

Physiological and hematological characteristics of blood recipients and donors subjects attending Tikrit teaching hospital from 2006 to end of 2007

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Abstract

Blood types are inherited & represent contribution from both parents. Any one with antigen A in all his RBCs is classified as belonging to blood group A. Those with agglutinin B is classified as type B. While those with A & B antigens belong to group AB. However, those with neither A nor B are belong to group O. The aim of the study is to determine the physiological & epidemiological characteristics & distribution of ABO blood group in blood donors & recipient in Tikrit city. A total of 4309 subjects were investigated in this study. 2411 blood donors (2357 men & 54 women) & 1898 blood recipient patients (759 men & 1139 women). It is clear that in blood donors, 97.8% of blood donors are male subjects. While in blood recipients patients only 39.9% of patients are male subjects. The highest frequency of blood group in blood donors subjects was blood group O+ (41.5%) & the lowest frequency of blood group was blood group AB- (0.29%). Also, the highest frequency of blood group in blood recipient subjects was blood group O+, (35.8%), and the lowest frequency of blood group was blood group AB- (1%).

Introduction

The principle blood group system is based on the presence or absence of inherited antigenic substances in the surface of RBCs. There are two mucopolysaccharides known as agglutinogens (1,2). These agglutinogens are termed A & B. Any one with antigen A in all his RBCs is classified as belonging to blood group A. Those with agglutinin B is classified as type B. While, those with A & B antigens belong to group AB. However, those with neither A nor B are belong to group O (3,4).

In addition to agglutinogens A & B, three further agglutinogens C, D, & E were occur in association with the red cells (5). Antigen D when it present on the surface of RBCs, it said to be, that 85% of population have D antigen on their RBCs & called Rh positive. While only 15% of population are without D antigen & are called Rh negative (2,3,5).

Unlike the previous ABO system, no preformed anti D agglutinin is found in both Rh positive & Rh negative. So, Rh negative person only can make anti D after transfusion of blood of Rh positive & sensitization occur (5,6). Rh antigens are transmembrane proteins with loops exposed at the surface of

red blood cells. They appear to be used for the transport of carbon dioxide and/or ammonia across the plasma membrane. They are named for the rhesus monkey in which they were first discovered. There are a number of Rh antigens. Red cells that are "Rh positive" express the one designated D (5).

Some blood group types are associated with inheritance of other diseases, for example, Kell antigen is associated with McLeod syndrome (7). Certain blood types may affect susceptibility to infections, or susceptible to certain diseases (8, 9,10,11). An example being the resistance to specific malaria species seen in individuals lacking the Duffy antigens (10). Women may carry a fetus with a different Rh factor from their own may lead to hemolytic anemia in the fetus (11, 12).

ABO blood groups are associated with several diseases, like carcinoma, cardiovascular disease, obesity, oosteoarthritis, erythroblastosis in neonates, and many others diseases especially suicide rate in different nations, (13-18). Blood types are one predictors of the national suicide rates. The suicide rates were negatively associated with the proportion of people with

type O, while homicide rates were positively associated with A and B blood groups (19).

Since association between blood group A and gastric cancer was reported in 1953, the relationship with blood groups and incidence, clinicopathologic parameter and prognosis had been studied in many cancer and other diseases. (20, 21)

The explanation for the association between ABO blood groups and some special diseases was still unclear. Many reports have shown that blood group antigen expression in tumor is correlated with metastasis and prognosis (21, 22). The loss or presence of blood group antigens can increase cellular motility or facilitate the interaction between tumor cells and the endothelium of distant organs. (23, 24) ABO (H) blood genes are map at 9q in which the genetic alteration is common in many cancers. Thus, ABO (H) blood group antigen expression may be affected by genetic change of tumors. On the other hand, it is possible that the observe of associations are not due to the blood group antigens themselves, but to the effects of genes closely associated with them. Additionally, it might have nothing to do with molecular mechanism or genetics. It is merely the result of population history, environment, diet, and customs (25, 26, 27, 28, 29, 30, 33).

The aim of the study is to determine the physiological & epidemiological characteristics & distribution of ABO blood group in blood donors & recipient in Tikrit city.

Material & Methods

The present study was done at Tikrit teaching hospital from 1/ Jan. /2006 to end of Dec./2007. A total of 4309 subjects were investigate in this study. 2411 blood donors (2357 men & 54 women) & 1898 blood recipient patients (759 men & 1139 women).

All subjects (blood donors & recipients) were tested by ABO blood group at laboratory department at Tikrit Teaching hospital.

One hundred & eighty one normal students in college of medicine, Tikrit university, (66 female & 115 male students) were also tested for ABO group.

All the blood samples were tested immediately after collection. The principle of

ABO grouping is based on a specific agglutination reaction between antigens on the red cells and IgM antibodies in the typing serum. The antisera used for blood grouping in this study were provided by monosera, which give more specific reactions and are very sensitive for weaker reaction (1,4).

Sex, age, residence & type of disease were recorded by specific questionnaire.

Results

In present study 4309 subjects have been investigated for the ABO blood group incompatibility to see the frequency of specific ABO blood types. One mode of analysis has been used, is the individual ABO blood group to evaluate the frequency of each blood groups.

A total of 4309 subjects were investigated in this study. 2411 blood donors (2357 men & 54 women & 1898 blood recipient patients (759 men & 1139 women), (Fig. 1 a & b).

It is clear that in blood donors, 97.8% of blood donors are male subjects. While in blood recipients patients only 39.9% of patients are male subjects.

Table 1 show that 2411 blood donors subjects, 2357 men & 54 women (the highest frequency of blood group in blood donors subjects was blood group O+ (41.5%) the lowest frequency of blood group was blood group AB- (0.29%) (fig. 2 a & b).

Also, in Table 2 show that in men the highest age group of blood donors is 30 to 40 years (47%), & the lowest age group of blood donors occur in age group less 20 years (2%) & in age group above 50 years (1%).

Table (3): Show the distribution of blood group donors according to type blood group in rural area, the highest frequency of blood group in blood donors subjects was blood group O+, (37%), & the lowest frequency of blood group was blood group AB- (0.38%), (fig.3 a & b).

While, table (4): show the distribution of blood group donors according to type blood group in urban area, the highest frequency of blood group in blood donors subjects was blood group O+, (49.7%), & the lowest frequency of blood group was blood group AB- (0.95%), (fig. 4 a & b)..

Table 5 : Show the distribution of blood recipient patients according to blood groups & sex, a total 1898 blood recipient patients (759 men & 1139 women).

The highest frequency of blood group in blood recipient subjects was blood group O+, (35.8%), & the lowest frequency of blood group was blood group AB- (1%).

Table (6) show the distribution of blood group for students of Tikrit college of medicine. 181 students (66 female & 115 male students), (fig. 5, a & b).

The highest frequency of blood group in blood donors subjects was blood group O+, (33%), & the lowest frequency of blood group was blood group AB- (0%).

Table 7 show a 759 blood recipient male patients were received blood for different causes, 66 patients due bleeding, 263 patients need blood transfusion due sever anemia, 219 patients due surgical operation, 127 due surgical operation due to bullet injury, 56 patients due car accident & 8 patients due to burns, (fig.6).

The highest frequency of blood group in blood donors subjects was blood group O+ 320 patients, (42.2%), & the lowest frequency of blood group was blood group AB- (0.5%).

Table (8): Distribution of blood groups according to cause of blood need for female blood recipient patients. Table 8 show a 1139 blood recipient female patients were received blood for different causes, 124 patients due bleeding, 164 patients need blood transfusion due sever anemia, 156 patients due surgical operation, 4 due to bullet injury, 30 patients due car accident & 644 female patients due to cesarean section, (fig.7).

The highest frequency of blood group in blood donors subjects was blood group O+ 359 patients, (31.5%), & the lowest frequency of blood group was blood group AB- 15 patients (1.3%).

Fig 8 a & b: show blood distribution in male & female according to blood need.

Discussion

There is not a proven correlation between blood type & personality. Blood type consultants attempt to calculate how well different people work together based on

blood type, but they never established reliable sources (13,14,15).

ABO blood group system is one of the most commonly used factor in different investigation especially in human population genetics for its important role and easy availability as compared with other tissues of the human body (1, 3). In the present study, the highest frequency of blood group in blood recipient subjects was blood group O+, (35.8%), & the lowest frequency of blood group was blood group AB- (1%).

Type A blood is the most common in Japan , Germany, Turkey, England and France, While type O is most prevalent in the United States, Saudia Arabia, Kuwait and Egypt (1,3).

The present study agree with Ali Mohammed about the frequency of blood group AB was the lowest one. In present study the most common blood group was blood group O, this is not similar to study done by Ali Mohammed in which the most common blood group was blood group A and this is may be due to differences in the communities (12).

Blood group O is said to be the characteristic of Arabia as it occur in high frequency in desert population and this confirmed in our study, which is related to neighboring countries study (20).

Blood group O individuals have about 25% less FVIII and vWF in their plasma. It is well established that low levels of FVIII and vWF are a cause of excess bleeding, and therefore it may also be the case that increased levels make clotting more likely, increasing the risk of both arterial (ischemic heart disease) and venous (thromboembolic disease) problems (20).

Repeated spontaneously abortion is increased in blood group O mother and lower in blood group AB(2).In the present study there is no similar finding related ABO blood group & abortion. But the blood recipient patients regarding CS operation in women, the highest frequency was in blood group O & the lowest frequency was in AB- blood group.

The highest frequency of blood group in blood donors subjects was blood group O+ 359 patients, (31.5%), & the lowest frequency of blood group was blood group AB- 15 patients (1.3%). Overall, type O blood is the most common blood type in

most western contraries, Australia, USA, UK, Canada, Korea & china (16). This result agree with the present finding. While Type A blood is more prevalent in central & eastern Europe countries (15, 16). In the present study, the high incidence rate in patients receiving blood was blood group O, followed by blood group A (table 7 & 8).

Blood group A is primarily associated with vegetarian food sources and individual in this group secrete smaller amount of stomach acid and have lesser chance for gastric ulcers, and diabetes (19). Persons of group A are affected more with coronary heart disease and ischemic heart disease due to higher concentration of serum total cholesterol, venous thrombosis and atherosclerosis (factors contributing to cardiovascular disease)(31, 32), while its low in people with blood group O which stated to have protective effect against some diseases . Also, blood group A is a risk factor for ovarian malignancies, while group O is a protective factors (17, 19).

Many studies reported increased breast cancer and carcinoma of the cervix in blood group O (34).

References

- 1-De-Grunchy's. Clinical hematology in medical practice. 5th edition. Blackwell scientific publication. Oxford. 1989; 475-83.
- 2- Aseel h. Ali, Haddia A. Khalil, Mossa M. Marbut. The relation between ABO blood group and spontaneously repeated abortion. TMJ. 2008;14(2): 152-155
- 3-Issitt PD. Applied blood group serology. 3rd edition. Montgomery scientific publication. Florida. 1985.
- 4-Firkin F, Ehestermen C, Pennington D, Rush B. De Gruch's clinical hematology in medical practice. 5th edition. Blackwell Scientific publication. Oxford.1989:475-83.
- 5-Landsteiner K, Wiener AS. An agglutinable factor in human blood recognized by immune sera for rhesus blood. Proc. Soc. Exp. Biol. Med. 1940; 43:223-31.
- 6-Lang DJ, Valeri CR. Hazards of blood transfusion. Adv. Paediat. 1977; 24:311.
- 7-Farr AD. Blood group serology. Med. Hist. 1979;23(2): 215-26.
- 8-Dean L. A number of illnesses may alter person ABO phenotype. Transfusion. 2007; 27(1): 41-45.
- 9-Matsushita S, Imamura T, Hanada M. Acquired B antigen & polyagglutination in a patients with gastric ulcer. JPN. J. Surgery. 1983; 13(6): 540-3.
- 10-Miller LH, Mason SJ, Clayde DF. The resistance factor to plasmodium Vivax in blacks. The Duffy blood group genotype. N. Eng. J. Med. 1976;295(6):302-6.
- 11-Clarke SC. Rhesus haemolytic disease of the newborn& its prevention. Brit. J. Haemat. 1982;52:1982.
- 12-Ali MM. ABO blood group prevalence in spontaneously repeated abortion. Turk J Haematol. 2004;21(4):181-187.
- 13-Lucarini N, Nicotra M, Gloria-Bottini F, et al. Interaction between ABO blood group and ADA genetic polymorphism during intrauterine life. A comparative analysis of couples with habitual abortion and normal puerperae delivering a live-born infant. Hum Genet 1995;96:527-31.
- 14-D'Adamo, Peter J, Catherine Whitney. The eat right for your type: complete blood type. Encyclopedia. 2002;28.
- 15-Nilsson K, Sjoberg R, Damberg M. Role of monoamine oxidase & A genotype & psychosocial factors in male adolescent criminal activity. Biol. Psychiatry. 2006; 59(2):121-7.
- 16-Nikel RG, Willadsen SA. Determination of Duffy genotypes in three populations. Human Immunol. 1999; 60(8): 738-42.
- 17-Managham JM. Malignant diseases of the ovary. In Edmonds DK. Dewharts Textbook of Obstetrics & genecology for postgraduate. 6th edition. Blackwell science books. London. 1999; 590-99.
- 18- Bottini N, Meloni GF, Finocchi A, Ruggiu G, et al. Maternal- fetal interaction in the ABO system: a comparative analysis of healthy mothers and couples with recurrent spontaneous abortion suggests a protective effect of B incompatibility. Hum Biol 2001;73:167-74.
- 19- Anees M, Mariza M. Distribution of ABO and Rh blood group Allels in Gujrat region of Punjab Pakistan. Proc. Pakistan Acad. Sci. 2005; 42(4): 233-238.
- 20- Bahaj A. ABO and Rhesus blood group distribution in Hadhramout population. Hadhramout for studies and researches.2003;4: 52-58

- 21- Min Su, Shan-Ming Lu, et al. Relationship between ABO blood group and carcinoma of esophagus and cardia in Chaoshan inhabitants of China. *World Gastroenterol.* 2001;7(5): 657-661.
- 22- Hu N, Roth MJ, Polymeropolous M, Tang ZZ, Emmert Buck MR, et al. Identification of novel regions of allelic loss from a genomewide scan of esophageal squamous-cell carcinoma in a high-risk Chinese population. *Genes Chromosomes Cancer*, 2000;27:217-228
- 23- Pack SD, Karkera JD, Zhuang Z, Pak ED, Balan KV, et al. Molecular cytogenetic fingerprinting of esophageal squamous cell carcinoma by comparative genomic hybridization reveals a consistent pattern of chromosomal alterations. *Genes Chromosomes Cancer*, 1999;25:160-168
- 24- Simoneau M, LaRue H, Aboukassim TO, Meyer F, Moore L, Fradet Y. Chromosome 9 deletions and recurrence of superficial bladder cancer: identification of four regions of prognostic interest. *Oncogene*, 2000;19:6317-6323
- 25- Zitzelsberger H, Engert D, Walch A, Kulka U, Aubele M, Hofler H, Bauchinger M, Werner M. Chromosomal changes during development and progression of prostate adenocarcinomas. *Br J Cancer*, 2001; 84:202-208
- 26- Sirivatanauksorn V, Sirivatanauksorn Y, Gorman PA, Davidson JM, Sheer D, Moore PS, Scarpa A, Edwards PA, Lemoine NR. Nonrandom chromosomal rearrangements in pancreatic cancer cell lines identified by spectral karyotyping. *Int J Cancer*, 2001;91:350-358
- 27- Singh B, Lim D, Cigudosa JC, Ghossein R, Shaha AR, Poluri A, Wreesmann VB, Tuttle M, Shah JP, Rao PH. Screening for genetic aberrations in papillary thyroid cancer by using comparative genomic hybridization. *Surgery*, 2000;128:888-893
- 28- Phillips R, Mawhinney T, Harmata M, Smith D. Characterization of Gall us domesticus alpha-N-acetyl-galactosaminidase blood group A2 activity. *Artif Cells Blood Substit Immobil Biotechnol*, 1995;23:63-79
- 29- Henry SM, Oriol R, Samuelsson BE. Detection and characterization of Lewis antigens in plasma of Lewis-negative individuals. Evidence of chain extension as a result of reduced fucosyltransferase competition. *Vox Sang*, 1994;67:387-396
- 30- Chen CY, Lu CL, Lee PC, Wang SS, Chang FY, Lee SD. The risk factors for gallstone disease among senior citizens: an oriental study. *Hepatogastroen terology*, 1999;46:1607-1612
- 31- Rosendale JD, McBride MA. Organ donation in the United States: 1990-1998. *Clin Transpl*, 1999:83-94
- 32- Langston MM, Procter JL, Cipolone KM, Stroncek DF. Evaluation of the gel system for ABO grouping and D typing. *Transfusion*, 1999;39: 300-305
- 33- Moen T. "Blood type diet"- science or fantasy *Tidsskr Nor Laegeforen*, 2001;121:355-358
- 34- Sharma G, Choudhary R, Bharti D. Studies showing relationship between ABO blood groups and major types of cancer. *Asian J. Exp. Sci.* 2007;21(1):129-132

Table (1): Distribution of blood donors according to blood groups & sex.

Blood groups	Number of male	Number of female	Total	Percentage
A ⁺	578	11	589	24.4 3%
A ⁻	51	3	54	2.24%
B ⁺	480	9	489	20.3%
B ⁻	55	6	61	2.51%
AB ⁺	83	2	85	3.53%
AB ⁻	6	1	7	0.29%
O ⁺	984	16	1000	41.5%
O ⁻	120	6	126	5.2%
Total	2357	54	2411	100%

Table (2): Distribution blood group donors according to sex & age group.

Age group	Number of men	Number of women	Total	%
20 <	39	Zero	39	2
20 – 30	602	21	623	26
30 – 40	1109	16	1125	47
40 – 50	574	15	589	24
50 >	33	2	35	1
Total	2357	54	2411	100

Table (3): Distribution of blood group donors according to type blood group in rural area.

Blood groups of Rural	Number of men	Number of women	Total	Percentage
A+	359	8	367	23.42
A-	35	2	37	2.36
B+	394	7	401	25.59
B-	31	5	36	2.3
AB+	61	1	62	3.96
AB-	5	1	6	0.38
O+	567	13	580	37.01
O-	74	4	78	4.98
Total	1526	41	1567	100%

Table (4): Distribution of blood group donors according to type blood group in urban area.

Blood groups of Urban	Number of men	Number of women	Total	Percentage
A ⁺	212	3	215	25.75
A ⁻	16	1	17	2.01
B ⁺	86	2	88	10.43
B ⁻	24	1	25	2.96
AB ⁺	22	1	23	2.73
AB ⁻	8	0	8	0.95
O ⁺	417	3	420	49.76
O ⁻	46	2	48	5.69
Total	318	13	448	100

Table (5) : Distribution of blood recipient patients according to blood groups & sex.

Blood groups	Number of male	Number of female	Total	Percentage
A ⁺	185	321	506	26.7
A ⁻	14	21	35	1.84
B ⁺	168	295	463	24.4
B ⁻	15	19	34	1.8
AB ⁺	24	56	80	4.2
AB ⁻	4	15	19	1
O ⁺	320	359	679	35.8
O ⁻	29	53	82	4.3
Total	759	1139	1898	100

Table (6): Distribution of Blood Group for Students of Tikrit College of Medicine.

Blood Group	Number of Male	Number Of Female	Total	Percentage
A ⁺	17	32	49	27%
A ⁻	1	1	2	1%
B ⁺	13	29	42	23%
B ⁻	1	0	1	1%
AB ⁺	4	8	12	7%
AB ⁻	0	0	0	0%
O ⁺	17	43	60	33%
O ⁻	13	2	15	8%
Total	66	115	181	100%

Table (7): Distribution of Blood Groups According To Cause of Blood Need For Male blood recipient Patients

Male								
Blood Group	Bleeding	Severe Anemia	Surgical Operation	Bullet Injury	Renal Failure	Burns	Car Accident	Total
A ⁺	12	51	66	28	3	4	21	185
A ⁻	5	4	4	0	0	0	1	14
B ⁺	15	51	57	15	9	1	20	168
B ⁻	1	5	8	0	0	1	0	15
AB ⁺	0	10	6	5	0	0	3	24
AB ⁻	0	4	0	0	0	0	0	4
O ⁺	33	127	76	67	7	2	8	320
O ⁻	0	11	2	12	1	0	3	29
	66	263	219	127	20	8	56	759

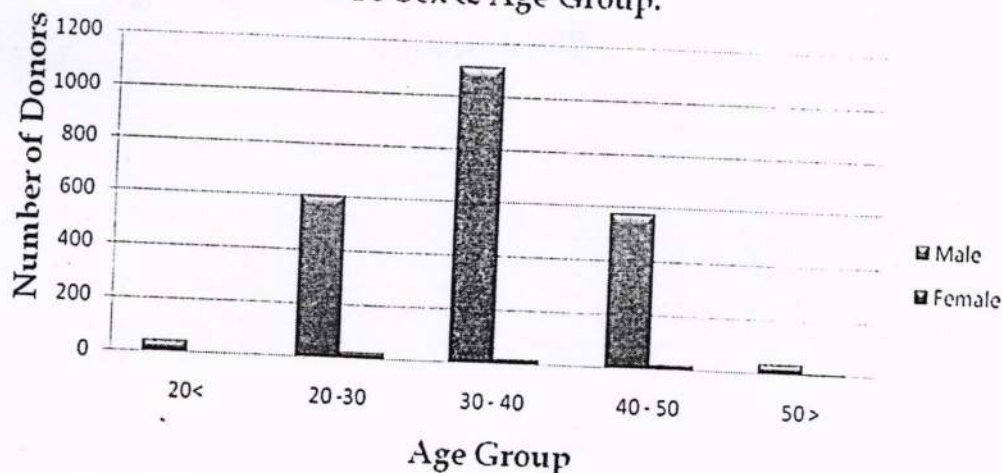
Table (8): Distribution of blood groups according to cause of blood need for female patients.
Caesarian Section : C.S

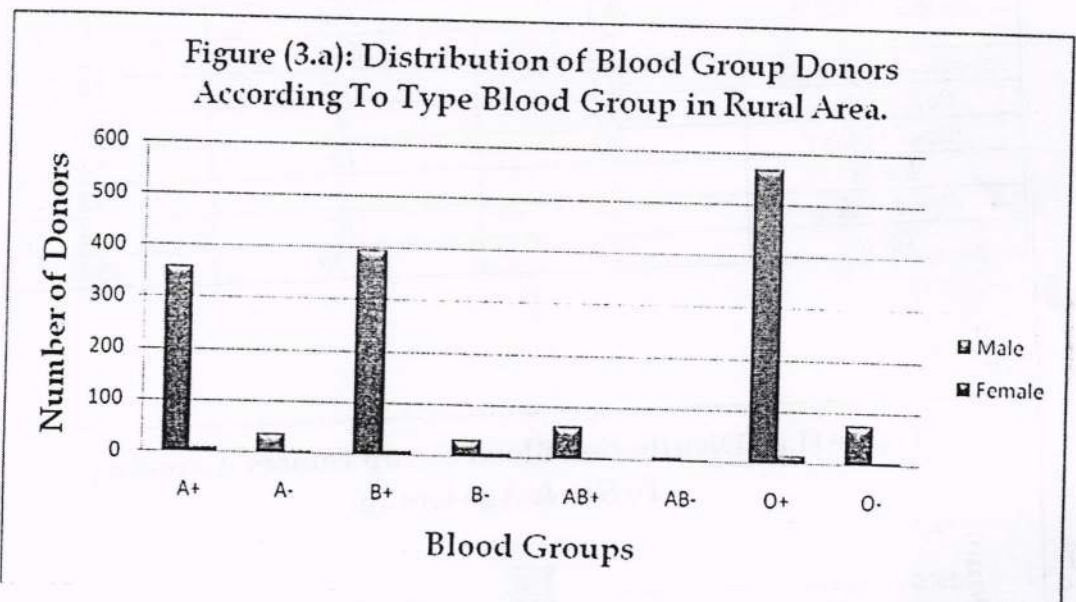
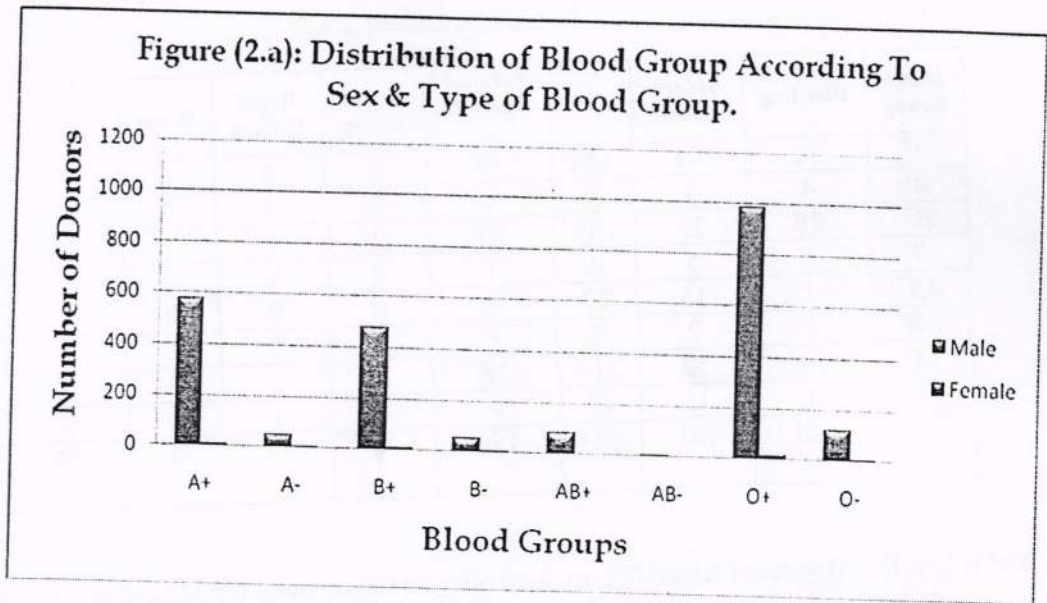
Female									
Blood Group	Bleeding	Severe Anemia	C.S	Surgical Operation	Bullet Injury	Renal Failure	Burns	Car Accident	Total
A ⁺	32	49	169	58	0	8	0	5	321
A ⁻	4	3	9	5	0	0	0	0	21
B ⁺	29	25	189	33	2	1	1	15	295
B ⁻	3	5	10	1	0	0	0	0	19
AB ⁺	7	13	27	9	0	0	0	0	56
AB ⁻	7	2	3	3	0	0	0	0	15
O ⁺	34	52	217	38	2	3	3	10	359
O ⁻	8	15	20	9	0	1	0	0	53
Total	124	164	644	156	4	13	4	30	1139

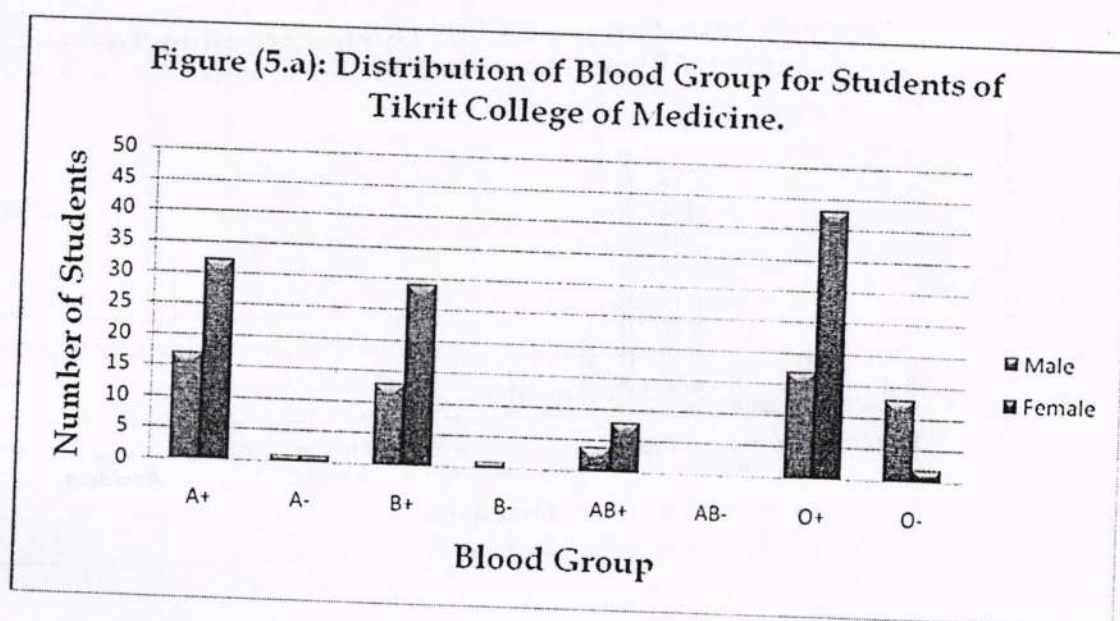
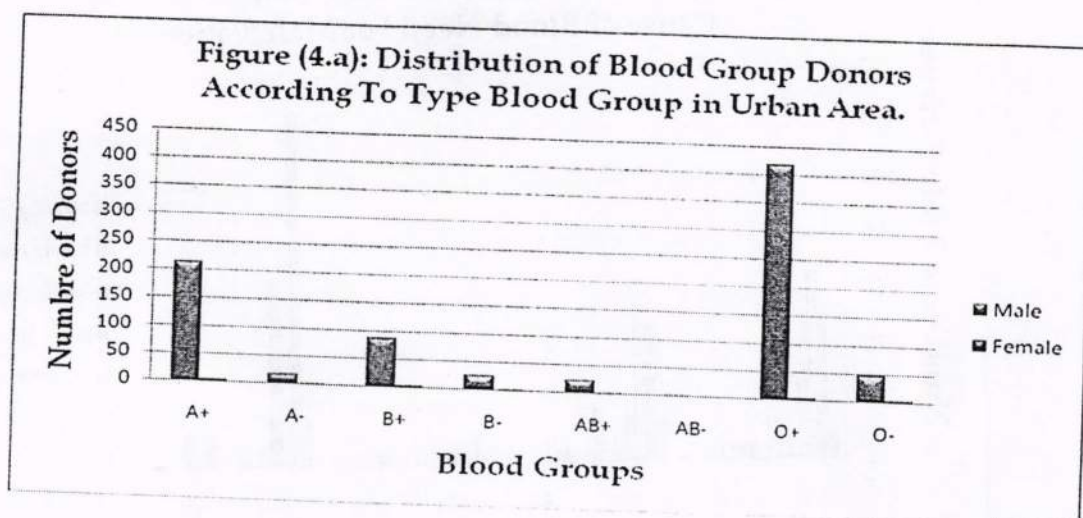
Table (9): Distribution of Blood Groups according to the cause of blood need in male & female of blood recipient subjects

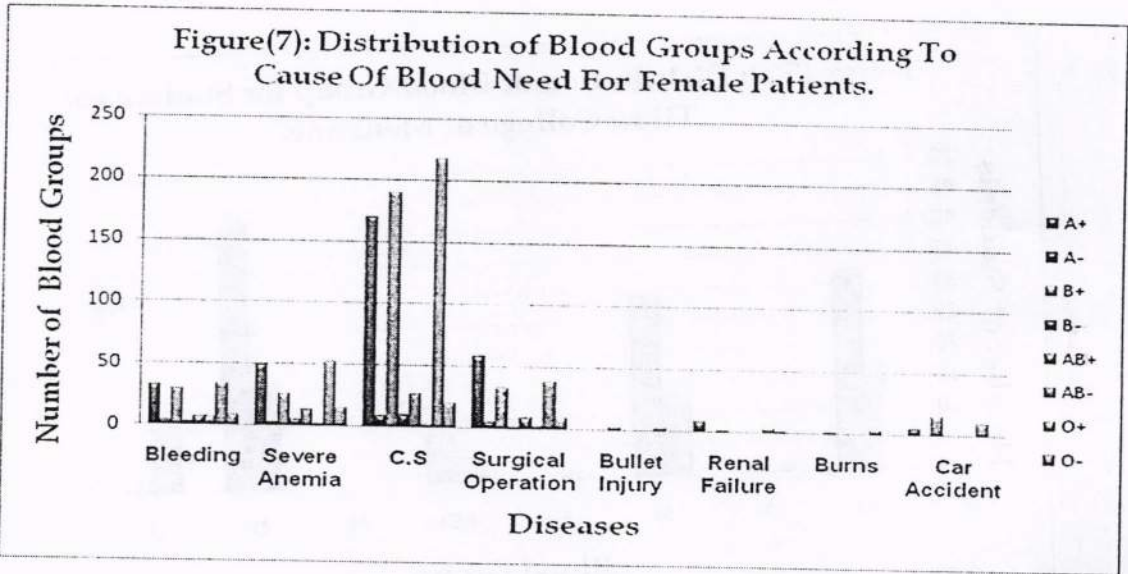
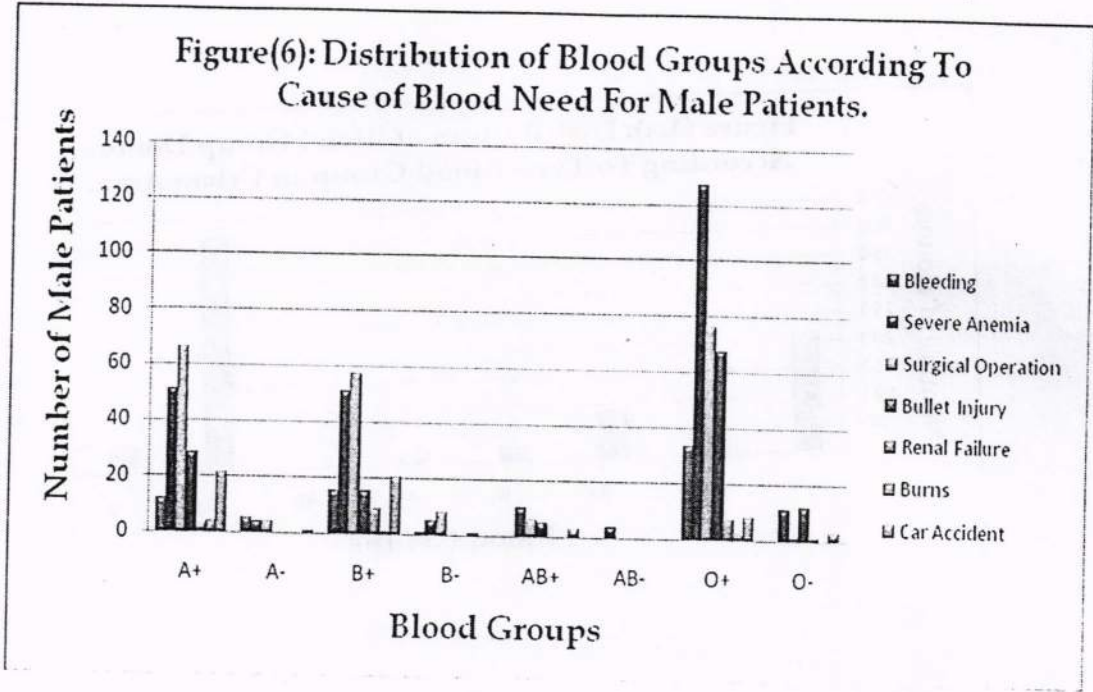
Diseases	Number Of Men	Number Of Women	Total
Bleeding	66	124	190
Severe Anemia	263	164	427
C.S	0	644	644
Surgical Operation	219	156	375
Bullet Injury	127	4	131
Renal Failure	20	13	33
Burns	8	4	12
Car Accident	56	30	86
Total	759	1139	1898

Figure (1.a): Distribution Blood Group Donors According To Sex & Age Group.









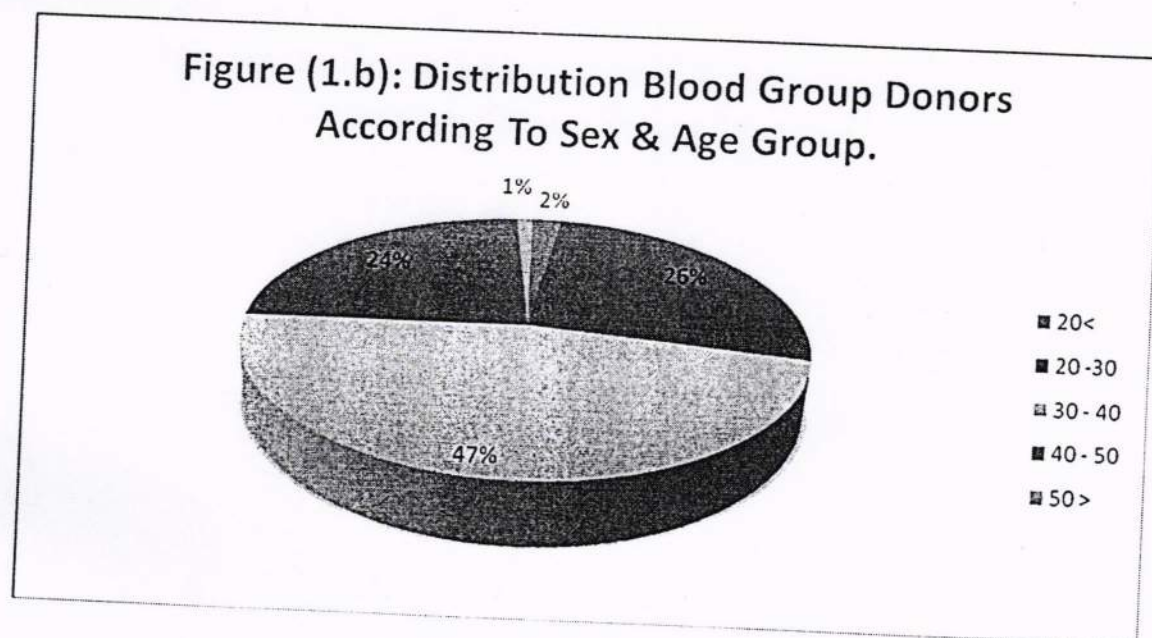
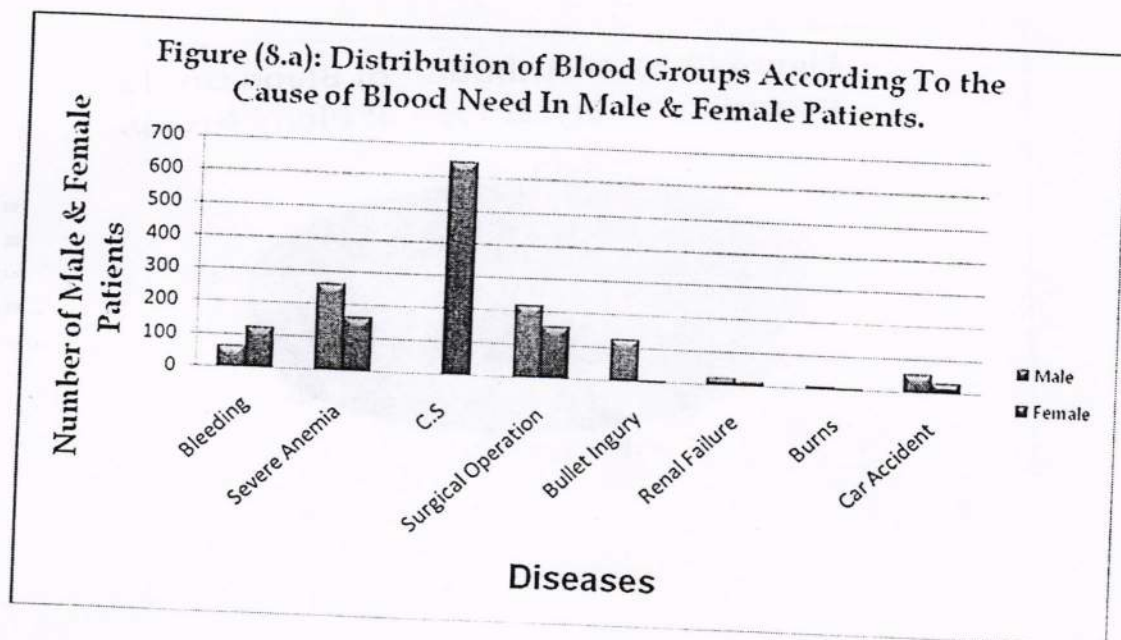


Figure (2.b): Distribution of Blood Group According To Sex & Type of Blood Group.

