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ASSOCIATION AND DISTRIBUTION OF ABO AND RH BLOOD GROUPS AMONG BLOOD DONORS IN GARHWAL REGION, UTTARAKHAND

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ABSTRACT

Introduction: This retrospective study was conducted to document the frequency of ABO and Rh blood groups among ethnic blood donors in Garhwal region of Uttarakhand. The ABO blood group appears to be an important biological marker for various human diseases. We aimed to investigate the frequency distribution of ABO and Rh blood groups and their association with some demographic characteristics.

Methods: ABO and Rh blood groups were determined among 9883 blood donors participated in donating blood at HNB Base Hospital, Srinagar and also determined the relationship of some demographic characteristics.

Results: The order of the blood group were found B (31.7%) > A (30.4%) > O (26.2%) > AB (11.7%) while 93.5% and 6.5% of donors were Rh positive and negative respectively. The maximum blood donors were found between the age group 20-30 years. The maximum prevalence of Hb range from 13.52 – 14.5 gm% (42.5%) and range of weight 55-60 kg (23%). Maximum prevalence of Season wise and District wise donors were found in rainy season (31.3%) and district Pauri Garhwal (with 49.5%) respectively.

Conclusion: Blood group B is the commonest among ABO blood group and 93.5% are Rh positive in this region. The maximum prevalence among the donors are in age group, Hb (gm%), weight (kg), season and district were found in 20-30 yrs, 13.52-14.5 gm%, 55-60kg, rainy season and Pauri Garhwal respectively.

KEYWORDS : ABO and Rh blood group, Garhwal Blood Donors, Prevalence, Demographic characteristics.

INTRODUCTION

The most important blood group systems among 29 blood types are ABO and Rh system [1]. In the early 20th century, three types of blood groups including A, B and C (later re-named to O) and a year later, the fourth blood group, AB were discovered [2]. The ABO blood group antigens (A, B and H) are determined by carbohydrate molecules that are ordinarily considered as red blood cell antigens. They are also present on other human tissues, which include: vascular endothelium and epithelium, sensory neurons and platelets [3]. The second most important blood group system is Rh which was discovered in 1941 which have only two phenotypes, Rh positive and Rh negative [4,5]. Blood group prevalence studies have been undertaken for several reasons; because of their importance in blood transfusion and organ transplantation, their application in genetic research, forensic pathology, anthropology and training ancestral relation of human [4]. Although the ABO blood group antigens are constant throughout life, the distribution of blood groups among different communities, races and geographical boundaries do vary over time even within the same region [5,6,7]. The ABO blood group appears to be a marker for various human diseases including: cardiovascular, neoplastic and infectious conditions [8]. It has also been suggested that these blood groups are associated with certain personality characteristics [9,10]. It is generally accepted that potential blood donors should be rejected if their Hemoglobin level is below 12.5 gm%, this level applies to both sex & is the standard adopted by the Singapore blood transfusion service [11]. However there is now a trend to raise this level to 13.5gm % in the case of male donors taking into considerations the fact that males have been found to have higher hemoglobin levels. The donors who showed hemoglobin below 12.5 gm% were not accepted [12]. The majority of donors were between 13.5 to 14.5gm percent. We aimed to determine the prevalence of blood groups as well as whether there was a relationship with demographic, seasonal and other factors among a representative donors sample population living in Garhwal region of Uttarakhand.

MATERIALS AND METHODS

The present retrospective study was carried out on 9883 blood donors (male and female) during the period from 1st January 2012 to 31st December 2016 in the blood banks of H.N.B. Base Hospital, under Veer Chandra Singh Garhwali Government Medical Science and Research Institute, Srinagar, Uttarakhand [13]. The blood donors were selected after taking a detailed history and a complete examination regarding their eligibility criteria for blood donation. Donor's name, age, sex, complete postal address and contact number was taken. Donors were deferred or accepted according to their medical history regarding chronic or acute diseases. Findings were further confirmed by physical examination of the donor. Blood was taken from a donor only after fulfilling all the eligibility criteria of a healthy donor. All blood collections had been taken either from voluntary donors at blood donation camps or as replacement donors at blood bank of the hospital. All individuals are more than 18 years in age. The blood samples were collected in vacutainer containing Ethylenediaminetetraacetic acid by the method of venepuncture. The tests were purely based on antigen-antibody agglutination test. In ABO blood grouping (forward and reverse), monoclonal anti A, anti-A1, anti B, anti AB, anti H antisera, and A, B, O pooled cells are used. For Rh typing, anti-D (R0 and R1, anti IgM and blend of anti IgM and anti IgG) antisera were used. Finally, blood groups were selected only when both forward and reverse groups are identical. Rh-negative blood groups were confirmed by anti-globulin technique and remaining all weak D groups

were considered as Rh positive. A detailed standardized donor questionnaire, determination of age, body weight, hemoglobin %, season (month of donation), home district (address)were given to all potential donors.

Collected data were entered into Microsoft Excel and all statistical analysis were performed using the SPSS for windows, version 21.0. to calculate significant result ($p<0.05$).

RESULTS

Table No 1 showed that out of 9883 Garhwali blood donors, male and female were found 9133 (92.4%) and 750 (7.6%) respectively. The most common blood group association of frequencies with percentage were found B (3131, 31.7%) > A (3003, 30.4%) > O (2593, 26.2%) > AB (1156, 11.7%) respectively. In addition, the frequency of Rh positive and Rh negative were found 9242 (93.5%) and 641 (6.5%) respectively. ABO blood group system and Rh factors had no significant association with gender. Maximum prevalence of age group among the donors was found between 20-30 years about 4750 (48.1%) and also Rh factors (positive & negative) were found statistically significant and insignificant respectively. The maximum prevalence of weight among the ABO and Rh blood group donors were found 55-60 kg (23%) and Rh positive is 22.9% and Rh negative 23.2% in same weight interval respectively while association between ABO blood group with weight and weight with Rh factors were found insignificant and significant respectively. The maximum prevalence of hemoglobin gram percentage (Hb gm%) between ABO blood group and Rh factors were found 13.5 – 14.5 gm% (42.5%), Rh positive 42.5% and Rh negative 43.1% with same hemoglobin (Hb) interval while Hb with ABO blood group system was found statistically significant. The maximum prevalence of seasonal variations among ABO blood group donors were found in rainy season (3097 with 31.3%) and that of Rh factors positive and negative, Rh (+)ve was found (2916 with 31.6%) in the same rainy season while Rh (-)ve was found (214 with 33.4%) in the summer season respectively. The association between seasonal variations with Rh factors were found statistically significant. All ABO blood donors were divided into seven districts in Garhwal region having maximum prevalence was found in Pauri Garhwal district (4891 with 49.5%) and the association is statistically significant while maximum prevalence according to Rh (+)ve (4553 with 49.3%) and Rh (-)ve (338 with 52.7%) also prevailed in the same district of Pauri.

Table No 2 showed that the quantitative data analysis by using the co-relation technique as age with weight, Hb were found positive co-relation with significant while co-relation between age with Rh factor was given week negative co-relation. Co-relation between weight with Hb and Rh factor were found statistically significant. Further, co-relation between Hb with ABO blood group system was found statistically significant.

DISCUSSION

There are large number of male donors as compared to female donors which has been observed in most of the studies in India being a developing nation. The main reasons behind it were lack of education, social taboo, cultural habits, lack of motivation, and fear of blood donation [13,14]. A large number of female from the menstruating age

groups were occasionally found anemic with low body weight, hence considered unfit for donating blood and usually eliminated during the predonation screening and counseling. In this regard, the general health status of the female needs to be improved by providing proper nutritional diet and iron supplements. The fear regarding blood donation among Indian females needs to be driven out by educating them proper with the advantages of blood donations. Most of the older people suffer from hypertension, diabetes mellitus, low hemoglobin, and ischemic heart diseases and found unfit during predonation counseling [15].

In our present study, majority were male donors and were between age group 20-30 years (4750, 48.1%), because young adult persons are usually willing to donate blood than other age group. It was also evident that number of female donors were less, because of lack of education, awareness and fear regarding donation of blood. The prevalence of Hemoglobin % among the blood donors is very important for the donation of blood to the recipient. The maximum prevalence of Hemoglobin % ranges from 13.5-14.5 about 4203 (42.5%) in our study. It is generally accepted that potential blood donors should have more than 13 gm% of Hb. If their Hb level is below 12.5 gm%, that donor should be rejected. This level applies to both sex and is the standard adopted by Singapore blood transfusion service. However there is a trend to raise the level to 13.5 gm% in the case of male donors taking into consideration the fact that males have been found to have higher haemoglobin levels [16]. The prevalence of weight among the blood donors is between 55-60 Kg about 2269 (23%) of 9883 blood donors. So it is noted that a large number of volunteers were rejected for being under weight, specially in the case of female volunteers. A minimum weight is necessary to ensure that the smaller built donors are not over bleed. Minimum weight adopted by the service below which volunteers are not accepted is 45 Kg. This is little higher than the minimum weight of 41 Kg adopted by other transfusion service. The prevalence of donating blood was higher in rainy season (3097, 31.3%), was because of the increase demand of blood during that period since more number of traumatic and accidental patients usually come to the hospital from the near by Himalayan hilly topography of this region particularly during the rainy season. The prevalence of blood donors was highest from the district of Pauri Garhwal (4891, 49.5%) was because the hospital have been situated in the same district and there have been many local blood donors association. In our study, 641 (6.5%) blood donors were found having Rh (D) negative blood group.

CONCLUSION

The study has substantial implication regarding the management of blood bank and transfusion service in this area. Awareness about donation of blood has to be enhanced in order to increase the number of female donors. The data obtained in our present study may be useful in policy making and implementation to face the future health challenges.

Table No1: Association among ABO & Rh factor with associated factors of Blood Donors

Variables		ABO Blood Group								Total		Rh Factor					p value for ABO	p value for Rh factor
		A	%	B	%	AB	%	O	%	No.	%	Rh+	%	Rh-	%			
Gender	Male	2797	93.1	2881	92.0	1079	93.3	2376	91.6	9133	92.4	8542	92.4	591	92.2		0.084	0.834
	Female	206	6.9	250	8.0	77	6.7	217	8.4	750	7.6	700	7.6	50	7.8			
Age Group (Year)	<20	324	10.8	306	9.8	110	9.5	268	10.3	1008	10.2	956	10.3	52	8.1		0.047	0.109
	20-30	1443	48.1	1488	47.5	577	49.9	1242	47.9	4750	48.1	4429	47.9	321	50.1			
	30-40	810	27.0	869	27.8	304	26.3	687	26.5	2670	27.0	2484	26.9	186	29.0			
	40-50	327	10.9	368	11.8	118	10.2	274	10.6	1087	11.0	1027	11.1	60	9.4			
	50-60	93	3.1	90	2.9	43	3.7	102	3.9	328	3.3	306	3.3	22	3.4			
	60+	6	0.2	10	0.3	4	0.3	20	0.8	40	0.4	40	0.4	0	0.0			
Weight (Kg.)	<50	260	8.7	275	8.8	118	10.2	238	9.2	891	9.0	853	9.2	38	5.9		0.062	0.035
	50-55	411	13.7	445	14.2	154	13.3	323	12.5	1333	13.5	1239	13.4	94	14.7			

	55-60	662	22.0	730	23.3	249	21.5	628	24.2	2269	23.0	2120	22.9	149	23.2		
	60-65	528	17.6	519	16.6	200	17.3	462	17.8	1709	17.3	1604	17.4	105	16.4		
	65-70	500	16.7	572	18.3	210	18.2	404	15.6	1686	17.1	1581	17.1	105	16.4		
	70+	642	21.4	590	18.8	225	19.5	538	20.7	1995	20.2	1845	20.0	150	23.4		
Hb (gm %)	12.5-13.5	992	33.0	992	31.7	377	32.6	812	31.3	3173	32.1	2976	32.2	197	30.7	0.000	0.500
	13.5-14.5	1293	43.1	1339	42.8	472	40.8	1099	42.4	4203	42.5	3927	42.5	276	43.1		
	14.5-15.5	541	18.0	611	19.5	248	21.5	438	16.9	1838	18.6	1722	18.6	116	18.1		
	15.5+	177	5.9	189	6.0	59	5.1	244	9.4	669	6.8	617	6.7	52	8.1		
Seasonal Variation	Spring	701	23.3	717	22.9	261	22.6	567	21.9	2246	22.7	2113	22.9	133	20.7	0.817	0.014
	Summer	854	28.4	866	27.7	325	28.1	714	27.5	2759	27.9	2545	27.5	214	33.4		
	Rainy	908	30.2	988	31.6	374	32.4	827	31.9	3097	31.3	2916	31.6	181	28.2		
	Winter	540	18.0	560	17.9	196	17.0	485	18.7	1781	18.0	1668	18.0	113	17.6		
District	Almora	33	1.1	58	1.9	20	1.7	36	1.4	147	1.5	138	1.5	9	1.4	0.010	0.360
	Chamoli	327	10.9	361	11.5	158	13.7	298	11.5	1144	11.6	1067	11.5	77	12.0		
	Dehradu	51	1.7	71	2.3	26	2.2	57	2.2	205	2.1	194	2.1	11	1.7		
	Hariduw	32	1.1	56	1.8	10	0.9	33	1.3	131	1.3	127	1.4	4	0.6		
	Pauri Garhwal	1478	49.2	1514	48.4	569	49.2	1330	51.3	4891	49.5	4553	49.3	338	52.7		
	Rudar paryag	665	22.1	641	20.5	218	18.9	492	19.0	2016	20.4	1889	20.4	127	19.8		
	Tehri	417	13.9	430	13.7	155	13.4	347	13.4	1349	13.6	1274	13.8	75	11.7		
Total		3003	30.4	3131	31.7	1156	11.7	2593	26.2	9883	100.0	9242	93.5	641	6.5		

Table No 2: Correlation between the quantitative variables of blood donors

Variables	Correlation with p value	Age	Weight	Hb%	Blood Group	Rh -factor
Age	Pearson Correlation	1	.118**	.088**	.009	-.004
	p value		.000	.000	.369	.683
Weight	Pearson Correlation		1	.759**	-.002	.021*
	p value			0.000	.809	.038
Hb%	Pearson Correlation			1	.043**	.015
	p value				.000	.140
Blood Group	Pearson Correlation				1	.013
	p value					.201

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