

Dyslipidemia in diabetes patient is responsible for developing nephritic syndrome with increasing ages, a survey based cross sectional study

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Abstract

Objectives: The objective of this study was to evaluate the level of lipid profile and serum creatinine in patients with diabetes mellitus to correlate the lipid profile abnormalities with serum creatinine levels in diabetic patients.

Methods: This cross sectional health survey was carried out with a self-designed standard questionnaire by manual data collection over a six months period (12.09.2015 to 10.04.2016) at three adjacent cities Jessore Sadar, Jhikargacha and Chowgacha upazila respectively. The data were collected from the patient's prescription, diagnostic reports and by directly interviewing the patients who were treated as either type 1 or type 2 diabetic 235 fasting patients during the study period. Descriptive statistics were applied to the collected data and analyzed using Microsoft Excel software.

Results: In our current survey, the average levels of HDL, LDL, TC, TG and Serum creatinine of investigated patients were observed with respect to their individual groups as for Group A - 40 mg/dl, 110 mg/dl, 220 mg/dl, 135 mg/dl and 0.8 mg/dl; Group B - 40 mg/dl, 150 mg/dl, 320 mg/dl, 290 mg/dl and 1.1 mg/dl; Group C - 38 mg/dl, 180 mg/dl, 210 mg/dl, 388 mg/dl and 1.25 mg/dl; Group D - 32 mg/dl, 190 mg/dl, 240 mg/dl, 435 mg/dl and 1.00 mg/dl. 39.13% male and 35.29% female patients with type 1 DM, whereas 85.25% male and 82.19% female patients with type 2 DM, containing dyslipidemia was seen. Being prone to develop dyslipidemia, the patients with uncontrolled lipid profile abnormalities are among the highest risk to develop diabetic nephropathy characterized by elevated levels of serum creatinine followed by reduced glomerular filtration rate (GFR).

Conclusion: This study revealed the interesting outcome is like that, diabetes mellitus patients are more prone to increasing bad cholesterol and creatinine levels in serum and these levels are found to increase with their age as well. Since lipid profile abnormalities, mainly dyslipidemia is inextricably linked with increased serum creatinine level as well as developing diabetic nephropathy, especial attention should be given for controlling hyperglycemia owing to avoid associated cardiovascular complications.

Keywords: Diabetes mellitus, Dyslipidemia, Creatinine, Diabetic nephropathy.

1. Introduction

Prevalence of diabetes mellitus mainly in developing countries like Bangladesh is tremendously increasing day by day. Almost all patients with diabetes mellitus are seen to develop lipid profile abnormalities which ultimately lead to build up dyslipidemia characterized by high serum level of triglyceride (TG), total cholesterol (TC) and LDL cholesterol and reduced levels of HDL cholesterol. The global public health has now almost been in threat by a group of metabolic disorders named diabetes mellitus (DM) characterized by hyperglycemia (increased blood glucose level) and metabolic changes which is the consequence of

insufficiency or defect in insulin secretion (type 1 DM), insulin action or both (type 2 DM) resulting of interaction amongst inherent and environmental factors [1-3]. DM leads to long term complications including nephropathy, retinopathy and peripheral and autonomic neuropathy which is associated with gastrointestinal, hepatic, urinary and cardiovascular disease and dyslipidemia and has certain probability to be the 7th leading cause of death by 2030 according to WHO [4-8]. Serum lipid profile abnormalities in patients with diabetes are almost the rule as the balance of cholesterol influx and efflux is ruptured due to accumulation of intracellular lipid in vascular

smooth muscle cells followed by increased level of glucose [9].

The most typical lipoprotein pattern in diabetes, which is also recognized as diabetic dyslipidemia or atherogenic dyslipidemia is characterized by elevated levels of triglyceride (TG) and reduced levels of HDL cholesterol, and also the elevated levels of total cholesterol (TC) and LDL cholesterol than the normal levels in healthy persons [10,11]. In case of both developed and developing countries, diabetes, hyperlipidemia and cardiovascular diseases (CVDs) are the most frequent devastating ailment among peoples [12].

Hypercholesterolemia and hypertriglyceridemia are the most important risk factors for cardiovascular disease especially in the development of atherosclerosis and progression of atherosclerotic lesions in which high triglyceride level is mostly important than high LDL cholesterol [13-16]. High level of sugar in blood in diabetic patients causes severe lesion to the blood vessels of kidneys due to too much stress on kidneys, leading to kidney disease which ultimately can lead to kidney failure [17]. The kidneys main function is to regulate the serum concentration of numerous types of substances, for example, serum creatinine, a breakdown product of creatinine phosphate, which level is inversely varied with changes in (GFR) in abnormal conditions of kidneys, by excreting metabolic waste products [17]. A severe chronic kidney disease in diabetic patients named diabetic nephropathy due to Glomerular and tubulointerstitial damage characterized by persistent albuminuria, increased arterial blood pressure, progressive turn down in GFR, is mostly associated with dyslipidemia which leads to a progressive turn down in kidney function [3,18,19].

Creatinine is a fairly reliable indicator of diabetic nephropathy and the elevation rate of serum creatinine indicates the impaired renal function [20,21]. The most important clinical application of the measurement of serum creatinine concentration as an index of renal function [22]. Both lipid profile and serum creatinine abnormalities are not only the most important biomarkers of DM but also for cardiovascular diseases [23, 24]. A study suggests that the risk of cardiovascular disease is tenfold greater in patients with type 1 diabetes and nephropathy than those without nephropathy [25]. The prevalence of both diabetes mellitus and cardiovascular diseases from last few decades in Bangladesh is simultaneously increasing as making the country the capital of those diseases. However, there are many evidences which show that the lipid profile abnormalities are developed in diabetic and severe diabetic patients [7, 26, 27]. Therefore our present survey based study was performed to observe the amount of serum lipid profile

and creatinine levels among patients with both of type 1 (17.02%) and type 2 (82.98%) diabetes mellitus (DM).

2. Materials and Methods

2.1 Study Area, Study Design, and Allocation of Groups

We performed a retrospective, cross-sectional study during 12 September, 2015 to 10 April, 2016 in three densely populated adjacent cities named Jessore Sadar, Jhikargacha and Chowgacha upazila of Jessore district under Khulna Division in Bangladesh. Total 235 diabetic patients (both indoor and outdoor patients) were investigated aged 15 years to more than 71 years among whose 145 males and 90 females by visiting major hospitals and diagnostic centers across the study area. The total investigated patients were categorized into four groups in accordance with their ages as

1. Group A – 15- 40 years
2. Group B – 41- 55 years
3. Group C – 56- 70 years
4. Group D – > 70 years

2.2 Samples and Data Collection

The patients were selected randomly with both type 1 and type 2 diabetes. The data were collected from fasting patients in collaboration with physicians and other pathologists. Demographic and anthropometric detailed information of all patients such as age, weight, height, duration of diabetes were collected and also performed the relevant clinical examination and all routine investigations.

2.3 Statistical Analysis

By using Microsoft Excel (2013 addition) software, the collected data were statistically analyzed.

3. Results

In our investigation, total 235 fasting patients were categorized four groups according to their age along with gender variation among whose male were 145 (61.70%) and female were 90 (38.30%) as shown in figure: 1. Both type- 1, 40 (17.02%) and type- 2, 195 (82.98%) DM patients (Shown in figure: 2) were inspected where 23 (15.86%) male and 17 (18.89%) female patients were type 1 DM patients and 122 (84.14%) male and 73 (81.11%) female patients were type-2 patients (Shown in figure: 3). Our obtained result has revealed the average levels of lipid profile as patients aged between 15- 40 years has got HDL 40 mg/dl; LDL 110 mg/dl; TC 220 mg/dl; TG 135 mg/dl, patients aged between 41-55 years; HDL 40 mg/dl; LDL 150 mg/dl; TC 320 mg/dl; TG 290 mg/dl, patients aged between 56-70 years; HDL 38 mg/dl; LDL 180 mg/dl; TC 210 mg/dl; TG 388 mg/dl and in case of patients aged >70 years; HDL 32 mg/dl; LDL 190

mg/dl; TC 240 mg/dl and TG 435 mg/dl as presented in figure: 4. The average serum creatinine levels of the patients were also determined and the results observed that, patients aged between 15-40 years had their average serum creatinine level 0.8 mg/dl; patients aged between 41-55 years had their average serum creatinine level 1.1 mg/dl; patients aged between 56-70 years had average serum creatinine level 1.25 mg/dl and in the case of

patients aged >71 years had their average serum creatinine level 1.00 mg/dl which is shown in figure: 5. The current test result also revealed that 39.13% male and 35.29% female patients with type-1 DM has developed dyslipidemia and 85.25% male and 82.19% female patients with type- 2 DM has developed dyslipidemia, which is shown in following figure: 6.

Figure 1: Percentage of patients at different ages and gender.

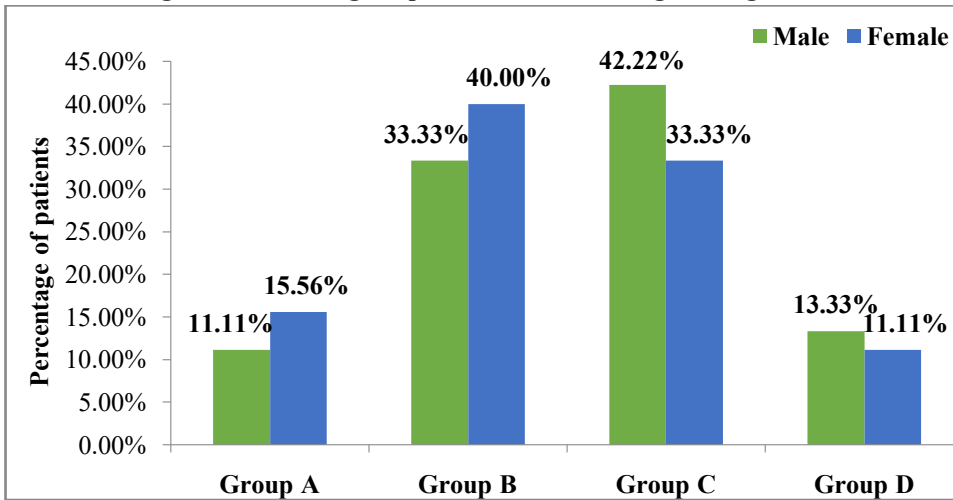


Figure 2: Percentage of patients with different types of Diabetes mellitus.

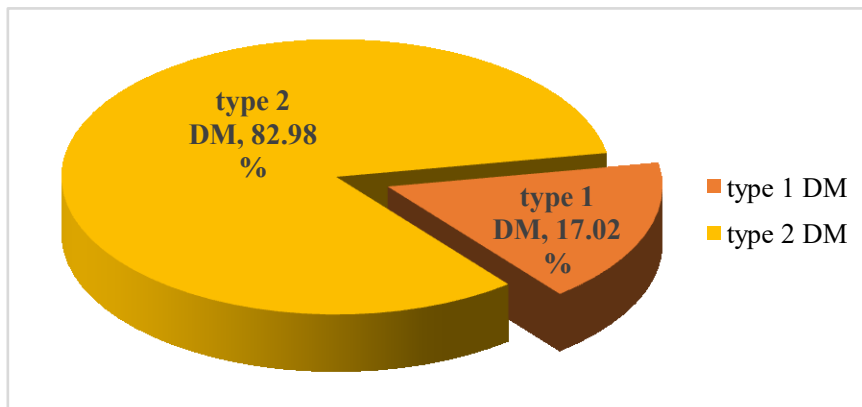


Figure 3: Percentage of different DM patients among each gender.

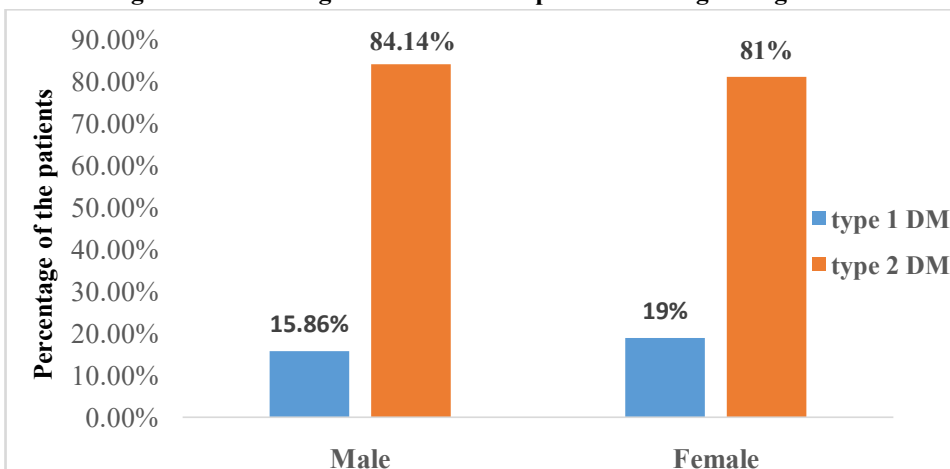


Figure 4: Average lipid profile level at different ages (mg/dl).

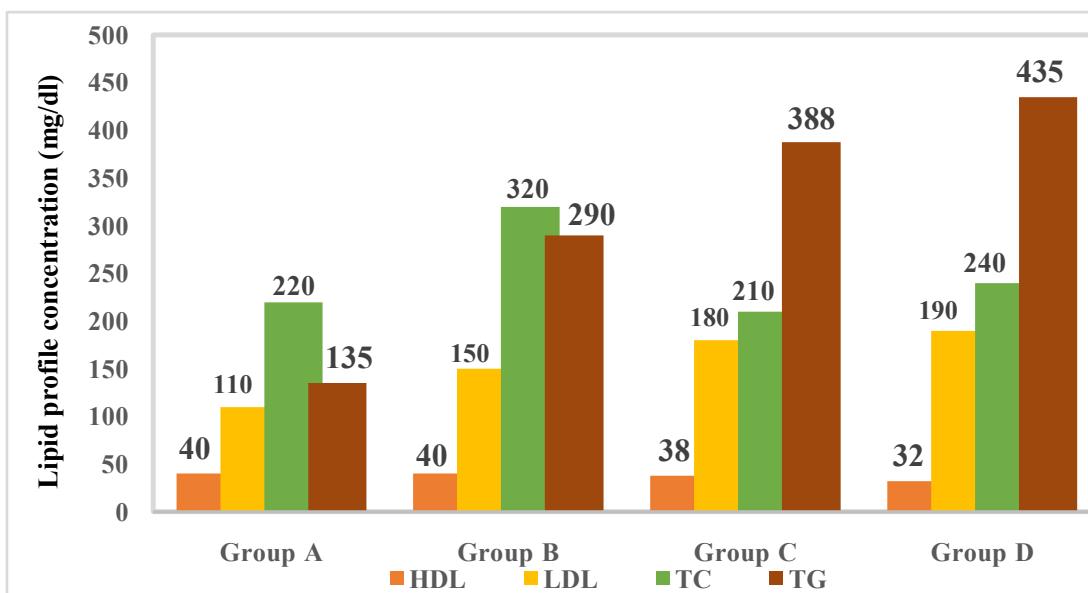


Figure 5: Average serum creatinine levels at different ages (mg/dl).

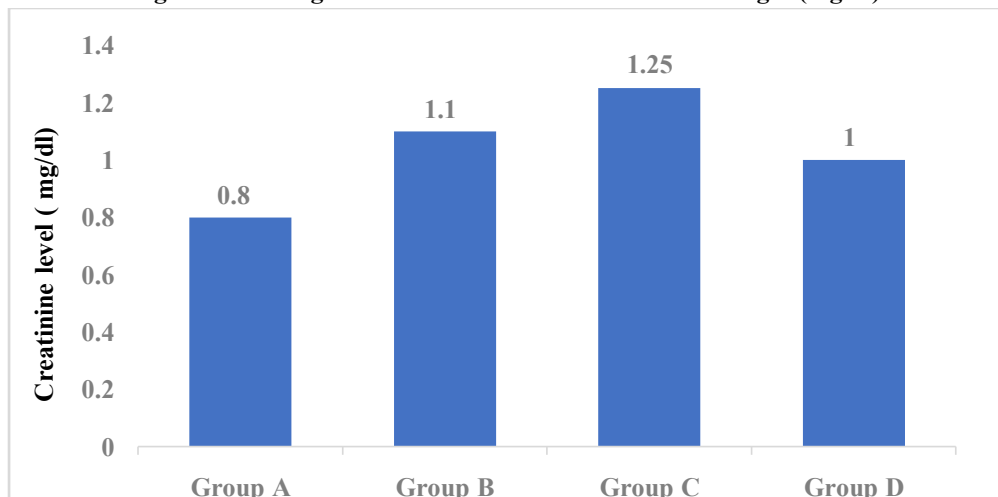
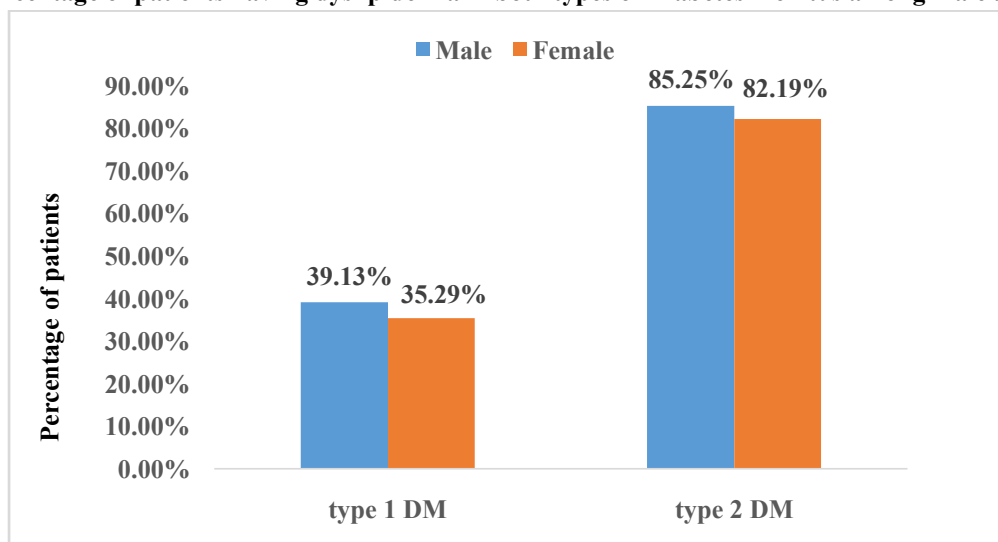


Figure 6: Percentage of patients having dyslipidemia in both types of Diabetes mellitus among male and female.



4. Discussion

The results of our current study shows a relationship to those previous studies as in the case of patients participating in our study (235), the variation in lipid profile was seen in almost every patients among whose 9 (39.13%) male and 6 (35.29%) female patients with type-1 DM developed dyslipidemia and 104 (85.25%) male and 60 (82.19%) female patients with type 2 DM developed dyslipidemia. So, according to our study, it is seen that patients with type-2 DM are largely prone to develop dyslipidemia. The lipid profile abnormalities observed mainly in Type 2 DM may be due to insulin resistance which has closely been associated to develop diabetic dyslipidemia [28]. This variation in lipid profile may somewhat depend on patients life style, food habit, environment, occupation, anti-diabetic medications and level of education [29]. Dyslipidemia is not only responsible for developing cardiovascular diseases, but may also play a vital role in the development of diabetic nephropathy [30]. High serum creatinine level due mainly to reduced GFR indicates the renal function impairment as well as diabetic nephropathy in diabetic patients and it serves as one of the most reliable indicators for nephropathy. But diabetic nephropathy is a chronic renal disease which is developed in severe phases of diabetes. Since both lipid profile abnormalities, mainly dyslipidemia and increased serum creatinine level are the two most important risk factors for cardiovascular diseases and also for renal diseases [30-32], the control of serum lipid and creatinine levels is not only important for diabetes management but also for cardiovascular diseases and also for keeping the kidneys in sound health.

5. Conclusion

Finally, dyslipidemia is one of the most serious and frequently occurring complications in patients with both type-1 DM and type-2 DM and greatly associated with increased levels of serum creatinine as well as reduced GFR which indicates the severe impairment of renal function as well as diabetic nephropathy. Therefore, maintaining of lipid profile and serum creatinine level is mandatory to reduce the chance of developing other complications such as renal failure and cardiovascular diseases including coronary heart disease, atherosclerosis, and hypertension. Since diabetic patients in Bangladesh are dramatically increased day by day with dyslipidemia and diabetic nephropathy, the healthcare professionals must need to take account that the treatment strategy must be such that the lipid profile must be controlled along with controlling hyperglycemia only with a single therapy.

Conflict Interest

The authors declare that they have no conflict interest to conduct the study.

Ethical Considerations

The study was conducted following the general principles of World Medical Association (WMA) declarations of Helsinki and which was performed in collaboration with both the patients and their physicians with full consent of patients. This research work is logistically supported by the department of Pharmacy, Jessore University of Science and Technology, Jessore-7408 in Bangladesh. The human subjects involved in this study did not use any hazardous agents and samples were not collected from them. As the human subjects only participated in the interview, this survey based research didn't take any further approval from institutional ethics committee.

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