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Relationship between ABO blood group and renal failure in Saladdin Governorate

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***Abstract*---**Background and Objective: Renal failure is a disorder with a feature of high urea and creatinine level with the outcome of an unexpected decrease in kidney function resulting in a significant decline in glomerular filtration rate. Apart from the major clinical importance of ABO blood group on blood transfusion and organ transplantation, there seem to be strong associations between blood group types and some diseases as a result of the carbohydrates compound found on the surface of the red blood cell membrane. This study aims to determine the effect of ABO blood group on renal disease patients. Materials and Methods: This case study was conducted on 150 patients with renal failure attending Dialysis unit in Tikrit Hospital from April-June, 2022. Ethical approval and patient consent statements were taken from everyone and the study was performed in the Medical Laboratory department of the hospital. Total 3 mL of patient blood was put into plain bottles. Serum was used to the determine ABO blood group was done with red cell samples by tube agglutination method. The data obtained were analyzed by SPSS software version 22. Results: Generally, the study revealed a strong association of ABO blood group on renal failure ($p<0.001$). However, Group O antigen was statistically discovered to cause the severity of renal failure ($p<0.05$). Conclusion: The results showed that blood group O individuals are more susceptible and suffer severely in renal disease than other blood group individuals.

***Keywords*---**ABO blood group, renal failure, dialysis unit.

Introduction

The most essential blood groups in medical practice are ABO blood group systems (1). It was described by Landsteiner in 1900 and forms the major foundation of blood banking and modern transfusion medicine (2). ABO blood groups are classified based on the presence or absence of A and B surface antigens into four types namely: A, B, AB and O. The frequency of these four major ABO blood groups differs across various ethnic, geographic and socioeconomic groups (3,4).

The variations of glycoprotein and glycolipids antigens present on red blood cells determine ABO blood groups (5,6). They were indicated by the expression of the carbohydrate antigens A and B on the erythrocyte membrane and blood plasma regular antibodies (anti-A, anti-B) (7). These carbohydrate sugars are N acetylgalactosamine for the A antigen and D-galactose for the B antigen while N-acetylgalactosamine and D-galactose for the blood type AB and absent for the phenotype O. The A, B and AB-related carbohydrate sugars are located on the H antigen and the unmodified H antigen explains the blood group O. The A and B alleles encode a specific glycosyl-transferring enzyme(8). When the kidney is unable to remove the toxic substance and metabolic waste from the blood, it is called renal failure or disease. Acute and chronic are two types of renal failure (9).

Chronic renal failure being the major focus in this study is a disorder with a feature of high urea and creatinine level with the outcome of an unexpected decrease in kidney function resulting in significant decline in glomerular filtration rate (10,11). The diagnostic yardstick is the laboratory analysis that shows high serum creatinine or Blood Urea Nitrogen (BUN) levels (11). Advanced age, male gender and diabetes mellitus are risk factors (12,11) Renal Failure (ARF) is classified into origins of kidney injury namely pre-renal, intrinsic and post-renal. Pre-renal ARF is the limitation of blood flow to the kidney with frequent symptoms of vomiting, diarrhea, poor fluid intake, fever, use of diuretics and heart failure. Intrinsic ARF occurs by destroying kidney tubules, interstitium and glomeruli. Post renal ARF is due to blockage of one or both urinary tracts. For surgical patients, ARF is a scourging clinical problem with a high rate of mortality based on the fundamental of the disease (13).

ABO antigens or carbohydrate (N-acetylgalactosamine and D-galactose) are assumed to be situated on the arterial and venal renal vascular endothelium, peritubular and glomerular capillaries and the epithelial cells of the convoluted tubules and collecting ducts in the kidney (14,6). In as much as the major focus of ABO blood group are on compatibility both for blood transfusion and organ transplantation (15) however, various studies have made an effort to show associations between blood group types and some diseases including gastric cancer, duodenal ulcers, real failure etc16. Some researchers had indicated facts that these blood group antigens may serve as receptors for infectious disease agents and host inflammatory response (15,17,18,5). This research is intended to determine the effect of ABO blood group on renal disease patients in Saladdin Governorate to establish associations between Renal failure and blood group types among this sector.

Materials and Methods

This retrospective study was conducted on 150 patients,75 male and 75 female ,aging 20-80 years patients with renal failure attending Dialysis unit in Tikrit Hospital for Hemodialysis, from April-June, 2022. Ethical approval and patient consent statements were taken from everyone and the study was performed in the Medical Laboratory department of the hospital. At first, all patients with proven renal failure were included in the study. During the study, no patient had blood transfusion or dialysis before blood sample collection. Total 3 mL of patient blood were put into plain bottles. Serum was used to determine the level of urea and

creatinine and ABO blood group was done with red cell samples by tube agglutination method. The data obtained were analyzed by SPSS software version 22.

Results

This study was conducted on 150 patients with renal failure, 50% male, 50% female and aging 20-80 years. This study showed the distribution of ABO blood groups among patients with renal failure as follow: blood group type (A) 20% (30), (B) 11.3% (17), (AB) 2% (3) and (O) 66.7% (100) ,as in table (1) and figure (1). For male patients, blood group percentages were as follow :type A 20% (15), type O 66% (50),type B 10% (7)and type AB 4% (3) as in table (2) and figure (2). For female patients, blood group percentages were as follow :type A 21% (15), type O 66% (50),type B13% (10), type AB zero % (0) as in table (3) and figure (3). When the distribution of blood group among male patients and female patients with renal failure were compared , the results were highly significant as shown in table (4) and figure (4) by using chi test.

Table (1): the distribution of blood group among patients with renal failure

Blood group	Frequency	Percentage
A	30	20
O	100	66.7
B	17	11.3
AB	3	2
	150	100

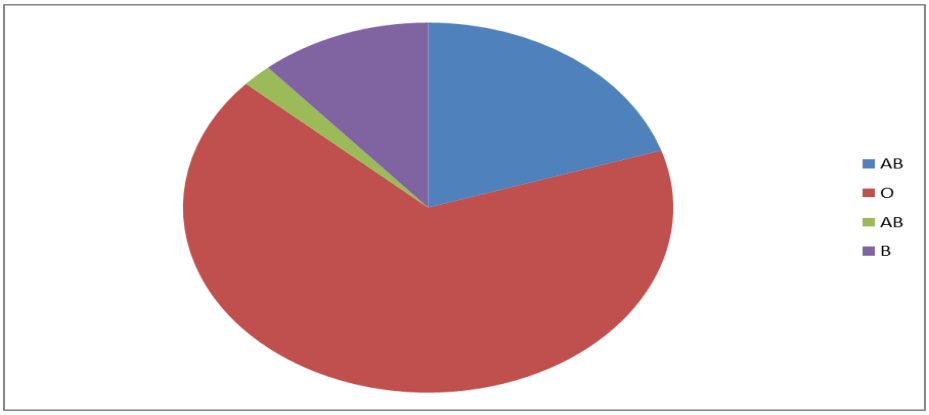
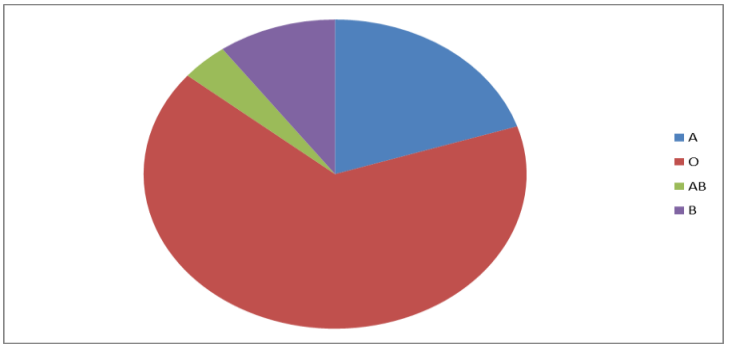


Figure (1): The distribution of blood group among patients with Renal failure

Table (2): the distribution of blood groups among male patients with Renal failure

Blood group	Frequency	Percentage
A	15	20
O	50	66
B	7	10
AB	3	4

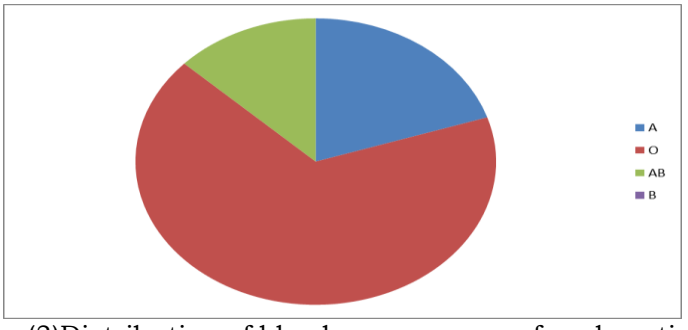
	75	100



Figure(2) Distribution of blood group among male patients

Table (3): the distribution of blood group among female patients with Renal failure

Blood group	Frequency	Percentage
A	15	21
O	50	66
B	10	13
AB	zero	0
	75	100

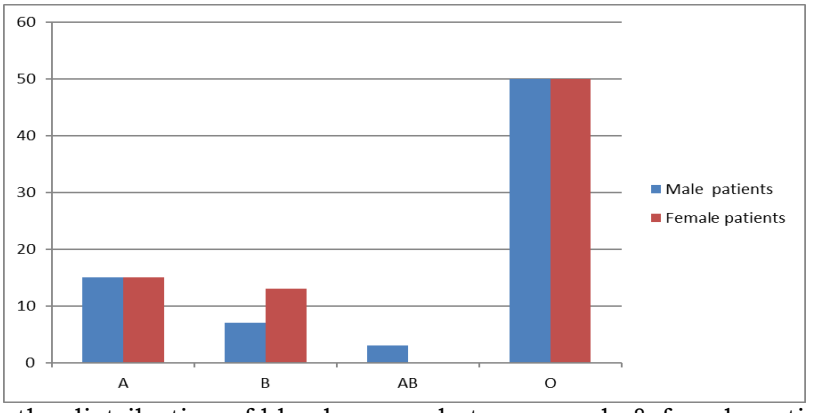


Figure(3)Distribution of blood groups among female patients.

Table (4): the distribution of blood groups between male & female patients with Renal failure

Blood group	Male patients		Female patients			
	Frequency	percentage	Frequency	Percentage	P value	Significancy
A	15	20	15	21	>0.05	Non significant
O	50	66	50	66	>0.05	Non significant
B	7	10	10	13	>0.05	Non significant
AB	3	4	zero	0	>0.05	Non

						significant
	75	100	75	100		



Figure(4): the distribution of blood groups between male & female patients with Renal faiure

Discussion

The finding of this study showed a strong association between renal failure and blood group type O and weak association with blood group AB. ABO blood group has been observed to link with many diseases [19]. A previous study indicates that blood groups A and O were most commonly associated with renal failure while the AB blood group was least associated[8] . Another separate study observed A and O blood group antigen subtypes were involved in the progression of immune-mediated Immunoglobulin A nephropathy[6]. However, these were the contrast of finding where the B blood group was the one associated with renal failure.

ABO histo-blood group is a major determinant of plasma levels of factor VIII (FVIII) and von Willebrand factor (vWF). Blood group O individuals have significantly (approximately 25%) lower plasma levels of both glycoproteins. This association is of clinical significance. Low plasma levels of either FVIII or vWF have long been established as causes of excess bleeding. Conversely, there is accumulating evidence that elevated FVIII-vWF levels may represent an important risk factor for ischaemic heart disease and venous thromboembolic disease. In spite of the well-documented association between ABO blood group and FVIII-vWF levels, the underlying mechanism remains unknown. However, it has been established that the ABO effect is primarily mediated through a direct functional effect of the ABO locus on plasma vWF levels. Theoretically, ABO blood group may alter the rate of vWF synthesis or secretion within endothelial cells. Alternatively, ABO group may affect vWF plasma clearance rates. ABO antigenic determinants have been identified on the N-linked oligosaccharide chains of circulating vWF and FVIII, according to the blood group of the individual. It remains unclear whether these carbohydrate structures are responsible for mediating the effect of ABO blood group on plasma vWF levels.

A previous study mentioned that D-galactose is present in the red blood cell of group B antigen. D-galactose metabolism occurs in the kidney and liver (20). It was observed in recent studies that treatment with D-galactose resulted in to increase in oxidative damages of kidney and liver damage thereby leading the rise in Creatinine and Blood Urea Nitrogen levels, increase the severity of the renal failure, impaired renal and liver function (21-24). Free radicals released by oxidative damage attack essential cell constituents and also induce lipid peroxidation, damage the membranes of cells and organelles in the liver and kidney, cause the swelling and necrosis of hepatocytes and nephrocytes and ultimately result in liver and kidney injury (21,25). It can therefore be inferred that D-galactose on the red cell of group B is responsible for the strong association with renal failure. We recommend that specific research should be carried out on the effect of D-galactose on renal and liver disease to understanding the mechanism there of.

A Canadian study from 1989, which included 8432 patients with end stage renal disease, found that the ABO blood group was associated with disease mortality[26]. There have also been other studies on renal diseases, such as diabetic nephropathy, end-stage renal disease, and IgA nephropathy[27-29]. In all of these studies, it was suggested that some blood groups may give a predisposition to renal diseases while others may have a protective effect. Many hypotheses (inflammation, infection) have been suggested to explain the predisposition or protection associated with blood groups, and while a clear mechanism has not yet been revealed, they are still considered as possible causes. In other studies, however, a relationship between blood group and disease has not been confirmed. In a study by Abbas et al.[30], no correlation was found between ABO blood group antigens and kidney function tests. In a study by Alhawary et al.[31], all blood groups: A (45.7%), O (30.4%), B (17.3%), and AB (6.6%) were found in patients with renal failure. Genetic studies have revealed that ABO blood type is an important genetic determinant of circulating glycoprotein levels, which are important in endothelial function and inflammation. These glycoproteins are composed of (sICAM-1) selectins, von Willebrand factor (vWF), thrombomodulin, and TNF-a[32-33]. Yang et al. [34] evaluated the relationship between the ABO blood group and the progression of IgA nephropathy. In IgA nephropathy, patients with blood group O or A and an increased inflammation level were found to be associated with an increased risk of impaired renal function and this is agree with this study.

Conclusion

The finding showed that blood group O individuals are more susceptible and suffer severely in renal failure than other blood group individuals. It is therefore necessary to ascertain the blood group of renal disease patients not only for a blood transfusion but for the management of the disease. However, the Rh blood group which is another essential blood group system in the medical practice was not included in this research work to determine their effect on renal disease.

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