World Journal of Pharmaceutical and Life Sciences
WJPLS
www.wjpls.org
SJIF Impact Factor: 3.347

PREVALENCE OF DIABETES MELLITUS AND HYPERTENSION AMONG SAUDI PATIENTS WITH CARDIOVASCULAR DISEASES, AT KING ABDULAZIZ MEDICAL CITY, RIYADH

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Article Received on 16/09/2016 Article Revised on 06/10/2016 Article Accepted on 26/10/2016

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ABSTRACT

The main objectives of the study were to: 1. Estimate the frequency of diabetes mellitus (DM) and hypertension (HTN) among patients with cardiovascular diseases (CVD) and to study types of CVD, 2. Correlate between glycosylated hemoglobin HbA1c and lipid profile among patients. **Methods**: A retrospective chart review study was conducted at Department of Clinical Chemistry, King Abdulaziz Medical City (KAMC) in Riyadh, Saudi Arabia, during the period from January 2014 to March 2014, including 100 male and female patients diagnosed with cardiovascular diseases. These patients were admitted to the hospital in the month of January, 2014. Medical history and biochemical laboratory data were obtained from medical records and from biochemistry laboratory database. Statistical analysis on frequency analysis, independent *t* test and correlation test was conducted using SPSS software version 20. **Results**: Result showed high frequency (80%) of glycemic index and hypertension among patients and Coronary Artery Disease (CAD) is a common cause of CVD. Significant positive correlations were observed between HbA1c with cholesterol, triglycerides, fasting blood glucose FBG (r=0.20 P=0.048), (r=0.38 P=0.000), (r=0.39 P=0.000) respectively. The increase in mean level of HbA1C, triglycerides, LDL,

HDL, troponin T, and FBG were 8.6 %, 1.8 mmol/L, 1.0 mmol/L,3.13 mmol/L, 4.9 and 14.4 mmol/L respectively. **Conclusion**: It is concluded that uncontrolled DM and hypertension could be considered significant factors for CVD. Therefore, good glycemic control and normal blood pressure lead to minimize the development of CVD among these patients. Furthermore HbA1c could be used as predictor for diabetic dyslipidemia. The findings of this study clearly suggest that CAD is the most common type of CVD.

KEYWORDS: Type 2 diabetes, Dyslipidemia, Glycemic control, HbA1c, lipids Biomarker

INTRODUCTION

Recent, data suggest that hypertensive patients and those having cardiovascular diseases are more prone to development of diabetes and death than normotensives.[1] Diabetes mellitus is closely associated with cardiovascular diseases (CVD) and hence, there is an increased risk of heart attacks, strokes and lower limb amputations in diabetics. Intensive glucose control reduces the risk of any CVD event by 42 percent and the risk of heart attack, stroke, or death from CVD by 57 percent.[2] In general, every percentage point drop in A1C results reduces the risk of diabetes, kidney, eye, and nerve disease by 40 percent.[3]

Hypertension(HTN) is one of the most prevalent risk factors in patients with established CVD.[4, 5] The control of HTN leads to significant reduction in the prevalence and incidence of target organ damage and mortality from CVD. [6, 7] Controlling HTN often requires the use of several antihypertensive agents, especially in elderly patients or those with stroke or DM.[8,9]

Blood pressure control reduces the risk of CVD among persons with diabetes by 33-50%, and the risk of diabetic kidney, eye, and nerve disease by approximately 33 percent. In general, for every 10 mm Hg reduction in systolic blood pressure, the risk for any complication related to diabetes is reduced by 12 percent. Improved control of cholesterol or blood lipids (for example, high density lipoprotein [HDL], low density lipoprotein [LDL], and triglycerides) can reduce CVD complications by 20-50%.[3, 10]

Cigarette smoking is an important risk factor of CAD, peripheral vascular disorders and atherosclerosis. Recently it has been suggested that smoking adversely affects the concentration of plasma lipids and lipoprotein levels.[11] Over 30% of the smoking population are prone to develop myocardial infarction.[12]

The present study on the prevalence of diabetes mellitus and hypertension among Saudi patients with CVD was undertaken, in view of the increasing incidence of DM and associated CVD and CAD.

METHODS

Settings and duration of study

This study was carried out on 100 patients diagnosed with cardiovascular diseases, at Department of Clinical Chemistry, King Abdulaziz Medical City in Riyadh (KAMC), Saudi Arabia, during the period from March 2014 to June 2014.

Study Design

This is a quantitative retrospective chart review study.

Inclusion and exclusion criteria

Male and female patients diagnosed with cardiovascular diseases, of all age groups, admitted at KAMC from January 2014 to March 2014.

Sample Size

The sample size was 100 subjects based on approximately previous auditing institutional report and on the calculated prevalence of cardiovascular diseases in Riyadh region.

Sampling Technique

Patients of both the genders of different age groups who were discharged from KAMC with diagnosis of cardiovascular diseases at any point in time during the study period were enrolled in this study.

Data Collection methods

After getting approval from institutional review board (IRB) of National Guard, laboratory results for study population was obtained from biochemistry laboratory database, while computer printout of demographic data related to study population were collected from medical records department at KAMC and all collected data were tabulated in master sheet in Excel before being analysed.

Data Management and Analysis

Descriptive and demographic data were analysed and expressed as mean ± SD and percentage by using Excel. Comparison was done by student t test using SPSS (Version 20) Pearson correlation test was performed between patient groups.

RESULTS

This is study was conducted on 100 patients diagnosed with CVD. Among these those diagnosed with CAD and heart failure were 73% and 12% respectively. In addition there were other conditions including supra-ventricular tachycardia, pneumonitis, hemiplegia and bradycardia (15%). The sex-wise distribution among male and female patients was 75 and 25 percent respectively. Eighty per cent patients had a history of type 2 DM and HTN. Thirty eight patients were smokers. Sixty two had both DM and HTN, while 2% had neither DM or HTN.

According to correlation analysis, significant positive correlations were observed between HbA1c and parameters, such as; cholesterol, triglycerides, fasting blood glucose FBG(r=0.20 P=0.048), (r=0.38 P=0.000), (r=0.39 P=0.000) (Figure 1, 2, 3) consecutively. Also these results showed significant positive correlations between triglycerides with LDL and FBG(r=0.21 P=0.026) (r=0.37 P=0.000) (Figure 4, 5) successively, while negative correlation was reported between triglycerides and HDL (r=-0.23 P=0.020) (Figure 6).

The mean concentration values of patients for HbA1C, cholesterol, triglycerides, LDL, HDL, troponin T, and FBG were 8.6%, 5.0mmol/L, 1.8 mmol/L, 1.0 mmol/L, 3.13 mmol/L, 4.9 and 14.4mmol/L respectively. These values were found to be increased as compared to the reference values, while cholesterol was in the range of the reference values (Table 1).

With the reference to independent t-test between diabetic and non-diabetic patients, the results of this study showed significant increase ($p<0.05$) in HbA1c, cholesterol, triglycerides, and FBG while showed insignificant difference ($p>0.05$) in LDL, HDL and Troponin.

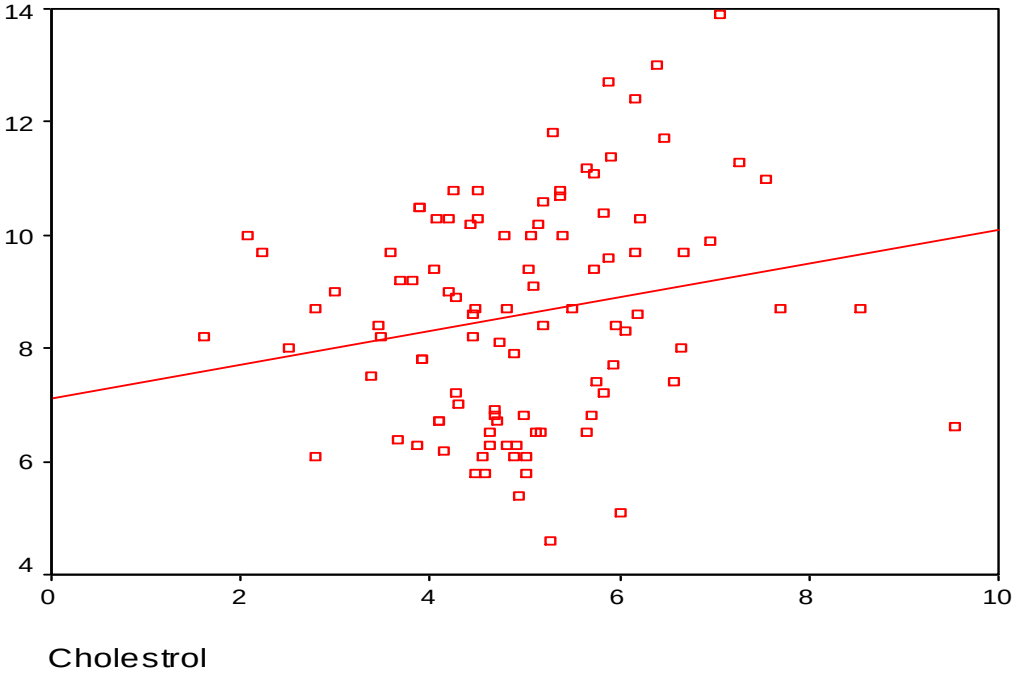

Figure (1) A scatter plot shows the correlation between levels of cholesterol in mmol/l and levels of HbA1c in % (r=0.20 P=0.048)

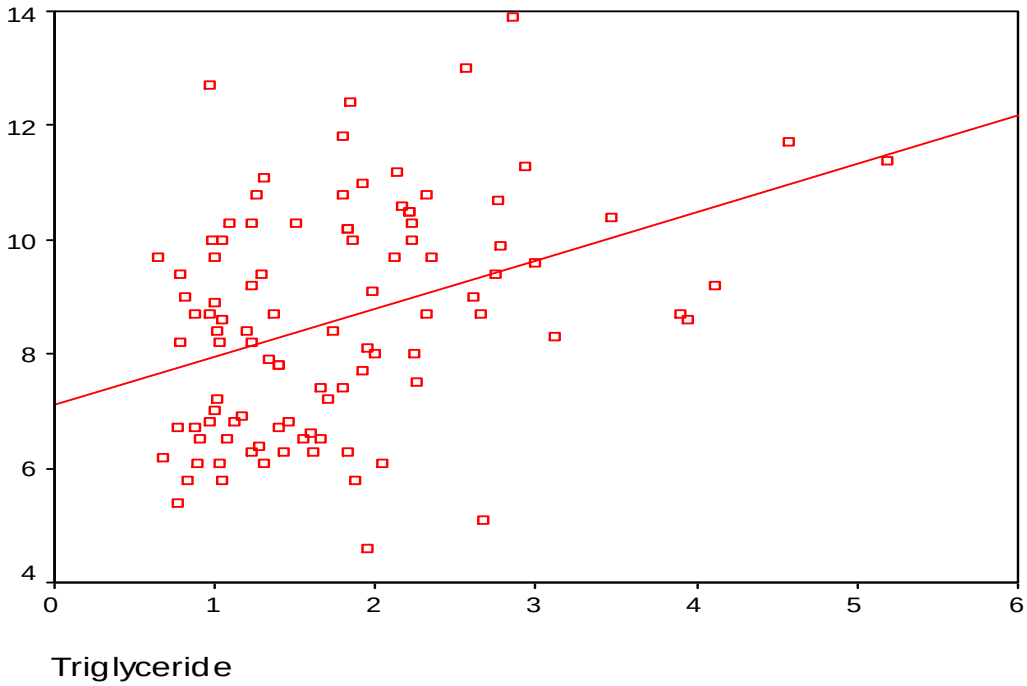

Figure (2) A scatter plot shows the correlation between levels of triglycerides in mmol/l and levels of HbA1c in % (r=0.38 P=0.000)

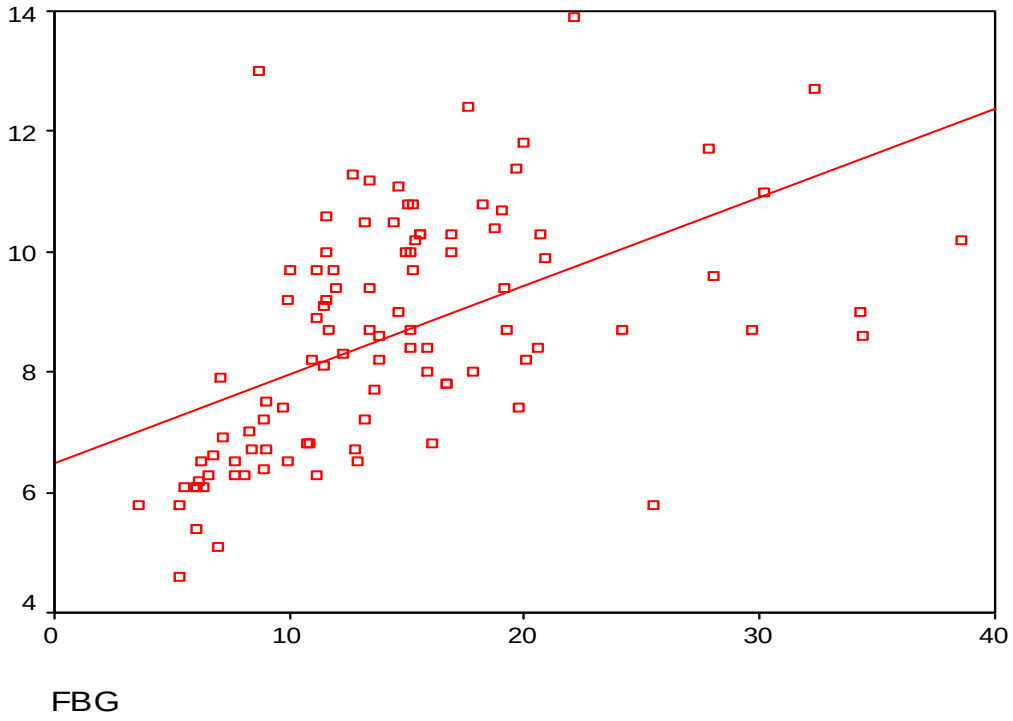

Figure (3) A scatter plot shows the correlation between levels of FBG in mmol/l and levels of HbA1c in % (r=0.39 P=0.000).

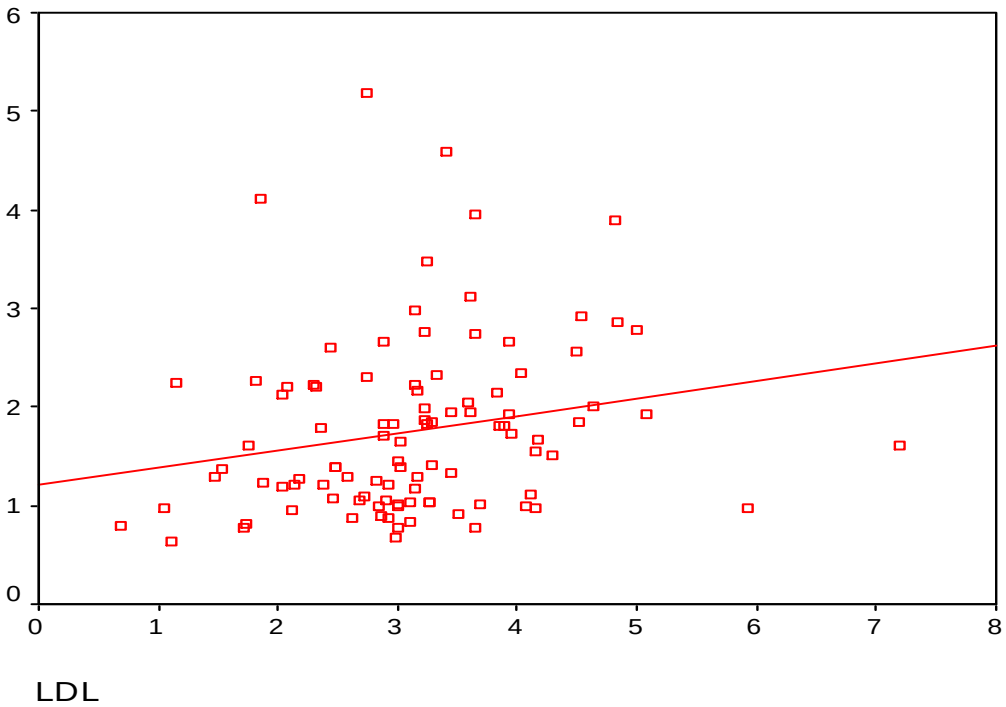

Figure (4) A scatter plot shows the correlation between levels of LDL in mmol/l and levels of triglycerides in mmol/l (r=0.21 P=0.026)

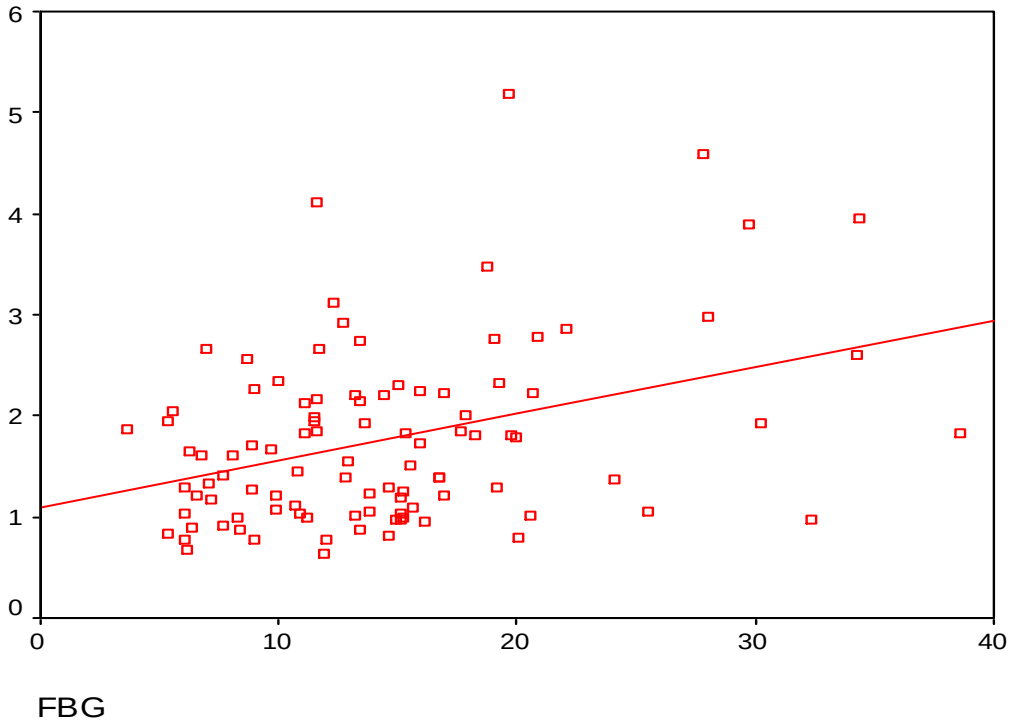

Figure (5): A scatter plot shows the correlation between levels of FBG in mmol/l and levels of triglycerides in mmol/l (r=0.37 P=0.000)

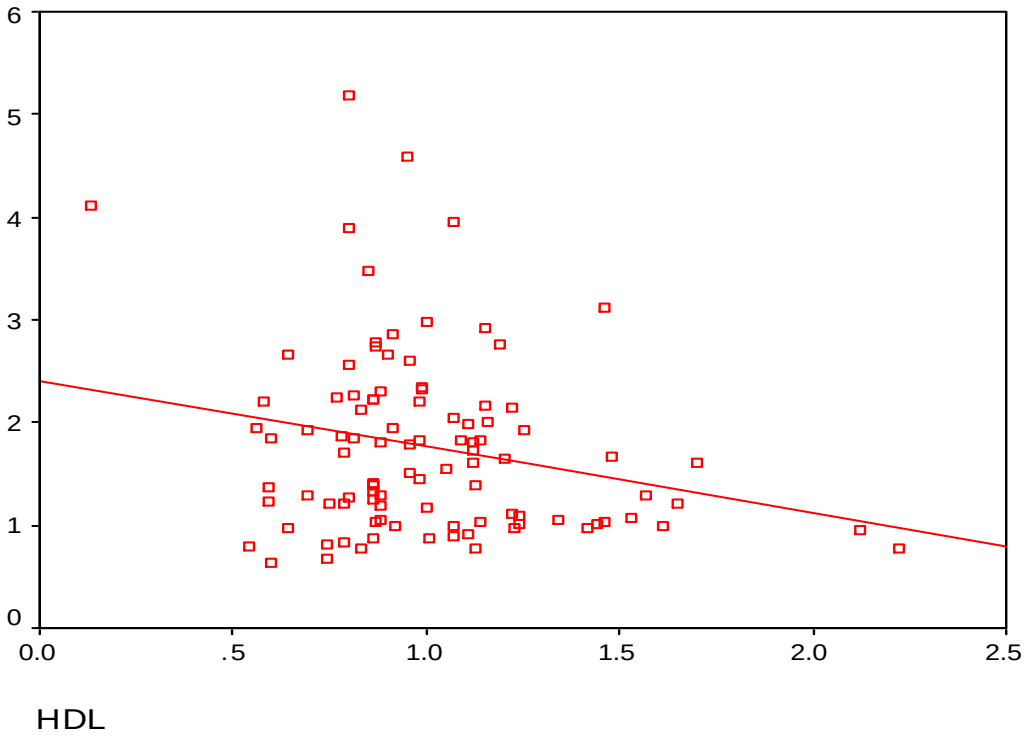

Figure (6) A scatter plot shows the correlation between levels of HDL in mmol/l and levels of triglycerides in mmol/l (r=-0.23 P=0.020)

Table (1): Base line parameter among patients.

Variable	Diabetic (80) Mean ±SD	Reference range
HbA1c	8.6±1.9	4.4 – 6.4(%)
Cholesterol (mmol/L)	5.00±1.3	≤5.18 (mmol/L)
Triglycerides (mmol/L)	1.80±0.9	≤1.70(mmol/L)
HDL (mmol/L)	1.00±0.3	≥1.55(mmol/L)
LDL (mmol/L)	3.13±1.0	≤ 2.60(mmol/L)
Troponin	4.9±1.2	<0.012
FBG (mmol/L)	14.4±7.0	3.9 – 5.8(mmol/L)

The table shows mean ± Std. deviation, reference range and units between brackets

DISCUSSION

The results of the present study showed that about 80% of the population were either diabetic or hypertensive or both. Our observation is confirmed by other reports in literature [13, 14] which showed a high risk of CVD in people with type 2 diabetes and in patients suffering from both diabetes and metabolic diseases such as dyslipidemia, hyperglycaemia and hypertension. Since glycemic control is crucial in normalizing dyslipidemia, several investigators have reported significant correlations between HbA1c and lipid profiles,[15, 16] We observed significant correlations between HbA1c with cholesterol and triglycerides (Fig 1, 2). These results are supported by Khan., *et al*[17] who found that HbA1c screening not only reflected glycemic control, but also predicted serum lipid profiles in diabetic patients as well. They demonstrated comparatively stronger association of HbA1c levels with serum lipid profiles than fasting blood glucose (FBG).

Our observation on correlation between HbA1c and FBG (Figure 3) is in agreement with an earlier report.[18] Moreover, it was found that FBG was positively correlated with triglycerides, which were statistically significant (Figure 5).

Furthermore, our study showed that there was an increase in the levels of triglycerides and LDL with decrease in the level of HDL among patients when compared with reference value, these observations agree with the laboratory findings of dyslipidemia (Table 1). These results showed increase in the levels of HbA1c and FBG when compared with reference range. Hence, this observation about poor glycemic control support the finding by Arshag[19] who suggested that dyslipidemia as one of the major risk factors for CVD in general and specifically in DM therefore diabetic patients with coexisting metabolic disorder like dyslipidemia have a higher prevalence of CVD, the role of increased level of HbA1c in CVD

is also supported by Selvin., *et al*[20] who reported a significant linear association between cardiovascular heart disease and HbA1c levels, the risk increased with the elevating levels of HbA1c was found lower than 7.0%.

This study revealed significant positive correlation between triglycerides and LDL (Fig 4), besides significant negative correlation between triglycerides and HDL (Fig 6). Accordingly the results of present study showed marked and significant increase in troponin among patients in comparison with reference range.

CONCLUSION

This study concludes that uncontrolled DM and hypertension can be considered serious risk factors for CAD, therefore good glycemic and blood pressure control minimizes the development of CVD among these patients. Furthermore HbA1c could be used as predictor for diabetic dyslipidemia. The findings of this study clearly suggest that CAD is the most common type of CVD

Ethical approval: The ethical approval and informed consent is not be required, as these studies are retrospective and the data was obtained from the medical records. However; approval was obtained from the Institutional Review Board (King Abdullah International Medical Research Centre).

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