

Research article

# The relation between renal failure and kidney function parameters, packed cell volume and blood pressure

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## ABSTRACT

This study was conducted to find out the relationship between renal failure and kidney function parameters like blood urea, blood sugar, blood pressure, serum phosphate, packed cell volume (PCV) %. Eight three subjects aged from 22 to 75 years old (53 males and 30 females), this study extended from December 2015 till April 2016. Sixty three patients were suffering from renal failure while other twenty were non infected and considered as control group. Blood urea, blood sugar, blood pressure, serum phosphorous level were assayed using biochemical function tests, PCV% level was assayed using hematological test. It was found significant increase in blood urea, serum phosphorous ( $P < 0.05$ ) in the patients compared with control group, and significant decrease in PCV% ( $P < 0.05$ ) in infected subjects as compared with non infected group. In contrast, it was observed no significant difference between infected and non infected individual in terms of level of blood sugar ( $P > 0.74$ ).

**Keywords:** Blood pressure, Kidney function tests, Packed cell, Renal failure.

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## INTRODUCTION

Renal failure definition is the inability of the kidneys to excrete wastes, concentrate urine, and conserve electrolytes. The condition may be varying from acute to chronic. Acute renal failure is characterized by oliguria and the rapid accumulation of nitrogenous wastes in the blood which is called (azotemia). It results from hemorrhage, trauma, burn, toxic injury to the kidney, acute pyelonephritis or glomerulonephritis, or lower urinary tract obstruction. Many forms of acute renal failure are reversible after the underlying cause has been identified. There are three typical phases for acute renal failure: prodromal, oliguric, and postoliguric [1]. Treatment includes regulated intake of fluids and of all sub-

stances that require excretion by the kidney. Antibiotics and diuretics medications were used. Chronic renal failure may result from many other diseases [2]. The initial signs include fatigue, sluggishness, and mental dullness. Later, anuria, convulsions, GI bleeding, malnutrition, and various neuropathies may occur. The color of the skin may turn yellow-brown. Congestive heart failure and hypertension are frequent complications, the results of hypervolemia. Urinalysis reveals greater than normal amounts of urea and creatinine, waxy casts, and a constant volume of urine regardless of variations in water intake. Anemia frequently occurs [3]. The prognosis of the patient health depends on



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the underlying cause. Treatment usually includes restricted water and protein intake and the use of diuretics. When medical measures have been exhausted, long-term hemodialysis or peritoneal dialysis is often begun, and kidney transplantation is considered as an option of life saving [4]. The aim of this study was to discuss the relationship between kidney function parameters like blood urea, serum phosphate, and some important biological indicators such as blood pressure, Packed Cell Volume (PCV) % and serum blood sugar.

## **MATERIALS and METHODS**

### **Patients**

This study conducted on 63 patients suffering from renal failure and also 20 healthy control group. Then blood pressure and biochemical and hematological tests performed including blood urea, blood sugar, serum phosphorous and PCV for each patient and finally obtained data were analyzed by SPSS software. The patients data released from Alyarmouk hospital, artificial kidney unite for about six months and the required tests and blood pressure were examined under medical expert in this field in order to ensure the accuracy for the demanding tests. The ages of patients were ranged from 26 to 75 years old.

### **Hematological and biochemical tests**

#### **PCV test**

The PCV or Hematocrit is the proportion of blood volume that is occupied by erythrocytes (the ratio of red blood cells to the whole blood volume). It is usually expressed either as a percentage or as a decimal fraction (e.g. 41% or 0.41). Normal value for adults' female should be 36 - 46 % and adult male should be 38 - 50 %.

#### **Blood Urea**

Blood urea test checks kidney function by measuring how much urea nitrogen is in your blood. Urea nitrogen is a waste product from the breakdown of protein in the body. Normally, this waste is filtered by the kidneys and leaves the body through urine. Too much or too little urea nitrogen in the blood could signify kidney problems. The blood urea test is frequently done along with other tests to diagnose or monitor kidney diseases. This test can also show whether the current kidney treatments are working, normal value for adults male and female should be 15 - 45 mg/dl.

#### **Serum phosphorus**

High serum phosphorus has been shown to be associated with a more rapid decline of renal function in patients with chronic kidney disease (CKD). Normal value for adults male and female should be 2.5-4.5 mg/dl.

#### **Serum Glucose**

Glucose is the major source of energy in the body. Insulin, produced by cells in the pancreas, facilitates glucose entry into the tissue cells. A deficiency of insulin or a decrease of its effectiveness increases blood glucose. Elevated serum or plasma glucose concentration is found in

diabetes mellitus (insulin dependent, non-insulin dependent) and in other conditions and syndromes. According to the National Diabetes Data Group (US) 3, elevation of fasting plasma glucose values over 140 mg/dL (7.77 mmol/L) on more than one occasion is diagnostic of diabetes mellitus.

### **Blood Pressure**

Blood pressure is the pressure exerted by circulating blood upon the walls of blood vessels and is one of the principal vital signs. A person's blood pressure is usually expressed in terms of the systolic (maximum) pressure over diastolic (minimum) pressure and is measured in millimeters of mercury (mm Hg). Normal resting blood pressure for an adult is approximately 120/80 mm Hg. To take a blood pressure reading, you need to be relaxed and comfortably seated, with your arm well supported. Alternatively, you can lie on an examination couch.

## **RESULTS**

**Table 1** shows the difference in the required tests between the renal failure group and control group, this table shows that there was significant difference ( $P < 0.05$ ) in blood urea, serum phosphorous and PCV % between patient suffering from renal failure group and control group. However, the experimental data showed no significant difference ( $P > 0.05$ ) in blood sugar between renal failure group and control group.

**Table 1** shows the result of blood urea test as comparison between patients group and control group. Tests results showed an elevation in blood urea value in the renal failure group. There was significant difference ( $P < 0.05$ ) between renal failure group and control group. Also, there was a significant difference ( $P < 0.05$ ) between patients suffering from renal failure group and control (healthy) group in terms of phosphorous test. Test shows that serum phosphorous value was higher than normal level in patients with renal failure. The result of PCV shows that there was significant difference ( $P < 0.05$ ) between patients group and control (healthy) group. The value of PCV was less than normal in patients group and an early signs of anemia were seen. However, the Blood sugar test result shows that there was no significant difference ( $P > 0.05$ ) between renal failure group and control group. For blood pressure, the result of systolic pressure in this article showed that there was a significant difference ( $P < 0.05$ ) between patients group and control (healthy) group. Nevertheless, the result of diastolic pressure in this article showed that there was no significant difference ( $P > 0.05$ ) between patients group and control (healthy) group.

## **DISCUSSION**

Previous study of Beier et al. (2011) agreed with the results of this study about the relation between renal failure and high blood urea. Beier et al. concluded that there was a correlation between high blood urea and mortality, and elevations in blood urea independent of creatinine may have negative impact on patient survival by reflecting the extent of catabolism, patients with acute renal failure tests shows an elevation in blood urea in the study cases [5].

**Table 1.** Levels of blood urea, serum sugar, serum phosphorus, PCV %, low and high blood pressure in patients and healthy control groups.

Tests	Groups	Mean	Standard deviation	T- test	P value
Blood urea	Patients	164.92	45.98	12.315	0.005
	Control	37.45	5.81		
Blood sugar	Patients	126.29	55.56	0.323	0.748
	Control	122.15	23.67		
Serum phosphorus	Patients	5.72	1.49	7.210	0.005
	Control	3.26	0.60		
PCV%	Patients	0.32	0.04	-6.232	0.005
	Control	0.39	0.05		
Blood Pressure high	Patients	147.56	24.27	2.856	0.005
	Control	131.20	14.19		
Blood Pressure low	Patients	87.41	16.64	1.407	0.163
	Control	81.95	8.50		

Merlin *et al.* (2004) supported the results of this study; they found that there is a significant association between anemia, blood sugar and renal function. Diabetes mellitus patients with a mild renal failure have 4 times greater (AOR = 4.29, 95% CI = 1.14, 16.13) risk to be anemic than patients with a normal renal function. The glomerular filtration rate increase, the risk to be anemic will decrease dramatically. Diabetes mellitus patients with a moderate renal failure have 11 times greater (AOR = 11.13, 95% CI = 2.69, 45.94) risk to be anemic than a normal renal function. This finding agrees with a study in UK, which indicates from anemic patients 36% with moderate renal failure and 9% of those with mild renal failure [6]. Coresh *et al.* (2007) found that hemoglobin (Hb) level was low in renal failure patients due to removal of blood during dialysis. In their study 60 patients (75%) had Hb between 5-11 g/dl, other 10 between 11-14 g/dl. This low Hb level most of the time led to the development of anemia [7]. Shokoufeh *et al.* (2009) showed that 13.8% of the population with diabetes have clinically significant chronic kidney disease (CKD) [8], also this finding is in agreement with a study in USA which says 15.9% of participants had at least moderately reduced kidney function [9]. Meanwhile, Helen *et al.* (2010) supported the result of our study that related to the serum phosphorous level, they found that higher serum phosphate, even within the normal laboratory range, was associated with an increase in mortality in patients with renal failure [10]. Moreover, Dhingra *et al.* (2007) study suggests that differences within the normal range of phosphate are associated with increased cardiovascular risk in the general population [11]. A previous study concluded that hypertension in renal failure patients is an important contributor to morbidity and mortality amongst acute medical admissions and that in a hospital based outpatient clinic hypertension is associated with a significant burden of renal disease [12]. The present study concluded that blood urea elevated in renal failure patients, serum phosphorous concentrations have a positive correlation with acute renal failure, renal failure patient's tests shows a reduction in hemoglobin rates and this may lead to anemia, renal failure patient's blood pressure shows an abnormal result in systolic and diastolic pressure, Renal failure is not accompanying with an increase or decrease in blood sugar.

**Conflict of interest**

The author declares that he has no conflict of interests.

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