

Genetic analysis of The Hill Korwas population in health perspective

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ABSTRACT

Studying population from a genetics point of view for understanding micro evolutionary changes has come into vogue since late fifties. Small Mendelian groups provide the necessary perspective for such population genetics studies as they are small in number, occupy limited area, and more or less represent distinct gene pool. To know the genetic phenomenon within a small Hill Korwa population the present study has been carried out among culturally and geographically isolated Hill Korwa tribe in Jashpur Distirct of Chattisgarh. Total 202 families were taken for investigation on demography, reproductive performances and for necessary blood samples to study their important genetic traits using standards techniques. Out of them 783.26 constitutes the Effective Size. The Admixture Rate for Hill Korwas is found to be 3.24%. Admixture rate was found to be 25.37. Kesingers Index and the selection intensity recorded for Hill Korwas is 0.6268 and Johnston, Kensingers index estimated to $I = 0.7205$. 7.9% prevalence of β – Thalassaemia trait was recorded among Hill Korwas of Jashpur district Chhattisgarh (2001-02).Wherein not a single case of HbS trait is reported.

Key Words: Hill Korwas, population genetics,natural selection,Jashpur,Chhattisgarh.

INTRODUCTION:

India is characterized by the presence of a large number of diverse population groups, endogamous castes, tribes and religious communities inhabiting different ecological settings. Human population Genetics is primarily concerned with the study of genetic composition of the populations and various factors determining the prevalence of deferent genetic traits and diseases in them. The mating behaviour and changing environmental conditions profoundly influence the human gene pool and consequently the frequencies of different genetics constitutions which determine the biological basis

of the health of populations. A fuller comprehension of human population genetics will lead to greater understanding of the complex interactions that have taken place in the past and that exist at present between man and his changing environment, and also of their implications for the health of future generations.

Studying population from a genetics point of view for understanding micro evolutionary changes has come into vogue since late fifties. Small Mendelian groups provide the necessary perspective for such population genetics studies as they are small in number, occupy limited area, and more or less represent distinct gene pool. Besides mutation, the force which induce genetic variability in the succeeding generations are selection, drift and admixture, the effects of these forces on the natural population need to be understood.

There are scientists and scholars investigated genetic analysis of human population in depth are: Johnston and Kensinger (1971), Saha (1981), Sahu (1983), Rao (1977), Gautam et al., (2007), Basu et al., (1988), Yadav and Sharma (2001), Rao and Murthy (1984), Chaudhary (1976), Gandhi (1978), Das (2006), Gautam K. et al., (2009), Kumar and Gautam (2014), Cavalli-Sforza and Bodmer (1971), Philippe and Yelle (1978), Henneberg (1980, 1976 & 1985), Barraï and Fraccaro (1964), Cruz-Coke et al. (1966), Bharati (1981), Rao and Murthy (1984), Rajnikumari and Rao (1986), Barua (1976, 1981 & 1983), Reddy and Lakshmauudu (1979), Reddy (1983), Reddy and Chopra (1990) and Basu et al. (1980).

Studies of the above nature have been conducted in certain parts of India, but so far no study has been reported from the Northern part of Chhattisgarh in India. With this lacuna in review of the present study has been undertaken on the Hill Korwas a lesser known tribe of Chhattisgarh.

The Land and People: The northern part being predominantly hilly region in Chhattisgarh. The North – Western part known as Surguja area and now divided in two districts Surguja and Korea. The north-eastern most district Jashpur Consists almost equal proportion of high and low land. On the northern part of the district lies the prominent table land on Uparghat. It rises abruptly above the rest of the district in a scarp-like wall of granite from west to east. The ascent is about 200 to 400 metres to the north of Bagicha tahsil. The Uparghat is roughly 2225 sq. KM in area. The general elevation of the tract varies from 600 meters to 750 metres on the Jashpur plateau in the east and 750 metres to 1000 metres on the Khuria plateau in the west.

Hill Korwa a sub-group of Korwa tribe was identified as a primitive tribal group during the fifth five year plan. Dalton stated that the history of this tribe reveals that they moved west-ward into the old Khudia jamindari (Present Sanna and Bagicha revenue circle) of Jashpur, district from Chhotanagpur region. Hill Korwas themselves claimed that they are the original inhabitants of Khudia region. Same consensus agreement stated by the Hill Korwa group of Jharkhand and Surguja area. It seems to be true because they are still residing with their natural ecology and primitive behaviour in Khuria region of Jashpur. They show the genetic purity in this region and due to migration and contact with contemporary population Hill Korwas population characteristics reveals variation in Jharkhand. Hill Korwas distributed in Surguga, Korba and Jashpur districts in Chhattisgarh and their total population is 27107 (census 1991). They are distributed in 12 villages of Manora and 72 villages of Bagicha tribal development blocks of Jashpur district. Their population in the two blocks are 8972 and 441 respectively.

Russel and Hiralal (1916) stated that the Korwa is a Kolarian tribe of the Chhotanagpur plateau. They have two territorial groups. The inhabitants of the hilly area are Paharia or Hill Korwa and those of the plains Diharia Korwas. E.T. Dalton believed the Korwa dialect most closely related to Asuri resembles Mundari and Santhali. Hill Korwas are Proto-australoid people with medium dark complexion. They are of medium height with medium narrow face. Hill Korwas practice semi settled agriculture and daily wage labours. Through it is their main economic pursuit, they are contented with subsistence level agriculture. They are always participate in hunting and gathering activities. Hill Korwas are much backward in respect of education and such as, the Government encourages the younger generation to receive formal education.

The Hill Korwas family consist of parents and children living together, it may also include some related persons particularly the widows, infirm persons and orphans. Marriage among Hill Korwas is characterized by clan exogamy and sub-group endogamy. Generally the martial alliances are within particular clan groups. Cross-cousin marriage is common. Monogamy is the recognized practice but polygamy also occurs depending upon economic position. Divorce is an accepted institution, separation generally leads to divorce or marriage after separation of after the death of spouse is quite common especially in the younger age groups.

Fig. 1. Map of the area of Jashpur, Chhattisgarh



MATERIAL AND METHODS:

The present study was carried out among Hill Korwas inhabiting villages of Bagicha and Manora tribal development blocks of Jashpur district, Chhattisgarh (Fig.1). The data were collected from 202 Hill Korwas households using a semi structured schedule in order to elicit the information on social organization, culture practices, mating patterns, clan structure economy, nutrition, sanitation and hygiene etc. A detailed genealogy was drawn enlisting pregnancy by pregnancy enumeration with of

each pregnancy. The information on reproductive wastage i.e. abortions, still births, neonatal and infant death were taken and cross-checked with the elderly members of the family. The data on morbidity pattern were collected by interviewing the head of household and his wife.

Blood samples from Hill Korwas (202 males and 202 females) were collected by finger prick using disposable lancet. Free following blood drops were collected in EDTA. Whole blood suspensions 2-5% were made in saline and tested for various blood group polymorphisms. The test for sickling, and thalassaemia, standard techniques were followed. Screening of sickling in red cells was tested by using fresh sodium metasilphite mix on a glass slide with blood drops. For screening of Thalassaemia, NESTROFT method by Kattamis et. al. (1981) was followed. Blood samples were centrifuged and separated plasma and red cells were kept frozen in the deep freezers of the community health centre.

RESULTS AND DISCUSSION

Genetic Structure of the Hill Korwa Population

Evolution at micro level, and consequently at macro level is brought about in small populations mainly through genetic drift, gene flow, admixture and selection. So to understand the genetic structure of the population, the parameters which best describe the genetic structure such as Effective Population Size, Admixture Rate, Coefficient of Breeding Isolation, Index of opportunity for selection and genetic drift have been computed using the demographic data.

Effective Population Size

The effective size of the population best describes the breeding potentiality of a population. The actual progenitors were 868 among the total population of Hill Korwas. Out of them 783.26 constitutes the Effective Size. This has been calculated after Li (1955) as under.

$$N = \frac{4 N_0 + 1}{N_0 + N_1}$$

(Where, N is the Effective Size, N_0 and N_1 are the male and females respectively).

Admixture Rate and Coefficient of Breeding Isolation

The admixture rate is calculated after Lasker (1952). There were 109 children who had one of their parents from outside their community affiliation. In total 42 males

had drawn their mates from outside their group, but only 33 of them had children up to the time of this investigation, the parental element which crept into the next generation from outside their community affiliation, i.e. admixture Rate, was calculate as follows.

$$\frac{1}{2} \frac{(n(1) + n(2))}{N} \%$$

N(1) and n(2) devote the number of the case where one parent and both the parents had from other populations and N is the total population size. The Admixture Rate for Hill Korwas is found to be 3.24%.

The coefficient of breeding isolation which was calculates by multiplying the effective population size with admixture rate was found to be 25.37.

Opportunity for Natural Selection:

The underlining assumptions of the genetic equilibrium model are random mating and absence of selection. The extent of which natural selection can occur in a population in measured by the index of total selection (crow, 1958) later Jonston and Kensinger (1971) modified the selection intensity index by taking into consideration pregnancies, prenatal mortality and mortality prior to reproductive age.

According to Crow's Index the demographic variables were computed, Kesingers Index and the selection intensity recorded for Hill Korwas is 0.6268 and Johnston, Kensingers index estimated to $I = I_m + I_f - P_s$. The fertility component among the Hill Korwas falls in lower of the range. Whereas neonatal mortality was higher in Hill Kowas is moderate and operates more through differential mortality than differential fertility.

Table – 1
Age at Menarche, Age at Marriage, Age at first conception and Age at current Childbirth (202 women)

Age group (Years)	Age at Menarche	Age at Marriage	Age at First Conception	Age at last child birth
10 – 12	15(7.43)	33(16.33)	-	-
13 – 15	187(92.57)	136(67.33)	76(37.62)	6(2.98)
16 – 18	-	30(14.86)	107(52.97)	30(14.85)
19 – 21	-	03(1.48)	14(6.93)	38(18.81)
22 – 24	-	-	02(0.99)	24(11.88)
25 & 25+	-	-	03(1.49)	104(51.48)
Total	202(100%)	202(100%)	202(100%)	202(100%)

Table – 2 Age specific Reproductive Wastages (202 Women)

Age group	No.of women	Abortions	Still births	Neonatal Deaths (7 Days)	PNM/100 births
15 – 19	42	7	2	2	160
20 – 24	54	5	5	2	280
25 – 29	63	9	-	4	160
30 – 34	32	6	3	6	360
35 – 39	10	3	-	1	40
40 +	1	-	-	-	-
Total	202	30	10	15	123.76

Table – 3 Estimation of Fertility and mean age at Child Bearing women from Age Specific Average Parities

Age Interval	No. of Women	No. of Births	Mean Parity
15 – 19	42	150	4.76
20 – 24	54	200	5.02
25 – 29	63	203	3.9
30 – 34	32	106	2.9
35 -39	10	11	1.00
40 +	1	-	-
Total	202	670	17.58

* Estimation of Total Fertility = 3.1

** M 22.76

* (P3)2/P2

* * Mean age at child bearing + 2.25 (P1/P2) = 17.95

**Table – 4
Distribution of ABO Blood Group and their percentage
Among Hill Korwas.**

S. No	Blood Group	Hill Korwas	
		No.	%
1.	O	114	28.35
2.	A	75	18.65
3.	B	173	43.03
4.	AB	40	9.95
5.	Total	402	100

ABO Blood grouping was done on 402 Hill Korwas. Distribution of blood group among Hill Korwas was 28.25%. Frequency of B blood group was highest among Hill Korwas.

Table – 5
Distribution of Phenotype and allele Frequencies of ABO Blood groups
Among Hill Korwas.

N	Phenotype				Allele Frequencies			X ² (d.f.=3)
	O	A	B	AB	A	B	O	
402								
Obs.	114	75	173	40	-	-	-	
Exp.	112.72	76.66	174.50	99.79	0.156	0.315	0.529	0.06

The distribution of the ABO blood groups among Hill Korwas shows that they were in perfect genetic equilibrium as there was no significant departure from Hardy-Weinberg equilibrium ($P > 0.05$, $df = 3$). χ^2 was 0.06 and $df = 3$, $P > 0.05$ in case of Hill Korwa.

Haemoglobinopathies:

(a) Sickle cell (HbS)

Presence of HbS in India was first reported in Southern India by Lehman and Cutbush (1952) and in Assam by Dunlop and Majumdar (1952) simultaneously. Since then, large data on the prevalence of sickle cell trait and disease have been collected in different tribal population from Indian subcontinent. In India, HbS is considered predominantly a tribal character. However, besides tribal populations, some of the other backward class and scheduled cast groups also possess this gene.

A study conducted by Indian Council of Medical Research (2005). Data reveals that there are seven primitive tribes in the states of Madhya Pradesh and Chhattisgarh. High prevalence of Sickle cell haemoglobin was found among Baigas (20.3%), Bharias (20.3%) and Abujhmarias (22.5%).

In present study out of 202 family sample all were found to be normal among Hill Korwas ICMR Data also verify these facts (2001).

(b) β – Thalassaemia

β – thalassaemia has not been studied well among the different tribal populations of central India. High prevalence of β – thalassaemia trait was observed in primitive tribes Saharia (9.4%) and Hill Korwas (10.6%). A prevalence of 6.6% was recorded in Kamar, another primitive of Chhattisgarh (ICMR 2005). According to present study 7.9% prevalence of β – thalassaemia trait was recorded among Hill Korwas of Jashpur district Chhattisgarh (2001-02).

Genetic and Common Diseases:

Jashpur district of Chhattisgarh is endemic for malaria (*P. falciparum*). A good correlation between the endemicity of malaria and the incidence of HbS trait was observed in Aurangabad Maharashtra but in Jashpur population there is no selection advantages. In present study sickle cell was absent among Hill Korwas and prevalence of malaria was 13.6% among these group.

Present study reveals the prevalence of the tuberculosis 3.7%, Arthritis (2.1%) Asthma (4.00%), Epilepsy (1.6%), Leprosy (1.76%), Blindness (2.2%), RTI/STI (3.65). Filariosis (1.00%), Diarrhoeal disease (7.23%), 3 cases of paralysis and one case of Albinism (observed), 6 couples reported they have problem of infertility (Data collected by semi-participant observation and on the basis of self reports of individuals).

Conclusion:

Out of total 783.26 constitutes the Effective Size. The Admixture Rate for Hill Korwas is found to be 3.24%. Admixture rate was found to be 25.37. Kesingers Index and the selection intensity recorded for Hill Korwas is 0.6268 and Johnston, Kensingers index estimated to $I = 0.7205$. The fertility component among the Hill Korwas falls in lower of the range. Whereas neonatal mortality was higher in Hill Kowas is moderate and operates more through differential mortality than differential fertility. 7.9% prevalence of β – Thalassaemia trait was recorded among Hill Korwas of Jashpur district Chhattisgarh (2001-02). Wherein not a single case of HbS trait is reported. ABO blood group frequency analysis with Hardy-Weinberg Law found perfect genetic equilibrium in Hill Korwas population in terms of genetic frequency. Early pregnancies, frequent and many pregnancy is prime reproductive problem found in the study which need effective health education interventions.

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