Original Research Article

Evaluating the Correlation between the Glycosylated Hemoglobin (HbA1c) and Lipid Profile in Diabetic Patients at Kanyakumari, Tamil Nadu

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Abstract:
Introduction: Diabetes mellitus is a metabolic disorder diagnosed by elevated blood glucose levels, affecting 10.5% of the global community. Causes include socio-economic, demographic, environmental, and genetic factors. Detection is based on glycosylated hemoglobin (HbA1c) levels above 6.5%. Diabetic dyslipidemia is common in type 2 diabetes and pre-diabetic patients.
Aim: To study the correlation between HBA1C and Lipid profile parameters in diabetic patients.
Material and Methods: A cross-sectional study was conducted in the Department of Physiology at Sree Mookambika Institute of Medical Sciences, Kulashekaram, for the period of one year, October (2022 – 2023) at Kanyakumari District, Tamilnadu. Sample size is 100 patients. All patients were examined for HBA1C and Lipid profile after getting approval from Ethics Committee.
Results: The total number of patients studied was 100. Out of them, Majority(45%) belong to the age group of 30-34 years. The Mean age is 38.4. 60% males and 40% females. Correlation between HBA1C and lipid pofile parameters was found to be statistically significant in this study.
Conclusion: There was a significant correlation between HBA1C and Lipid profile parameters. Screening of lipid profile parameters should be done in all patients in those who have diabetes every 6 months.

Introduction

Diabetes mellitus is a disorder caused due to elevation in blood glucose levels, and classified into several categories: Type 1, type 2, gestational, neonatal diabetes. Type 1 is due to the defective insulin secretion affecting the children and adolescents, while Type 2 is due to defective insulin action affecting middle aged and elderly people [1]. Type1 and type 2 diabetes symptoms are similar but type 2 is usually mild and gradual in onset compared to type 1. 95% of the patients with diabetes are of type 2 [2]. Classical symptoms are thirsty, frequent urination, blurred vision, tiredness [3]. The common causative factors of the diabetes are usually driven by socio-economic, demographic, environmental, and genetic. Contributing factors responsible for rise in diabetes is due to urbanisation, decrease in physical activity, obesity, and overweight prevalence [2].

Glycosylated haemoglobin levels are tested to diagnose the diabetes, this test usually provides the average of blood sugar level over the past 3 months, if the level is above 6.5% the person is considered as diabetic, 5.7 to 6.4% is pre diabetic and below 5.7% is non diabetic [4]. Diabetes patients' lipid abnormalities, also known as "diabetic dyslipidaemia," which is typically characterized by the high total cholesterol (T-Chol), high triglycerides (Tg), low high density lipoprotein cholesterol (HDL-C), and elevated levels of small dense LDL particles. LDL cholesterol (LDL-C) levels may be moderately elevated or normal. The abnormalities observed in the lipid levels is common in type 2 diabetes and pre diabetes patients but the pattern of variation is different between ethnic groups, financial status, and accessibility to health care services [5]. Conversely on the other hand, the result of HbA1c is considered with caution because test sensitivity is low in certain patients with sickle cell anemia, thalassemia, anemia, kidney failure, liver disease, or patients receiving blood transfusions due to the longevity of the red blood cell [4].

A Study conducted at rural regions of Vidarbha, Maharashtra revealed that there is no significant

association between HbA1c and lipid profile with the sample size of 60 diabetic patients [6]. Another study at BIRDEM general hospital, Dhaka, Bangladesh with the sample size of 300 patients stated that there is a significant correlation between HbA1c and lipid profile and HbA1c can be used as a both predicator of dyslipidaemia and glycemic control indicator [7]. Globally, as per international diabetes federation 2021 report reveals that approximately 10.5% of population has diabetes and it estimates that by 2045, 1 in 8 adults will be living with diabetes that is a raise of 46% of cases [2]. India stands as the second state after China in global prevalence rate of diabetes with 77 million people, of these there is an estimation of increase in rate from 12.1 million to 27.5 million (age >65 years) by 2045, and undiagnosed patients will be around 57% [8]. The present study is conducted inTamil Nadu as this state is considered as highest prevalence according to a study conducted in India [8]. As a result of the prevalence rate and varied contraindications between the association of HbA1c and lipid profile, there is an indefinite need for conducting the study to evaluate the relationship between the HbA1c and lipid profile in diabetic patients.

Material and Methods:

There was a cross-sectional study conducted in the Department of Physiology at Sree Mookambika Institute of Medical Sciences from October 2022 to October 2023 in Tamil Nadu. A total of 100 patients with type 2 diabetes milletus were studied after getting approval from the ethics committee. The exclusion criteria were pregnant women and patients taking statins for dyslipidemia. HBA1C was done on all the patients and lipid profile was done on patients on an empty stomach. Ethics committee approval was obtained for this study.

Data was entered into Excel and analyzed using SPSS. p-value of less than 0.05 was considered statistically significant in the study.

Results

The total number of patients studied was 100. Out of them, Majority(45%) belong to the age group of 30-34 years(Table 1). The Mean age was found to be 38.4. 60% were males and 40% were females in the study. 25% of the patients in the study had diabetes for more than 10 years. In this study HBA1C was found to be statistically correlated with all parameters of the lipid profile.(Table 3).

Discussion

There are several studies that have reported that there is an association between HbA1c and lipid profile parameters in Type 2 diabetes mellitus patients, and other few studies has reported that HbA1c can be used as a possible biomarker for assessing any abnormalities in the lipid profile for diabetes patients [9,10]. Present our study has reported that there is a significant correlation between the HbA1c and triglycerides, HDL, LDL, total cholesterol. These present findings are in agree with other studies which has mentioned that there is a correlation between HbA1c and one of the lipid profile parameters [9,11,12]. Our study and other previous studies has mentioned that there is a significant association between glycemic control and dyslipidaemia [9,13,12,14]. This specifies thatHbA1c is directly associated with dyslipidaemia in Type 2 diabetes mellitus and indirectly helps in estimating the risk of micro and macrovascular problems [15,16] Dyslipidaemia is caused by the Insulin resistance in the type 2 diabetes mellitus. An abnormal secretion or action of insulin reveals that there is a linkage with increased triglycerides in type 2 diabetes mellitus patients through several mechanisms [9,17].

The present study has also revealed a significant correlation between lipid profile parameters and the duration of diabetes mellitus. A study conducted by Mahajan et al. found a correlation of HbA1c with LDL, triglycerides, total cholesterol, HDL, VLDL, and both high-density and low-density lipoprotein cholesterol. Similarly, research conducted in Bangladesh demonstrated a significant association between lipid profile parameters and HbA1c levels in diabetes mellitus patients. This study also indicated that HbA1c levels can be used as a predictor for assessing the incidence and prevalence of dyslipidemia in patients with diabetes mellitus. [18]

Another important study revealed that screening for serum HbA1c, glycemic levels, and lipid profiles helps in identifying high-risk patients for timely diagnosis of hyperlipidemia, thereby reducing the incidence of cardiovascular and peripheral vascular complications through appropriate treatment [19]. Research in Tamil Nadu has suggested that HbA1c can serve as a marker for abnormalities in the lipid profiles of patients with diabetes mellitus, indicating an increase in HDL-C levels and other lipid profile parameters in these patients. [20] These findings collectively suggest a significant correlation between HbA1c and lipid profiles, as mentioned in our study.

Study conducted at Jedah city, Saudi Arabia has mentioned that the levels of dyslipidaemia patients is as high as half of the patients with high LDL C levels and also majority of the patients has revealed that they have abnormal levels in at least one of the lipid profile parameter. There is a positive significant correlation between the HbA1c and triglycerides, and cholesterol. [21]

One of the studies in Kancheepuram, Tamil Nadu had mentioned that there is a direct significant association and correlation with the Total

cholesterol, VLDL and LDL but specifically mentioned that there is no association with the HDL among the lipid profile. So this positive significant correlation has clearly mentioned that HbA1c can be actually used a primary indicator of dyslipidaemia in addition to the glycemic control for complication prevention [22].

Conclusion:

The study has mentioned that there is a significant correlation between the lipid profiles and HbA1c and also in association with the duration of illness, implies that diabetes levels are interdependent on both HbA1c and lipid profile. This study has highlighted the importance of this parameter association which helps in using the HbA1c as biomarker to prevent the complications. This study has mentioned that majority of diabetic patients are of 30- 34 years of age which is clearly states that Diabetes is a major health concern and cannot be neglected. Furthermore, this study has its own limitations that the duration of illness correlation with HbA1c levels and lipid profile. This study provides further scope to research in detail about the correlation.

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