Ind. J. Phys. Anthrop. & Hum. Genet. Vol. 34. No. 1, (2015) : 1-13

BIOLOGICAL AFFINITY OF BRAHMINS OF UTTAR PRADESH (INDIA)

Vibha Agnihotri

ABSTRACT

In India, the caste system is a living reality. The caste system is characterized by hierarchy, economic specialization and endogamy. The different castes are divided into endogamous groups. These endogamous groups vary in their gene frequencies even though they share the same ecological niche. Principles of endogamy regulate their gene pool and are normally not disturbed except by selection effect and mutation. In Uttar Pradesh like other parts of India, there are several endogamous groups of Brahmins. Probably these endogamous groups are split products of a larger group. Therefore, in order to examine the hypothesis whether these endogamous groups are the products of fission of a common parental population or independent realities, which have evolved during the course of time and continue to exist as individual genetic isolates. Studies have been done on their demographic, morphological and genetic traits. These traits indicate similarities between the Brahmin groups, suggesting the belief of a common parental stock or "original oneness". The statistical test for natural selection (of Crow), Morphological distance-T2 (of Sanghvi), and G2 for genetic distance (Sanghvi) were also used to assess quantitatively the biological affinities between these groups. On the basis of these statistics, it appears that probably the process of fission following adaptation to new ways of life has been at work (as historical evidence with various myths and legends also suggest the same), resulted in the formation of different endogamous groups of Brahmins.

Keywords: Endogamy, Brahmins, Uttar Pradesh.

INTRODUCTION

Biological anthropology focuses its attention on the study of biology and environmental factors including micro and macro-evolutionary forces. These forces ultimately determine the biological structure of human population. Mendelian population or breeding population as defined by Dobzhansky is considered as the unit of the study. The Indian sub-continent with a panorama of social diversities, ethnic differences and rich cultural heritage includes a large number of endogamous groups. There are religious, linguistic and ethnic divisions of the Indian populations,

Vibha Agnihotri, Associate Professor & Head Department of Anthropology, Nari Shiksha Niketan, P.G. College, University of Lucknow, *E-mail: agnihotri_vibha@yahoo.co.in*

Besides these, there is an interesting population segmentation comprising numerous caste groups, many of them further divided into smaller units called isolates which restricts the flow of genes within the same isolates. Such isolates represent the effective breeding population which is governed by Mendelian precepts sharing a common gene pool and is therefore a justifiable unit for genetic studies.

Various studies undertaken in this country reveal a great deal of morpho-genetic diversity at the levels of the endogamous groups (Malhotra, 1974). Each endogamous group has a definite form and continuity. Such groups represent populations which are not merely a conglomeration of individuals, but are ordered coherent systems to definite degrees. The structure of such Mendelian populations is manifested in a series of genetical, biological and cultural characteristics. There are strong similarities and differences among these populations. The neighbouring populations have a strong possibility of higher levels of biological and cultural exchange. Demographic structure is relevant and provides a milieu on which agents of genetic change may operate. Thus, the dynamics of a population cannot be understood without a proper understanding of fertility, age and sex composition, which are quite wider. Fertility and mortality patterns are the aspects through which natural selection operates. It is in fact a differential fertility and mortality which effects the genetics combined in genotype having their own behavioural consequences. Therefore, in order to understand the interplay of genes into genotypes it is necessary to examine the genealogical data and marriage practices of the population. In fact, demographics, morphological and genetical components must be essentially examined for a proper and intensive study of a population.

Anthropologists studying Indian population have long held the view that the different endogamous groups which have the same general name may be the product of a single parental population. "Brahmins" is a general appellation applied to a number of endogamous divisions indicating that they have the same rank and status in old social order. Brahmins constitute a very important social group having the highest social status in the hierarchy of Hindu castes. Karve (1958, a,b,c, 1959) on the basis of her cultural data and physical measurements (1941, 1948, 1951) on Maharashtrian Brahmins has put forth the hypothesis that the 'sub castes' were not derivable from castes, but were independent social realities. The Maharashtrian Brahmin groups examined by her, no doubt shared the same social status and function in the Hindu society but not the biological affinity which is expected if they had arisen as a result of the process of splitting from a common parental stock. On the other hand there have been historical cases of 'sub-castes' as split product of a larger division. They have arisen as a group with a definite status as a consequence of the process of fission.

In Uttar Pradesh a case of Brahmins possibly suggests that the process of fission following adaptations has been at work and ultimately resulted into the formation of independent groups, of Brahmins who continue to exist as individual realities.

MATERIALS AND METHODS

The present study considers 500 households representing five endogamous groups of Brahmins; Kanyakubja, Sarayuparin, Saraswat, Gaur and Sanadhaya Brahmins drawn from their own specific areas of concentration in a random manner. Every attempt was made to exclude any personal bias on the part of the investigator. Blood relatives were completely avoided and only husband, wife or their offsprings were included in the sample. The total number of Brahmins considered for the present study of the Brahmins is 2789 of which 1493 are males and 1296 are females. The number of Brahmins studied group wise are as follows: *Kanyakubja Brahmins*: Male-318, Female-288, Total-606; *Sarayuparin Brahmins*: Male-327, Females-270, total-597; *Saraswat Brahmins*: Male-258, Female-251, Total-509; *Gaur Brahmins*: Male-299, Female-240, Total-539; *Sanadhya Brahmins*: Male-291, Female-247, Total-538.

The data for the present study was collected from the original locus of concentration and was drawn from the districts of Lucknow, Faizabad, Meerut, Aligarh and Hathras. The following data on these subjects was recorded.

THE DEMOGRAPHIC DATA

Demographic data collected through household schedules were analysed to depict the composition of the population in terms of age sex, education, marital status, occupation, economic status and the pattern of mating, marital distance, marital migration, age at menarche, age at marriage, age at first conception and last conception, age at menopause, fertility, mortality and morbidity patterns have been analyzed. Selection Intensity Index has also been calculated for each population (Table 1) (Fig. 1).

GENETICAL DATA

The genetical data included an analysis of six gene traits representing different loci. The traits considered are the ABO, MN, Rh (D) blood groups, the ABH(O) secretion in saliva, Secretor and non-secretor phenotypes,ability to taste phenyl thio-carbamide (PTC) solutions and colour blindness (Table 4).

MORPHOLOGICAL TRAITS

Fifty one somatic measurements and 16 Indices provide the basis for the elucidation of the somatological or morphological characterization of the Brahmin population (Table 2, 3).

STATISTICAL METHODS

Statistical procedures which enable distance coefficient to be calculated from qualitative or discontinuous traits are of particular significance for genetical variables. Most of these follow the original χ^2-method designed by Sanghvi (1953). However, Sanghvi (1953) has designed the statistical method of biological comparison by which it could be possible to arrive at a quantitative measure of

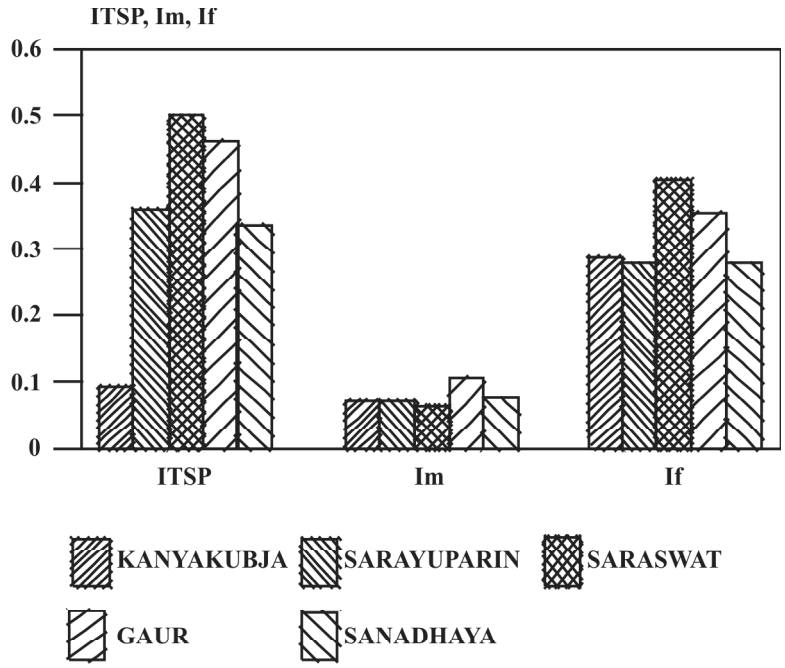

Figure 1 : Index of Opportunity of Selection

biological differentiation between a pair of endogamous groups based on all the characters whether genetical or morphological. He calls such a quantitative measure based on genetical traits, as the "genetical difference' and the ones based on morphological measurements as "morphological difference". Thus the values obtained would enable us to comprehend the relationship between the groups, and compare the relationships of genetical differention with that of morphological.

We have chosen to use the statistics developed by Crow (1958)-Natural Selection, by Sanghvi (1953)-T^2 (morphological difference) and G^2 (genetic difference). T^2 was determined by the application of the t test. G2 was arrived at by the application of the Chi-square test (Fisher 1941) to 2 × 2 and 2 × n tables (with Yate's correction applied to each 2 × 2 table). The statistical significance of various differences is indicated on the Tables by superscripts.

DISCUSSION

The materials have been considered on three levels : (1) Characteristic of the individual group, (2) Intergroup differences and (3) Over all differences. Table 1 gives an idea about the Index of opportunity for selection among Uttar Pradesh Brahmins were as Table 2, 3 and 4 gives an idea about the degree of somatometrical (T^2) and Genetical (G^2) affinity between the group. The demographic analysis of the Brahmins indicates only marginal differences except Saraswat Brahmins, all the other four endogamous groups of Brahmins have sex ratio lower than sex ration

of India. It is further noted that Saraswat Brahmins also have the highest mean age, youth dependency ration. On the other hand, Kanyakubja Brahmins have low Crude Birth Rate, General fertility rate and Crude Death Rate.

The opportunity of natural selection among Brahmins has been worked out on the basis of selection intensity as suggested by Crow (1958). This index is slightly higher among Saraswat Brahmins as compared to other Brahmins. This might be due to the fertility differences among them.

GENETICAL DISTANCE

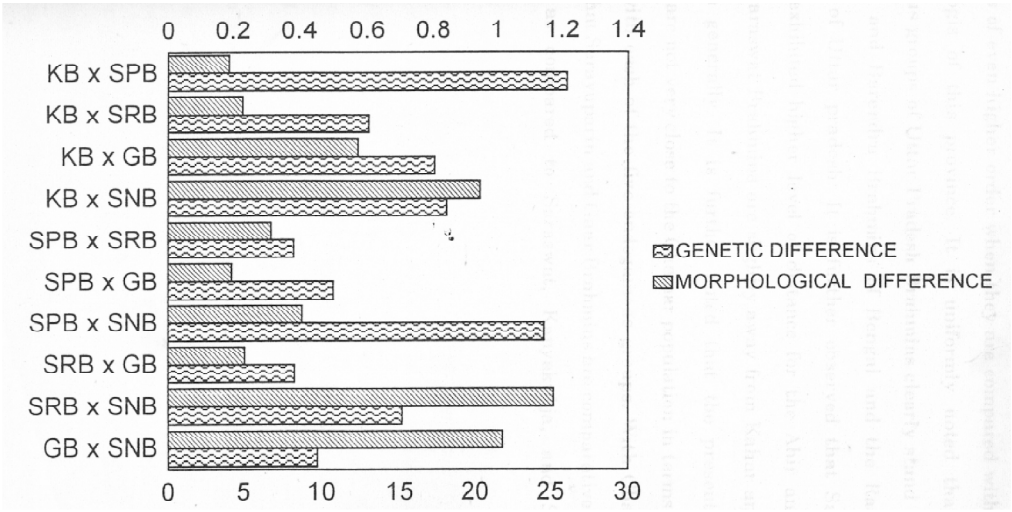

Figure 2: Comparison of genetical and Morphological Differences among the 5 Endogamous Groups of U.P. Brahmins

CONCLUSION

The present study is based on the demo-genetic and morphological make up of the five Brahmin populations which clearly demonstrates that these five endogamous groups of Brahmins understudy are settled in their specific areas of original concentrations and by the practice of endogamy they have maintained their distinct identities and have their own gene pools. Their social history ibased on myths and legends suggests that perhaps they are the descendants of a common parental population. As such, it is expected that this original oneness should also be reflected in their morpho-genetic makeup. As they exhibit a similar pattern of phenotypic variation, as indicated by the six genetic loci (ABO, MN, Rh(D), ABH secretion in saliva, PTC Tasting ability and colourblindness). However, the morphological characters, particularly, some of the somatic measurements indicate significant differences among certain groups of Brahmins.

The five Brahmin populations are settled in their own specific areas ranging from Western Uttar Pradesh to Eastern Uttar Pradesh. These areas do not have uniform environmental conditions. There are differences in their health, hygiene, nutritional habits, economic and cultural factors including the behavioural norms and practices relating to food diseases etc. Perhaps these differences are the basis for the observed morphological variations among these five groups of U.P. Brahmins. However these environmental conditions have not been so potent to cause further genetical differentiation and, it requires a very long period for change to be evident in the genetical traits. Therefore, the genetic picture remains the same and confirms the hypothesis of original oneness.

Thus, in the case of Uttar Pradesh Brahmins on the basis of present study, it appears that probably the process of fission following adaptations (as historical evidence with various myths and legends also suggests) to new ways of life has been at work and resulted into the formation of different endogamous groups of Brahmins. It may be further emphasized that there is still a need for assimilation of new results using more sophisticated techniques and markers. However, a clear exposition as to which groups are really closer and which stand apart can be seen.

Table 1: Index of opportunity for selection among Uttar Pradesh Brahmins

Crow Index	*Kanyakubja Brahmin*	*Sarayuparin Brahmin*	*Saraswat Brahmin*	*Gaur Brahmin*	*Sanadhaya Brahmin*
No. of women aged 40+	73	73	75	71	55
Total No. of live Births	70	328	73	67	240
No. of surviving upto 15 years	63	301	67	59	209
No. of death upto 15 years	5	24	4	7	13
Proportion of surviving (Ps)	0.900	0.9176	0.917	0.880	0.870
Proportion of dead (Pd)	0.071	0.073	0.054	0.104	0.054
Mean live Births (X)	5.013699	5.1369	4.17333	4.614286	4.709091
Variance of live Births (Vf)	6.80414	6.889771	7.055074	6.635635	5.02471
Index of mortality (Im)=-Pd/Ps	0.078	0.0795	0.058	0.118	0.062
Index of fertility (If)=Vf/x^2	0.27068	0.2610973	0.405075	0.311654	0.266587
Index of Total Selection	0.08666	0.364043	0.49973	0.472152	0.322445

Table 2: Value of overall genetical distance (G2)

Pair of Endogamous groups	*ABO system (5)*	*MN system (2)*	*Rh system (1)*	*Secretor/ Nonsecretor (1)*	*Taster/ Non Taster (1)*	*Colourb-lindness (1)*	*Total No. of degree of freedom*	*Genetic distance (G2)*
Kanyakubha Brahmin × Sarayuparin Brahmin	8.7110	0.1784	4.0312	1.7686	0.5264	0.4210	11	1.4215
Kanyakubha Brahmin × Saraswat Brahmin	1.9758	0.1828	2.4050	0.5332	0.5264	0.8658	11	0.5899
Kanyakubha Brahmin × Gaur Brahmin	2.9598	0.0868	4.0312	0.0838	0.7420	0.0000	11	0.7185
Kanyakubha Brahmin × Sanadhaya Brahmin	4.2908	0.2374	3.1914	0.1852	1.0972	0.1164	11	0.8289
Sarayuparin Brahmin × Saraswat Brahmin	3.0910	0.3618	0.2442	0.3618	0.0000	0.0824	11	0.3764
Sarayuparin Brahmin × Gaur Brahmin	1.9104	1.0840	0.0000	1.0840	0.2120	0.4210	11	0.4283
Sarayuparin Brahmin × Sanadhaya Brahmin	2.8360	2.0886	0.0612	2.0886	0.5792	0.0962	11	0.7045
Saraswat Brahmin × Gaur Brahmin	0.5344	0.1940	0.2442	0.1940	0.2320	0.8658	11	0.2058
Saraswat Brahmin × Sanadhaya Brahmin	1.3766	1.3448	0.0642	1.3448	0.5792	0.3544	11	0.4604
Gaur Brahmin × Sanadhaya Brahmin	0.9880	0.5186	0.0582	0.5186	0.0904	0.1164	11	0.2082

Table 3: The 't' and T^2 test for somatic measurements of Brahmins and Non Brahmin populations of U.P. and neighbouring areas

Groups	*ST*	*SHV*	*HL*	*HB*	*MFB*	*BZB*	*BG*	*TFH*	*UFH*	*NL*	*NV*	*T2*	*Reference*
Kanyakubja × Saryuparin	2.323*	7.134*	0.862	1.529	0.212	1.326	0.195	1.106	1.279	1.358	1.815	12.58385	Agnihotri, 1996
Kanyakubja × Saraswat	3.222*	0.494	1.502	0.887	0.949	1.504	0.650	0.038	1.249	0.099	0.376	3.44897	Agnihotri, 1996
Kanyakubja × Gaur	3.329*	1.487	0.154	1.624	0.000	1.272	1.441	1.261	0.504	0.188	0.604	3.98108	Agnihotri, 1996
Kanyakubja × Sanadhaya	1.668	0.119	0.192	7.080*	4.902*	2.910*	0.525	1.890	0.765	0.454	0.789	16.49317	Agnihotri, 1996
Kanyakubja × Brahmin Basti	3.396*	2.869*	0.057	0.979	0.591	0.846	0.774	1.193	0.702	0.611	0.223	3.30658	Agnihotri, 1996 & Majumdar 1948
Kanyakubja × Brahmin	2.693*	2.631*	0.053	1.179	0.564	0.796	0.931	0.895	0.974	0.202	0.080	2.45660	Agnihotri, 1996 & Majumdar 1948
Kanyakubja × Dacca Brahmins	0.447	0.097	0.908	0.255	0.460	0.561	0.303.	0.412	1.669	0.346	0.202	0.76218	Agnihotri, 1996 & Bhasin *et al*. 1992
Kanyakubja × Rarhi Brahmins	1.995*	1.876	9.041*	2.284*	0.062	1.914	0.730	5.191*	5.433*	0.127	4.263*	25.20828	Agnihotri, 1996 & Debmili, 1980
Kanyakubja × Barendra Brahmins	1.828	1.443	9.300*	1.610	0.944	2.488*	0.867	5.452*	6.574*	0.241	0.342	25.52085	Agnihotri, 1996 & Debmili, 1980
Kanyakubja × Rajputs	4.876*	2.393*	0.141	1.331	0.961	0.142	1.224	1.556	1.438	0.983	0.141	3.77171	Agnihotri, 1996 & Negi & Das 1963
Kanyakubja × Rastogi	8.469*	3.911*	4.130*	8.066*	18.995*	8.229*	0.133	2.303*	1.314	2.475*	0.184	55.53173	Agnihotri, 1996 & Kushwaha *et al.* 1990b
Kanyakubja × Kayastha	4.364*	0.308	10.556*	2.200	4.449*	4.533*	2.634*	5.231*	8.709*	0.038	0.979	26.07847	Agnihotri, 1996 & Srivastava & Tyagi, 1967
Kanyakubja × Kurmi	6.748*	0.991	0.417	1.606	1.280	0.123	1.019	0.869	1.119	0.133	0.120	6.81903	Agnihotri, 1996 & Majumdar, 1948
Kanyakubja × Ahir	6.536*	0.185	0.983	1.242	1.106	0.137	1.109	0.566	1.259	0.174	0.107	7.65445	Agnihotri, 1996 & Majumdar, 1948

contd. table 3

Groups	*ST*	*SHV*	*HL*	*HB*	*MFB*	*BZB*	*BG*	*TFH*	*UFH*	*NL*	*NV*	*T2*	*Reference*
Kanyakubja × Kahar	5.453*	2.993*	0.248	1.100	0.853	0.220	0.539	0.447	0.957	0.401	0.155	7.19346	Agnihotri, 1996 & Bhasin *et al.* 1992
Kanyakubja × Chamar	6.845*	4.866*	0.948	2.656*	1.508	0.565	2.427*	0.607	1.962*	0.495	1.785	8.26195	Agnihotri, 1996 & Kushwaha *et al.* 1990b
Saryuparin × Saraswat	0.513	8.029*	0.422	0.467	1.072	0.500	0.684	0.732	2.148*	1.384	0.730	13.56245	Agnihotri, 1996
Saryuparin × Gaur	0.733	5.372*	0.674	0.257	0.200	0.299	0.871	0.372	1.576	1.033	2.011*	7.00632	Agnihotri, 1996
Saryuparin × Sanadhaya	0.620	7.565*	0.366	4.922*	4.651*	3.462*	0.568	2.572*	0.427	1.924	2.101*	23.78691	Agnihotri, 1996
Saryuparin × Brahmin Basti	0.064	2.722*	0.126	0.546	0.503	0.602	0.816	1.374	0.447	1.140	0.215	19.98309	Agnihotri, 1996 & Majumdar, 1948
Saryuparin × Brahmin Other	0.389	12.433*	0.118	0.689	0.489	0.475	0.969	1.075	0.696	0.577	0.390	20.32736	Agnihotri, 1996 & Majumdar, 1948
Saryuparin × Dacca Brahmins	0.086	1.595	0.768	0.051	0.563	0.858	0.357	0.609	1.405	0.720	0.600	1.14377	Agnihotri, 1996 & Bhasin *et al.* 1992
Saryuparin × Rarhi Brahmins	1.032	5.283*	5.718*	0.197	0.147	2.720*	0.684	5.382*	3.935*	1.7720	6.233*	22.69590	Agnihotri, 1996 & Debmili, 1997
Saryuparin × Barendra Brahmins	1.038	9.331*	5.804*	0.408	0.605	3.137*	0.757	5.659*	4.519*	1.319	2.318*	27.97586	Agnihotri, 1996 & Debmili, 1997
Saryuparin × Rajputs	1.060	6.654*	0.364	0.841	0.842	0.480	1.244	1.801	1.076	1.408	0.692	5.34758	Agnihotri, 1996 & Bhasin *et al.* 1992
Saryuparin × Rastogi	3.304*	4.494*	1.950	4.4312*	16.306*	7.148*	0.081	3.023*	0.294	0.939	1.943	35.03756	Agnihotri, 1996 & Kushwaha *et al.* 1990b
Saryuparin × Kayastha	0.590	8.343*	6.307*	0.144	3.481*	4.447*	1.825	5.295*	5.672*	0.211	3.210*	19.59374	Agnihotri, 1996 & Srivastava & Tygi, 1967
Saryuparin × Kurmi	2.648*	8.428*	0.228	1.079	1.160	0.463	1.053	1.059	0.862	0.213	0.351	10.60183	Agnihotri, 1996 & Majumdar, 1948
Saryuparin × Ahir	2587*	9.000*	0.801	0.757	1.005	0.462	1.140	0.733	1.035	0.109	0.526	14.37943	Agnihotri, 1996 & Majumdar, 1948

contd. table 3

Groups	*ST*	*SHV*	*HL*	*HB*	*MFB*	*BZB*	*BG*	*TFH*	*UFH*	*NL*	*NV*	*T2*	*Reference*
Saryuparin × Kahar	2.661*	4.960*	0.140	0.806	0.793	0.438	0.573	0.571	0.800	0.073	0.150	5.86083	Agnihotri, 1996 & Bhasin *et al.* 1992
Saryuparin × Chamar	2.344*	4.404*	0.684	1.876	1.357	0.995	2.305*	0.857	1.617	0.041	1.127	3.64019	Agnihotri, 1996 & Kushwaha *et al.* 1990b
Saraswat × Gaur	0.261	2.034*	1.224	0.300	0.887	0.169	1.629	0.953	0.740	0.270	0.759	2.06708	Agnihotri, 1996
Saraswat × Sanadhaya	1.202	0.660	0.688	5.147*	3.820*	3.361*	0.216	1.417	1.738	0.319	0.896	11.03829	Agnihotri, 1996
Saraswat × Brahmin Basti	0.611	2.451*	0.225	0.700	0.930	0.455	0.522	1.183	0.990	0.565	0.071	1.46655	Agnihotri, 1996 & Majumdar, 1948
Saraswat × Brahmin Other	1.109	2.192*	0.210	0.860	0.854	0.285	0.645	0.90	1.280	0.172	0.075	1.34613	Agnihotri, 1996 & Majumdar, 1948
Saraswat × Dacca Brahmins	0.000	0.006	0.697	0.064	0.938	1.011	0.078	0.414	1.948	0.315	0.324	0.99537	Agnihotri, 1996 & Bhasin *et al.* 1992
Saraswat × Rarhi Brahmins	1.879	2.472*	5.999*	0.734*	0.969	2.503*	0.191	3.222*	5.427*	0.000	2.750*	14.66209	Agnihotri, 1996 & Debmili 1980
Saraswat × Barendra Brahmins	1.842	0.984	6.118*	0.189	1.969*	2.794*	0.148	3.584*	6.012*	0.336	0.382	14.97853	Agnihotri, 1996 & Debmili, 1980
Saraswat × Rajputs	0.517	3.229*	0.489	1.010	1.378	0.660	0.855	1.522	1.811	0.945	0.305	2.07796	Agnihotri, 1996 & Negi & Das 1963
Saraswat × Rastogi	3.126*	4.791*	1.681	4.670*	19.430*	5.572*	0.696	1.371	2.229*	2.420*	0.298	43.56370	Agnihotri, 1996 & Kushwaha *et al.* 1990b
Saraswat × Kayastha	0.038	0.934	6.782*	0.464	5.515*	3.613*	0.857	2.933*	6.933*	0.057	0.909	13.52549	Agnihotri, 1996 & Srivastava & Tyagi, 1967
Saraswat × Kurmi	2.347*	1.739	0.129	1.256	1.681	0.644	0.765	0.864	1.402	0.159	0.038	2.10731	Agnihotri, 1996 & Majumdar, 1947
Saraswat × Ahir	2.278*	0.415	0.710	0.926	1.461	0.636	0.832	0.567	1.506	0.195	0.238	1.94743	Agnihotri, 1996 & Majumdar, 1948

contd. table 3

Groups	*ST*	*SHV*	*HL*	*HB*	*MFB*	*BZB*	*BG*	*TFH*	*UFH*	*NL*	*NV*	*T2*	*Reference*
Saraswat × Kahar	2.370*	3.745*	0.083	0.912	1.079	0.560	0.396	0.449	1.137	0.434	0.051	4.04445	Agnihotri, 1996 & Bhasin *et al.* 1992
Saraswat × Chamar	1.997*	5.967*	0.556	2.102*	1.977*	1.193	1.776	0.601	2.305*	0.531	1.408	5.31035	Agnihotri, 1996 & Kushwaha *et al.* 1990b
Gaur × Sanadhaya	1.398	1.471	0.097	5.907*	4.561*	3.180*	1.720	2.503*	1.121	0.602	0.194	14.69348	Agnihotri, 1996
Gaur × Brahmin Basti	0.881	4.646*	0.028	0.625	0.586	0.510	1.156	1.449	0.802	0.680	0.401	3.75081	Agnihotri, 1996 & Majumdar, 1948
Gaur × Brahmin Other	1.343	4.414*	0.026	0.782	0.560	0.356	1.350	1.151	1.080	0.257	0.237	3.43117	Agnihotri, 1996 & Majumdar, 1948
Gaur × Dacca Brahmins	0.041	0.430	0.885	0.000	0.636	0.941	0.671	0.696	1.764	0.400	0.033	0.97981	Agnihotri, 1996 & Bhasin *et al.* 1992
Gaur × Rarhi Brahmins	2.065*	0.315	7.632*	0.596	0.058	2.264*	2.107*	4.548*	5.266*	0.328	2.469*	18.49545	Agnihotri, 1996 & Debmili, 1997
Gaur × Barendra Brahmins	2.028*	3.004*	7.793*	0.181	0.865	2.551*	2.292*	4.862*	6.041*	0.000	0.382	21.33582	Agnihotri, 1996 & Debmili, 1997
Gaur × Rajputs	0.163	0.445	0.175	0.936	0.947	0.581	1.723	1.889	1.566	1.036	0.091	1.19650	Agnihotri, 1996 & Bhasin *et al.* 1992
Gaur × Rastogi	2.540*	2.007*	3.298*	6.261*	17.171*	5.304*	1.144	2.690*	1.617	‘1.962*	0.794	36.28982	Agnihotri, 1996 & Kushwaha *et al.* 1990b
Gaur × Kayastha	0.360	1.459	8.611*	0.202	3.921*	3.353*	3.804*	4.332*	7.333*	0.000	0.000	17.28040	Agnihotri, 1996 & Srivastava & Tyagi, 1967
Gaur × Kurmi	1.887	0.943	0.387	1.186	1.263	0.565	1.390	1.139	1.217	0.079	0.312	1.60796	Agnihotri, 1996 & Majumdar, 1948
Gaur × Ahir	1.834	1.955	0.952	0.850	1.095	0.560	1.503	0.807	1.344	0.130	0.070	2.32129	Agnihotri, 1996 & Majumdar, 1948
Gaur × Kahar	2.037*	1.227	0.231	0.860	0.849	0.509	0.769	0.628	1.019	0.323	0.282	1.63721	Agnihotri, 1996 & Bhasin *et al.* 1992
Gaur × Chamar	1.520	2.727*	0.902	0.070*	1.481	1.092	3.062*	0.961	2.078*	0.405	1.950	3.21823	Agnihotri, 1996 & Kushwaha *et al.* 1990b

contd. table 3

Groups	*ST*	*SHV*	*HL*	*HB*	*MFB*	*BZB*	*BG*	*TFH*	*UFH*	*NL*	*NV*	*T2*	*Reference*
Sanadhaya × Brahmin Basti	0.860	3.419*	0.003	1.136	2.299*	1.556	0.618	0.827	0.542	0.453	0.471	3.10340	Agnihotri, 1996 & Majumdar, 1948
Sanadhaya × Brahmin Other	0.373	3.145*	0.003	1.191	2.024*	1.708q	0.755	0.538	0.799	0.087	0.348	2.57239	Agnihotri, 1996 & Majumdar, 1948
Sanadhaya × Dacca Brahmins	0.195	0.122	0.848	1.273	2.143*	0.383	0.159	0.030	1.500	0.232	0.033	1.43360	Agnihotri, 1996 & Bhasin *et al.* 1992
Sanadhaya × Rarhi Brahmins	0.271	1.893	4.268*	5.601*	4.741*	1.918	0.061	1.884	4.231*	0.432	2.039	15.30174	Agnihotri, 1996 & Debmili, 1997
Sanadhaya × Barendra Brahmins	0.303	1.699	4.296*	6.324*	6.443*	1.652	0.128	2.354*	4.827*	0.805	0.589	19.71129	Agnihotri, 1996 & Debmili, 1997
Sanadhaya × Rajputs	1.916	2.526*	0.204	1.028	3.084*	0.891	1.001	1.042	1.206	0.858	0.180	2.47840	Agnihotri, 1996 & Negi & Das 1963
Sanadhaya × Rastogi	4.314*	4.179*	1.699	1.925	25.119*	1.008	0.580	0.395	0.234	3.270*	0.974	62.44085	Agnihotri, 1996 & Kushwaha *et al.* 1990b
Sanadhaya × Kayastha	1.443	0.194	4.530*	6.377*	11.260*	1.032	1.470	1.466	5.941*	0.115	0.250	20.98668	Agnihotri, 1996 & Srivastava & Tyagi, 1967
Sanadhaya × Kurmi	3.535*	0.957	0.344	0.904	3.326*	0.915	0.864	0.493	0.957	0.240	0.387	3.58079	Agnihotri, 1996 & Majumdar, 1948
Sanadhaya × Ahir	3.454*	0.355	0.898	1.098	2.912*	0.859	0.941	0.241	1.117	0.262	0.139	3.93928	Agnihotri, 1996 & Majumdar, 1948
Sanadhaya × Kahar	3.347*	3.135*	0.211	0.348	1.995*	0.458	0.449	0.207	0.858	0.551	0.332	4.55007	Agnihotri, 1996 & Bhasin *et al.* 1992
Sanadhaya × Chamar	3.280*	5.37*	0.815	0.838	3.921*	0.793	2.061*	0.114	1.738	0.667	2.025*	5.99174	Agnihotri, 1996 & Kushwaha *et al.* 1990b

*Indicates significant difference

REFERENCES

Agnihotri, V., 1996. Demo-Genetic and Morphological Variations among five Endogamous groups of Uttar Pradesh Brahmins, University of Lucknow, Lucknow, India.

Bhasin, M.K., Walter, H. and H. Danker., 1992. The Distribution of Genetical, Morphological and Behavioural Traits among the peoples of Indian Region. Kamal Raj Enterprises, Delhi.

Crow, J.F., 1958. Some possibilities for measuring selection intensities in Man. *Human Biology*., 30:1-13.

Deb, M., 1980. Mophological Genetical and Demographic study of the Bengalis in Lucknow. Ph.D. Thesis, Dept, Anthropology. Univ, Lucknow.

Karve, I., 1941. Anthorpometric investigation of the Madhyandina Brahmins of the Maratha country. *Bull. Deccan Coli. Res. Inst. Poona*., 3: 1-74.

Karve, I., 1948. Anthropometric Measurements of the Marathas. Deccan College Monograph Series No.2. Deccan College Post-Graduate and Research Institute, Poena.

Karve, I. and V.M. Dandekar., 1951. Anthropometric Measurements of Maharashtra Deccan College Monographs S. NO.8. Deccan College Post-Graduate and Research Institute, Poona.

Karve, I., 1958a. What is caste? (I) Caste as extended Kin. *The Economic Weekly*, I 0(4,5,6)., 125- 138.

Karve, I., 1959. What is caste? (IV) Caste Society and Vedantic thought. *The Economic Weekly*., 11 :49-63.

Kushwaha, K.P.S., Gaur, J.R., Sangwan, S.K., Yadav, A.S., Thukral, K., Kushwaha, B.P., Chopra, I.S., Chugh, O.P. and S.M.S. Chahal., 1990b. ABO and Rh blood groups among 19 caste populations of Haryana. *Bio nature*., 10:73-75.

Majumdar, D.N., 1948. Serological status of castes and tribes of Asia Publishing House, Calcutta

Malhotra, K.C., 1974. Some models for the study of human population genetics in India. PP 157- 172. In: *Human Population Genetics in India*. L.D. Sanghvi, V. Balakrishnan, H.M. Bhatia, P.K. Sukumaran and 1.V. Undevia (Eds.). Orient Longman Ltd., New Delhi.

Negi, R.S. and A. Das., 1963. The blood groups, (ABO, MN and Rh) ABH secretor in saliva and colour blindness in the Rajput of western Uttar Pradesh and Dholpur. *Bull. Anthrop. S.I. Govt. of India*., 11 (3 and 4): 221-231.

Sahghvi, L.D., 1953. Comparison of genetical and morphological methods for a study of biological differences. *Am.J.Phys.Anthrop.*, 11: 385-404.

Srivastava, A.C. and D. Tyagi., 1967. A study of taste sensitivity to phenyl-thio-urea (PTU) among various population groups in Uttar Pradesh. *Bull. An. S.I. Govt. of India*., 16(1-2): 89-109.