ISSN No:-2456-2165

Analysis of Biochemical Parameters of Hemodialysis Patients and their Relationship to ABO Blood Group at the Kidney Center in Al-Zawia City

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Abstract:-

➢ ***Background***

Chronic kidney disease (CKD) is defined as abnormalities of the kidney structure and function. The incidence of the disease continues to increase annually. CKD patients develop several complications such as hypertension, electrolyte abnormality, anemia, and kidney failure. This study aims to assess the prevalence of the disease according to gender, age, and blood group. CKD patients were also subjected to determine the levels of urea and creatinine before and after hemodialysis.

➢ ***Methods***

The study participants included 157 patients diagnosed with CKD undergoing hemodialysis department at Al-Zawia Kidney Center. Urea and creatinine were also assessed before and after hemodialysis.

➢ ***Results***

This study found that the incidence of the disease was higher in females compared to males. Diabetes and hypertension were seen in patients with CKD. Our study also found a high incidence of CKD in patients with blood group O+. The level of urea and creatinine was significantly reduced in the post-dialysis samples.

➢ ***Conclusion***

The incidence of CKD was higher among patients with blood group O+. These patients have significantly reduced the level of urea and creatinine after dialysis. Hence hemodialysis could improve the life expectancy of patients with CKD.

Keywords:- *Chronic Kidney Disease, ABO Blood Groups, Urea, Creatinine.*

I. INTRODUCTION

Chronic kidney disease (CKD) is a major health concern. It is characterized as a chronic and irreversible condition associated with significant morbidity and high mortality (Goleg *et al*., 2014). During the 20th century, the disease was part of a new epidemic of chronic diseases that replaced malnutrition and infection as the primary causes of death (Al-taworghei *et al*., 2019; Abd Elhafeez *et al*., 2018). Epidemiological studies of the adult population in various countries reported that the prevalence of CKD is 9%–11%. Although in Libya, data about the incidence of CKD is lacking. It is reported that the prevalence of End –stage renal disease (ESRD) is 80–100 per million per year, and there are approximately 2100 patients currently on dialysis in Libya (Sauod *et al*., 2017).

The kidneys intervene as blood filters, removing waste products, regulating fluid, and electrolyte balance. Filtration occurs via bundles of capillaries called glomeruli. CKD is defined as kidney impairment that lasts longer than three months and results in a glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m2 of body surface area.

CKD has been recognized as a risk factor for death because it is associated with disorders or complications, such as cardiovascular-related problems, which result in increased morbidity and a significant financial load in the healthcare system (Habas *et al*., 2016). In addition, several chronic conditions have been identified as CKD risk factors such as diabetes mellitus (DM) and hypertension (HTN) (Jha *et al*., 2013).

Furthermore, diabetes and hypertension are linked to aging and obesity in developed countries. Other risk factors for CKD in developing countries include glomerular diseases and tubulointerstitial insults caused by infections, nephrotoxic drugs and herbal medications, environmental toxins, and pesticide exposure at work (Habas *et al*., 2016).

A study has shown that the ABO blood types and Rh are associated with various diseases. Since blood-type antigens are genetically programmed, they may make various diseases more common while keeping others less common. Several diseases, including coronary artery disease, type 2 diabetes mellitus, chronic kidney failure, gastroduodenal ulcers, Crohn's disease, and several cancer types, particularly brain, breast, skin, and pancreatic, are related to the ABO blood group (Idris *et al*., 2021).

ISSN No:-2456-2165

This study aims to investigate the relationship between ABO blood types and CKD and to evaluate the level of urea and creatinine in hemodialysis patients before and after dialysis.

II. DATA COLLECTION

Data was collected from CKD patients who regularly attended the hemodialysis department at Al- Zawia Kidney Center from August to December 2021. A total of 157 patients including 69 males and 88 females were recruited in this study. Demographic data including age, gender, blood group, and history of diabetes and hypertension were collected from patients' medical records. Levels of creatinine and urea were also obtained from the patients before and after dialysis.

➢ *Statistical Analysis*

Data was analyzed using Graph pad prism7 Software. Demographic data including age, gender, ABO blood type, history of diabetes, and hypertension were calculated as percentages. Parameters including urea and creatinine were calculated and presented as the mean and SEM. Mann-Whitney test was performed to compare the differences between the level of urea and creatinine before and after dialysis. $p<0.05$ was considered statistically significant**.**

III. RESULTS

A. Age and gender variation

A total of 157 CKD patients from Al-Zawia Kidney Center were recruited in this study. The result shows that 69 (44%) were males and 88 (56%) were females. So females were more affected by kidney disease than males (Fig 1). Patients' age groups were divided into five distinct 10-year periods, starting from 25 to 68 years. Our result found that the most affected age groups were between 58 and 68 years, with a total count of 22 patients (21.5%) (Fig 2). In addition, the patients were investigated for comorbidity diseases, hypertension was the highest (n 48; 47%), followed by diabetes mellitus (n = 29; 8.8%) (Fig3).

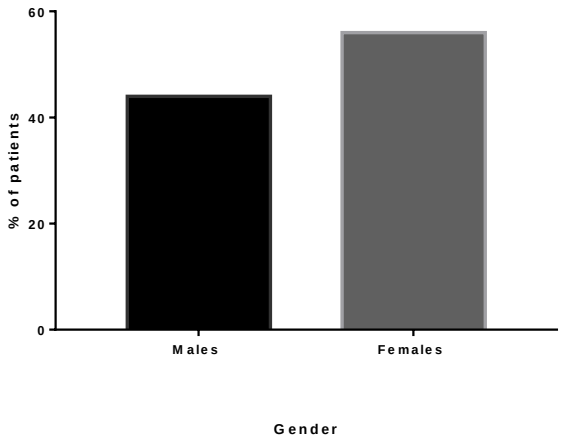

Fig 1: Gender variations among patients

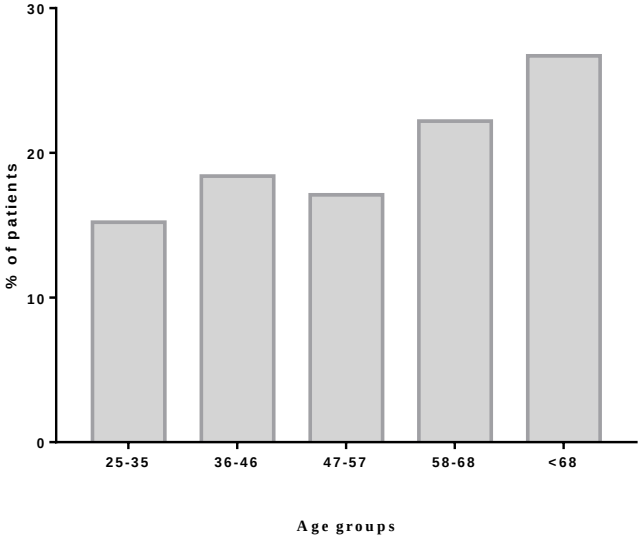

Fig 2: Distribution of study samples over different age periods

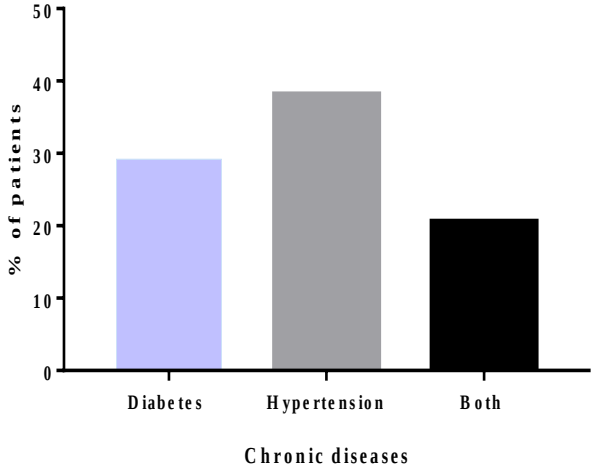

Fig 3: Comorbidity disorders in CKD patients

B. Determination of blood group

Blood groups were also investigated in this study to find out the correlation between CKD and blood groups. The result showed that the highest proportion of patients with blood group O+ (32.4%), followed by A+ (15.9%), whereas the lowest proportion was in patients with blood group AB- and B- (3.1%) and (1.9%) respectively (Fig 4*)*.

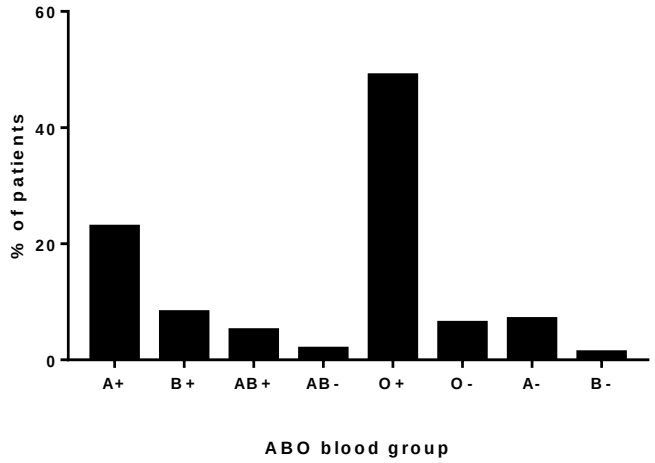

Fig 4: Distribution of blood groups in patients with CKD

C. Clinical Parameters:

In this study, 60 patients were subjected to kidney function tests to determine urea and creatinine levels before and after dialysis. Our study found that patients with CKD had significantly higher levels of urea in pre-dialysis compared to the post-dialysis (p=0.0001) (Fig 5). In addition, our finding demonstrated that creatinine levels were significantly higher in pre-dialysis samples compared to the level in post-dialysis in CKD patients (p=0.001) (Fig 6).

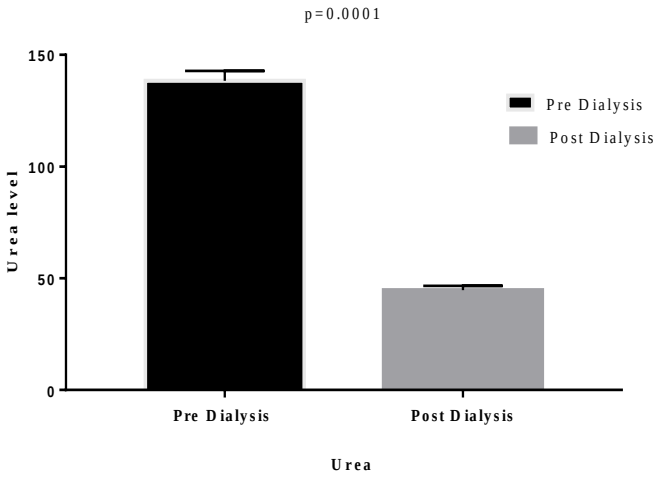

Fig 5: Urea levels in CKD patients (before and after dialysis)

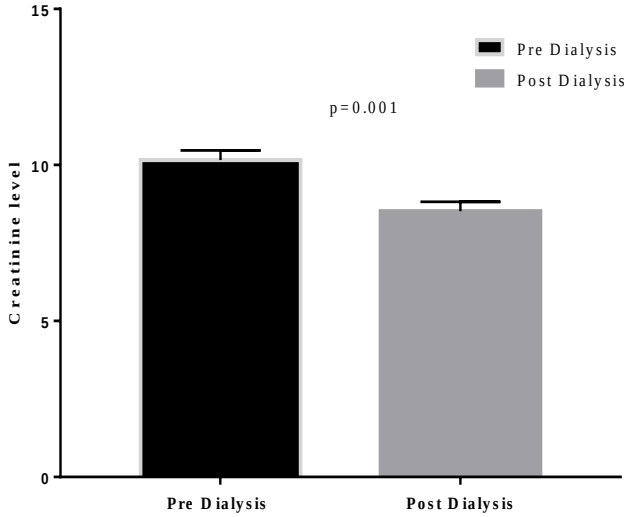

Fig 6: Creatinine levels in CKD patients (before and after dialysis)

IV. DISCUSSION

Chronic kidney disease is a major public health problem and a major cause of death worldwide. This study included 157 CKD patients (69 males and 88 females. Our findings in this study showed that the prevalence of CKD was higher in females compared to males (56% to 44% respectively). This result is in agreement with a previous study revealed that a higher prevalence of CKD among females compared to males (Habbas *et al*., 2016; Al-taworghei. *et al*., 2019; Jaat *et al*., 2021). The greater prevalence of CKD in women might be due to the effects of longer life expectancy on the natural decline of glomerular filtration rate (GFR) with age in women (Carrero *et al*., 2018). It has been suggested that low iron stores in females in lower socioeconomic groups may influence the elimination of heavy metals and oxidative stress on the kidney. These factors would make the kidneys more susceptible to CKD, resulting in a higher incidence in females (Jayatilake *et al*.,2013). Furthermore, the present study found that the incidence of CKD increased with increasing age. The age groups < 68 years and age (58-68 years) had the highest proportion of patients with renal disease. Our study is similar to a previous study that demonstrated that the prevalence rates peaked in the 55–64 year age group for males and females (Alashek ., *et al* 2012). The result suggested that the incidence of CKD in Libya is associated with increasing age.

Currently, several studies have been published on the relationship between CKD and blood group types. The present study also found the highest proportion of patients with blood group O+ (46%), followed by type A+ (24.5%), among renal disease patients.

It has been found that ABO blood groups are associated with disease mortality, such as renal disease, end-stage renal disease, diabetic nephropathy, and IgA nephropathy. This implies that some blood groups are predisposed to renal disease while others are protective, which is thought to be a

possible cause of the disease (Idris *et al*., 2021). Blood group A/O has been identified as a risk factor for IgA nephropathy progression (Jaat *et al*., 2021).

Yang *et al* (2017) investigated the link between ABO blood group and IgA nephropathy progression. Patients with blood groups O or A have an elevated inflammation level which increased the risk of impaired renal function in IgA nephropathy.

The current study showed most of the patients had hypertension (47%) followed by diabetes (8.8 %) of the study sample. Hypertension is a common result and frequent cause of chronic kidney disease. According to data from the World Health Organization, hypertension is estimated to affect up to 40% of adults worldwide, and the incidence is continuously increasing (Kim *et al*., 2019). Diabetes also is another risk of developing CKD as demonstrated by previous studies. Approximately 20–30% of patients with type 2 diabetes mellitus develop renal impairment, classified as moderate-to-severe CKD (Betônico *et al*.,2016). In addition, our study found 12.7% of patients had both diabetes and hypertension. Several studies have stated that diabetes and hypertension are the main risk factors for chronic kidney disease and renal failure (Wulnadari *et al*., 2013; Nazzal *et al*., 2020).

Levels of urea and creatinine were also investigated in this study. The comparison of serum urea and creatinine values after dialysis and before dialysis showed that the values were significantly reduced in the post-dialysis sample (p-value = 0.0001 and 0.001) respectively. This finding is similar to the result from a previous study which stated that the level of urea and creatinine was significantly reduced in post-dialysis samples (Bhuvaneswari *et al*., 2023)

Chronic renal failure is characterized by a progressive decline of glomerular filtration rate followed by an increased level of creatinine and urea in serum (Kamal, 2014). Uric acid is the final product of purine metabolism which is eliminated in the urine; therefore the high level of kidney disease is due to impair the kidney to eradicate it (Gu *et al*., 2017). Furthermore, creatinine levels slightly increased as a result of kidney damage, and with this; there was a reduced glomerular filtration rate due to inflammation of the kidney (Kamal, 2014). Thus urea and creatinine are good indicators of the normal functioning of the kidney.

V. CONCLUSION

In conclusion, our findings showed that the prevalence of CKD was higher in males compared to females. Patients with blood type O+ are more likely to develop chronic kidney disease. Furthermore, hypertension and diabetes mellitus were the most common comorbid diseases in patients with chronic kidney disease. Notably, we identified that the level of urea and creatinine significantly declined in CKD subjects after they underwent hemodialysis.

ACKNOWLEDGEMENT

The authors thank all patients who participated in this study and all the healthcare workers and in the Al-Zawia Kidney Centre for their contribution and help in completing this study.

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