Effect of Hemodialysis on the Blood Glucose in AlKhoms Kidney Services Center

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Abstract

Background and aims. Patients with chronic kidney disease (CKD) when hemodialysis (HD) process may effect on the blood glucose levels **.** This research was targeted to evaluation the effect of hemodialysis on blood glucose in renal failure patients pre and post dialysis. **Methods**. it was included 100 patients diagnosed with renal failure disease, at Alkhoms Kidney Services Center. 3ml of fresh venous blood was collected from HD patients pre and post dialysis for determination of glucose level**. Results** showed that the mean value of glucose before dialysis process is (less than 60 mg/l) and post dialysis (less than 109 mg/l), indicating significant differences between the mean value of glucose before and post dialysis process, This indicates that the level of glucose post dialysis decreased than pre dialysis process. It concluded that the level of blood glucose in renal failure patients is pre hemodialysis greater than post hemodialysis , which means there is a clear effect of hemodialysis on blood glucose level**.**

Keywords: Chronic Renal Failure, Hemodialysis , Glucose levels

Introduction

Maintenance hemodialysis patients with diabetes, the incidence of hypoglycemia during dialysis is as high as up to 16%, which might lead heart and cerebro-vascular accidents in severe cases. Hypoglycemia could be diagnosed in diabetic patients with a blood glucose value of ≤3.9 mmol/L (1). Conversely, since the blood glucose of patients in dialysis is in a state of non-physiological decline, various patients got symptoms with hypoglycemia earlier before the blood glucose value reaches 3.9 mmol/L, and a little patients have unperceived hypoglycemia (2). Additional experienced nursing team should not only noticed to low blood glucose levels but also combine the observation of the symptoms of hypoglycemia and the blood glucose drop range to achieve early detection and early prevention (3).

The majority of studies investigate finding the contact of the blood glucose drop range during hemodialysis on the clinical symptoms of hypoglycemia during nephropathy and to use the blood glucose drop percentage as a reminder to carry out nursing interventions for patients in advance, so as to reduce the occurrence of hypoglycemia in patients with diabetic nephropathy during hemodialysis and ensure the safety and comfort of patients during dialysis (4, 5).

Diabetes is a central risk factor for chronic kidney diseases and countless affected individuals develop diabetic nephropathy, the leading cause of end-stage renal disease (6). In Asian population, about 95% of diabetic patients with chronic renal disease receive hemodialysis, therapeutic options for diabetic patients with ESRD requiring hemodialysis are generally limited due to the accumulation of anti-diabetic drugs in the body by the reduction of glomerular filtration rate (GFR) and leading to hypoglycemia(7, 8).

A long-acting glucagon-like peptide (GLP-1) receptor agonist, have been measured in type 2

diabetic patients. nevertheless, evaluation of the efficacy and safety of liraglutide in non-diabetic and diabetic patients with severe renal destruction was limited to several small researches (9). Another previous studies have indicated that diabetic patients with chronic renal failure may have episodes of hyperglycemia, usually asymptomatic, during hemodialysis sessions when dialysate without glucose was used. These events tend to recur often, and this recurrence has been identified as a cause for the absence of symptoms. Furthermore, these recurrences may expose such patients to the risk of progressive cognitive impairment (10, 11).

Via using of glucose-containing dialysis solutions radically increase the risk of HG episodes, presently extensively used. However, it was observed that a dialysis containing around 100 mg/ dl of glucose causes average intradialytic blood glucose level higher than a glucose- free dialysate; a similar finding was noted when comparing a dialysis solution containing glucose 200 mg/dl and another containing 100 mg/dl of glucose (Lucidi *et al*, 2018 ; Varlawmov *et al*, 2014).

Methods

Enzymatic Colorimetric Method (GOD-PAP)

Blood glucose is the level of glucose in the blood. This carbohydrate is the body's main sugar and is its main source of energy. Its concentration is regulated by pancreatic hormones: insulin, which promotes its absorption into the cells; and glucagon, which has the opposite role. This hormonal control helps maintain normal blood sugar levels. In some cases, howerever, blood sugar levels can be higher or lower than the reference values (between 0.7 and 1.40 g/I), which can lead to various disorders. Hyperglycemia may be a sign of diabetes, hyperthyroidism or following surgery. On the contrary, hypoglycemia can be a sign of undernutrition, excessive alcohol consumption, adrenal or pituitary insufficiency or even hypothyroidism.

Priciple

Enzymatic determination of glucose according to the following reactions:

$$\text{Glucose} + O_2 + H_2O \xrightarrow{\text{Glucose oxidase}} \text{Gluconic Acid} + H_2O_2$$

$$2H_2O_2 + \text{Phenol} + \text{4- Aminoantipyrine} \xrightarrow{\text{Peroxidase}} \text{Quinoneimine} + 4H_2O$$

Reagent Composition

Reagent 1 Buffer	Buffer Tris pH= 7 Phenol	100 mmol/l 0,3 mmol/l
Reagent 2 Enzymes	Glucose oxidase Peroxidase Amino-4-antipyrine	10000 U/l 1000 U/I 2,6 mmol/l
Reagent 3 Standard	Standard Glucose	100 mg/dl 1g/l 5,56 mmol/l

Procedure

Wavelength: 505 nm (492-550);

Temperature: 37ºC;

Tank: 1cm thick;

Adjusting the spectrophotometer zero with the reagent blank

	Blank	Standard	Sample
Standard	--	10 µl	--
Sample	--	--	**10 µl**
Working solution	1 ml	1 ml	**1 ml**
Mix, read absorbances after 10 minutes incubation at 37ºC or 30 minutes at 20-25ºC. Staining is stable 30 minutes.			

Results

Research was done to exam blood glucose using spectrophotometers during pre & post kidney hemodialysis, there were 100 patients (40 female, 40 %) and (60 male, 60%) as confirmed in figure 1. The patients mean age was about 35 years subdivided into (20-30Y/30-40Y/40-50Y) as showed in figure 2. This research includes chronic kidney disease, had normal Libyan life style, excluded other chronic disease such as hypertension, heart or diabetes mellitus and hypo-hyperthyroidisms as well as another disorders, not take any other medicine.

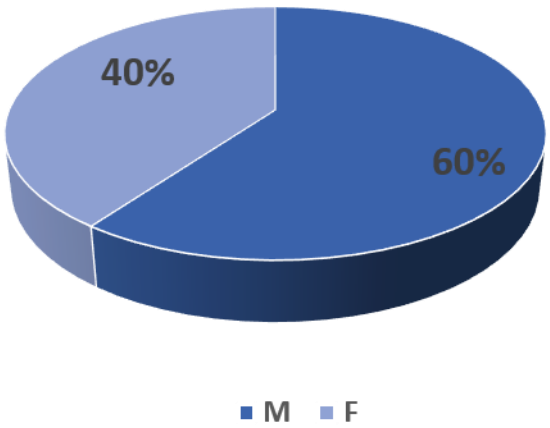

Figure 1; Excel Diagram showing case details in this project, 100 blood specimen's chronic kidney patients include 40 female and 60 males.

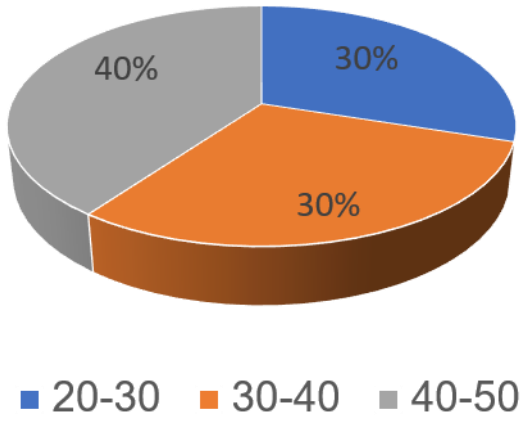

Figure 2: displays the percentage of CKD (female) comparing to their ages, most of samples were at age ranges between 20-50years.

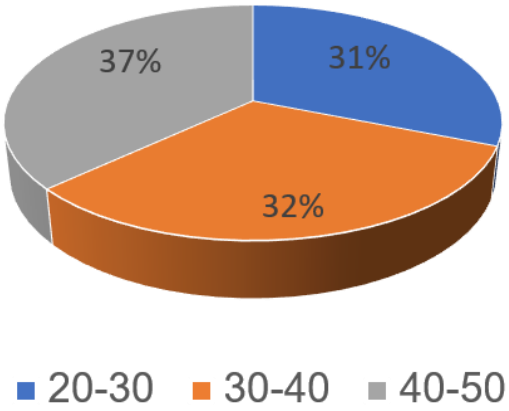

Figure 3: displays the percentage of CKD (male) comparing to their ages, most of samples were at age ranges between 20-50years.

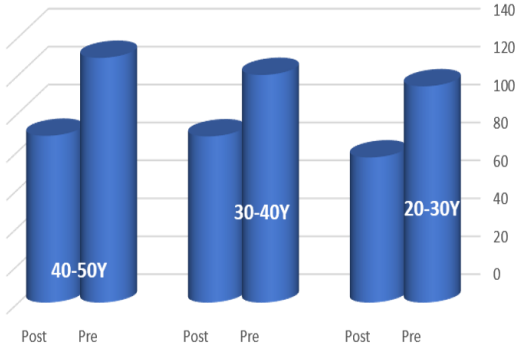

Figure 4; Statistical analysis of the effect of hemodialysis treatment on blood glucose in men chronic renal failure assessed via spectrophotometers. Showing low level of glucose post hemodialysis less than 76, 85, 87 mg/l with various ages 20-30, 30-40, 40-50 respectively. Note, data presented as mean.

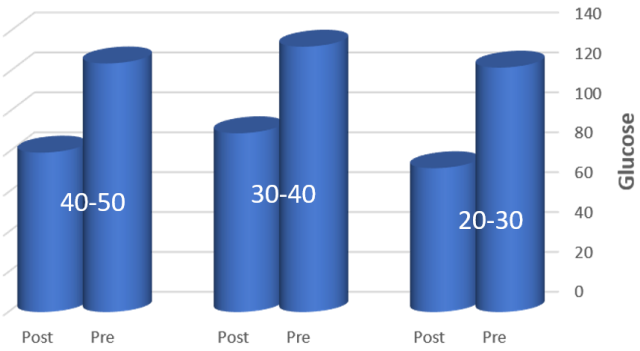

Figure 5; Statistical analysis of the effect of hemodialysis treatment on blood glucose in Female chronic renal failure accessed via spectrophotometers. Showing low level of glucose post hemodialysis less than 72.1, 89.6, 79.9mg/l with various ages 20-30, 30-40 and 40-50 respectively. Note, data presented as mean.

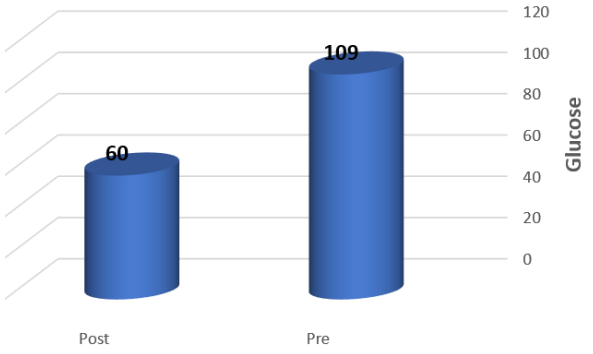

Figure 6; Statistical analysis of the effect of hemodialysis treatment on blood glucose in (Female/male) chronic renal failure assessed via spectrophotometers. Showing low level of glucose post hemodialysis less than 60mg/l with various ages 20-50, where their glucose levels less than 109 mg/l during pre-hemodialysis. Note, data presented as mean.

Discussion

It is well recognized, especially in DM individuals, that asymptomatic hypoglycemia was usual during hemodialysis with glucose-free dialysis solution, and that a glucose-added dial sate prevents these events (13). However, to the best of our knowledge, no one has previously studied the relationship of these hypoglycemic events with pre-HD blood glucose levels in Libya.

It observed that the occurrence of Hg during the dialysis session was related to blood glucose level significantly lower, though normal, at the beginning of dialysis. Moreover, when considering only those patients with pre-HD blood glucose level under 140 mg/L, who are apparently more prone to HG during dialysis, it found intra-HD glycemia radically lower than pre-HD glycemia only during glucose-free dialysis (14). These data give the impression to indicate a higher risk of intra-dialytic HG for DM individuals who presumably present the best glycemic control, especially when in glucose-free dialysis. Further, it could be said a significant decrease of blood glucose levels during dialysis , which could be due, at least in part, to a loss of glucose in the dialysate (15, 16).

Highlight risk of using dialysis solution without glucose in DM patients, as the maintenance of good glycemic control in DM patients on dialysis is related to lower mortality and better quality of life (17, 18) , it seems fundamental that this control must be in line with a dialysis procedure that precludes HG. This paper results indicated that many patients suffer from CKD, got hypoglycemia (low glucose level during hemodialysis with percentage (60 %). This research recommended to give glucose in patients with glucose less than 60mg/ml before beginning of hemodialysis as they suffer from hypoglycemia during hemodialysis (20).

Many studies indicated that early days of dialytic therapy, glucose was present in hemodialysis fluid. Later, this was followed by the wide use of glucose-free solutions in order to avoid the risk of bacterial contamination and for cost reduction. This practice turn out to be usual despite reports, since that time, about possible venomous effects related to the lack of glucose in the dialysis solution. However, this matter was recently resumed, and the presence of glucose in dialysate became widely advisable to prevent frequent symptom-free HG and its consequences in patients with DM (21). The frequent repetition of these asymptomatic events leads to a cerebral adaptation to low blood glucose levels, and this has been attributed as the cause of the lack of symptoms. In result, these patients were submitted to the risk of a progressively compromised cognitive function. Their results showed that glucose-added dialysate was more efficient than glucose-free fluid in providing energy to the central nervous system (22, 23).Numerous studies signified that lack of information about some clinical data (for instance, the presence of autonomic neuropathy, and a proper method of regular glycemic control), and also some characteristics peculiar to this kind of study (e.g., the different ranges of time between daily meals and the start of the dialysis session; and the individual administration schedule of insulin or oral hypoglycemic drugs) –all may have caused some influence on our results(24).

Conclusion

From this research it concluded that the level of blood glucose in renal failure patients was decrease post hemodialysis, which means there is a significant effect of hemodialysis on blood glucose level.

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