HEMATOLOGICAL AND BIOCHEMICAL FINDINGS AMONG JORDANIAN PATIENT WITH END STAGE RENAL DISEASE

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Abstract

Chronic renal failure is a continuous decreased loss of renal function which leads to long term renal treatment including renal replacement therapy. One of the renal therapeutic options is renal haemodialysis, which acts in removing body's waste products, including creatinine, urea and excess water. The present study was conducted to study the frequency of some hematological and chemical parameters among patients with chronic kidney disease at Royal Medical City Clinics. Study methodology implied withdrawing blood samples from study participants to carry out the following hematological and chemical parameters: hemoglobin, hematocrit, mcv, bun, creatinine, phosphorous, calcium, albumin, sodium, and potassium. Study findings showed that patients were anemic (hemoglobin 8.99). Chemical parameters indicated that renal dialysis was not able to effectively maintain chemical constituents of the body. Taken together, the current renal dialysis regimens need to be revised in terms of duration and frequency.

Keywords: Chronic kidney disease, renal dialysis, erythropoietin, bun, creatinine, albumin

Introduction

It is believed that chronic renal failure to be a continuous decreased loss of renal function which leads to long term renal treatment including renal replacement therapy. One of the renal therapeutic options is renal haemodialysis, which acts in removing body's waste products, including creatinine, urea and excess water (Amin et al., 2014).

In their study, Levey et al (2007) showed that chronic kidney disease (ckd) as one of the major public health problems worldwide. In a previous study by Levey et al (2003), it has been estimated that about twenty six million adults having non-dialysis dependent kidney disease in the united

states. In another study, it has been estimated that more than 13% of the us population to have chronic renal disease (Coresh et al., 2007). Furthermore, the prevalence of ckd is expected to increase wit time worldwide (Bethesda, 2009).

Chronic renal failure is associated with a continuous reduction in glomerular filtration rate (gfr) which, in turn, causes the accumulation of various chemicals in the blood including urea and creatinine (Amin et al., 2014). It has been indicated that gfr of less than 60 ml/minute/1.73 m2 gives the indication of ckd (Couchoud et al., 1999).

Studies have identified increased blood pressure to be one of the main factors causing kidney failure. It is plausible that hypertension induces kidney failure through impacting the blood vessels within the kidney which, in turn, has effects on the secretion of waste products. It has been observed that the waste may be secreted into extra cellular fluid leading to more increased blood pressure ending with esrd (Santulli, Trimarco and Iaccarino, 2013).

Haemodialysis is considered as a good therapeutic option in the context of the renal replacement therapies. Body waste product including urea, creatinine and free water are removed from the blood in case of impaired kidneys. From an economic point of view, dialysis is considered cheaper compared with the high cost of renal transplant. So, dialysis has superiority over renal transplant particularly, when the possibility of rejection is taken into account (Abram and Anju, 2012). The frequency of haemodialysis is 2-3 times per week, whereas dialysis time ranged from 2-4 hours depending on several factors among which are kidney function, amount of waste in body, level of salts and body weight. Several complications have been associated with haemodialysis such as sleeping sickness, exhaustion low blood pressure, chest pain, nausea, leg cramp, anemia and headache (Unruh et al., 2011).

It has been observed that ckd is associated with anemia since erythropoietin production is reduced as a consequence of impaired function of kidneys in case of chronic renal failure (Hodges et al., 2007).

The effect of haemodialysis on the elimination of excess body waste as well as hemoglobin level of patients was investigated. Researchers analyzed 70 patients. They found that 53% of patients to have serum urea level above 200 mg/dl before dialysis, which reduced to about 100 mg/dl after dialysis; serum creatinine was among 57% of patients between 7-12 mg/dl before dialysis, whereas after dialysis 58% of patients had their creatinine levels below 7 mg/dl (Amin et al., 2014).

Study objectives

To study the frequency of some hematological and chemical parameters among patients with chronic kidney disease at royal medical city clinics.

Methodology

Study design and setting

This is an experimental cross sectional study. Participants were recruited from internal medical clinics who visited renal department for dialysis.

Study sample

Study sample included 262 patients with chronic kidney disease and subjected to renal dialysis.

Blood samples

Two blood samples were taken from each patient, one with anticoagulant for hematological investigations such as hemoglobin, hematocrit, and mcv. The other blood sample was used to investigate chemical tests including blood urea nitrogen (bun), creatinine, phosphorous, calcium, albumin, sodium and potassium.

Statistical analysis

Data was entered into spss version 20 for statistical analysis. Data was represented as frequencies and percentages for gender and hematocrit level. Other parameters were represented as mean and standard deviation.

Results

As shown in table 1, the study included 150 (57.3%) males and 112 (42.7%) females.

Table 1: frequency of study participants by gender

Gender	Frequency	Percentage
Male	150	57.3
Female	112	42.7

Erythropoietin administration according to hematocrit level

Erythropoietin was given to patients per week according to following criteria:

If hematocrit level is > 36%, no erythropoietin is required. If hematocrit level is between 33-36 %, 1 injection of erythropoietin is required, if hematocrit level is between 32-35%, 2 injections of erythropoietin are required, and if hematocrit level is < 32%, 3 injections of

erythropoietin are required per week. Accordingly, results showed that about 18% of patients without need for any injections of erythropoietin, about 15% of patients required 1 injection of erythropoietin per week, about 44% of patients required 2 erythropoietin injections, and about 10% required 3 injections of erythropoietin weekly.

Table 2: the criteria of erythropoietin administration according to hematocrit level

Hematocrit level	Frequency	Percentage
> 36	47	17.9
33-36	38	14.5
32-35	114	43.5
< 32	26	9.9
Missing	37	14.1

Hematological and biochemical findings among study participants

The results showed that the mean of hematocrit was 26.15% (± 11.73%), hemoglobin 8.99 g/dl (± 7.83), mcv 90.27 (± 53.54). The mean level of bun was 69.52 (± 30.89), creatinine 9.35 (± 3.21), the mean level of phosphorous 5.48 (± 6.51), the mean level of calcium 8.75 (± 0.98), the mean level of albumin 39.13 (± 7.69), the mean level of sodium 138.85 (± 4.28), and the mean level of potassium 4.99 (± 0.96).

Table 3: hematological and biochemical findings among study participants

Lab finding	Mean (m)	Standard deviation (sd)
Hematocrit	26.15	11.73
Hemoglobin	8.99	7.83
Mcv	90.27	53.54
Bun	69.52	30.89
Creatinine	9.35	3.21
Phosphorous	5.48	6.51
Calcium	8.75	0.98
Albumin	39.13	7.69
Sodium	138.85	4.28
Potassium	4.99	0.96

Discussion

The present study showed that males were more likely to be involved in chronic kidney disease that require renal dialysis compared with females. This finding agreed with other studies that reported similar trends (iseki e al., 1996, 2008).

Erythropoietin administration at different doses was required for 67.9% of patients. This finding is in line with the context that chronic kidney disease is associated with anemia since erythropoietin production is reduced as a consequence of impaired function of kidneys in case of chronic renal failure (hodges et al., 2007).

The mean mcv was 90.27 which was less compared with other studies in which an mcv > 102 fl was associated with increased mortality among patients with esrd (Karthik et al., 2011).

Bun mean was high among study participants compared with other studies which showed the ability of renal dialysis to reduce urea approximately to half (Amin et al., 2014).

The mean level of creatinine among study patients was 9.35 mg/dl after dialysis. Actually, it is still higher than that compared with other studies which pointed to creatinine level of 7 mg/dl after dialysis (Amin et al., 2014).

The mean phosphorous level in the present study is 5.48 mg/dl and this was higher than that compared with other studies in which the highest phosphorous level was 4.2 mg/dl (Levin et al., 2007).

The mean calcium level in the present study was 8.75 mg/dl and this was lower than that reported in other studies in which calcium was 9.2 mg/dl (Levin et al., 2007).

Finally, the levels of albumin, sodium and potassium were disturbed in patients with chronic kidney disease which agree with other studies (Levin et al., 2007; Amin et al., 2014).

References:

A Levin, GL Bakris, M Molitch, M Smulders, J Tian, LA Williams, DL Andress (2007). Prevalence of abnormal serum vitamin D, PTH, calcium, and phosphorus in patients with chronic kidney disease: Results of the study to evaluate early kidney disease. Kidney International, 71, 31–38.

Abram S and Anju V (2012). Assessment of quality of life in patient on haemodialysis and the impact of counseling. Saudi Journal of kidney Diseass and Transplantation, 23: 953-957.

Bethesda M D. USRDS (2009). Annual data report: atlas of chronic kidney disease and end-stage renal disease in the United States. National Institute of Diabetes and Digestive and Kidney Diseases.

Coresh J, Selvin E, Stevens L A, Manzi J, Kusek J W and Eggers P (2007). Prevalence of chronic kidney disease in the United States. Journal of the American Medical Association, 298(17): 2038–47.

Couchoud C, Pozet N and Labeeuw M (1999). Screening early renal failure: cut-off values for serum creatinine as an indicator of renal impairment.. Kidney International; 55: 1878–1884.

Hodges V M, Rainey S, Lappin T R and Maxwell A P (2007). Pathophysiology of anemia and erythrocytosis. Critical Reviews in Oncology/Hematology, 64: 139–158.

Karthik K Tennankore, Steven D Soroka, Kenneth A West, Bryce A Kiberd (2011). Macrocytosis may be associated with mortality in chronic hemodialysis patients: a prospective study. BMC Nephrology, 12-19.
Kunitoshi Iseki (2008). Gender differences in chronic kidney disease. Kidney International, 74, 415–417.
Levey A S, Atkins R, Coresh J, Cohen E P, Collins A J and Eckardt K U (2007). Chronic kidney disease as a global public health problem: Approaches and initiatives -a position statement from Kidney Disease Improving Global Outcomes. Kidney International, 72: 247-259.
Levey A S, Coresh J, Balk E, Kausz A T, Levin A and Steffes M W (2003). National Kidney Foundation practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Annals of Internal Medicine; 139(2:): 137–47.
Noor ul Amin, Raja Tahir Mahmood, M. Javaid Asad, Mudassar Zafar, and Asad Mehmood Raja (2014). Evaluating Urea and Creatinine Levels in Chronic Renal Failure Pre and Post Dialysis: A Prospective Study. journal of cardiovascular disease, 2 (2): 1-4.
Santulli G, Trimarco B and Iaccarino G (2013). G-protein-coupled receptor kinase 2 and hypertension: molecular insights and pathophysiological mechanisms.. High Blood Pressure Cardiovascular Prevention, 20(1): 5-12.
Unruh A, Kurella M, Brett T, Larive C, Rastogi A and James S (2011). Impact of Sleep Quality on Cardiovascular Outcomes in Hemodialysis Patients: Results from the Frequent Hemodialysis Network Study. American Journal of Nephrology, 33: 398-406.
Iseki K, Iseki C, Ikemiya Y, Fukiyama K (1996). Risk of developing end-stage renal disease in a cohort of mass screening. Kidney Int, 49: 800–805.