Chapter Six
areas of Madhya Pradesh approximately 150 years ago.

The whole community is a single endogamous group and only subdivided into several intermarrying 'gotra' or clans.

The homogeneity of the community is attested by random marriages and enable one to consider it as a single breeding population or deme. They are 1131 souls, with a sex-ratio of 1106 (m : f).

Rate of literacy and education is very low. These people are not considered as scheduled tribe, but only as a backward class. Though educational facilities are available, very inconsistent participation is noticed. Mostly they drop out in middle school career. Most of them are poverty stricken, but this can not be the only answer for the lack of enthusiasm towards modern education. Only two girls were seen to study in the final year classes of school.

Technologically they are backward as most of our rural people. Their living condition is as poor and simple as a low income farmer can be and a degree of cleanliness is observed. But medical care is remote and a doctor's service is rarely available to them. For these reasons, they can be thought to be in semi-primitive status of technological development.

The population structure according to age and sex shows usual phenomena observed in rural India. The basal part of the pyramid is broad and it tapers upwards with only 1.59 p.c. of the total population in the oldest age-group.
The youngest age-group reveals ideal sex-ratio, but with the advance of age-group (taken 5 yearly interval) the sex-ratio fluctuates. A steady decline in female proportion is marked after 35 years of age.

A three fold age-category of the population, dividing it into infant to sub-adult (0-14) years, adolescent to adult (15-49 years) and the old (50 years and above) reveals, that the highest proportion of the total population constitute the 1st group, followed closely by the 2nd category and the oldest group is far less. This is indicative of high birth rate and high death rate and also of economic load in the economically active group due to unbalanced ratio in different age-groups.

These people practise early marriage but not exactly child-marriage. The mean age at marriage of girls is 10.26 years. The prepuberty marriage becomes valid when actual consummation occurs after the girl is matured. The usual age for consummation is 14 years. Very few unattached women are noticed. Majority (55 p.c.) of the ever married women are still within their reproductive period and living with their husbands. This enhances scope for procreation.

The society permits multiple marriage for men i.e. polygyny. But actual polygyny cases are very low; only 1.61 p.c. of total marriages. Serial marriages after death of previous wife is found in 17 p.c., and serial marriages after death of husband is only 1.18 p.c.
These customs promote more pace of population growth. Usually in the populations, who want to multiply quickly, such custom of multiple marriages are prevalent. One man marrying more women - be it serial or at a time, increases propensity of more male contribution to the gene pool of next generation. But here the incidence is so low, that the difference in variance of sibship size between male and female parents is negligible.

In the Siyalgir society, certain types of preferential marriages are observed. These are: cross-cousin marriage, sorrate and levirate. Also, it has been observed from genealogies that, there are certain families who like to keep marital relationship with another group of families. By this, not only the maternal cross-cousin are involved, but there are marriages of two or three brothers with two or three sisters of the other family. This situation has been discussed in the text for their increased likelihood of inviting a homogeneity in the gene pool of the following generation or successive generations.

Cousin-marriage involves a certain degree of inbreeding. The inbreeding co-efficient $F$ has been discussed and calculated to be 0.0028. This value is very low and towards the lower category of Indian range (from 0.001 to 0.013 compiled by Sanghvi, 1970).

326 marriages have been analysed to see the extent of geographical distance involved. It may be
conceived that, in case of a small endogamous population, where choice is restricted, and the area is not a difficult hilly zone, such distances should not interfere. Yet it has been observed in actual data, that marriages depend much on neighborhood knowledge. Highest frequencies of marriage are observed between villages within 2 miles of distance. A generation-wise analysis reveals that with the lapse of generations, the rate of close vicinity marriages have declined from 41.1 p.c. to 33.33 p.c. Also the most distant villages are tied with marital relation in an increasing trend from 3.6 p.c. in the last generation to 10 p.c. at present. The reason may be attributed to increased communication facility and to a change in social values.

All the above discussed situations have intricate relation with fertility performance. A fertility ratio or child-woman ratio of 583 per 1000 women indicate a moderately high ratio. This when examined with the 52 mothers who have completed their fertile career (one woman without issue) shows a fairly high average number of live births (6.07 per mother) with 4.55 (per mother) children surviving. They have a net reproductive index of 3.06 indicating good chances of perpetuation of the community through daughters.

Fertility performance of 245 ever married women from 15 years onwards (all living) is 1062 pregnancies leading to 947 live birth. This gives 89.17 p.c. of pregnancies developing successfully. This results in 4.33 pregnancies per mother with 3.87 of them born alive.
Fertility performance gets a jolt when the women are divorced or widowed and re-married on the husband stays away for economic or other reasons. So it is useful to examine the length of period spent with husband. This is the actual reproductive duration. For this, some women whose husbands died also were considered. In this analysis, it has been found that in this population the optimum duration is nearly 22 years which resulted maximum pregnancy (average 5.8 per woman); a little more than those marked with highest duration of 32 years of married life. But comparatively, proportion of live birth is slightly less in the former group (1 live birth per 1.3 pregnancy in the former as against 1 : 1.2 in the latter).

There are 4 recorded cases of twin births. All the twins born are reported to be unisex, and from that it may be conjectured that they were identical. Only one partner is living at present. All other died in the neonatal condition. Out of 4 pairs, two pairs were female and two other pairs male. One boy of the male pair is living and was of 1 year at the time of investigation. Rate of twining in this population is 0.376 and survival is 0.25 of the twin birth.

The twin births occurred between 4th to 7th birth orders of mothers aged from 25 years to 32 years. The lone surviving partner of twin pair was born of mother of 25 years age. The rest of the mothers are around 30 years.
Analysis of loss of life in utero or in infancy shows a differential rate regarding sex. 55.88 p.c. of male baby dies in total sample and among still birth this proportion is very high for males (81.8 p.c.). Total loss of pregnancy is estimated to be 26.8 p.c. where death in infancy occurs in 17.9 p.c.

Death of married women is very high in the age-group of 15-19 years. Next higher in frequency is observed among the women of above 50 years followed closely by the women of 20-24 years. If we accept the death above 50 years as normal or due to exhaustion of vitality, the death of married women of younger ages from 15 years to 24 years, deserves a special attention. Half of the death of girls between 15-19 years were at labour where the mothers died along with foetus. Most of these deaths were recorded to be just after delivery, which indicate a considerable loss of prospective mothers. In total, 16.66 p.c. of cases, mothers died along with the child.

As per our informations about the causes of mortality, it is observed that 12.5 p.c. deaths were caused by suicide (all female), 20.8 p.c by accidents (snake bite, dog bite and drowning), 50 p.c. by lethal diseases like cholera, small pox and tuberculosis and 16.6 p.c. were due to unclassified diseases.

Death among the children of incompatible mating of parents is 16.3 p.c. of reported 92 live births of 19 mothers. Also among these 19 mothers, 3.15 p.c. of total pregnancies were lost. In this way, unfavourable genotype for ABO
has caused death to nearly 19 p.c. of life in a very early stage * (foetal and infancy).

From these vital statistical analysis, the intensity for natural selection operating on these people has been calculated using formula of Crow (1958). According to his proposition, two components of the total selection (I) has been calculated. Thus the mortality component Im is calculated to be 0.307, which is a proportion of premature deaths (died before reproductive age) to the rest. The fertility component If is calculated from the variance in the progeny number of the actual living couple, and the average number of live births per woman 40 years and above. If is equal to the value obtained by dividing the former (variance) by the square of the latter, and is found to be 0.172. Then the intensity of total selection I is found to be 0.532.

Though a population is large, actual breeding population is far lesser than the total number. They are the active couple who are participating or have contributed to the next generation. This is enumerated from the census data and marked as N. N is here 227, far less than the total population. Actual breeding size of the population also do not effectively take part in reproduction. As there is inequality in the sexes of parents, an effective size is sought which is calculated in the formula of Wright (1940):
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N_e = \frac{4N-2}{\sigma^2 + 2},
\]

where \( N \) is the actual breeding size of the population and \( \sigma^2 \) is the family size. Thus \( N_e \) or effective size of the Siyalgir population becomes 125, which is 55 p.c. of the actual breeding size (N).

The Siyalgir are found to show low degree of intermixture with other populations through marriage. Only one case of concubinage was recorded and no case of illegitimacy could be detected. Thus the admixture rate is calculated to be 0.265, a very low rate indeed, to offset the actions of natural agencies.

Few genetic characters were chosen for assessing genic behaviours in such a small population with respect to evolutionary background. The genetic characters were to be limited due to various inconveniences. Here only six such characters are (1) ABO blood group system, (2) Rh-factor (using only anti-D serum), (3) A~/F secretion in the saliva, (4) Tongue rolling and tongue folding (5) PTC taste sensitivity and (6) Red-green colour blindness. These characters were studied on pedigrees (two generations) and using standard techniques required for each character.

Out of 392 samples of ABO group, highest frequency of O is marked (39.79 p.c.), next of B as 37.75 p.c. followed by A₁ (15.31 p.c.), A₂ (3.06 p.c.), A₁B (3.06 p.c.) and A₂B (1.02 p.c.). The maximum likelihood estimation of gene frequency stands as \( p_1 = 0.48021 \), \( p_2 = 0.2308 \), \( q = 0.24522 \) and \( r = 0.63148 \), respective with standard errors as 0.01089, 0.00479, 0.01644 and 0.01848.
When analysed generation-wise, the p, q and r alleles exhibit some amount of diversions from the ancestral frequencies. Thus, in three generations, allele $p_1$ for phenotype $A_1$ increases in frequency, whereas an increase in $q$ between I and II generation is marked in case of $p_2$ which again decreases in the III generation. The q allele decreases from I to II generation and again rises in III generation. But r allele increases from I to II generation and again decreases in the III generation. Such fluctuation in the three alleles, inducing increase in one and decrease in the other, maintains what is known as balance in ABO polymorphism.

No case of negative Rh factor could be detected among 391 individuals of the population. This is indicative of fairly strong selection against the recessive genotype which causes unfitness of the individual.

ABH secretion in the saliva was tested among 373 individuals out of which there are 61.93 p.c. secretors and 38.07 p.c. non-secretor. The frequency of secretor gene 'Se' is found to be 0.6171.

Secretion of H substance was tested only with O group. Among the secretors, highest number is found in case of O group, then B group and still lesser in group A. AB secretor is very less (only 1.30 p.c.).

Generation analysis of secretion phenotype reveals a 10 p.c. increase in secretor status from I to II generation and then 3.41 p.c. of decrease in secretor phenotype in
the III generation. This fluctuation is reflected in the frequency of genes.

Two tricks of tongue movement have been recorded: one is overfolding of the tongue-tip and the other is rolling up the lateral margins of the tongue. The former is known as 'tongue folding' and the latter as 'tongue rolling'. Both the traits are believed to be diallelic with one dominant over the other. In case of rolling, the recessive homozygotes constitute the negative phenotype pair of recessive genes.

In this population, 45.36 p.c. roller and 40.24 p.c. folder have been observed. Correlative occurrence of these two tongue movement capacities do not yield fruitful result (with high value of chi-square at 1 p.c. level). The present data has roller frequency very near the lower range but folder frequency is the highest recorded (cf. 15.97 p.c. among American Negroes).

An up and down fluctuation in gene frequencies is noticed in case of roller character when analysed through generations. Also in folding character similar fluctuation is noticed. Allelic frequencies (A and B) for both the characters decrease in the II generation and again increase in the III generation. In the combined sample, the frequency of A (rolling) allele is 0.261 and B allele (following) is 0.366.

Taste sensitivity for phenyl-thio-urea was studied among 346 individuals employing serial dilution method,
using 1.3 gms. of the chemical in 1000 ml. of water. Threshold distribution from 1 to 12 solution (with diminishing strength in higher solution number), showed a mean value of 7.82 for the male and 9.89 for the female. The combined data shows 8.38 as mean threshold for tasters. Percentage of taster is 64.46 in total sample. Significant bisexual variation is revealed in taste-sensitivity. The observed frequency of non-taster is 35.54 p.c. which is very near the Indian average of 36.52 p.c. for non-mongoloid populations.

In three generations, the mean threshold value for taster show an increase from the I generation (high increase in II and again slight decrease in III generation). The frequency of t (recessive) allele decrease gradually from I to III generation. In total sample, the t gene frequency is 0.6011.

Red-green colour blindness is an inherited defect, believed to be associated with X chromosome. Hence it manifests in hemizygous condition in males. Rarely two carrier X chromosomes unite in a female to manifest in defect.

In total 403 Siyalgir males and females were tested with Ishihara colour plates. No individuals have been found to exhibit this defect. The nature and causes of this defect has been discussed at length. Also the limitations of Ishihara charts, as experienced by many workers, has been discussed.
The defect is found to occur in very low degree in most of the populations studied. Data on tribal and non-tribal populations (rural and urban) from Orissa have been tabulated to assess the occurrence of this X-linked recessive trait in Oriya populations. A range of 0-7.50 p.c. have been marked. Assuming the Origin of these people from either Madhya Pradesh or Gujarat, the average rate of these two regions have also been compared, and found to be between 3 to 4 p.c.

Non-detection of the defect in the sampled data, indicated high probability that the deleterious allele is kept out of the population by well maintained selection.

Genetic drift or chance fluctation of gene frequency between generations is thought to be a factor assisting evolution. In this population, the scope of such drift is enhanced by its isolated nature (less admixture) and very limited size. So, the possibility is first tested using the formula of Wright (1940) for variance due to drift and assuming the value of q as high as 0.50. This gives an estimation of 0.0010.

Then with the actual observation of deviations in gene-frequencies, the variance due to drift have been calculated. Three alleles have been selected, one is dominant (Se) the other is co-dominant (q) with high frequency and the third is a recessive (t). Taking the initial values of each of these alleles, as the frequency at parental generation (between I and II, I is parental and between II-III, II is parental), the
value of variances due to drift and the corresponding standard deviations have been computed, which gives the expected values of variation due to drift. These expected values slightly from the observed differences.

Again, another approach has been made to attest the validity of the age-group generations and actual pedigree generation, in analysis of allelic dispersion. For doing so, the allelic deviations between the parent and the filial generations have been compared with the II-III generation (based on age-category). The difference is very slight. Also, the expected value of variance due to drift, differs very insignificantly from the observed value of parent-filial difference.

Utilization of demographic technique for explaining genetic behaviour in a small isolate, like Siyalgir, has enabled us to understand some of the processes of evolution in human population. Though the investigation followed the beaten track, it has been pointed out that it is better to depend on actual observed generations while studying drift. Factors influencing human evolution are interdependent. Human culture has also influence on some of these factors. So, it is better to study such small populations as quickly as possible, as such communities are gradually doing away with traditional cultural practices. As a result many invaluable informations regarding gene dynamics will evade our knowledge.