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# The Serological Variation Among Tribal and Non-Tribal Popullation of Himachal Pradesh

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**ABSTRACT : Data is presented on distribution of the ABO, Rh (D) blood groups in one thousand individuals from non-tribal and one thousand individuals from tribal population of Himachal Pradesh in India. The study was conducted to see the difference between non-tribal and tribal population by calculating gene frequencies. The frequencies of alleles O, A, B, and AB were found to be 24.0%, 27.0%, 31.0% and 18.0% in the non-tribal population and 23.0%, 22.0%, 44.0 % and 11.0% observed in the tribal population. The incidence of ($Rh^{-ve}$) phenotype was found 9% in tribal population and 10.7% in non-tribal population of Himachal Pradesh.**

**Keywords :** Allelic frequency, Blood Groups, Tribal and Non- Tribal population.

## INTRODUCTION

The Indian populations comprised of about 4,000 endogamous groups are stratified into various castes and tribes bound together by social factors, offering an excellent scope for genetic studies (Bhasin *et al.*, 1992) The population genetic studies carried out in Himachal Pradesh (Bhasin *et al.*, 1992, Papiha *et al.*, 1996) and northwest India are quite limited (Kushwaha *et al.*, 1990, Yadav and Gupta 1992, Yadav *et al.*, 1997*a*, 1997*b*, 2001, Yadav and Singh 2002)Tribes and non-tribes occupy 40% to 60% of the total geographical area of the state. The study aimed at investigating the distribution of serological trait among tribal and non-tribal populations in Himachal Pradesh.

## MATERIAL AND METHOD

The tribes are mostly engaged in semi-agricultural activities. Festivals and fairs are an important part of cultural life of people. Serological data were collected from individual residing in different localities in Pangi and Keylong of tribal region and Shimla, Solan, Mandi Hamirpur and Palampur in non-tribal regions of Himachal Pradesh. For each regions 1000 unrelated individual were randomly sampled. The following traits investigated and their allele frequencies were analyzed.

Investigations were made following standard technique of Weiner and Lourie (1969). The red blood cells were typed for ABO and Rh (D) systems following standard serological techniques. Tests with antisera Anti-A, Anti-B and Anti-D were performed by conventional slide agglutination method. The gene frequency was calculated by using Hardy and Weinberg Law of Equilibrium (1908) *i.e.*, $(P + Q)^2 = 1$ and $P^2 + Q^2 + 2PQ = 1$ To test the significance of results, Mean, Standard Deviation (S.D), Coefficient of Variation (Snedecor and Cochran, 1976) and Fisher "*t*-test were applied in the study.

## RESULT AND DISCUSSION

The distribution of ABO blood group system studied has been shown in Table 1 for the two populations. In the non-tribal population blood group B (31.0%) is predominant followed by group A (27.0%), O (24.0%) and AB (18.0%).In the tribes blood group B(44.0%) predominant followed by O (23.0%), A (22.0%) and AB (11.0%).

**Blood Group 'O':**

In the non-tribal population the incidence of blood group O with Rh factor is shown in Table 1. Comparative statistically analyzed data for phenotypic frequency of blood group O-ve showed non significant differences in both the regions. The coefficient of variation for phenotypic frequency was higher for O, $O^{+ve}$, and $O^{-ve}$ in the tribal region which shows the variations for these groups with $Rh^{-ve}$ and Rh+ve factor in the tribal populations.

Genotypic frequency had non significant values for blood group O and $O^{+ve}$ which showed the variability in both regions where as $O^{-ve}$ showed the significant values in both the regions (Table 2). Co-efficient of variation was higher for group O, $O^{+ve}$ and $O^{-ve}$ in tribes. Nath, *et al.*, (2000) reported group O higher with $Rh^{-ve}$ factor remarkably low among Adi (mixed) tribal population of Arunchal Pradesh. Reedy and Papa Rao (1995) also reported the highest frequency of O group among the Sugalis tribes in Andhra Pradesh. In the present investigation the phenotypic frequency of blood group O showed close resemblance with other population of Punjab *i.e.* Bazigar (28.79%) (Sidhu and Sidhu 1988), Chamars (27.67%) (Sidhu 1994) and Khatik Harijans (28.57%) (Sidhu, 1999). Similar observations were made by Bhattacharjee (1954), Balgir and Dutta (1990), Naidu and Misra (1995) and Singh, *et al.*, (1997)

**Blood Group 'A':**

The blood group A with Rh factor (27%) was in the non-tribes and (22%) in the tribes (Table 1). Statistically

analyzed data for phenotypic frequency of this blood group showed significant differences ($p < 0.01$) values for A and $A^{+ve}$ whereas $A^{-ve}$ was non-significant. These values recorded for phenotypic frequency showed the variation for A and $A^{+ve}$ blood groups in both the regions. In case of $A^{-ve}$ the homogeneous distribution found in tribal and non-tribal populations.

**Table. 1: Comparative Statistically Analyzed Data of Phenotypic Frequencies of Blood Groups (Rh+ve, Rh-ve) Collected from Non-tribal/Tribal Populations.**

| *S. No.* | *Blood Group* | | *Rh$^{+ve}$* | | | *Rh$^{-ve}$* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | N.T. (q2) | T (q2) | P.D. | N.T. (2pq) | T (2pq) | P.D. | N.T. (p2) | T (p2) | P.D. |
| 1. | O | R.V. | 26-16 | 30-16 | | 30-16 | 28.13 | | 5-1 | 3-1 | |
| | | X | 24.000 | 23.000 | 4.17 | 22.800 | 21.300 | 6.58 | 2.800 | 1.700 | 39.29 |
| | | S.D. | 4.397 | 5.011 | | 4.614 | 5.478 | | 1.317 | 0.823 | |
| | | SEx | 1.391 | 1.585 | | 1.459 | 1.732 | | 0.417 | 0.260 | |
| | | C.V. | 18.32 | 21.79 | | 20.24 | 25.72 | | 47.04 | 48.41 | |
| 2. | A | R.V. | 32-22 | 25-19 | | 28-19 | 24-17 | | 4-1 | 4-1 | |
| | | X | 27.000 | 22.000 | 18.52** | 24.800 | 19.800 | 20.16** | 2.200 | 2.100 | 4.55 |
| | | S.D. | 3.091 | 1.944 | | 3.011 | 2.440 | | 1.033 | 0.994 | |
| | | SEx | 0.978 | 0.615 | | 0.952 | 0.772 | | 0.327 | 0.314 | |
| | | C.V. | 11.45 | 8.84 | | 12.14 | 12.32 | | 46.95 | 47.33 | |
| 3. | B | R.V. | 34-28 | 50-39 | | 32-24 | 47-34 | | 6-1 | 6-2 | |
| | | X | 31.000 | 44.000 | | 27.300 | 39.900 | | 3.700 | 4.000 | |
| | | S.D. | 2.055 | 3.162 | 41.94** | 2.263 | 3.957 | 46.15** | 1.494 | 1.333 | 8.11 |
| | | SEx | 0.650 | 1.000 | | 0.760 | 0.680 | | 0.472 | 0.422 | |
| | | C.V. | 6.63 | 7.11 | | 15.03 | 21.94 | | 40.38 | 33.33 | |
| 4. | AB | R.V. | 21-15 | 14-9 | | 19-12 | 14-8 | | 4-1 | 2-0 | |
| | | X | 18.000 | 11.000 | | 16.000 | 9.800 | | 2.000 | 1.200 | |
| | | S.D. | 1.826 | 1.700 | 38.39 | 2.404 | 2.150 | 38.75 | 1.054 | 2.214 | 40.00 |
| | | SEx | 0.577 | 0.538 | | 0.760 | 0.680 | | 0.333 | 0.250 | |
| | | C.V. | 10.14 | 15.45 | | 15.03 | 21.94 | | 52.7 | 65.75 | |

R.V = Range Variation, X = Mean, S.D = standard Deviation, SEx = Standard Error of Mean, C.V = Coefficient Of Variation
** = P < 0.001, N.T+ Non Tribes, T = Tribes, Q = Recessive, P = Dominant

Genotypic frequency had highly significant ($p < 0.01$) values for A and $A^{+ve}$. The $A^{-ve}$ blood group has non-significant values. Chahal et al., (1995) found the frequency of blood group A higher than B in the tribal population of Bhotia group from Tihari and Pauri districts of Uttar Pradesh Himalayas. Present investigations showed the slightly higher frequency of blood group A in the non-tribal (27%) as compared to the tribes (22%) (Table 2).

Various studies reported for the different caste of Punjab by Sidhu (1981), 27.32% in Bazigar, Ahuja and Sidhu (1981), 28.98% in Gujars, (Sidhu and Sidhu 1980), 20.50% in Sansis, Sidhu (1995), 20.67% in Sikh Harijans and Sidhu (1999), in Balmiki Harijans 20% and Khatik Harijans 23.81%. In the present investigations in the tribal region mixed type of population includes Bhotia, Rajput, Koli and Hali etc.

**Blood Group 'B':**

The blood group B with Rh factor was (31%) in the non-tribes and (44%) in the tribes (Table 1). Statistical data for phenotypic frequency of blood group B and $B^{+ve}$ have highly significant ($p < 0.01$) .Blood group $B^{-ve}$ has non-significant values for both the regions. These values showed the heterogeneous distribution for B and $B^{+ve}$ and homogeneous distribution for $B^{-ve}$ in both the regions. The coefficient of variation showed the variation for B and $B^{+ve}$ in the tribes, where as $B^{-ve}$ has variation in the non-tribal populations. Genotypic frequency also showed the variation for B and $B^{+ve}$ in the non-tribal, but the $B^{-ve}$ blood group has variation for tribal populations (Table 2). This shows that B blood group is more predominant in the tribal region as compared to the non-tribal regions.

Tiwari (1972) also reported the higher frequency of blood group B among caste population group of Southern Himalayas adjoining Tibet in northern region and showed higher frequency of blood group B.

**Table 2: Comparative Statistically Analyzed Data of Genotypic Frequencies of Blood Groups (Rh+ve, Rh-ve) Collected from Non-tribal/Tribal Populations**

| *S. No.* | *Blood Group* | | *Rh+ve* | | | *Rh-ve* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | N.T. (q2) | T (q2) | P.D. | N.T. (2pq) | T (2pq) | P.D. | N.T. (p2) | T (p2) | P.D. |
| 1. | r | X | 0.488 | 0.477 | 2.25 | 0.458 | 0.439 | 4.15 | 0.161 | 0.126 | 21.74* |
| | | S.D. | 0.048 | 0.053 | | 0.052 | 0.064 | | 0.041 | 0.030 | |
| | | SEx | 0.015 | 0.017 | | 0.016 | 0.020 | | 0.013 | 0.009 | |
| | | C.V. | 9.84 | 7.34 | | 11.35 | 14.58 | | 25.47 | 23.81 | |
| 2. | p | X | 0.260 | 0.182 | | 0.306 | 0.229 | | 0.747 | 0.766 | |
| | | S.D. | 0.023 | 0.018 | 30.00** | 0.033 | 0.040 | 25.16** | 0.038 | 0.019 | 2.54 |
| | | SEx | 0.007 | 0.006 | | 0.010 | 0.013 | | 0.012 | 0.006 | |
| | | C.V. | 8.85 | 9.89 | | 10.78 | 17.47 | | 5.09 | 2.48 | |
| 3. | q | X | 0.287 | 0.332 | | 0.324 | 0.360 | | 0.778 | 0.807 | |
| | | S.D. | 0.022 | 0.037 | 15.68** | 0.035 | 0.042 | –11.11* | 0.024 | 0.029 | 3.73* |
| | | SEx | 0.007 | 0.012 | | 0.011 | 0.013 | | 0.008 | 0.009 | |
| | | C.V. | 7.67 | 11.14 | | 10.80 | 11.67 | | 3.08 | 3.59 | |
| 4. | 2pq | X | 0.150 | 0.113 | | 0.199 | 0.165 | | 1.164 | 1.237 | |
| | | S.D. | 0.021 | 0.040 | 24.67** | 0.037 | 0.032 | 17.09* | 0.077 | 0.036 | 6.27* |
| | | SEx | 0.007 | 0.013 | | 0.012 | 0.010 | | 0.024 | 0.011 | |
| | | C.V. | 14.04 | 35.49 | | 18.56 | 19.42 | | 6.62 | 2.91 | |

R.V. = Range Variation, X = Mean, S.D. = Standard Deviation, SEx = Standard Error of Mean, C.V. = Coefficient of Variation ** = P < 0.001, N.T. + Non Tribes, T = Tribes, r = O, p = A, q = B, pq = AB

**Blood Group 'AB':**

The non-tribal population has (18%) AB blood group with Rh factor. The tribal population has (11%) AB blood group with Rh factors (Table 1). Comparative statistically analyzed data for phenotypic frequency of blood group has high significant values ($p < 0.01$) for AB and $AB^{+ve}$ and non significant values for AB-ve group. The coefficient of variation showed heterogeneity for AB, $AB^{+ve}$, and $AB^{-ve}$ in the tribal region ad homogeneity in non-tribal region.

Genotypic frequency also showed significant values ($p < 0.05$) for blood group AB, $AB^{+ve}$ and $AB^{-ve}$ indicating the variation in both regions (Table 2). Coefficient of variation showed great variation for group AB and $AB^{+ve}$ in the tribal population. The $AB^{-ve}$ blood group showed variation in non-tribal population (Table 2). Nath, *et al.*, (2000) recorded least value for AB group in Adi (mixed) tribal population of Arunachal Pradesh. In the present investigation the phenotypic frequency of blood group AB showed close resemblance with other population of Punjab *i.e.* Bazigar (7.76%) (Sidhu and Sidhu 1988), Chamars (9.0%) (Sidhu 1994) and Khatik Harijans (9.52%) (Sidhu, 1999). In the present investigation tribal population has also showed low incidence (11%) of AB blood group.

**Rh factor**

The incidence of $Rh^{+ve}$ (89.3%) and $Rh^{-ve}$ (10.7%) was found in the non-tribes where as in the tribal population of $Rh^{+ve}$ (91.0%) and $Rh^{-ve}$ (9.0%). Result presented in the (Table 1) showed lowest incidences of $Rh^{-ve}$ factor and highest $Rh^{+ve}$ in both the regions. Similarly Chahal (1995) observed low incidence of Rh-ve factors (1.67-7.82%) in the caste population of Garhwal division of Uttar Pradesh, and for Brahmin and Rajput of Garhwal (4.8-7%) (Tiwari and Bhasin, 1968). Paramanik and Paramanik (2000) also found lowest frequency of $Rh^{-ve}$ (3.33%) and highest for Rh+ve (96.66%) in the Nepalese students. Same results were observed for $Rh^{+ve}$ factor in the present investigations from in both non-tribal and tribal regions (Table 1).

## CONCLUSION

The pattern of ABO blood groups distribution of Himachal Pradesh is similar with that of North-west Indian population. The present serological investigation has demonstrated great heterogeneity in the distribution of the ABO and Rh (D) blood groups among caste and tribal populations inhabiting Himachal Pradesh. Predominance of the B blood group and lowest incidence of the Rh (D)-phenotype observed in both non-tribal and tribal population of this study is indeed a characteristic of Tibetans also. Several immigrant samples of that have now been investigated from different parts of India (Mourant *et*

*al.*, 1976: Bhasin *et al.*, 1992). The study suggests the close genetic affinities between different Bhotia groups of tribal region and Tibetans. In addition, close geographical proximity of the border districts of Lahoul Spiti and Kinnaur to Tibet and Garhwal in the north as well. The trade and cultural links between Bhotias and Tibetans over centuries have provided ample opportunities for continued gene flow between these populations.

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