                    | 0.1712                    |
| Total Index (I)                                    | 0.3863                    |
| % of fertility component                           | 44.4                      |
| % of mortality component                           | 55.6                      |
| According to Johnston and Kensinger’s Index (1971)  |                           |
| Prenatal mortality component (I_{mc})              | 0.0675                    |
| Postnatal mortality component (I_{mc}/P_s)         | 0.0933                    |
| Fertility Component (I_f / P_s.P_d)                 | 0.2368                    |
| Total Index (I)                                    | 0.6017                    |
| % of Fertility component                           | 73.3                      |
| % Prenatal mortality component                     | 11.2                      |
| % Postnatal mortality component                    | 15.5                      |
Table 4: Cross-comparison of Selection Indices prevalent among different ethnic groups of India

| Population groups/ Tribes | No. of Mothers | Mean live births | Selection Indices (According to Crow, 1958) | References |
|---------------------------|----------------|------------------|-------------------------------------------|------------|
|                           |                |                  | \(I_m\) | \(I_r\) | \(I\) |
| In South India, Andhra Pradesh & Telangana | | | | |
| Kolam | 55 | 4.04 | 0.215 | 0.121 | 0.386 | Present Study |
| Khond | 41 | 3.68 | 0.324 | 0.372 | 0.613 | Rao et al., 2006 |
| Gadaba | 269 | 3.39 | 0.160 | 0.147 | 0.331 | Bharathi, 2015 |
| Savara | 167 | 3.48 | 0.194 | 0.154 | 0.378 |
| Chenchu I | 146 | 5.70 | 0.500 | 0.200 | 0.810 | Sirajuddin and Basu, 1984 |
| Chenchu II | - | - | 0.49 | 0.96 | 1.45 |
| Kolam | 229 | 5.65 | 0.443 | 0.295 | 0.870 | Murthy and Ramesh, 1978 |
| Hill Kolam | 104 | 5.81 | 0.348 | 0.284 | 0.728 |
| Manne Kolam | 125 | 5.51 | 0.540 | 0.306 | 1.012 |
| Pardhans | 28 | 6.18 | 0.802 | 0.222 | 1.186 |
| Raj Gonds | 52 | 4.52 | 0.346 | 0.287 | 0.724 |
| Sugalis | 73 | 6.08 | 0.375 | 0.162 | 0.606 | Reddy and Reddy, 1984 |
| Yanadi, Plains I | - | - | 0.053 | 0.194 | 0.258 | Vasulu, 1978 |
| Yanadi, Plains II | - | - | 0.109 | 0.301 | 0.443 |
| Yanadi, Hills | - | - | 0.110 | | 0.570 |
| Yerukula I | - | - | 0.444 | 0.35 | 0.79 | Narahari, 1982 |
| Yerukula II | - | - | 0.19 | 1.05 | 1.24 | Prakash and Narayanan, 2009 |
| Manne Dora | - | - | 0.82 | 0.35 | 0.82 | Ramana, 1991 |
| Bod Mali | - | - | 0.20 | 0.45 | 0.65 | Babu and Kusuma, 2002 |
| Manzai Mali | - | - | 0.21 | 0.50 | 0.71 | |
| Karnataka | | | | |
| Koraga | - | 3.97 | 0.075 | - | 0.336 | Sekare et al., 1998 |
| Tamilnadu | | | | |
| Irula | 279 | 5.03 | 0.327 | 0.370 | 0.818 | Reddy, 1985 |
| Kota I | 120 | 4.10 | 0.790 | 0.815 | 2.250 | Basu, 1972 |
| Kota II | 328 | 3.73 | 0.445 | 0.638 | 1.367 | Ghosh, 1970 |
| In North India | | | | |
| Himachal Pradesh | | | | |
| Bodh | 61 | | 0.105 | 0.143 | 0.263 | Chaudhury, 1982 |
| Shipi | 79 | | 0.227 | 0.207 | 0.482 |
| Swangla | 63 | | 0.157 | 0.157 | 0.339 |
| Kinnuara | 160 | 4.89 | 0.194 | 0.159 | 0.384 | Gautam et al., 2009 |
| Jammu & Kashmir | | | | |
| Tibetan | 92 | 4.2 | 0.142 | 0.324 | 0.512 | Kapoor et al., 2003 |
| Bodh | 122 | 4.58 | 0.114 | 0.244 | 0.386 | |
| Bodhs | - | | 0.201 | 0.327 | 0.594 | Bhasin and Nag, 2002 |
| Baltis | - | | 0.624 | 0.243 | 1.020 |
| Brokpas | - | | 0.506 | 0.168 | 0.759 |
| Arghuns | - | | 0.265 | 0.455 | 0.828 |
| Uttar Pradesh | | | | |
| Bhoska | 30 | 6.45 | 0.282 | 0.058 | 0.356 | Garget al., 1980 |
| Uttarananchal | | | | |
| Barbatiya | 54 | 3.89 | 0.243 | 0.443 | 0.794 | Kapoor et al., 2003 |
| Buthalia Bora | 118 | 4.79 | 0.148 | 0.226 | 0.407 |
| Harkotiya | 113 | 4.58 | 0.223 | 0.330 | 0.627 |
| Rajput | 62 | 5.26 | 0.148 | 0.263 | 0.450 |
| Central India | | | | |
| Madhya Pradesh | | | | |
| Kol | - | | 0.504 | 0.122 | 0.688 | Gharamiet al., 2003 |
| Baiga | 111 | 5.16 | 0.077 | 0.249 | 0.345 | Gautam et al., 2007 |
| Region                | Location       | Gond | Ghar | Gondh | Gondh | Gondh |
|-----------------------|----------------|------|------|-------|-------|-------|
| Eastern India         |                |      |      |       |       |       |
| West Bengal           |                |      |      |       |       |       |
| Pahira (North)        | 39             | 4.97 | 0.815| 0.175 | 1.133 | Basu, 1967 |
| Pahira (Southern I)   | 50             | 5.44 | 0.529| 0.137 | 0.738 |
| Pahira (Southern II)  | 50             | 5.70 | 0.484| 0.137 | 0.687 |
| Sherpa                | 7.44           | 0.206| 0.173| 0.415 |
| Lepcha                | 5.83           | 0.111| 0.294| 0.438 | Mukhopadhay, 1982 |
| Toto                  | 40             | 7.63 | 0.320| 0.100 | 0.550 | Debnath and Sen, 1983 |
| Munda                 | 11             | 5.23 | 0.132| 0.166 | 0.353 | Kapoor and Kshatriya, 2000 |
| Santal               | 64             | 3.97 | 0.081| 0.302 | 0.462 |
| Lodha                | 74             | 4.19 | 0.157| 0.292 | 0.668 |
| Odisha                |                |      |      |       |       |       |
| Bhuiriyan            | 71             | 2.69 | 0.587| 0.190 | 0.7804 | Kuiti and Bose, 2014 |
| Santal I             | 15             | 4.73 | 0.7167| 0.3299 | 1.2046 | Sahoo et al, 2013 |
| Santal II            | 90             | 2.87 | 0.539| 0.185 | 0.725 | Binoyet al., 2015 |
| Gujarat               |                |      |      |       |       |       |
| Naika                | 49             | 5.71 | 0.305| 0.135 | 0.481 | Padmanabham, 1985 |
| Rajasthan             |                |      |      |       |       |       |
| Sahariya             | 72             | 4.28 | 0.145| 0.212 | 0.524 | Kapoor and Kshatriya, 2000 |
| Mina                 | 80             | 5.21 | 0.104| 0.146 | 0.334 |
| Bhil                 | 88             | 5.27 | 0.105| 0.203 | 0.386 |
| Kathodi              | 62             | 4.06 | 0.245| 0.250 | 0.557 | Bhasin and Nag, 2007 |
| Damor                | 47             | 4.47 | 0.167| 0.265 | 0.477 |
| Garasia              | 27             | 5.37 | 0.160| 0.358 | 0.575 |
| In North-Eastern India|               |      |      |       |       |       |
| Assam                |                |      |      |       |       |       |
| Jaintias             | 39             | 8.10 | 0.456| 0.125 | 0.638 | Deka, 1978 |
| Sonowai Kachari      | 200            | 7.04 | 0.192| 0.141 | 0.360 |
| Deori                | -              | 4.38 | 0.226| 0.179 | 0.445 | Das and Sikdar, 2010 |
| Garo                 | -              | 5.21 | 0.116| 0.114 | 0.244 |
| Oraon                | -              | 7.58 | 0.083| 0.087 | 0.094 |
| Meghalaya            |                |      |      |       |       |       |
| Hajongs              | 51             | 6.80 | 0.443| 0.131 | 0.631 | Barua, 1983 |
| Jiantias             | -              | 0.456| 0.125| 0.638 | Deka, 1989 |
| Phar                 | -              | 0.236| 0.134| 0.401 | Khongsdier, 1990 |
| Sankar Koch          | 23             | 2.25 | 0.262| 0.070 | 0.531 | Kotal and Sengupta, 2003 |
| Garo                 | -              | 5.21 | 0.116| 0.114 | 0.244 | Das and Sikdar, 2010 |
| Mizoram              |                |      |      |       |       |       |
| Hmar                 | 132            | 7.48 | 0.085| 0.250 | 0.357 | Varte and Varte, 2006 |
| Manipur              |                |      |      |       |       |       |
| Hmar                 | -              | 0.072| 0.250| 0.340 | Varte, 1998 |
| Nagaland             |                |      |      |       |       |       |
| Chakesang            | 74             | 7.16 | 0.076| 0.143 | 0.233 | Chanu and Varte, 2009 |
| North-Easternpart    |                |      |      |       |       |       |
| Gangte (Pooled)      | 444            | 6.45 | 0.060| 0.145 | 0.213 | Hemam and Reddy, 1999 |
| Gangte (Town)        | 227            | 6.15 | 0.048| 0.156 | 0.211 |
| Gangte (Settled)     | 77             | 7.11 | 0.052| 0.104 | 0.161 |
| Gangte (Shifting)    | 140            | 6.45 | 0.080| 0.162 | 0.0256 |
Table 5: Cross-comparison of Selection Indices prevalent among different caste groups in India

| Caste group | X | Vf | Im | It | Reference (s) |
|-------------|---|----|----|----|----------------|
| **In South India** | | | | | |
| Andhra Pradesh&Telangana | | | | | |
| Brahmins | 3.7 | 2.4 | 0.127 | 0.180 | 0.330 | RajaniKumari et al, 1985 |
| Jalari | 4.3 | 1.9 | 0.188 | 0.103 | 0.310 |
| Madiga I | 6.3 | 9.5 | 1.059 | 0.236 | 1.545 | Rao and Murthy, 1984 |
| Madiga II | 4.8 | 9.8 | 0.239 | 0.429 | 0.770 | Reddy and Lakshmanudu, 1979 |
| Madiga (Gampa) | 5.7 | 7.1 | 0.451 | 0.217 | 0.766 | Reddy, 1984 |
| Madiga III | - | - | 0.23 | 0.47 | 0.70 | Babuet al., 1995 |
| Maheswari | 5.3 | 7.9 | 0.204 | 0.282 | 0.543 | Rao and Murthy, 1984 |
| Mala I | 4.5 | 6.0 | 0.217 | 0.294 | 0.575 | Reddy and Lakshmanudu, 1979 |
| Mala II | 4.9 | 7.4 | 1.062 | 0.303 | 1.687 | Rao and Murthy, 1984 |
| Mala (Rampala) | - | - | 0.336 | 0.700 | 0.936 | Ramesh Babu, 2003 |
| Palle I | 5.3 | 9.9 | 0.441 | 0.347 | 0.941 | Reddy and Chopra, 1990 |
| Palle II | - | - | 0.38 | 0.16 | 0.65 | Srinivasa Rao, 1991 |
| Reddy I | 6.2 | 8.8 | 0.424 | 0.227 | 0.747 | Rao and Murthy, 1984 |
| Reddy II | - | - | 0.17 | 0.26 | 0.43 | Reddy and Reddy, 1984 |
| Reddy, Pedakanti | 4.4 | 6.3 | 0.211 | 0.326 | 0.606 | Reddy and Reddy, 1984 |
| Vadde | 5.9 | 8.7 | 0.346 | 0.253 | 0.687 | Reddy and Chopra, 1990 |
| Vyshya | 5.6 | 6.1 | 0.422 | 0.194 | 0.698 | Rao and Murthy, 1984 |
| Chakali | - | - | 0.13 | 0.20 | 0.63 | Babuet al, 1995 |
| Kshatriya | - | - | 0.10 | 0.33 | 0.43 | DharaniPriyaet al, 2003 |
| KoppalaVelama | - | - | 0.06 | 0.30 | 0.37 | Sudhakaret al. 1998 |
| Kummari | - | - | 0.32 | 0.63 | 0.95 | Babuet al. 1995 |
| Mangali | - | - | 0.20 | 0.48 | 0.68 |
| Pattapu | - | - | 0.37 | 0.19 | 0.67 | Rao, 1991 |
| Rajaka | - | - | 0.16 | 0.12 | 0.28 | Parvaheesam and Babu, 1998/7 |
| Settibaliya | - | - | 0.05 | 0.38 | 0.46 | Prakash and Sudhakar, 2011 |
| AryaVysya | 183 | 3.46 | 0.1064 | 0.3385 | 0.4809 | Lakshmi et al., 2005 |
| KalingaVysya | 192 | 4.01 | 0.1493 | 0.2215 | 0.4039 |
| Thrivarnika | 165 | 2.96 | 0.1346 | 0.2607 | 0.4304 |
| Pattusali | 90 | 6.29 | 0.2263 | - | 0.5625 | Rao et al., 2015 |
| Padmasali | 116 | 5.56 | 0.1168 | - | 0.3629 |
| **Kerala** | | | | | |
| Ezava | 3.4 | 1.4 | 0.082 | 0.123 | 0.216 | Kapoor et al., 2001 |
| Christians | 3.2 | 12.9 | 0.012 | 1.20 | 1.22 |
| Scheduled Castes | 3.1 | 9.1 | 0.204 | 0.946 | 1.344 |
| **Maharashtra** | | | | | |
| Sindhi | - | - | 0.130 | 0.284 | 0.452 | Das et al., 2006 |
| **In North India** | | | | | |
| Jammu and Kashmir | | | | | |
| Dogra Brahmans | 5.60 | 6.31 | 0.256 | 0.201 | 0.513 |
| DograRajputs | 4.97 | 5.50 | 0.074 | 0.223 | 0.313 |
| Dogra Scheduled Castes | 5.92 | 7.91 | 0.265 | 0.226 | 0.551 |
| Kashmiri Pandits | 4.50 | 4.33 | 0.059 | 0.214 | 0.286 |
| Bodhs | 4.06 | 5.39 | 0.201 | 0.327 | 0.594 |
| Baltis | 6.33 | 9.74 | 0.624 | 0.243 | 1.020 |
| Brokpas | 6.78 | 7.71 | 0.506 | 0.168 | 0.759 |
| Arghuns | 4.70 | 10.04 | 0.256 | 0.455 | 0.828 |
| Kashmiri Muslims | 3.00 | 5.00 | 0.154 | 0.556 | 0.795 |
| Gujjars | 5.61 | 6.27 | 0.173 | 0.195 | 0.401 |

Bhasin and Nag, 2002
Figure 1. Index of Mortality among different ethnic groups

Figure 2. Index of Fertility among different ethnic groups
Conclusion
Natural selection shows differences due to fertility among different individuals with different genotypes. The ability of a genotype to survive and reproduce is reflected in the average number of offspring or live births for a woman. The average number of children per couple is larger than the variance in the number of children and hence resulted in low level of selection. According to Crow’s Index, the selection among Kolam manifested through differential mortality rather than differential fertility. Further, the present results also substantiate with Johnston &Kensinger postnatal mortality component findings which are more than prenatal mortality component. The cause for high mortality in the studied population is due to lack of adequate knowledge of mother(s) towards neonatal care. This situation can be attributed to incomplete educational levels among Kolam women. Another contributing factor is due to early marriage among girls which endorses early conception resulting in postnatal mortality.

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"data excludes ST population of Submergence of Sch.villages of 7 mandals from Khammam district to the A.P. State (as per Reorganisation Act 2014).

"Fig.2 shows the differential fertility of 76 ethnic groups only (data of 2 groups not available)

"Fig.4 shows the differential fertility of 76 caste groups only (data of 2 groups not available)

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