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COMPARATIVE ANALYSIS OF BLOOD GLUCOSE AND SERUM CREATININE LEVELS IN PATIENTS

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ABSTRACT

Background: Blood glucose and serum creatinine are important biomarkers used in clinical practice to assess various physiological conditions and monitor disease progression. Understanding the relationship between these biomarkers can provide valuable insights into the interplay between glucose metabolism and renal function in patients. This study aims to conduct a comparative analysis to explore the correlation between blood glucose and serum creatinine levels in a sample of patients with different medical conditions. **Methods:** Data for this analysis was collected from patient records at a tertiary care hospital over a period of six months. The study included patients diagnosed with diabetes, renal dysfunction, and other comorbidities. Blood glucose and serum creatinine levels were measured at regular intervals during the patients' hospital stay. Statistical analysis techniques were employed to examine the correlation between these variables and identify any potential patterns or associations. **Results:** Preliminary findings revealed a significant positive correlation between blood glucose and serum creatinine levels in the patient population under investigation. This suggests a potential link between glucose metabolism and renal function. Subgroup analysis based on specific medical conditions will be conducted to further investigate these associations. **Conclusion:** This analysis provides insights into the correlation between blood glucose and serum creatinine in patients, suggesting a link between glucose metabolism and renal function. Understanding this aids managing diabetes, renal dysfunction, and related conditions. Study limitations require further research to validate findings, yet it serves as a valuable starting point.

KEYWORDS: Blood glucose, Serum creatinine, Comparative analysis, Correlation, Diabetes, Renal dysfunction.

INTRODUCTION

Creatinine, a waste product of muscle metabolism, constitutes approximately 98% of the total creatinine in the body. It is primarily produced in the muscles and is released into the bloodstream. From there, it is filtered by the kidneys and eliminated from the body through urine. Monitoring serum creatinine levels can provide valuable information about kidney function, as elevated levels indicate decreased kidney filtration. The measurement of serum creatinine as an indicator of glomerular filtration rate (GFR) was introduced by Rehberg in 1926 and has since become a widely used clinical test for assessing kidney function. Creatinine possesses many characteristics that make it an ideal marker for renal filtration. It is important to note that there is no single normal value for serum creatinine. However, commonly referenced normal ranges are 0.8 to 1.3 mg/dl for males and 0.6 to 1.0 mg/dl for females. These ranges serve as general guidelines, and individual factors such as age, muscle mass, and underlying medical conditions can influence an individual's baseline creatinine levels. Regular monitoring of serum creatinine levels is crucial for evaluating kidney health, detecting potential kidney dysfunction, and assessing the progression of renal diseases. Abnormal creatinine levels warrant further investigation and may prompt additional diagnostic tests or medical interventions to manage kidney-related conditions effectively.[1-5]

Diabetes Mellitus is a group of metabolic disorders characterized by impaired carbohydrate metabolism, leading to elevated blood glucose levels known as hyperglycemia. Among the different types of diabetes, Type 2 Diabetes Mellitus (DM) accounts for more than 90% of all cases. The increasing prevalence of diabetes has become a significant public health concern worldwide. Individuals with diabetes are at a higher risk of developing various complications, including

nephropathy (kidney damage), retinopathy (eye problems), neuropathy (nerve damage), and atherosclerosis (hardening of the arteries). Diabetic nephropathy, in particular, affects approximately one-third of individuals with Type 2 diabetes. Monitoring renal function in diabetic patients is crucial to detect and manage kidney-related complications. One common approach is to measure serum creatinine and blood urea nitrogen (BUN) levels through a blood test. These tests provide valuable information about kidney function. However, serum creatinine is considered a more sensitive diagnostic marker because it reflects renal function more accurately. It is important to note that an increase in serum creatinine can be influenced by factors beyond renal function, such as dehydration or other non-renal issues. Nevertheless, serum creatinine remains a valuable tool in assessing kidney function in diabetic individuals. Regular monitoring of renal function using serum creatinine and BUN tests allows healthcare professionals to detect early signs of kidney dysfunction and initiate appropriate interventions. By closely monitoring renal function, healthcare providers can help manage and prevent complications associated with diabetic nephropathy and other renal disorders in diabetic patients.[6-8]

In individuals without renal illness, it is important to note that blood urea nitrogen (BUN) levels may undergo slight changes, while serum creatinine levels tend to remain relatively stable. BUN is a measurement that reflects the amount of nitrogen present in the blood in the form of urea, a waste product produced during protein metabolism in the liver. It is eliminated from the body primarily through the kidneys. In cases where renal function is normal, BUN levels can be influenced by factors such as diet, hydration status, and liver function. For individuals diagnosed with diabetes, regular monitoring of renal function is essential to detect any potential kidney-related complications. As part of the routine care, healthcare providers often recommend performing a BUN test along with serum creatinine measurement. This helps assess the overall renal function and provides valuable information about the health of the kidneys. The initial BUN test is typically conducted at the time of diabetes diagnosis to establish a baseline level. Subsequent BUN tests are then performed during annual follow-ups to monitor any changes or trends in renal function over time. By comparing the BUN results from different time points, healthcare providers can identify any deviations from the baseline and detect potential kidney dysfunction.[9-10]

Although serum creatinine levels are a more sensitive marker for assessing renal function, monitoring BUN levels alongside serum creatinine provides a more comprehensive evaluation of kidney health. Together, these tests help healthcare professionals gain a better understanding of renal function and promptly address any concerns or abnormalities. Regular monitoring of BUN levels, in addition to serum creatinine, aids in the early detection of renal complications in individuals with diabetes. This proactive approach allows healthcare providers to implement appropriate interventions and treatments to preserve kidney function and prevent the progression of kidney disease.

MATERIAL AND METHODOLOGY

Study centre

Cardiothoracic operation theatre, department of Anaesthesiology Sawai Man Singh Medical College & hospital, Jaipur.

Study design

Hospital based, prospective randomized double blind, Interventional study.

Study duration

After approval of plan from research review board & ethics committee till the desired sample size is complete.

Sample size

The sample size required was 39 cases in each group at 95% confidence & 80% power to verify the minimum expected difference of 2 mmol/l (+- 3.1m mol/l) in serum Na+ level at 24 hrs after the begining of surgery in both group. The sample size enhanced to 40 in each group as final sample size for purpose of study.

Study universe

Cardiac surgeries (CABG, valvular surgery, congenital heart surgeries) going on cardiopulmonary bypass.

Study group

Total Cases [Group A(n=40) + Group B(n=40) = 80]

Group A (n=40): Was receive balanced salt solution + 6% hydroxy ethyl starch (130/0.42)

Group B (n=40): Was receive RL + 6% hydroxy ethyl starch (130/0.42)

Randomization & double blinding technique

Randomization was done by sealed envelop method & blinding was done by covering the solution bottle with bag.

Eligibility criteria

Inclusion criteria

- Patient undergoing cardiac surgery on cardio pulmonary bypass.
- ASA Grade II,III.
- Age 30-60 Years.
- Weight 40-60 Kilogram.
- Patient with Normal Coagulation Profile with normal liver and kidney function.
- Witten informed consent.

Exclusion criteria

- Patient refusal.
- Emergency and redo surgery.
- Patient with Congestive heart failure, renal, liver and respiratory disorder.

Study procedure

Pre anaesthetic check up

All patients were visited on the day of surgery and explained about the anaesthetic technique and perioperative course. Each patient was have a preanaesthetic check up which includes:

1. Any significant present and past medical/surgical history.
2. Physical examination.
3. Vital parameters like pulse, B.P., temperature & respiratory rate.
4. All routine and specific investigations required for major surgeries were obtained.

Informed consent of the patients for the study was taken. An independent assistant was randomly assign a particular group to the patients.

RESULTS

Table 1: Showing mean of Creatinine (mg%) distribution in both the groups.

	Group A		Group B		p value	Significance
	Mean	SD	Mean	SD		
T0	0.91	0.18	0.96	0.18	0.273	N.S.
T6	0.91	0.18	1.07	0.19	0.0003	S.

The table above depicts the mean creatinine distribution in both groups. There was no statistically significant difference in Creatinine mean at time interval T0 in either group.

At interval T6, there was a statistically significant difference in mean Creatinine levels between the two groups.

Creatinine levels were greater in group B than in group A.

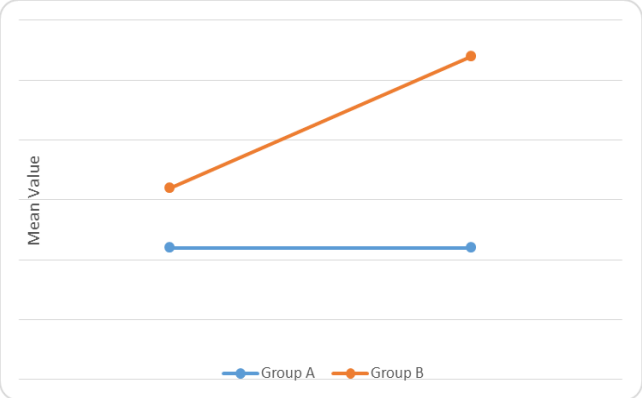

Figure 1: Comparison of Creatinine (mg%) among both the groups.

DISCUSSION

Mitch and Walser believed that a straight line could be obtained by plotting the inverse of creatinine (I/ Cr) over time. Assuming that the patient is losing kidney function at a consistent rate, one can extend the line out in time to gain a general sense of when the kidney will fail entirely and when dialysis may be required, as well as to measure the success of treatment in halting renal failure development. It is also useful in detecting abrupt drops in kidney function, in addition to chronic decline. As a result, Sr. creatinine is used to "monitor disease progression." As a result, the current study is being conducted to determine whether there is a significant difference in Sr. creatinine and blood sugar levels (BSLs) in male and female type 2 diabetes.[11]

The current study found that Sr. creatinine levels in type 2 diabetic males were substantially higher when compared statistically to controls ($P<0.05$), indicating a kidney function abnormality. When female patients were compared to controls, similar effects were observed. This alludes at the prevalence of renal damage in type 2 diabetes. Furthermore, in type 2 diabetic male patients, the increase in Sr. creatinine levels with age is significantly significant ($P<0.001$). Renal plasma flow and GFR typically decline with age. Renal creatinine clearance is reduced in older people due to a decrease in GFR. This observation is observed till the age of 60. Beyond the age of 60, values drop because decreasing muscle mass impacts Sr. creatinine levels in both healthy and diabetics. There were no consistent outcomes in either the female control or the patients. The mean Sr. creatinine levels in male and female patients over 60 years of age were 1.60 and 1.17 0, respectively, demonstrating greater Sr. creatinine levels in male patients, possibly due to the difference in muscle mass between males and females. Furthermore, the rate of growth and final concentration of Sr. creatinine are affected by a variety of parameters, including the severity and time course of resolution of renal damage, the rate of creatinine generation, the volume of creatinine distribution, and extra renal elimination. Even the

pathophysiology of diabetic nephropathy is multifactorial, with metabolic problems, haemodynamic changes, different growth factors, and hereditary factors all playing a role. Epidemiologic and familial investigations have shown that ethnicity and family clustering play a major influence in the likelihood of acquiring this kidney disease. The clinical picture of long-term diabetics is markedly heterogeneous.[12]

In 2000, Joel Neugartan et colleagues researched the effect of gender on the course of non diabetic renal disease, and found that males with chronic renal disease of diverse aetiologies have a faster drop in renal function over time than women. In 2004, Kasper Rossing et al evaluated the evolution of nephropathy in type 2 diabetes. According to this study, DM type 2 is the most common cause of end stage renal disease (ESRD), but kidney function decrease differs between individuals. A gender comparison of BSLs in patients revealed a substantial increase in BSLs in female patients above the age of 40. This suggests a greater dysregulation of glucose metabolism as a result of hormonal changes, such as lower oestrogen and progesterone levels in the menopausal age group. Male patients' mean BSLs were 213.4 mg/dl in the 41-50 year age group and 211.92 mg/dl in the 51-60 year age group, whereas female patients' BSLs were 241.7 mg/dl in the 41-50 year age group and 244.57 in the 51-60 year age group, indicating considerably higher values.[13]

Thus, in female patients over the age of 40, while BSLs are much higher than in males, Sr. creatinine levels are significantly lower than in males, establishing a positive association and the effect of gender on the course of renal disease in type 2 diabetes. So yet, there are no well-defined criteria for a certain age group in terms of gender. Gender has not been firmly demonstrated to play an independent impact in the course of renal disease in humans. This study will assist clinicians establish different baselines for Sr. creatinine levels in male and female type 2 diabetes patients. This investigation can help to avoid incorrect nephropathy diagnoses based on Sr. creatinine levels, as well as inaccurate drug dosing and needless medical intervention, and to start essential medical therapy as soon as possible. Although it is hypothesised in this study that gender influences the course of diabetic renal disease, the study only included 200 participants. As a result, age and gender specific reference intervals should be created in a larger population for monitoring the evolution of renal nephropathy in type 2 diabetes.[14]

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