



ABO BLOOD GROUP DISTRIBUTION AND GENE FREQUENCIES OF TELANGANA PEOPLE

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Abstract: This study examined the distribution of ABO and Rh blood groups among college students in Telangana, India. B +ve was the most prevalent blood group, followed by O+ve, with Rh-positive samples predominating (9.0% Rh-negative). A-ve and B-ve groups were equally represented, while AB-ve was rare. Compared to historical data, A+ve and A-ve groups have declined. The prevalence of O blood groups is increasing, with its overall frequency approaching that of B blood groups, suggesting a potential shift towards O group dominance. These results indicate a change in ABO blood group distribution in Telangana, possibly due to selective marriages between heterozygous B and O alleles.

Key Words: Blood groups, Alleles, Gene frequency, Rh antigen and Telangana.

I. INTRODUCTION:

The ABO blood grouping system, discovered by Karl Landsteiner in 1901, categorizes blood based on the presence or absence of antigens A and B on red blood cells, resulting in four main blood types: A, B, AB, and O. Understanding this system is crucial for safe blood transfusions and has broader applications in fields like forensics and population studies.

Red blood cells (erythrocytes) have antigens on their surface that determine blood type whereas plasma contains antibodies that react with antigens that are not their own. There are four blood groups based on this antigen present on RBC membranes, they include, Group A, B, AB and O.

Besides the ABO system, the Rh (Rhesus) system is another important blood group system, this depends on the

presence of antibodies against the Rh antigens. There exist Positive or negative for every group

The ABO blood group antigens are encoded by one genetic locus, the ABO locus, which has three alternative (allelic) forms—A, B, and O. A child receives one of the three alleles from each parent, giving rise to six possible genotypes and four possible blood types (phenotypes).

OBJECTIVES:

- 1.To find the dominant Blood groups in Telangana state of India.
- 2.To find the prevalence of homozygous and heterozygous alleles distribution in Telangana.
- 3.We can know the change in Genotypic frequencies of Blood group antigen in due course of time in our Telangana state.

II. METHODS AND MATERIALS:

The red cells contain different types of agglutinogens and plasma contains agglutinins. In order to determine the blood group of a subject, the red cells are allowed to react with sera containing known agglutinins.

An agglutination test is done with, Anti-A Serum, Anti-B serum and Anti D Serum to determine the blood group. Results obtained were tabulated. In addition to the results obtained, some previous results are taken periodically from the reliable sources for the purpose of comparison and to get the findings about evolution of blood groups.

Calculation of allele frequencies is done by using Hardy-Weinberg equation and the genotypic frequencies are also calculated by considering the allelic frequencies obtained so far.

III. OBSERVATIONS AND RESULTS:

The results obtained based on agglutination test to recognize the blood group are tabulated for further analysis.

Table-1

ABO and Rh (D) blood group distribution:

| Blood Group | Percentage 2025 Hyderabad | Percentage 2018 Hyderabad | Percentage 2016 In Karimnagar District. | Percentage 2013-14 Hyderabad |
|-------------|---------------------------|---------------------------|---|------------------------------|
| | | | | |



| | | | | |
|--------|---------|--------|-------|--------|
| A +Ve | 17.1% | 31.0% | 14.2% | 29.02% |
| A -Ve | 1.80% | 8.0% | 3.5% | 0.68% |
| B +Ve | 34.23 % | 9.0 % | 41.0% | 27.87% |
| B -Ve | 1.80 % | 2.0% | 3.5% | 0.45% |
| AB +Ve | 6.30 % | 2.0% | 1.7% | 8.33% |
| AB-Ve | 0.00 % | 0.00 % | 0.0% | 0.74% |
| O +Ve | 33.33% | 35.0% | 35.7% | 31.78% |
| O -Ve | 5.40 % | 13.0 % | 0.0% | 1.03% |

Table-2
 ABO and Rh (D) blood group distribution:

| Blood Groups | Percentage 2025 | Percentage 2018 | Percentage 2016 | Percentage 2013-14 |
|--------------|-----------------|-----------------|-----------------|--------------------|
| Positive | 90.99 % | 77.0% | 92.6% | 97.06% |
| Negative | 9.001 % | 23.0% | 7.0% | 2.94% |

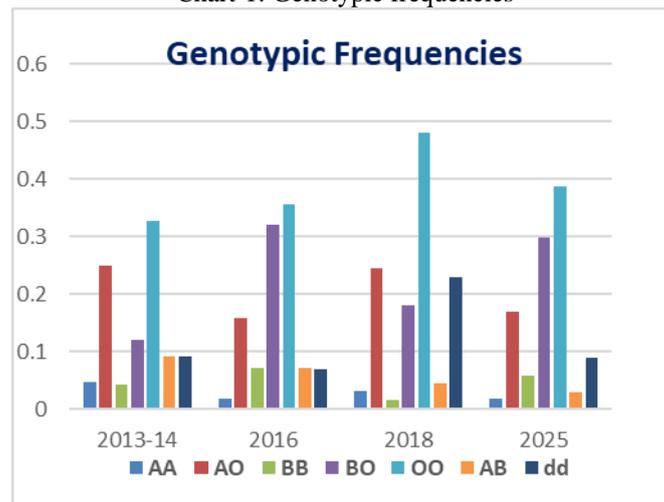
Table-3
 Calculation of allele frequencies:

| Blood Group alleles frequency | 2013-14 | 2016 | 2018 | 2025 |
|---|----------------|-------------|-------------|-------------|
| Calculation of O allele frequency I^O (r) | 0.5728 | 0.5974 | 0.6928 | 0.6223 |
| Calculation of A allele frequency I^A (p) | 0.2178 | 0.1333 | 0.1772 | 0.1368 |
| Calculation of B allele frequency I^B (q) | 0.2094 | 0.2693 | 0.13 | 0.2408 |
| Calculation of D allele frequency I^d (u) | 0.3039 | 0.2645 | 0.479 | 0.3000 |
| Calculation of D allele frequency I^D (v) | 0.6961 | 0.7354 | 0.520 | 0.700 |

Table- 4:
 Calculation of genotypic frequency:

| | 2013-14 | 2016 | 2018 | 2025 |
|--------------------------|----------------|-------------|-------------|-------------|
| AA= p² | 0.0474 | 0.0177 | 0.0313 | 0.0187 |
| AO= 2pr | 0.2495 | 0.1592 | 0.2455 | 0.1702 |
| BB= q² | 0.0438 | 0.0725 | 0.0169 | 0.0579 |
| BO= 2qr | 0.1199 | 0.3217 | 0.1801 | 0.2996 |
| OO= r² | 0.3280 | 0.3568 | 0.4799 | 0.3872 |
| AB= 2pq | 0.0912 | 0.0717 | 0.0460 | 0.0305 |
| dd= u² | 0.0923 | 0.0699 | 0.2294 | 0.09 |

Chart-1: Genotypic frequencies



IV. FINDINGS AND RESULT ANALYSIS:

For this study I have collected blood samples of our college students (representing from different regions of Telangana) to detect the blood groups. I found that, B +ve blood group is dominated over all the blood groups followed by O +ve group. Most of the blood samples were detected as positive group against the 9.0% of negative blood groups.

From the table -1, is found that both A and B negative groups are equal in Telangana state. It is observed from the blood groups screened that, only 6.3% students blood group is found AB +Ve and Zero or No students were found with AB -Ve blood group. From this finding it is confirmed that, AB -Ve blood group is very rare blood group and still becoming rare as the occurrence of this group is declined due to the genetic variations or selective marriages among the communities of Telangana state. There appears a big decrease in A +Ve blood group compared to 29.02 % of 2013-14 and 31.0% of 2018. It is also found that, even there is a huge drop down in the percentage of A -Ve group when compared against the 3.5% of 2018 and 8.0% of 2018.

Next to the B +Ve group O +Ve group became the second largest group in Telangana.

O +Ve students contributed a total of 33.33 % in our Telangana. Whereas O -Ve group is also prevalent to the expected extent and is of 5.4%.

The British and West Europeans have a high percentage of groups O and A. Indians have a high frequency of group B since 1980s. More over my findings surprised that, O +Ve grouping is gradually raising in Telangana due to selective marriages and cumulative effect of alleles for blood group antigens.

A total of B group students irrespective Rh factor was 36.03% and a total of O blood group are 38.7 i.e. inclusive of negative blood group. These findings indicate that gradually O Blood group is increasing and may surpass the B blood group in the near future. All my findings shown the

new scenario in Telangana state that, marriages in Telangana are being taken place between heterozygous persons for B, and O blood groups.

From the Table-2, further it is clear that, even the negative blood group percentage is seen declining gradually in due course of time. AB -Ve blood group is found at zero percentage, that means Rh factor in AB blood group persons is in the way of missing due to genetic changes. Whereas the Rh allelic frequency for O blood group is standing high compared to all other negative blood groups.

From the Table-3, it is observed that, the allelic frequency of I^O is increasing from 2013 to 2025. This is the probable reason for raise in O blood group in Telangana. The allelic frequency of I^B is also slightly increasing by replacing I^O allele from 2013 to 2025. It is evident from the table-3 that, there is a slight decrease in I^d allele frequency and slight increase in the frequencies of I^D allele.

From the table-4 of genotypic frequencies, it is clear that, the frequency of homozygous A gene frequency is reducing from 2013 to 2025. Not only the homozygous but heterozygous A gene frequencies are also brought down from 2013 to 2025. Whereas a rapid growth in the homozygous B frequency is noticed along with a steady increase in heterozygous B gene frequencies. The gene frequency of I^O is increasing all the time on par with B. Hence one can expect the O surpass the B within a short period if there are no further migrations. It also found and made it clear that a gradual and continuous decline in AB gene frequencies in Telangana population.

V. CONCLUSION AND SUGGESTIONS:

Blood groups in Telangana state are determined by random sampling in BJR Govt. College as the students representing different districts and areas of Telangana state. There appeared a change in blood group percentages of ABO Blood groups in Telangana due to selective marriages and



variations. As compared to previous data of India a deviation has occurred in the percentages ie a shift from dominant B blood group to O blood group. As of now a slight difference is seen B and O blood group +Ve percentages. But when a total positive and negative groups for these two groups are considered O Blood group is raising and dominating.

The common belief and fact that, The British and West Europeans have a high percentage of groups O and A. Indians have a high frequency of group B. is need to be changed. This is due to cumulative effect heterozygous alleles which brought a profound change in expression of blood groups.

It is suggested that, the globalization, sharing of gene pool, and immigrations are help full in bringing the variations and reducing the negative blood group trait. The intercommunity and interreligious marriages and possibly due to selective marriages between heterozygous B and O alleles. Continuous and regular screening of blood groups may help to understand the genetic changes in terms of blood group antigens.

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