

# ABO and Rh Blood Group Distribution among Medical Students in Mandya

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## ABSTRACT

**Introduction:** ABO and Rhesus (Rh) blood groups are useful in researching population genetics, migration patterns, resolving medico legal issues, particularly of disputed paternity, and preventing erythroblastosis fetalis. The knowledge of its distribution at various levels is helpful in the effective management of blood banks and safe blood transfusion services. Blood group distribution varies in different communities, races, populations and also from time to time in the same region. Hence the present study has been conducted to determine the ABO and Rh blood group distribution among medical students in Mandya.

**Material and methods:** The present study which is a cross-sectional observational study, was conducted on 82 first year medical students in the Department of Physiology, MIMS, Mandya, after taking their informed written consent and Institutional ethical committee clearance. The ABO and Rh blood grouping was determined by glass slide method which is based on agglutination of antigens with its corresponding antibodies. The data was expressed as percentages.

**Results:** In our study, the most frequently occurring blood group was B group (39.02%) followed by O (31.7%), A (26.8%) and AB group (2.4%). 95.1% students were Rh positive whereas only 4.9% were Rh negative. Same pattern of B,O,A and AB is followed in Rh positive blood group distribution whereas in Rh-negative, 50% belonged to A group and 25% each to B and O.

**Conclusion:** It can be concluded that B blood group is more common than other blood groups among ABO system and AB being the least. Rhesus positive blood groups were found to be more common than Rhesus negative.

**Keywords:** Blood Group, Distribution, Females, Males, Medical Students, Rh Typing

## INTRODUCTION

Karl Landsteiner, an Australian scientist, first discovered ABO blood group system in 1900 and identified A, B and O blood group types.<sup>1,2</sup> The O blood group was initially described as "C" type by Landsteiner as it signifies lack of antigens A and B. It is even rendered as "0" (zero) in some parts of Europe. In 1902, the fourth type of blood group, AB type was discovered by Alfred Von Decastello and Adriano Sturli.<sup>3</sup> In 1930, Noble Prize in Physiology or Medicine was awarded to Landsteiner for his work.<sup>1</sup>

The Landsteiner's discovery opened the door to the birth of a wide spectrum of discoveries in the field of immune haematology, blood transfusion, unmatched pregnancy, legal medicine and anthropology. Even the other blood groups discovered are deemed as a result of Karl's discovery.<sup>4,5</sup> Karl Landsteiner's discovery of ABO system was marked as an

important achievement followed by Rh antigen discovery in the blood transfusion history.<sup>6,7</sup>

The Blood groups are determined genetically by the presence of specific antigens on the erythrocytes (Red blood cells). The genes of ABO and Rh are located on chromosome nine and one. The antibodies against red blood cell antigens are called agglutinins and individuals are classified according to the presence or absence of antigens and agglutinins into four major blood groups, i.e. A, B, AB and O. The ABO and Rh blood group antigens are hereditarily transmitted and are used in studies relating to population genetics, to study patterns of population migration and also resolving certain medico legal issues, more so of issues of paternity disputes. The blood group studies are not only important in evolution but also in modern medicine where the relation between blood groups and diseases, environment is increasingly being studied.<sup>8-1</sup>

Also, some blood groups are more prone for some diseases like duodenal ulcer, diabetes mellitus, urinary tract infection, and blood group incompatibility in newborn.<sup>12</sup>

Percentages of people belonging to these blood groups are different in different communities. Blood group distribution also varies in different races. The frequency distribution pattern of ABO blood groups differ in the same population in different time zones and also differs in different populations. Hence, for the effective management of blood banks and safe transfusions, it is always helpful to have the knowledge of ABO and Rhesus blood groups distribution at local and regional levels.<sup>13</sup>

The significance of the Rh blood group is related to the fact that the Rh antigens are highly immunogenic. After ABO system, Rh blood group is the second most common and has 50 defined antigens. Among these many antigens, five antigens namely C,D,E,,c,d and e are more important. The terms commonly used in Rh system like Rh factor, Rh positive and Rh negative refers to D antigen and the presence or absence of this antigen. The D antigen, besides its role in transfusion, also is used in the determination of haemolytic disease of newborn (or erythroblastosis fetalis) for Rh disease management. Individuals who do not form

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D antigens in their body will produce anti D antibodies when they are exposed to D antigen present on RBCs in transfused blood. (causing a haemolytic transfusion reaction, HTR) or on fetal RBCs (causing haemolytic disease of new born, HDN). For this reason, the Rh status is routinely determined in blood donors, transfusion recipients, and in mothers-to-be. In order to prevent erythroblastosis fetalis, which arises due to the presence of Rh positive fetus in Rh negative mother, identification of Rh system becomes very important.

Blood group distribution knowledge is also important in reducing maternal mortality rate because of access to safe and sufficient blood supply. This helps in reducing many preventable deaths. This knowledge is also important for clinical studies and geographical information. Even in modern medicine, the blood group system is important because of the relation between different blood groups with different diseases and environment. Hence, it is important to know about blood group distribution pattern in any population. Therefore, this present study was conducted to know the ABO and Rh blood group distribution among medical students in Mandya.

## MATERIAL AND METHODS

This cross-sectional observational study was conducted on first year medical students who volunteered to take part in the study, in the Department of Physiology at Mandya Institute of Medical Sciences, Mandya. The Institutional ethical committee clearance was obtained and then informed written consent was taken from volunteers.

Eighty two medical students, males 48 and females 34, volunteered to participate in the study. The ABO blood grouping and Rh typing was determined by glass slide method, after collecting blood samples by finger prick method under aseptic precautions. Blood samples were collected from one of the middle three fingers and three separate glass slides marked as A, B and D were used to detect A, B, AB, O group and whether they are Rh positive or negative. Commercially available standard anti sera – anti A, anti B and anti D were used for the agglutination test to detect

blood group. Glass slides marked as A, B and D were used to mix suspended RBCs with anti-A, anti-B and anti-D anti sera. Separate applicator sticks were used to mix blood drop with anti sera for three glass slides to prevent false results. The mixture observed for agglutination, macroscopically and again microscopically for confirmation and compared with the control.

The glass slide method of blood group determination is based on antigen antibody agglutination. The antigen present on the surface of RBC agglutinates with the antibody present in the antisera. Hence, blood group was determined based on agglutination with the corresponding anti sera. If agglutination was present in the blood drop on slide marked A, then it belongs to 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, then O group. Similarly, agglutination in blood drop on glass slide marked D was considered as Rh Positive and no agglutination as Rh negative. The data was expressed as percentages.

## STATISTICAL ANALYSIS

The data was analysed and final results were listed according to frequency and gender. Data was expressed in percentages.

## RESULTS

Out of total 82 medical students who volunteered, 48 (58.5%) were males and 34 (41.5%) females. The results of this study are illustrated in Table 1 and 2, also in Figures 1 and 2. In our study, the most frequently occurring blood group was B (39.02%) followed by O group (31.7%), A group (26.8%) and AB group (2.4%) (Figure 1). 78 (95.1%) students were Rh positive whereas only 4 (4.9%) were Rh negative (Figure 1). Among the most frequently occurring B group, males were 59.4% and females 40.6% while in AB group which was least frequent males were 100% with no females in AB group.

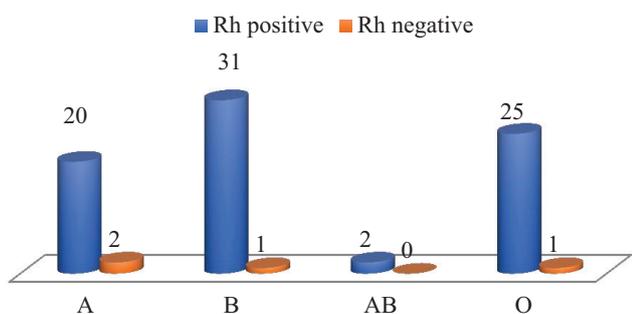
In Rh-positive blood group distribution, B blood group had highest frequency of 39.7% (31) followed by O (32.1%, N=25), A (25.6%, N=20) and AB (2.6%, N=2). Rh-negative blood group distribution showed 50% (N=2) belonging to A group followed by B (25%, N=1) and O (25%, N=1). Among both males and females, there were no Rh negatives belonging to AB, also in O blood group among males and no Rh negative in blood group A and B among females. Among Rh positive females, both O and A blood groups shows equal distribution whereas in males, B blood group shows the highest frequency followed by O, A and AB (Fig 3).

Blood group	Rh Positive	Rh Negative	Total
A	20	02	22 (26.83%)
B	31	01	32 (39.02%)
AB	02	00	02 (2.44%)
O	25	01	26 (31.71%)
Total	78 (95.12%)	04 (4.88%)	82 (100%)

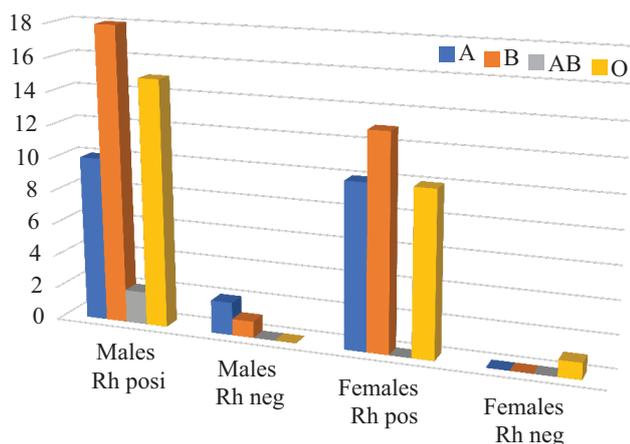
**Table-1:** ABO and Rh blood group distribution among Medical students

ABO	Males (n=48)			Females (n=34)			Total (n=82)		
	Rh pos.	Rh neg.	Total	Rh pos.	Rh neg.	Total	Rh pos.	Rh neg.	Total
A	10	02	12	10	00	10	20	02	22
B	18	01	19	13	00	13	31	01	32
AB	02	00	02	00	00	00	02	00	02
O	15	00	15	10	01	11	25	01	26
Total	45	03	48	33	01	34	78	04	82

**Table-2:** Gender wise distribution of ABO and Rh blood group system



**Figure-1:** ABO and Rh blood group distribution among Medical students



**Figure-2:** Gender wise distribution of ABO and Rh blood group system

## DISCUSSION

ABO and Rh blood group distribution studies are important as they play a major role in blood transfusion, transplantation of organs, research in the field of genetics, human evolution and forensic pathology. Some blood groups are more prone for some diseases like diabetes mellitus, duodenal ulcers, UTI.<sup>14</sup> During the First World War in 1919, the blood group investigation started in this subcontinent with Hirschfeld determining blood groups among large number of soldiers including Indians and found that B blood group was more frequent. Blood groups are known to have genetic association with some diseases. Studies conducted shows that A group individuals are more prone for cardiovascular diseases like coronary heart disease, venous thrombosis, ischemic heart disease and atherosclerosis. These cardiovascular diseases are less likely in people with O blood group, which stated to have protective effect against these. These O group individuals are known to have protection against squamous and basal cell carcinoma with risk being reduced by 14% and 4% respectively as compared to other groups. It is also known to have less risk of pancreatic cancer. The ovarian cancer is more in individuals having B antigen. A group people have reported more association with gastric cancer whereas it is least in O group individuals. Therefore, it is important to do blood grouping studies in each and every region so as to draft appropriate national transfusion policies and to supply blood during emergency situations to the needy people.<sup>15</sup> The blood group distribution has been observed to be different

in different parts of the world based on ethnic origin of races. Indians from South Africa belong to O blood group whereas O and A blood groups were common in Australian origins. B group was found to be common in Africans whereas A among Europeans. In USA, 46% constitute group O, 41% A, 9% B and 4% AB.<sup>16</sup>

Blood group distribution also differs in different populations inside India and also within different districts in each state in India.

In our study, the frequency distribution of blood group B was the highest with percentage frequency of 39.02% followed by blood group O, 31.71%; blood group A, 26.83% and the least percentage frequency being AB with 2.44%. Our study further confirmed that Rhesus- positive (95.1%) has the highest percentage frequency while Rhesus-negative (4.9%) has the lowest percentage frequency. In Rh-positive blood group distribution, B blood group has the highest frequency of 39.7% followed by O 32.1%, A 25.6% and AB 2.6%. In Rh negative blood group distribution, 50% belong to A group followed by B 25% and O 25%. The frequency of Rh negative was found to be more in males than in females but the Rhesus-positive was higher in females than in males.

Study done in Latur<sup>17</sup> described 'B' as the most frequent and 'AB' as the least common blood group. 'O' blood group was second most common, similar to findings in our study. Also in rhesus system, 95.19% donors were Rh-positive and 4.81% donors were Rh negative.

The studies by Chandra et al at Lucknow<sup>18</sup> and Sindhu et al<sup>19</sup> Punjab in Northern parts of India showed blood group B was the commonest, followed by O, A and AB, which is similar to this study. B blood group was also found to be predominant (36.5%) in Ahmedabad region, the western part of India followed by O (30.5%), A (21%) and AB (12%).<sup>20</sup> Studies done at Surat by Nidhi Mehta et al<sup>21</sup> and Giri h<sup>22</sup> et al in Maharashtra, showed that the B group was commonest among people studied followed by O, A and AB groups, similar to present study. All these studies showed Rh positive as predominant group compared to Rh negative.

Study done in Eastern part of India, Durgapur by Nag et al<sup>23</sup> and in Southern part of India by Periyavan<sup>24</sup> et al at Bangalore, Das PK Nair et<sup>25</sup> et at Vellore and at Davangere by Mallikarjuna S. et al<sup>26</sup> found that commonest blood group was O followed by B, A and AB.

According to the available literature, over 99% Asians belong to Rh positive group but among our subjects 95.1% were Rh +ve and 4.9% Rh -ve. It is close to the findings of Parmanik and Parmanik from Nepalese students, in Nepal medical college, Kathmandu. Their subjects were 96.66% Rh+ve and 3.33% Rh -ve.<sup>27</sup> Rh blood group is documented as 5% in Nairobi<sup>28</sup>, 4.5% in Nigeria.<sup>29</sup> Blood group distribution knowledge is not only important for blood bank management but also for clinical studies, geographical information and forensic studies.

Blood groups are required not only for transfusion purposes but also to prevent diseases associated with blood groups, to prevent dangerous transfusion reactions which occurs because of mismatched blood transfusions, effective

management of blood bank and to provide blood to the needy patients. This blood group distribution knowledge is important to determine recruitment of voluntary donors in case of emergencies. The importance of blood group determination lies in the transfusion of blood among different populations irrespective of their age, gender, ethnic origin, in organ transplantation and in the development of legal medicine, genetic research, and anthropology.

## CONCLUSION

It can be concluded that blood group B was found to be more common among the medical students studied whereas AB blood group was found to be the least. Rh positive blood group was most common than Rh negative. In situations where emergency transfusions of yet to be cross matched blood is required, the blood groups indicated on identity cards from school or colleges, driving licenses will be of great use. This study along with other similar studies in other regions of the country will be useful for health planners to face medical emergencies.

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