



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 1(J), pp. 23601-23605, January, 2018

**International Journal of
Recent Scientific
Research**

DOI: 10.24327/IJRSR

Research Article

FREQUENCY DISTRIBUTION OF ABO AND RHESUS BLOOD GROUPS AMONG MBBS STUDENTS IN A HILLY STATE OF NORTH INDIA

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DOI: <http://dx.doi.org/10.24327/ijrsr.2018.0901.1497>

ARTICLE INFO

Article History:

Received 15th October, 2017
Received in revised form 25th
November, 2017
Accepted 23rd December, 2017
Published online 28th January, 2018

Key Words:

ABO, Rhesus, blood group.

ABSTRACT

Background: The ABO blood group system was the first human blood group system to be discovered by Landsteiner in 1900. The second type of blood group is the rhesus system. Beside playing an integral role in blood transfusion service, blood groups are also useful in inquiring about populace hereditary qualities, migration patterns, settling medico legitimate issues especially of debated paternity and forestalling erythroblastosis foetalis. The present study was carried out with the aim of determining the ABO and Rhesus blood group distribution among MBBS students at tertiary care hospital in a hilly state of North India.

Materials and Methods: A cross sectional investigation was directed to decide the distribution of the type ABO blood and Rhesus factor among all the students of Indira Gandhi medical college, Shimla. Blood sample from all medical students consented to give blood was taken by Scrub the middle finger with a sterile disposable lancet. The assurance of the ABO and Rhesus (RhD) blood groups was done.

Result: In our study, 467 were given consent among all the students of Indira Gandhi medical college, Shimla and were tested. This consisted of 222 males and 245 females between ages of 17 and 24. In our examination, the most frequently occurring blood group was B group (37.9%) trailed by O (27.62), A (23.13%) and AB group (11.35%). The frequency of Rh positive group (93.15%) was more than Rh negative group (6.85%). Same pattern of B, O, A and AB is followed in Rh positive blood group distribution although in Rh-negative, O group took after by B, A AB.

Conclusion: This investigation affirmed that ABO and Rh antigenic structures found in the medical students of IGMC Shimla follows the familial pattern prevalent in Northern India. The study helps in preparing a database of the medical students and its multipurpose future utilities like supplying blood to the needy patients during emergency.

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INTRODUCTION

The discovery of the ABO blood groups by Landsteiner in 1900 was a critical accomplishment in the historical backdrop of blood transfusion that was trailed by the revelation of Rh (D) antigen in 1940 by K. Landsteiner and A.S. Weiner from rabbits vaccinated with the blood of the monkey *Macaca rhesus*.¹

The ABO blood group system is the only system in which antibodies are consistently and predictably present in the serum of normal individuals whose red cells lack the antigens.

Determination of ABO blood groups is done by detecting A and B antigens. In addition, known red cells are used to detect anti-A and anti-B in the serum, by a process called 'reverse' grouping. People are separated into 4 noteworthy blood groups in particular A, B, AB and O groups relying upon the antigen show on their RBCs There are only two Rh phenotype such as Rh positive and Rh negative, depending on whether Rh antigen is present on the red cell or not.²

ABO and Rh gene phenotypes vary widely across races and geographical boundaries despite the fact that the antigens involved are stable throughout life.³ Apart from differences amongst species, differences between the individuals of the

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same species have also been demonstrated.⁴ Attempts have been made to classify the racial groups of mankind according to the incidence of known blood groups.⁵

Apart from the significance in blood transfusion, the revelation of ABO and Rh blood groups has contributed hugely to population genetic studies, hereditary investigations of populaces, estimating the availability of compatible blood, evaluating the probability of hemolytic disease in the new born, resolving disputes in paternity/maternity and for forensic purposes.^{6,7} A few investigations have additionally revealed the relationship of ABO blood group with certain neurotic conditions; for instance a higher commonness of stomach disease has been found among individuals with blood group A, people with O blood group are more powerless to intestinal sickness contamination than non O blood group people.⁸

Knowledge of blood group distribution is also important for clinical studies, for reliable geographical information and it will help a lot in reducing the maternal mortality rate, as access to safe and sufficient supply of blood will help significantly in reducing the preventable deaths.⁹

The present study was done to assess the information on the distribution of ABO and Rh blood groups among medical students in a hilly state of North India and its multipurpose future utilities for the health planners.

MATERIALS AND METHODS

Blood samples from all the medical student (Batch 2013-17) were obtained with their consent upon request. Blood from every student in medical college was taken by Scrub the center finger with a bit of cotton immersed with 70% alcohol and pierce it with a sterile disposable lancet and was put a little drop of blood on a three clean white glass slide on which a couple of drops of antisera for blood group A and B was applied. A drop of each of the antisera, anti A, anti B and anti D was added and mixed with each blood sample, with the aid of applicator stick.

Blood was blended altogether with the antisera and shook tenderly for 60 sec to watch agglutination. The slide was then tilted to recognize for agglutination and the outcome recorded accordingly. In instance of uncertainty, the test was analyzed under a magnifying lens, or the outcomes were affirmed by switch gathering utilizing known group A and B red cells.

The antigen show on the surface of RBC agglutinates with the antibody exhibit in the antisera. Consequently, blood group was determined in light of agglutination with the corresponding anti sera. On the off chance that agglutination was available in the blood drop on slide denoted A, at that point it has a place with A blood group, agglutination in blood drop slide B, B group, agglutination in both A and B drops, AB group and if there was no agglutination in both A and B drops, at that point O group. Thus, agglutination in blood drop on glass slide stamped D was considered as Rh Positive and no agglutination as Rh negative.

The collected Data was thoroughly screened and entered in Microsoft Excel spreadsheet 2007. Statistical analysis was done by using Epi Info 7 software. Descriptive statistics, frequency percentages was determined for categorical variables. To assess the differentials in relation to categorical variables, chi square test was used. A p value of < .05 was taken as significant

RESULTS

Four hundred sixty seven students were given consent among all the students of Indira Gandhi medical college, Shimla and were tested. This consisted of 222 males and 245 females between ages of 17 and 24. In our examination, the most frequently occurring blood group was B group (37.9%) trailed by O (27.62), A (23.13%) and AB group (11.35%). (Figure 1)

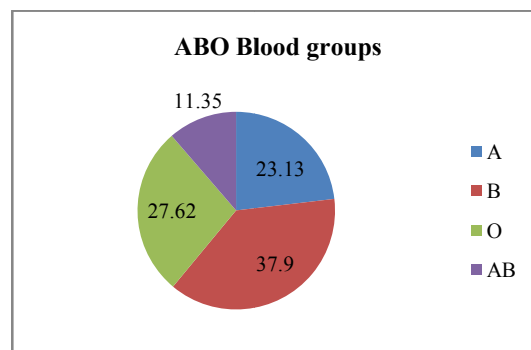


Figure 1 Percentage of ABO blood groups

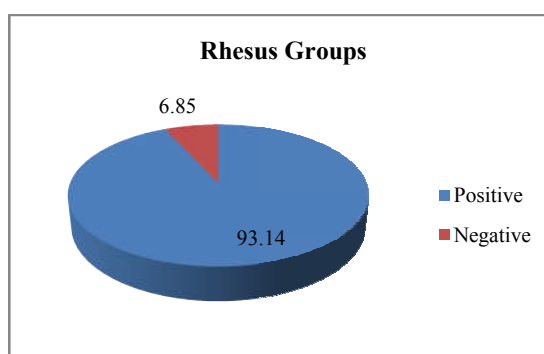


Figure 2 Percentage of Rhesus blood groups

Among the total students tested, 93.15% students were Rh positive while just 6.85% were Rh negative. (Figure 2) Same pattern of B, O, A and AB is followed in Rh positive blood group distribution though in Rh-negative, 2.36% with O- group and 2.14% to B- took after by 1.28A- and 1.07% AB-blood group. (Table 1)

On gender wise examination, 207 out of 222 male students (93.24%) were Rh positive whereas remaining 15 male (6.76%) students were Rh negative. Regarding females, 228 out of 245 females (93.06%) were Rh positive and 17 were Rh negative (6.94%). The difference between male and female were found insignificant. (p value=0.94)

DISCUSSION

ABO and Rh genes and phenotypes vary widely across races and geographical boundaries despite the fact that antigens

Table 1 Distribution of ABO and Rh Blood Group Systems among medical students

Blood Group	Numbers	% Age	Blood Group	Numbers	% Age	Blood Group	Numbers	% Age
A+	102	21.84	A-	6	1.28	A+/-	108	23.13
B+	167	35.76	B-	10	2.14	B+/-	177	37.90
O+	118	25.26	O-	11	2.36	O+/-	129	27.62
AB+	48	10.27	AB-	5	1.07	AB+/-	53	11.35
Rh+	435	93.15	Rh-	32	6.85	ABO/Rh	467	100

Table 2 Distribution of Rhesus blood groups between male and female

	Male	Percent	Female	Percent	Total	Percent
Rh positive	207	93.24	228	93.06	435	93.15
Rh negative	15	6.76	17	6.94	32	6.85
total	222	100%	245	100%	467	100%

Chi square value=0.006 p value=0.94

Among males pattern of B,0,A and AB blood groups is followed in Rh positive blood group distribution though in Rh-negative, 3.15% with O- group and 1.80 % to B-blood a group took after by 0.90 % A- and AB-blood groups both. While in female also the pattern of B,0,A and AB is followed in Rh positive blood group distribution though in Rh-negative, 2.44% with O- group ,1.63% each of B- & 0-took after by 1.22 % AB-blood group.

involved are stable throughout the life. Research on ABO group system has been of immense interest, due to its medical importance in different diseases, population studies resolving disputes of paternity, for forensic purposes etc. The ABO blood group system is not only important in blood transfusions, cardiovascular diseases, organ transplantation, erthroblastosis in neonates, but also one of the strongest predictors of national suicide rate and a genetic marker of obesity.¹⁰ The present study provides preliminary information about ABO and Rh frequency among the medical students of Indira Gandhi medical college Shimla. From this investigation, the frequency of blood group B was the most astounding with percentage frequency of 37.90%, trailed by blood group O with the percentage frequency of 27.62 %, A blood group a with the percentage of 23.13% and the lowest percentage frequency is that of blood group AB which is 11.35%.

Table 3 Distribution of Rhesus blood groups between male and female

	A+	B+	O+	AB+	A-	B-	O-	AB-	Total
Male	48	80	52	27	2	4	7	2	222
% Age	21.63	36.04	23.42	12.16	0.90	1.80	3.15	0.90	100%
Female	54	87	66	21	4	6	4	3	245
% Age	22.05	35.52	26.94	8.57	1.63	2.44	1.63	1.22	100%
Total	102	167	118	48	6	10	11	5	467

Table 4 Comparative study on frequency of ABO and Rh phenotypes at different geographical areas (in percentage)

Location	Place of Study	Authors	A	B	O	Ab	Rh+ve	Rh-ve
	Present Study	Sachdeva et al	23.13	37.90	27.62	11.35	93.15	6.85
Northern India	1.Himachal Pradesh	Pathania et al	27.0	31.0	24.0	18.0	89.3	10.7
	2.Kashmirvalley	Handoo et al	23.88	33.34	34.72	8.06	91.17	8.83
	3.Uttaranchal	Gauniyal et al	40.69	22.03	23.72	11.86	89.27	10.73
	5. Uttar Pradesh	Tulika et al	21.73	39.84	29.10	9.33	95.71	4.29
	6.Punjab	Sidhu S et al	21.91	37.56	31.21	9.3	97.3	2.7
Western India	7. Rajasthan	Shekhar et al	22.3	35.7	34.4	7.6	94.2	5.8
	8.Ahmedabad	Wadhwa et al	23.30	35.50	32.50	8.80	94.20	5.80
Central India	11. Madhya Pradesh	Gupta et al	24.15	35.25	31.50	9.10	95.43	4.57
	12.Chattisgarh	Shrivastava et al	22.17	35.42	33.55	8.17	96.85	3.15
	13.Manipur	Soram et al	23.9	35.7	34.4	7.6	94.2	5.8
Eastern India	14.Arunachal Pradesh	Prakash et al	13.0	40.0	42.0	5.0	99.0	1.0
	15. Meghalaya	Haloi et al	25.37	22.87	41.36	10.49	98.77	1.23
	16. West Bengal	Saha et al	13.31	36.52	31.27	10.15	99.97	0.03
	17. Jharkhand	Pandey et al	23.81	44.76	23.81	7.62	100	0
	18. Durgapur	Pandey et al	23.90	33.60	34.80	7.70	95.07	4.93
Southern India	19. Karnataka	Periyavan et al	23.85	29.95	39.81	6.37	94.20	5.79
	21. Andhra Pradesh	Reddy et al	18.95	25.79	47.37	7.89	90.6	8.42
	22.Pondicherry	Subhashini et al	20.5	39.5	34.0	6.0	93.5	6.5
	23. Telangana	Sukumaran et al	18.31	35.86	41.20	4.58	96.18	3.82
	24. Tamil Nadu	Das et al	21.86	32.69	38.75	6.70	94.5	5.5
Other Countries	25. Pakistan	Hammed et al	23.8	38	28.2	10	89.1	10.9
	26. Nepal	Pramanik et al	34.0	29.0	32.5	4.0	96.66	3.33
	27. West Iran	Zahara et al	34.2	16.2	33.7	7.0	91.1	8.9
	28. Macedonia	Kostovski et al	34.45	15.66	28.85	10.29	89.26	10.74
	29. Australia	Roteskreuz et al	38	10	49	3	81	19
	30. Usa	Mollison et al	41	9	46	4	85	15
	31. Uk	Frances et al	41.7	8.6	46.7	3	80	20

Comparative data on ABO and Rh frequency of various Indian populations at different geographical areas in India and abroad is presented in Table 4.

The studies done in Northern parts of India by authors like Pathania *et al*¹¹ at Himachal Pradesh, Tulika Chandra *et al*¹⁴ at Uttar Pradesh, and by Sidhu *et al*¹⁵ at Punjab, showed blood group B was the most transcendent, trailed by O, A and AB. The same incidence was found in our study i.e. B was more frequent than O and followed by A and AB blood groups while in another studies in North India like Handoo *et al*¹² at Kashmir and Gauniyal *et al*¹³ at Uttranchal found the O and A blood group most frequently in their studies respectively. Reason may be that both these state share international boundaries.

In Western parts of India like in Shekhar *et al*¹⁶ in Rajasthan and Wadhwa *et al*¹⁷ in Gujrat also showed blood group B is the commonest followed by O, A and AB which is same as in our study.

Study done at Central India like Gupta *et al*¹⁸ in Madhya Pradesh and Shrivastva *et al*¹⁹ in Chhattisgarh also revealed B group to be the most common followed by O, A and AB which is in consonance with present study.

Study done in Eastern part of India, Soram *et al*²⁰ in Manipur, Sah *et al*²³ West Bengal and Pandey *et al*²⁴ in Jharkhand found the B group to be the most frequent blood group similar to the present study while Prakesh *et al*²¹ in Arunachal Pradesh, Haloi *et al*²² in Meghalaya and Pandey *et al*²⁵ in Bihar showed O group to be the commonest group which is different from our study.

In Southern part of India studies done by Periyavan *et al*²⁶ at Karnataka, Reddy *et al*²⁷ in Andhra Pradesh, Sukumaran *et al*²⁹ at Telengana and Das *et al*³⁰ at Tamil Nadu found that the commonest blood group was O followed by B, A and AB whereas our study showed commonest blood group B followed by O, A & AB. Only the study done by Subhashini *et al*²⁸ at Pondicherry found the B blood group to be most frequent in the southern India like our study.

So, the geographical distribution of Blood Groups in India shows that in Northern, central & Western part of India, B is the commonest blood group where as in Eastern and Southern and Central, O is the most frequently occurring blood group.

Outside India, in Pakistan the study done by Hamed A *et al*³¹, the commonest blood group is B which is same as in our study. The study done in Australia by Red Cross Society³⁵, in UK by Frances *et al*³⁷ and in USA by Mollison *et al*³⁶ the commonest blood group was O, followed by A, B & AB. Another study done at Nepal by Pramanik *et al*³², Zahara *et al*³³ in Iran and Kostovski *et al*³⁴ in Greece found the commonest blood group was A trailed by blood group O, B and AB which which is not in agreement with the various studies in India. (Table 4)

Pertaining to Rhesus system, in our study frequency of Rh positive was 93.15 %, while only 6.85 % was Rh negative. These figures are similar to the figures from other studies carried out in different parts of India. In comparison similar frequencies of prevalence of Rh groups were found in Nepal, Pakistan, Iran and Greece whereas studies across USA, UK and Australia showed a higher fraction of prevalence of Rh negative groups.(Table 4)

In every one of the examinations referred to and including our examination, blood group AB is the least distributed among the number of inhabitants on the planet. (Table 4)

In our study the ABO blood groups and Rh positivity in both boys and girls showed that the blood group B positive was most prevalent followed by group O, A and AB. Also the difference between Rh positivity (93.24% vs 93.06%) and Rh negativity (6.76% vs 6.94%) between boys and girls were found insignificant.(p value=0.94) in our study.

To conclude, the commonest ABO blood group was group B in Northern India with Rh negativity at only 6.85%. These figures are similar to the figures from other studies carried out in different parts within the country and abroad. The study helps in preparing a database of the medical students and its multipurpose future utilities like supplying blood to the needy patients during emergency.

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How to cite this article:

Amit Sachdeva *et al.* 2018, Frequency Distribution of Abo And Rhesus Blood Groups Among Mbbs Students In A Hilly State of North India. *Int J Recent Sci Res.* 9(1), pp. 23601-23605. DOI: <http://dx.doi.org/10.24327/ijrsr.2018.0901.1497>
