



Original Research Article

Distribution of ABO and Rhesus Blood Groups in North Coastal Andhra Pradesh, Visakhapatnam

Authors

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Abstract

Introduction: *The incidence of ABO and Rh blood groups varies markedly in different parts of India. Knowledge about blood group distribution is useful in blood bank inventory management thereby reducing morbidity and mortality. It is also useful for parental testing, legal medicine and population genetic studies*

Material and Methods: *The study was conducted in GIMSR Blood bank and local licensed blood bank in north coastal Andhra Pradesh Visakhapatnam over a period of 3 years from 1 April 2015 to 31 March 2018. ABO blood grouping and Rh typing were done by Gel card and tube agglutination methods.*

Results: *During this period 70173 blood groups were performed. The study revealed the commonest blood group was O (39.12%) followed by B(30.57%), A(24.78%) and AB (5.53%)*

Conclusion: *The most common blood group in our donors was O positive and the least common was AB negative.*

Introduction

Karl Landsteiner is the father of blood banking. He discovered ABO blood grouping system in 1900 which marked the beginning of modern blood banking and transfusion medicine¹. He drew blood from himself and his five colleagues, separated the cells and serum, and then mixed each cell sample and serum. He was unknowingly the first individual to perform the forward and reverse grouping². Blood groups are proteins, carbohydrates linked to glycolipids or glycoproteins on the cell wall depending on the blood group system.

Approximately 700 erythrocyte antigens are described and arranged into 30 blood group systems by the International Society of Blood Transfusion of which ABO and Rh are important³.

The Landsteiner's invention opened the door to the birth of a wide spectrum of discoveries in the field of immune hematology, blood transfusion among humans irrespective of their origin, unmatched pregnancy, legal medicine, anthropology and the discovery of other new blood group systems, all are supposed to be the sequel of Karl's discovery^{4,5}

Rh group system was discovered in 1940 by Alex Wiener, Philip Levine and R.E. Stetson⁶.

The major clinical disease associated with the Rh blood group system is hemolytic disease of the fetus and newborn (HDFN). HDFN usually arises when a mother who is blood group D- carries a fetus who is blood group D+, and fetal red cells released into the maternal circulation immunize the mother to make antibody to D, which traverses

the placenta and damages the fetus. In severe cases anti-D crosses the placenta and causes death of the fetus in utero, a condition known as hydrops fetalis. More commonly, disease occurs in the neonatal period, where severe and acute anemia and severe jaundice is fatal, a condition known as icterus gravis neonatorum.⁷

Besides their presence on red blood cells these antigens are also expressed on tissues other than red cells this fact is important to consider in organ transplantation⁸.

Diseases like duodenal ulcer, diabetes mellitus, urinary tract infection are more frequently associated with certain blood groups⁹

People with blood group A suffer Coronary heart disease, ischemic heart disease, venous thrombosis and atherosclerosis more commonly than people with group O. It may be due to Non-group O patients have a greater risk of venous thrombo embolism than patients of group O and have higher levels of von Willebrand factor (vWF) and factor VIII^{10,11,12}. Again, people with blood group O have reduced risk of squamous cell carcinoma as well as reduced risk of basal cell carcinoma and pancreatic cancer as compared to any other blood groups^{13,14,15}. Similarly gastric cancer is more prevalent in people with group A but least common in group O. Again, female with group B are more prone to develop ovarian cancer.

Apart from their importance in blood transfusion practice, the ABO and Rh blood groups are useful in population genetic studies and researching population migration patterns.

Many studies have been conducted on the distribution of blood groups in our country. Blood group distribution varies with place to place and from time to time within the same place. So it is necessary to do blood grouping studies in all the regions for supplying the blood in times of need.

The blood bank stock keeps on changing everyday and it is very difficult to predict which group donor to accept for donation and whom to reject.

The objective of this study was to indentify the distribution of ABO and Rh blood donors in

tertiary care hospital at Gitam institute of medical sciences and research Hospital, Visakhapatnam, North Andhra Pradesh as well as licensed blood bank in Visakhapatnam.

Material and Methods

The present retrospective study was carried at department of pathology by collecting data from blood bank of Gitam institute of medical sciences and research (A tertiary care teaching hospital) and local licensed blood bank, Visakhapatnam, North Andhra Pradesh during the 3year period from april 2015 to march 2018.

The blood collections were taken from the voluntary donors at outdoor blood donation camp and in-house blood bank as well as from replacement donors at blood bank.

Total 70173 donors were accepted for blood donation during the study period.

The donor selection criteria was age between 18-60 years, weight more than 45 Kgs and hemoglobin content greater 12.5gm/dl. Blood pressure, pulse rate, condition heart and liver is normal . They must have not suffered from any major ailments like jaundice, malaria in the recent past. They should not have donated blood for the last 3 months.

The blood samples were collected in EDTA containing vacutainer by venepuncture

ABO grouping is done by microtyping system (gel card). Each microtube has a gel that contains sodium azide as preservative and group specific antisera which is incorporated into the gel at the time of manufacture .washed red cells are added in the microtube . Incubation at 37 C for 5 minutes is followed by centrifugation which pulls the cells down. The red cells react with the specific antibody incorporated into the gel resulting in hemagglutination. Agglutinated red cells are too large to pass through the gel matrix which acts a sieve and are trapped at various places within the gel forming a line in the microtube indicating positivity of the test. In case the specific antigen is not present on the red cells, agglutination does not

occur and the red cells pass through the gel forming a pallet at the bottom of the microtube. For Rh typing anti-D (R0 & R1, anti Ig M and blend of anti Ig M and anti Ig G) antisera were used and done by tube method. Rh negative blood groups were confirmed by antiglobulin technique. All weak D groups were considered as Rh positive. The antisera used were from tulip and span diagnostics

Results

Total donors studied from 1 April 2015 to 31 March 2018 were 70173 of which 40,541 (57.77%) were voluntary donors and 29632 (42.23%) were replacement donors.

Males donors were 67121 (95.65%) and females were 3052 (4.35%).

Table 1 shows the distribution of ABO and Rh blood group systems

O blood group individuals in our population accounted for 39.12% (O + ve 37.16% and O - ve 1.96%). This is followed by blood group B 30.57% (B + ve 28.74% and B - ve 1.83%) then by blood group A 24.78% (A+ ve 23.79% and A -ve 0.99%) and blood group AB 5.53% (AB +ve 5.31% and AB -ve 0.22%)

Rh (D) +ve were 94.99% and Rh (D) -ve were 5.01%.

Table 1 Distribution of ABO and Rh blood group systems

BLOOD GROUPS	TOTAL STUDY SUBJECTS	PREVELANCE (%)
ABO blood group		
A	17389	24.78
B	21452	30.57
AB	3880	5.53
O	27452	39.12
Rhesus(D)blood group		
Rh positive	66662	94.99
Rh negative	3511	5.01

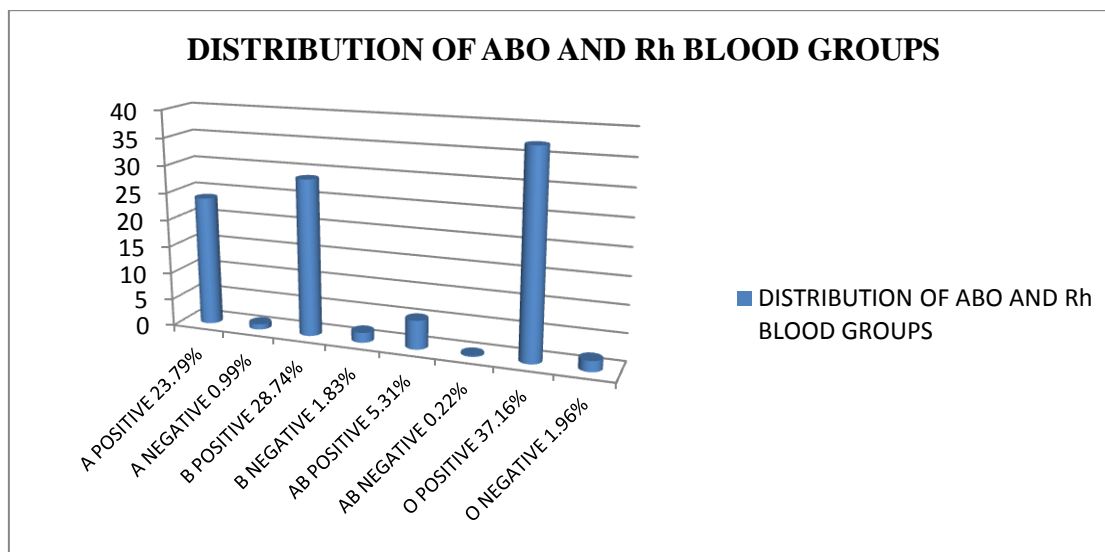
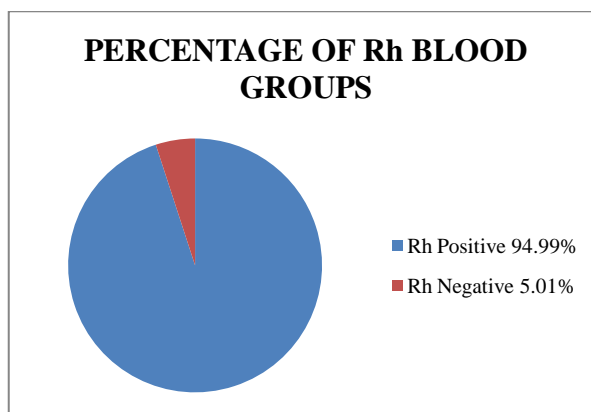
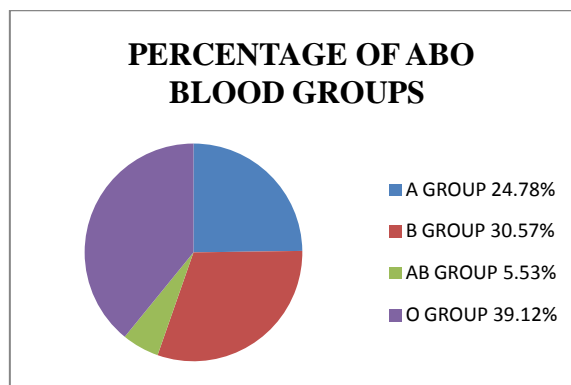


Table 2 Distribution of ABO and Rh blood groups among study population

BLOOD GROUP	TOTAL DONORS	PREVELANCE (%)
A POSITIVE	16693	23.79%
A NEGATIVE	696	0.99%
B POSITIVE	20165	28.74%
B NEGATIVE	1287	1.83%
O POSITIVE	20679	37.16%
O NEGATIVE	1373	1.96%
AB POSITIVE	3725	5.31%
ABNEGATIVE	155	0.22%

Discussion

In our study the proportion of female donors was very less 3052 (4.35%) this may due to anemia,

illiteracy, lack of motivation, taboo that blood donation causes weakness. In addition women are rejected from donating blood during menstruation, pregnancy and lactation. Again most of the females are proved to be unfit due to low weight, low hemoglobin due to repeated pregnancies .So the health of the women must be improved by educating them about nutritious diet, iron supplementation, and preventing multiple pregnancies and abortions. Similar findings were observed in a study done by saha et al in jadvapur, Kolkata ¹⁶

Table 3 Comparison of frequency percentage of ABO and Rhesus blood group in different parts of India

Population	A	B	AB	O	Rh positive	Rh negative
Northern India						
¹⁷ Lucknow	21.73	39.84	9.33	29.10	95.71	4.29
¹⁸ Punjab	21.91	37.56	9.3	31.21	97.3	2.7
¹⁹ Jodhpur	22.2	36.4	9.4	31.7	91.75	8.25
Western India						
²⁰ Western Ahmedabad	21.94	39.40	7.86	30.79	95.05	4.95
²¹ Eastern Ahmedabad	23.30	35.50	8.80	32.50	94.20	5.80
²² Surat	24.10	34.89	8.69	32.32	94.18	5.82
²³ Maharashtra	23.38	31.89	8.72	30.99	95.36	4.64
Eastern India						
²⁴ Durgapur (steel city)	23.90	33.60	7.70	34.80	94.70	5.30
Southern India						
²⁵ Bangalore	23.85	29.95	6.37	39.82	94.2	5.8
²⁶ Vellore	21.86	32.69	6.70	38.75	94.5	5.5
²⁷ Davangere	26.15	29.85	7.24	31.76	94.8	5.2
²⁸ Shimoga – Malnad	24.27	29.43	7.13	39.17	94.93	5.07
Present study	24.78	30.57	5.53	39.12	94.99	5.01

The studies in Northern India by authors like Tulika Chandra et al¹⁷ at Lucknow, and by Sidhu et al¹⁸ studies at Punjab, and Western India like in Eastern Ahmedabad by Wadhwa MK et al²³, Western part of Ahmedabad by Patel, Piyush et al²⁰ and studies done at Surat by Nidhi et al²¹, revealed B group is more common than O group followed by A and AB. Our study in contrast showed O group more common than B group.

The studies in Eastern India at Durgapur by Nag et al²⁴ showed O group to be the commonest group which is the same blood group distribution as southern India.

Studies done in Southern part of India by Periyavan A et al²⁵ at Bangalore, Das PK Nair et

al²⁶ at Vellore, and at Davanagere by Mallikarjuna S et al²⁷ and at Shimoga- Malnad study done by Girish et al²⁸, found that the commonest blood group was O followed by B, A and AB which are same as our study.

The percentage of Rh positive blood groups varied from 94% to 98% and Rh negative varied from 2% to 6% in India. Our results also were similar with Rh positive 94.99% and Rh negative 5.01%

Conclusion

It is concluded that O blood group is significantly high and AB blood group is low in our population Knowledge of blood group distribution helps to prepare database for blood banks and also create

awareness as to which blood groups should be stored and given importance

It is also important and useful for medical diagnosis, genetic information, genetic counseling, forensic medicine needs, and also for the general wellbeing of individual

In short blood group database provide data about blood group availability in case of emergencies and insight into future burden of diseases

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