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RESEARCH ARTICLE

GLYCEMIC STATUS AND DYSLIPIDEMIA IN TYPE-2 DIABETES MELLITUS IN THE MILITARY HOSPITAL MARRAKESH, MOROCCO

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ABSTRACT

Introduction: Dyslipidemia is a major cause of premature mortality, morbidity and high healthcare costs. It has an important impact in terms of public health and most of them are the result of clinical complications secondary to atherosclerotic lesions of arteries. The aim of the study was to understand the pattern of dyslipidemia among the type 2 diabetic adults' patient and to understand its association with glycated hemoglobin (HbA1c). **Materials and Methods:** This is a descriptive retrospective cross-sectionalstudy done over one year in the Military Hospital (Marrakesh, Morocco). To assess the relationship between glycemic control (as reflected by HbA1c) and serum lipid profile in type 2 diabetic patients which included a total of 200 type 2 diabetic patients (104 males and 96 females). **Results:** The sera were analyzed for HbA1c fasting blood glucose (FBG), total cholesterol, triglyceride (TG), high-density lipoprotein (HDL) cholesterol, and low-density lipoprotein (LDL) cholesterol. The levels of HbA1c, FBG, and LDL did not differ significantly between males and females. Female patients showed significantly correlation between HbA1c and FBG. There was a highly significant correlation between HbA1c and FBG, both HbA1c and FBG exhibited direct correlations with cholesterol, TG, and LDL and inverse correlation with HDL; the magnitude of significance for all these lipid parameters being greater with HbA1c than FBG. There was a linear relationship between HbA1c and dyslipidemia. The levels of serum cholesterol and TG were significantly higher and HDL significantly lower in patients with poor glycemic control as compared to patients with good glycemic control. **Conclusion:** The findings of this study showed that HbA1c is useful biomarker of long-term glycemic control, also a good predictor of lipid profile.

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INTRODUCTION

Diabetes has been described as one of the major threats to human health in the 21st century. Chronic hyperglycemia, dyslipidemia of diabetes is associated with long-term damage, dysfunction and organs failure, especially the eyes, kidneys, nerves, heart, and blood vessels [Care, 2005]. The lipid abnormalities in diabetic such as increased cholesterol, increased LDH, high triglycerides (TG), and low high-density lipoprotein (HDL) are major cause of cardiovascular disease (CVD). It is the main cause of increasing mortality worldwide. In 2008, heart disease accounted for 20% of deaths in Morocco [Care, 2005]. This is a major public health challenge, and it is increasing in epidemic proportions. The combination of hyperglycemia, dyslipidemia, and hypertension have an important impact in terms of public health and most of them are result of clinical complications secondary to atherosclerotic lesions of arteries. Among primary risk factors, the Framinghan study has shown the important role of lipids in causing lesions [Maroc, 2011]. The management should focus on controlling diabetes and managing lipid levels which will reduce mortality and morbidity for ischemic heart disease and other diabetic complications [Feld Stanley, 2002]. The main purpose of our study was to understand the pattern of

dyslipidemia among type 2 diabetes patients and to understand their association with Glycated hemoglobin (HbA1c) among Moroccan adults.

MATERIALS AND METHODS

This retrospective cross-sectional descriptive study was performed on diabetic patients during 12 months period from 1st January to 31th December 2019 at the Military Hospital (Marrakesh, Morocco). Source of the data-History, physical examination, laboratory investigations were obtained from the medical records department.

Inclusion Criteria: Data for 200 patients were taken for the study, out of the total 927. These patients reported to the hospital for routine health check-up. The data were present online in the hospital portal. The FBS, HbA1c, HDL, LDL, besides the demographic information were taken and filled into a proforma.

Exclusion Criteria: For analysis of prevalent dyslipidemia among DM2 patients, we excluded individuals without information on baseline HbA_{1c} (n = 375), those who with chronic renal disease, liver cirrhosis and cancer (n = 303), and those who take anti-lipidemic drugs and alcohol (n = 26), those missing information on follow-up 2 diabetes Mellitus (n = 223), resulting in a final sample size of 200. The laboratory data collected for the study were the cholesterol, triglyceride, HDL-C and fasting blood sugar were evaluated on Cobas ® 6000 from Roche Diagnostic. Total cholesterol (TC) and Triglycerides (TG) was measured by enzymatic method using respectively cholesterol esterase and cholesterol oxidase, lipoprotein lipase and glycerol kinase. HDL-c was determined by enzymatic method direct measurement in homogeneous phase.

The LDL-C was indirectly measured using the Friedewald equation (LDL=TC-HDL-TG/5), for TG values <4g/l. non-HDL-c was calculated by subtracting from HDL-C from total cholesterol. Dyslipidemia is defined according to the Adult Treatment Panel III (ATPIII) classification of the national cholesterol education program (NCEP) [5,6] by the presence of one of the factors: Low HDL <40 mg/dl,high low-density lipoprotein (LDL)>190 mg/dl, high cholesterol>200 mg/dl, and high TG >200mg/dl. The results were subjected to statistical analysis using Statistical Package for Social Sciences (SPSS) version 20.0. software. Quantitative variables were expressed as a mean ±standard deviation, and the qualitative variables were expressed as a percentage.

RESULTS

A total of 200 patients with Type 2 diabetes mellitus were followed (104 males and 96 females) (Figure 1). The mean age was 65.92±17 years with an M/F sex ratio of 1.5. Poor glycemic control (HbA1c>8.0%) was seen in 61 of total patients. Poor glycemic control was associated with dyslipidemia in 45.5% of total patients, whereas 39% accounted for poor glycemic control without dyslipidemia, the maximum frequency of abnormal lipid profile status in all patients was low LDL cholesterol (LDL-C) (Table 1 and 2) and the age group with maximum patients with both dyslipidemia and higher HbA1c levels was 51-60 years.

Table 1. Lipid parameters and HbA1c of diabetic 2 patients

Parameter	Mean±SD
Total cholesterol	147.37±46.37
TG	172.27±43.62
LDL	65.85±51.17
HDL	39.60±14.05
HbA1c	8.82±2.22

TG: Triglyceride, LDL: Low-density lipoprotein, HDL: High-density lipoprotein, HbA1c: Glycated hemoglobin, SD: Standard deviation

Table 2. Percentage of abnormal lipid profile status in all patients

		Participant N (%)	
Dyslipidemia	All participant (n=200)	Male	Female
Hypercholesterolemia	36	17(47.2)	19 (52.8)
Hyporcholesterolemia	34	14(41.18)	18 (52,10)
Low HDL-C	62	34(54.8)	27(43.5)
High LDL-C	10	4 (40)	5 (50)
No abnormal lipid profile	17	9 (53)	6 (35.30)
One abnormal lipid profile	45	20(44.5)	25(55.55)
Two abnormal lipid profile	26	14 (53.85)	14(53.85)
>Two abnormal lipid profile	10	4 (40)	7(70)

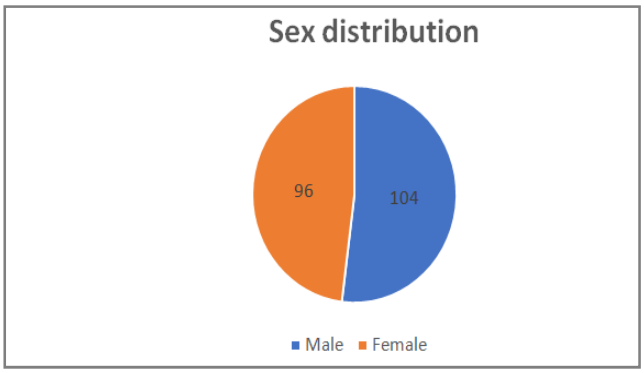

Figure 1. Sex distribution among diabetic 2 patient's

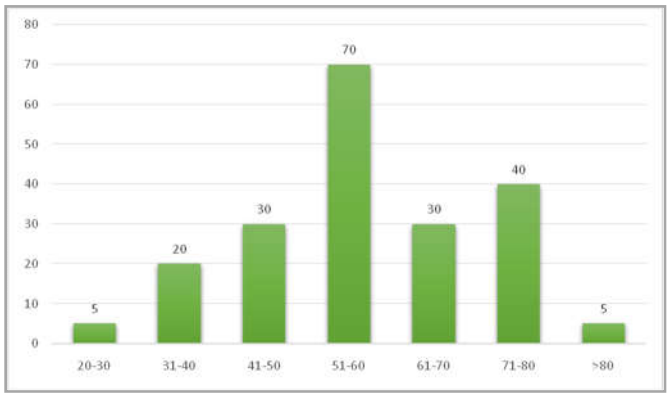

Figure *2.* Age distribution among the diabetic 2 patient's

DISCUSSION

Morocco, like most other developing countries is experiencing an epidemiological transition. The latest statistics [Care, 2005] showed that 25% of women in Morocco have a high BMI being either overweight or obese. This study was designed to understand the pattern of dyslipidemia among type 2 diabetes patients and to assess their association with Glycated hemoglobin (HbA1c).

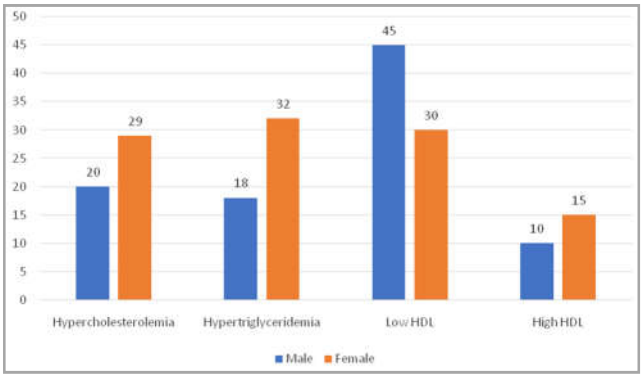

Figure 3. Lipid profile among study population

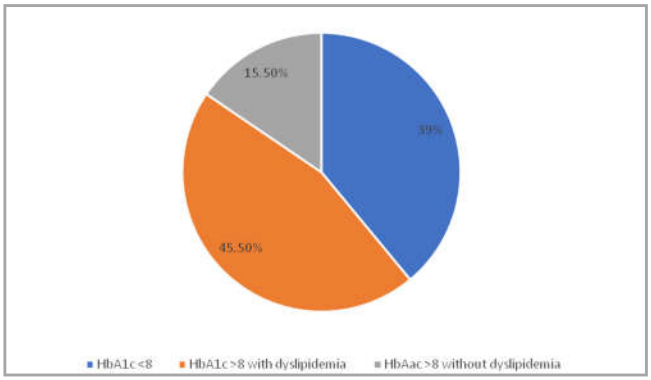

Figure 4. Correlations between glycated hemoglobin and dyslipidemia

It is conducted in a Military Hospital of Marrakesh, Morocco. The lipid profile, fasting blood glucose (FBS), and HbA1c were investigated. A total number of 200 patients were included in the study. Elevated lipid and lipoprotein level were found in diabetic patients which may be due to insulin resistance [Cai, 2021]. This study reveals a high prevalence of hypercholesterolemia, hypertriglyceridemia, high LDL, and low HDL levels which are known risk factors for cardiovascular disease and increase incidence of poor glycemic control in Type 2 diabetic population [Third Report of the National Cholesterol Education Program]. Insulin affects the liver apo-lipoprotein production. It regulates the enzymatic activity of lipoprotein lipase and cholesterol ester transfer protein. All these factors are likely cause of dyslipidemia in diabetic mellitus [Mahmood, 2014]. Furthermore, hypercholesterolaemia,hypoHD Laemia, hypertriglyceridaemia and mixed hyperlipidaemia were higher among females compared to their male conterparts. On the other hand, hypo HD Laemia was higher in man (figure 3). A study conducted in Jordan by khader et al in 2010 [Cai, 2021]. Poor glycemic control with dyslipidemia was seen maximum in patients of age group 51-60 years (figure 2).The main of this study revolved around identification of an association between dyslipidemia and poor glycemic control. The prevalence of dyslipidemic individuals among the study population amounted to 45,5%, among which 39% accounted for dyslipidemia with poor glycemic control (HbA1c >8.0%), thus showing a positive correlation between dyslipidemia and HbA1c among patients in the population under study (Figure 4). The pattern of dyslipidemia showed that 84,5% of the patients with abnormal lipid profiles and 15,5% of patients has no lipid profile abnormality; One lipid profile abnormality was seen in 45% of the study population, 28% had two lipid profile abnormalities, and 11% of the individuals had more than two abnormal lipid profile parametric.

84% among the study group of 100 patients had lipid profile abnormalities, among these 36 patients had hypercholesterolemia, 32% had hypercholesterolemia, 8% had high LDL-C, and 60% had low HDL cholesterol levels (figure 3). In the Framingham Heart Study, 13% of men and 24% of women with diabetes mellitus had increased total plasma cholesterol levels, compared with 14% of men and 21% of women without diabetes mellitus[9] The significant correlation between HbA1c and FBG is in accordance with various previous study done all over the world[8–10]. Higher levels of FBG were noted in patients with poor glycemic control (84% of total study population of Type 2 diabetics.

CONCLUSION

Our study shows a clear and strong association between lipid profile and high glycated hemoglobin (>8.0%). Thus, HbA1c can be used as a potential biomarker for predicting dyslipidemia in type 2 diabetic patients. Regular monitoring of lipid profile and control blood glucose and cholesterol prevent from complications. Achieving the target in HbA1c will contribute in improving the lipid state, and may be utilized for screening high-risk diabetic patients for timely intervention.

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