KINETIC CHANGES OF KIDNEY FUNCTION TESTS AMONG PATIENTS WITH KIDNEY FAILURE IN ROYAL MEDICAL SERVICES

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Abstract

Introduction: Kidney function tests are requested to monitor the general status of kidney health in general, and particularly to assess renal failure status.

Objectives: To investigate the efficacy of therapeutic options for renal failure patients through studying changes in selected laboratory investigations..

Methodology:

A retrospective study design was involved to review files of patients with kidney failure at Royal Medical Services. A total of 263 files were reviewed for kidney function tests over a period of three months. After the end of data collection, data were analyzed employing SPSS V20. The representation of data was as means and standard deviations. Kinetic changes were tested using paired T-test. Significance between variables was considered at an alpha ≤ 0.05.

Results

Among study variable including Hematocrit (HCT), mean cell volume (MVC), blood urea nitrogen (BUN), creatinine, phosphorous, calcium, albumin, sodium, and potassium, there were insignificant changes except for BUN ($p=0.004$), sodium ($p=0.013$), and potassium ($p=0.000$).

Conclusion

From the results, following changes in the level of kidney function tests help in assessment of renal failure status as the progression of disease can be monitored. Understanding and comparing various laboratory findings help in

better monitoring of clinical status of patients.

Keywords: Renal failure, kidney function test, BUN, sodium, potassium, kinetic changes

Introduction

It has been estimated that about 35,000 deaths occurred in United States yearly due to renal diseases (Waknine, 2007). Millions of patients have complained from various kidney diseases such as urinary tract infections, kidney stones and urinary obstruction (Alpers, 2004).

Chronic Renal Failure (CRF) has been described as a syndrome in which there is a continuous and irreversible alterations of renal function resulting from the damage of renal parenchyma, which may end with death if appropriate numbers of nephrons are damaged (Alpers, 2004; (Eknoyan et al., 2004). Patients with CRF are more likely to develop cardiovascular diseases (Al-Aly et al., 2010; Wang et al., 2011; Chen et al., 2012; Hallan et al., 2012).

There are various therapeutic options to treat CRF, but these options vary according to the underlying cause. Furthermore, complications associated CRF are treated to help patients coping with these complications. In case blood pressure has been encountered, angiotensin-converting enzyme (ACE) inhibitors are prescribed. Patients usually suffer from increased levels of cholesterol, and statins are prescribed to lower cholesterol and to decrease the risk of heart disease. If anemia is encountered, erythropoietin is prescribed, sometimes with iron to help in production of red blood cells to help in get rid of fatigue and weakness associated with anemia. Sometimes, diuretics are given to relieve swelling. Calcium and vitamin D supplements are given to protect bones. In case of developing end-stage kidney disease, dialysis and kidney transplant are the potential therapeutic choices (Abecassis et al., 2008; Mayoclinic.org, 2015).

In a study conducted by Suresh et al (2012) to investigate the hematological changes including red blood cell (RBC) count, Hb concentration, hematocrit, and platelet count in patients with CRF, it was found that CRF had significantly decreased levels of variables under study ($P<0.05$) with control group.

Study objective: the main objective of this study is to investigate efficacy of therapeutic options for renal failure patients through studying changes in selected laboratory investigations.

Methodology

This study employed retrospective design to collect data from files of patients with renal failure at Royal Medical services. A total of 262 files of

renal patients were reviewed. Two readings for each patient were taken and analyzed for the following laboratory investigations: Hematocrit (HCT), mean cell volume (MVC), blood urea nitrogen (BUN), creatinine, phosphorous, calcium, albumin, sodium, and potassium. The data of all patients included were entered into excel sheet to create raw data, and after that were transferred into SPSS version 20 for statistical analysis. Paired T test was used to investigate the significance between variables. Significance was considered at an alpha level ≤ 0.05.

Results

First and second readings of laboratory investigation

As it can be seen from table 1, there were slight differences in HCT reading, and second readings were slightly lower than the first reading. The level of MCV was higher in the second reading compared with the first reading (from about 87 to about 90). The level of BUN increased from 62to 69.52. Slight increases in creatinine level were observed. Phosphorous levels increased slightly in the second readings. Calcium levels slightly decreased in the second reading. The level of albumin was slightly increased. Sodium level slightly decreased, and potassium level increased in the second reading.

Table 1: First and second readings of laboratory investigation

First reading (M±SD)	**Second reading (M±SD)**
HCT (30.81± 5.18)	HCT (30.45±5.73)
MCV (86.99± 5.84)	MCV (90.27±53.54)
BUN (62±19.81)	BUN (69.52± 30.89)
Creatinine (9.32±5.91)	Creatinine (9.35± 3.22)
Phosphorous (4.96±1.76)	Phosphorous (5.48±6.51)
Calcium (8.83±1.0)	Calcium (8.75±0.98)
Albumin (38.94±5.46)	Albumin (39.14±7.69)
Sodium (139.87±4.36)	Sodium (138.85±4.29)
Potassium (4.62+0.83)	Potassium (4.99+0.96)

Statistical variation in the level of laboratory investigations

In this section, there was an attempt to investigate if the variations between first and second readings were statistically significant. As shown in table 2, although some slight changes were observed, but they were not statistically significant ($p > 0.05$), except for three investigations BUN ($p=0.04$), sodium ($p=0.013$), and potassium ($p=0.000$).

Table 2: Statistical variation in the level of laboratory investigations (Paired T test)

First reading (M±SD)	**Second reading (M±SD)**	**P value**
HCT (30.92±5.26)	HCT (30.27±5.26)	0.214
MCV (86.89±5.83)	MCV (90.40±55.15)	0.357
BUN (61.88±20)	BUN (69.31±32.30)	0.004
Creatinine (9.43±6.25)	Creatinine (9.20±3.16)	0.611
Phosphorous (4.75±1.83)	Phosphorous (5.42±7.0)	0.193
Calcium (8.81±1.0)	Calcium (8.77±0.94)	0.689
Albumin (39.18±4.75)	Albumin (39.11±7.74)	0.919
Sodium (140.02±4.05)	Sodium (138.96±4.02)	0.013
Potassium (4.65±0.82)	Potassium (4.99±0.98)	0.000

Discussion

The present study focused on kinetic changes of biomarkers for assessment of renal function of renal failure patients. Actually changes from time to time can help in monitoring of progression of disease and the efficacy of medications used. Our results showed the importance of continuous monitoring of laboratory investigations and the following points can be argued:

1- hanges in the level of these investigations are necessary to be followed to monitor minor changes before being major changes and create further problems for the patients with renal failure (figure 1).

2- Although, changes may be still statistically insignificant, but they can draw the line for disease progression.

3- Our study indicated that three of investigations were statistically significant, BUN (p=0.004), sodium (p=0.013), and potassium (p=0.000).

Increased level of BUN implies a deterioration in protein metabolism and this is in agreement with other studies (Dwinnell and Anderson, 2012; Kamal, 2014). On the other hand, deteriorations in the level of sodium and potassium indicate to complications related cardiovascular disease and therapeutics under use need to be assessed again (Mayoclinic.org, 2015).

Conclusion

From the results, following changes in the level of kidney function tests help in assessment of renal failure status as the progression of disease can be monitored. Understanding and comparing various laboratory findings help in better monitoring of clinical status of patients.

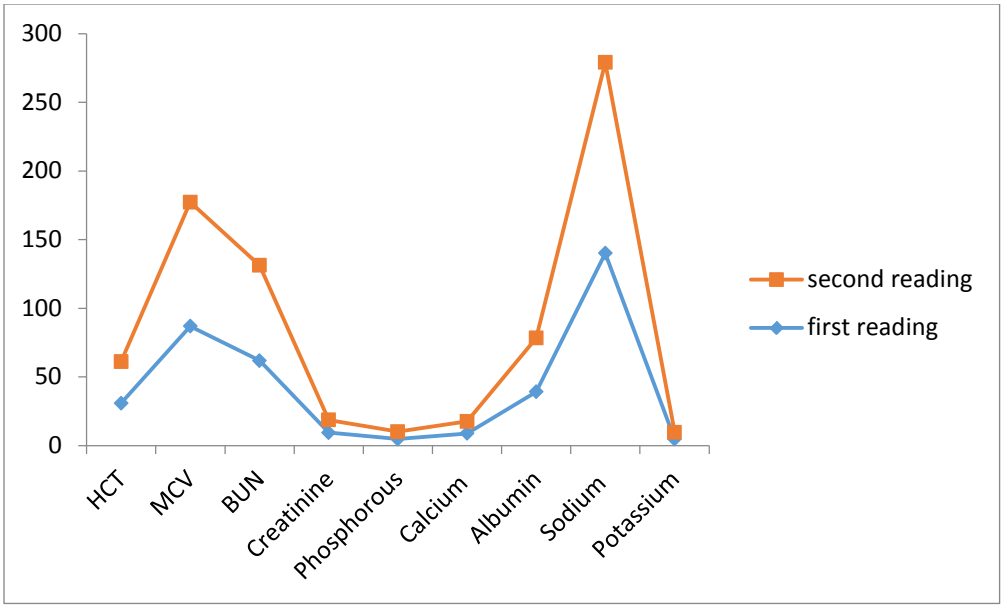

Figure 1: Schematic diagram representing changes in the level of laboratory investigations for the first and second readings.

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