Section: General Medicine

Original Research Article

EVALUATION OF PLASMA GLUCOSE AND HBA1C IN PATIENTS WITH CHRONIC LIVER DISEASE: A TEACHING HOSPITAL BASED STUDY

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ABSTRACT

Background: Chronic liver disease (CLD) significantly contributes to morbidity. In the case of CLD, high levels of plasma glucose and HbA1c are linked to both severe disease and poor prognosis, independently of each other.
Materials and Methods: This cross-sectional and observational study, conducted in the Department of General Medicine at World College of Medical Sciences Research and Hospital in Jhajjar, was based in a teaching hospital. The study included sixty known diabetic patients, both with and without CLD, who met the criteria for chronic hepatitis C.
Results: The current study involved 60 participants, who were split into groups I and II. Group I consisted of 30 participants with chronic hepatitis C and diabetes, with a mean age of 58.64±12.24 years, while Group II included 30 participants without chronic hepatitis C but with diabetes, having a mean age of 52.32±10.16 years. Low levels of fasting blood glucose were seen in group I than group II (144.29±26.24 mg/dl vs. 202.12±28.67 mg/dl $p<0.02$). Low levels of fasting blood glucose were seen in group I than group II (144.29±26.24 mg/dl vs. 202.12±28.67 mg/dl $p<0.04$).Group I also exhibited lower HbA1c levels compared to group II (6.62±1.34% vs. 8.67±2.64%, $p<0.04$). Group I had a significantly higher serum ALT level compared to group II (78.21±21.36 IU/L vs. 36.54±12.34 IU/L, $p<0.05$). Group I exhibited a significantly elevated serum AST level in comparison to group II (62.58±18.36 IU/L vs. 28.32±12.52 IU/L, $p<0.04$). In group I, HbA1c levels showed a significant negative correlation with ALT ($r=0.42$, $p<0.02$), whereas in group II, this correlation was not statistically significant ($r=0.12$, $p=0.52$).
Conclusion: These findings suggest that HbA1c levels are significantly lower in diabetic patients with chronic hepatitis C compared to those without chronic liver disease. As a result, HbA1c cannot be trusted as an accurate predictor for long-term glycemic monitoring in diabetic patients with chronic liver disease.
Keywords: Chronic liver disease, hepatitis C, FBS, HbA1c, AST & Diabetes mellitus.

INTRODUCTION

The liver plays a crucial role in sustaining glucose homeostasis through glycogenesis and glycogenolysis. Chronic liver disease is associated with insulin resistance, glucose intolerance, and diabetes mellitus. Conversely, DM type II in the absence of obesity and hypertriglyceridemia serves as a risk factor for liver disease development and progression. To identify glucose metabolism impairment, it is essential to conduct OGTT. The natural progression of chronic liver disease is marked by a gradual deterioration of liver function that persists for over 6 months and necessitates hospitalization. In addition, individuals who have both diabetes mellitus and liver cirrhosis experience complications that can lead to death more often. Due to the hepatotoxicity of oral hypoglycemic drugs, treating diabetes in patients with chronic liver disease is complicated, necessitating careful monitoring for hypoglycemia.[1,2] For about the last ten years, liver disease has been acknowledged as a

significant complication associated with type 2 diabetes.[3] Chronic liver disease usually manifests clinically as chronic hepatitis, with cirrhosis and hepatocellular carcinoma being its long-term complications.[4] Chronic liver disease leads to a substantial disturbance of glucose homeostasis. In chronic liver disease, approximately 75% of patients exhibit glucose intolerance, and frank diabetes is present in 35–55% of patients. Chronic liver disease has a significant impact on hepatic glucose metabolism.[5] Chronic liver disease can be caused by various factors, with the Hepatitis C Virus being the most prevalent among them.[6] The Hepatitis C Virus poses one of the most serious health challenges worldwide, affecting 150 million people out of the global population. "By the year 2030, approximately 4.1 million people in the United States had been infected with the Hepatitis C Virus, of which 2.7 million were carriers. Each year, almost 30,000 new Hepatitis C Virus cases have been identified.[7] The liver is the organ most impacted by HCV, leading to cirrhosis, chronic liver failure, and hepatocellular carcinoma.

Numerous epidemiological studies have demonstrated the high prevalence of hepatitis C in T2DM and have suggested that hepatitis C may progress into the development of DM. Both the American Diabetes Association and the World Health Organization consider HbA1c to be the most dependable chemical measure for diagnosing and predicting glycemic control in T2DM. Numerous studies back the use of HbA1c in diagnosing T2DM. In patients with CLD, the erythrocyte turnover is elevated and the serum albumin concentration is reduced. The present study aims to demonstrate the accuracy of HbA1c in diabetic patients who have chronic liver disease.

MATERIALS AND METHODS

This cross-sectional and observational study, conducted in the Department of General Medicine at World College of Medical Sciences Research and Hospital in Jhajjar, was based in a teaching hospital in collaboration with department of biochemistry. The study included sixty known diabetic patients, with and without CLD, who met the criteria for chronic hepatitis C during the period October, 2022 to September, 2023. The exclusion criteria encompassed individuals without illnesses such as acute liver disease, renal disease/failure, hepatitis B, or any other virus; pregnant women; and those who opted out of participation in the study. The subjects of the study were divided into two groups (group I and group II). Diabetics with CLD (chronic hepatitis C) were placed in Group I, while those without CLD were placed in Group II. Each group was made up of 30 participants with known diabetes. Patients were chosen at random from the liver and medical outpatient departments of World College of Medical Sciences Research and Hospital, Jhajjar. After explaining the study's aims and objectives to all participants, proper consent was obtained.

All participants provided blood samples that were collected while ensuring aseptic conditions. To separate the serum for liver function tests including FBS, HbA1c, ALT, AST, ALP, albumin, and bilirubin, blood was centrifuged for 5 minutes at 2500 rpm. The chemistry fully automated analyzerErba EM-200 was used to measure these parameters. Statistical analysis was performed with SPSS version 20. Quantitative data are presented as mean ± standard deviation (SD). Independent t-tests were used to compare the two groups. Pearson's correlation coefficient was utilized to demonstrate the relationship between the variables and HbA1c. The connection between the dependent and independent variables was demonstrated using regression analysis. Results were deemed significant when $p < 0.05$.

RESULTS

This cross-sectional and observational study, conducted in the Department of General Medicine at World College of Medical Sciences Research and Hospital in Jhajjar, was based in a teaching hospital. The current study involved 60 participants, who were split into groups I and II. Group I consisted of 30 participants with chronic hepatitis C and diabetes, with a mean age of 58.64±12.24 years, while Group II included 30 participants without chronic hepatitis C but with diabetes, having a mean age of 52.32±10.16 years. Low levels of fasting blood glucose were seen in group I than group II (144.29±26.24 mg/dl vs. 202.12±28.67 mg/dl p<0.04).Group I also exhibited lower HbA1c levels compared to group II (6.62±1.34% vs. 8.67±2.64%, p<0.04). Group I had a significantly higher serum ALT level compared to group II (78.21±21.36 IU/L vs. 36.54±12.34 IU/L, p<0.05). Group I exhibited a significantly elevated serum AST level in comparison to group II (62.58±18.36 IU/L vs. 28.32±12.52 IU/L, p<0.04).

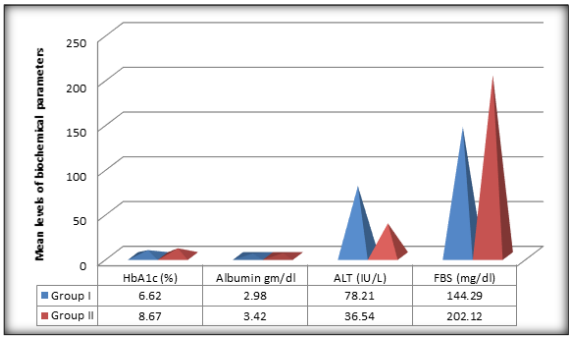

Figure 1: Shows the mean levels of biochemical investigation of both groups

The groups' comparison is summarized in Fig.-I. In group I, HbA1c levels showed a significant negative correlation with ALT (r=0.42, p<0.02), whereas in

group II, this correlation was not statistically significant (r=0.12, p=0.52). Group I also showed lower serum albumin as compared to group II (2.98±0.05gm/dl vs. 3.42±1.02gm/dl p<0.03). In a similar Situation, within group I, Albumin demonstrated a considerable inverse correlation with HbA1c (r=0.11 p<0.56). However, the correlations of ALP and bilirubin with each other were not significant in either group.

DISCUSSION

A significant portion of the Indian population suffers from chronic illnesses, including diabetes and chronic liver disease.The expense, measured in the number of work hours lost to illness, is huge. Additionally, both diseases necessitate long-term management and treatment. The average Indian cannot afford to pay for such costly treatments. Therefore, it was crucial to establish a relationship between HbA1c and CLD and to determine whether the HbA1c results in CLD accurately reflected the actual levels. While numerous investigations have been conducted regarding the dependability of HbA1c in diabetics with CLD concerning cirrhosis, very few studies have examined the accuracy of HbA1c in the diabetic demographic with chronic hepatitis C infection. From this perspective, our research focuses on diabetes and chronic hepatitis C, which are significant contributors to chronic diseases in India. Our research found a significant reduction in HbA1c levels among diabetic patients with CLD compared to those without CLD. In diabetics with CLD, the ALT level was significantly higher, while serum albumin was notably lower in this group, which may indicate disease progression to cirrhosis. In their study, Koga et al. noted that in patients with chronic liver disease (CLD), the HbA1c levels measured were lower than those estimated.[8] In their study, Lahousen et al. assessed HbA1c to evaluate long-term plasma glucose control in patients with chronic hepatitis, those with compensated cirrhosis, and individuals undergoing ribavirin treatment for chronic hepatitis. In all cases, HbA1c levels were observed to be lower than the diabetic range.[9] The findings of all these studies align with those of the current study. In 2016, Nadelson et al. conducted their research and found that in cirrhotic patients with HbA1c levels between 5-6%, HbA1c was not a dependable biomarker of glycemicindex.[10] In their study, MF Bashir et al. demonstrated that ALT levels were significantly elevated in diabetics with hepatitis C (HCV), but they found HbA1c to be higher in individuals with both HCV and diabetes. This may be due to the fact that their patients did not meet the criteria for chronic hepatitis C.[11]Our research further revealed that in diabetics with CLD, there is a significant negative correlation between HbA1c and both ALT and albumin when compared to diabetics without CLD. Christman et al. demonstrated similar findings, noting an association between low HbA1c and increased liver enzymes as well as reduced albumin levels. Our study's limitation includes having a small sample size. When monitoring prolonged glycemic control in type 2 diabetic patients with CLD, it is advised to use HbA1c carefully and to place greater reliance on fasting plasma glucose levels, liver function tests, and red blood cell indices.[12] Research is needed to explore newer options for monitoring glycemic levels in these patients.

CONCLUSION

These findings suggest that HbA1c may not be a dependable measure of long-term glycemic control for diabetes mellitus patients with chronic liver disease, and clinicians should recognize the limitations of using HbA1c as a marker of glycemic control in these patients. To accurately monitor long-term glycemic control in these patients, HbA1c should be assessed alongside fasting plasma and postprandial glucose levels, as well as liver function tests. Patients with CLD can benefit from early identification and management, as this can enhance their overall outcome.

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