

FREQUENCY OF ABO AND RHESUS BLOOD GROUPS AMONG NEONATES BORN AT A PRIVATE HOSPITAL IN ISTANBUL

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Abstract. In this study we used gel centrifugation to determine the frequency and sex distribution of ABO and Rh blood group antigens among 4,656 neonates (2,317 males, 2,339 females) born at a private hospital in Istanbul. Group A Rh+ was the most frequent blood type and AB Rh- was the least frequent. Female neonates had a higher frequency of Rh+ blood than male neonates. Group A blood was detected most frequently followed by group O, group B, and group AB. Sex was not significantly associated with blood type. These results fall within the range of previously reported blood type frequencies for Turkey. Our data allow the creation of a blood bank database for the hospital.

Keywords: ABO blood group, Rh blood group, neonates, Turkey

INTRODUCTION

A total of 308 human red blood cell (RBC) antigens are currently recognized by the International Society of Blood Transfusion (ISBT), 270 of which are clustered into 30 blood group systems. Nine of these systems (ABO, Rh, Kell, Kidd, Duffy, MNS, P, Lewis and Lutheran) are used most frequently for classification (Smart and Armstrong, 2008; Daniels *et al*, 2009). The most important of these are the A and B antigens, which are complex oligosaccharides. Landsteiner first defined the ABO blood group system in 1901 (Gar-

ratty *et al*, 2000). Human RBCs containing the D antigen are known as rhesus positive (Rh+), and those lacking the D antigen are classified as Rh negative (Rh-). The antigens of the Rh blood group, defined by Landsteiner and Weiner in 1941 (Smart and Armstrong, 2008), are proteins. The A, B, and O antigens are under the control of three allelic genes located on chromosome 9, and the Rh antigens are defined by three allelic genes on chromosome 1 (Calhoun and Petz, 2001). Blood group antigens are important not only for blood transfusion and organ transplantation, but also for genetic research and anthropological studies of human ancestral relationships. ABO and Rh group frequencies vary by geographic region and ethnic group (Smart and Armstrong, 2008). Regional variation is present within Turkey (Yakut *et al*, 1991; Ergin and Yardımcı, 1993; Genç

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and Aslan, 1997).

In this study, we aimed to determine the frequency of ABO and Rh blood group antigens among neonates and to prepare a database for the blood bank of a private hospital in Istanbul.

MATERIALS AND METHODS

This study was conducted at American Hospital, Istanbul, Turkey, from May 2007 to June 2010. All Turkish neonates ($N = 4,656$) born at the hospital during this period were included in the study. Informed consent was obtained from the parents. In our hospital, ABO and Rh blood group typing from cord blood was routinely performed for all neonates. ABO and Rh blood groups were examined using the gel centrifugation method with the DiaMed-ID Micro Typing System (DiaMed AG, Cressier sur Morat, Switzerland) and DG Gel ABO/Rh kits (Grifols S. A., Barcelona, Spain). ABO and Rh blood group frequencies and sex distributions were analyzed using SPSS software (version 17.0 for Windows; SPSS, Chicago, IL). A p -value <0.05 was considered statistically significant.

RESULTS

A total of 4,656 neonates [2,317 males (49.8%), 2,339 females (50.2%)] were evaluated for blood group antigens. Blood group ARh+ occurred most frequently and AB Rh- occurred least frequently (Table 1). Four thousand one hundred seventy-two neonates (89.6%) were Rh+. Female neonates exhibited a higher frequency of Rh+ blood type ($N = 2,107$, 90.1%) than male neonates ($N = 2,063$, 89.1%; Table 2).

Table 3 shows the sex distribution of ABO and Rh blood group frequencies among neonates. Among Rh+ male

Table 1
Frequency of blood groups among studied neonates.

Blood group	Neonates (%)
A Rh+	1,802 (38.7)
O Rh+	1,406 (30.2)
B Rh+	659 (14.2)
AB Rh+	305 (6.6)
A Rh-	221 (4.7)
O Rh-	143 (3.1)
B Rh-	84 (1.8)
AB Rh-	36 (0.8)
Total	4,656

neonates, group A was detected most frequently (38.2%), followed by group O (29.7%), group B (14.4%), and group AB (6.8%). The distribution was similar for Rh+ female neonates (A, 39.2%; O, 30.7%; B, 13.8%; AB, 6.3%). Among Rh- males, blood group A was the most common (5.3%), followed by group O (2.9%), group B (1.8%) and group AB (0.9%). A similar distribution was found among Rh- females (A, 4.3%; O, 3.1%; B, 2.0%; AB, 0.6%). Thus, sex was not significantly associated with the distribution of ABO and Rh blood group systems ($p > 0.05$).

DISCUSSION

The ABO and Rh blood group systems are commonly used classifications in medical practice. Blood typing is important for blood transfusions, organ transplantation, genetic research and anthropological investigations of human ancestral relationships. Some blood groups are associated with an increased risk of developing certain diseases. For example, the ABO group is associated with stomach

Table 2
Sex distribution of Rh blood groups among neonates studied.

Sex	Neonates (%)	Rh+ (%)	Rh- (%)
Male	2,317 (49.8)	2,063 (89.1)	253 (10.9)
Female	2,339 (50.2)	2,107 (90.1)	233 (9.9)
Total	4,656 (100)	4,170 (89.6)	486 (10.4)

Table 3
Frequency and sex distribution of ABO and Rh blood groups among neonates studied.

Blood group	Male				Female			
	Rh+	%	Rh-	%	Rh+	%	Rh-	%
A	886	38.2	118	5.3	916	39.2	103	4.3
B	333	14.4	38	1.8	326	13.8	46	2.0
O	689	29.7	75	2.9	717	30.7	68	3.1
AB	157	6.8	21	0.9	148	6.3	15	0.6
Total	2,065	89.1	252	10.9	2,107	90	232	10.0

ulcers (more common among group O individuals) and gastric cancer (more common among group A individuals). Individuals with blood type O tend to have lower levels of the von Willebrand Factor (vWF), a protein involved in blood clotting (Goodnough *et al*, 1999; Smart and Armstrong, 2008).

The frequencies of ABO and Rh blood groups differ by population worldwide. For example, Garratty and colleagues (2004) found the frequencies of A, B, O, and AB blood groups in a US population were 37.1, 12.2, 46.7 and 4.1%, respectively, and Rh+ was found in 85.4%. In England, these frequencies were 41.8, 8.6, 46.6, and 3%, respectively (Garratty *et al*, 2004). The A, B, O, and AB blood groups occurred in frequencies of 42.8, 16.5, 32.7, and 8.0%, respectively, in a Turkish population (Ergin and Yardımcı, 1993).

The frequency of A, B, and O blood groups in the Turkish cities of Denizli, Gaziantep, Diyarbakır, Van, Ankara, and Konya were similar to this study (Demirağ *et al*, 1993; Ergin and Yardımcı, 1993; Coskun, 1995; Dilek *et al*, 2006; Temiz *et al*, 2008; Balcı *et al*, 2010). The frequency of blood group A in Turkey ranges from 38% to 45% (Balcı *et al*, 2010; Dilek *et al*, 2006). The highest frequencies of blood group A were found in Ankara (44.6%) and Konya (45%) (Demirağ *et al*, 1993; Ergin and Yardımcı, 1993). In our study, the frequency of blood group A (43.4%) was similar to that found in Ankara. In our study blood group B was found in 16%, similar to the results of Denizli and Eskişehir (Gezer *et al*, 1997). The highest frequency of group B in Turkey was detected in Gaziantep (18.1%) and the lowest frequency was in Malatya (11.4%) (Genç and Aslan, 1997).

The frequency of blood group O in Turkey ranges from 30.8% to 41.2% (Dilek *et al*, 2006). The frequency of blood group O in our study was 33.3%, the same as in Diyarbakır. The frequency of blood group AB in Turkey ranges from 6% to 9.2% (Temiz *et al*, 2008). We found a frequency of 7.4%, similar to 7.5% detected by Denizli and Eskisehir (Gezer *et al*, 1997).

The Rh+ blood group in Turkey was found in approximately 85%, similar to that of other Asian countries (Calhoun and Petz, 2001). In our study Rh+ was found in 89.6%, slightly higher than the Turkish average but similar to that found by Denizli and Eskisehir (89.9%) (Gezer *et al*, 1997). We observed no correlation between sex and ABO and Rh blood types, similar to reports from eastern Turkey and Nigeria (Dilek *et al*, 2006; Odokuma *et al*, 2007).

This research determined neonatal blood group frequencies and sex distributions using gel testing of cord blood. Our results provided data necessary for the preparation of a database for the blood bank of a private hospital in Istanbul.

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