



Factors Predicting Dyslipidemia in Obese Type 2 Diabetic Subjects

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Authors' contributions

This work was carried out in collaboration between all authors. Author MAT designed the study, performed the analysis and wrote the first draft of the manuscript. Author GMC designed the study, edited and reviewed the final draft of the manuscript. Authors AF and AS edited and reviewed the final draft of the manuscript. Author NM managed the analyses of the study and reviewed the final draft of the manuscript. Author MK managed the literature searches, wrote and reviewed the final draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Objective: To determine the frequency and associated factors of dyslipidemia among obese type 2 diabetes mellitus subjects.

Materials and Methods: A total of 377 consecutive subjects diagnosed with Type 2 diabetes mellitus who were falling in the eligibility criteria were included in the study. Complete physical examination was done including weight, height and BMI. All subjects with diabetes were investigated for the presence of dyslipidemia by obtaining a fasting lipid profile. The results were analyzed using SPSS version 20.

Results: Out of 377 study cases, 163 (43.2%) were male and 214 (56.8%) were female.

Dyslipidemia was found to be present in 297 (78.8%) while it was negative in 80 (21.2%) obese type 2 diabetics. Presence of dyslipidemia was significantly associated with age (p-value=0.004) and family history (p-value<0.0001) along with the deranged components of lipid profile.

Conclusion: It was observed that dyslipidemia was common among obese subjects with type 2 diabetes mellitus, with age and family history as the strong predictors of dyslipidemia.

Keywords: Type 2 diabetes; dyslipidemia; hypertriglyceridemia; low HDL; obesity.

1. INTRODUCTION

Diabetes mellitus is a constantly increasing burden over the healthcare system [1]. It is usually an irreversible disease but people can lead a normal lifestyle if managed properly. The late complications of diabetes result in reduced life expectancy and major health costs. The complications include macrovascular disease, leading to an increased prevalence of coronary artery disease, peripheral vascular disease, cerebrovascular disease and microvascular damage causing diabetic retinopathy, neuropathy and nephropathy [2].

Diabetes mellitus also affects many metabolic processes in body and one of them is lipid metabolism. It causes dyslipidemia which contributes to the complications associated with it. Many studies conducted for the presence of dyslipidemia in obese diabetic subjects showed that it is strongly associated with DM and contributes to the progression of complications related to it [3,4,5].

The prevalence of dyslipidemia is increasing rapidly around the globe due to westernization of dietary patterns, reduced physical activity, obesity, aging of population and many other co factors contribution [6,7].

Obesity and dyslipidemia are strongly associated with each other, as a study indicate that, "With increasing overweight and obesity class, there is an increase in prevalence of hypertension (18.1% for normal weight to 52.3% for obesity class 3), diabetes (2.4% for normal weight to 14.2% for obesity class 3) and dyslipidemia (8.9% for normal weight to 19.0% for obesity class 3) [8] Pakistan is an underdeveloped country and increasing obesity is a major concern for health care professionals. In one of the study conducted in Pakistan revealed the prevalence of overweight and obese population, weighted to the general Pakistani population, was 25.0%. and 10.3% respectively [9].

Early identification and proper management is utmost important in obese diabetic subjects with dyslipidemia, however, it is overlooked quite frequently which results in higher rates of morbidity and mortality in these settings. Therefore, the purpose of this study was to find out the burden of dyslipidemia and to determine the factors predicting dyslipidemia in our local population of obese type 2 diabetic subjects.

2. METHODOLOGY

This cross-sectional study was conducted at Diabetes Research Centre, Medical Unit 11, Nishtar Hospital Multan. The subject recruitment period was between June 2014 to December 2014. A total of 377 consecutive subjects were selected for this study. Eligibility criteria included subjects of age > 30years up to 75 years and have diagnosed T2DM for minimum of two years' duration, with laboratory value of random blood sugar (RBS) > 200 mg/dl, fasting blood sugar (FBS) >126 mg/dl, obese body mass index (BMI) ≥ 27 as per the Canadian guidelines [10] and were not on any lipid lowering medications. Whereas, Pregnant women, subjects with chronic liver disease, chronic kidney disease, coronary artery disease and decompensate heart failure were excluded from the study. Written informed consent was obtained from the subjects and No Objection Certificate (NOC) was granted from the ethical review committee of the Nishtar Hospital Multan. Complete physical examination was done in all subjects including weight, height, BMI. All the participants were investigated for the presence of dyslipidemia through a Fasting Lipid Profile sample after 8 hours fast from central laboratory of NHM [11]. Dyslipidemia was defined as the presence of one or more of the following conditions [12]: Serum Cholesterol > 200 mg/dl, Serum LDL-C > 130 mg/dl, Serum TG > 150 mg/dl, and Serum HDL <40 mg/dl. Whereas mixed dyslipidemia was defined as the existence of serum LDL-C > 130 mg/dl, serum TG > 150 mg/dl, and serum HDL <40 mg/dl. The results were entered in a separately designed Performa by the research officer.

2.1 Statistical Analysis

Statistical analysis was performed by entering all the data in SPSS version 20. Results were described as mean±standard deviation for continuous variables whereas, frequencies and percentages were calculated for categorical variables. T-test and Chi-square test were applied to see the significance. A binary logistic regression analysis was conducted to determine risk factors associated with dyslipidemia. P-value equal to or less than 0.05 was considered as significant.

3. RESULTS

In the present study, out of 377 study cases, 163 (43.2%) were male and 214 (56.8%) were female. Mean age of subjects was 48.24± 9.65 years (minimum age was 30 years while maximum was 70 years). Mean duration of diabetes mellitus was also inquired from the subjects and it was 6.25 ± 3.94 years (minimum duration was 2 years while maximum duration of diabetes was 22 years). Whereas, mean BMI value was 30.21 ± 3.24 kg/m² (minimum BMI was 27 kg/m² while maximum BMI was 58.3 kg/m²). Majority of our study cases were from urban areas i.e. 282 (74.8%) were from urban areas and 95 (25.2%) were from rural areas. Dyslipidemia was present in 297 (78.8%) subjects whereas mixed dyslipidemia was present in 53(14.1%) subjects. Mean levels of total cholesterol, triglycerides, LDL (low-density lipoprotein) cholesterol, and HDL (high-density lipoprotein) cholesterol of all study cases were 194.25 ± 39.73 mg/dl, 197.43 ± 78.31 mg/dl, 119.32 ± 32.36 mg/dl, and 42.79 ± 7.50 mg/dl respectively. All the parameters were significantly different among gender except for BMI, dyslipidemia, family history of dyslipidemia, duration of diabetes, HDL and level of triglycerides (Table 1).

In univariate analysis, apart from all the components of dyslipidemia, the presence of dyslipidemia was significantly associated with age (p-value=0.004), and family history (p<0.0001). The presence of dyslipidemia was not significantly associated with residential status, gender, BMI and duration of diabetes (Table 2).

Multivariate analyses were undertaken with the presence of dyslipidemia as dependent variable and all other parameters, which were significantly associated with dyslipidemia in univariate

analysis, as independent variables. It showed that the presence of dyslipidemia remained associated with triglyceride, LDL, and family history. In multivariate analysis, with adjustment for family history of dyslipidemia, triglyceride, and LDL, it was no longer associated with age (p-value= 0.192), cholesterol (p-value=0.938), and HDL (p-value= 0.278) (Table 3).

4. DISCUSSION

This study was intended to assess the presence of dyslipidemia among obese type 2 diabetics and to determine the associated factors predicting dyslipidemia in these subjects. Diabetic dyslipidemia is a major risk factor for macrovascular complications due to promotion of atherosclerotic changes in major vascular beds. Subjects with type 2 diabetes mellitus usually suffers from dyslipidemia, the major reason is insulin resistance and its effect on metabolism of lipids, even with tight glycemic control. The burden of dyslipidemia is reported to be as high as 72% in subjects with diabetes and generally varies from 25-60% [13] These results are comparable with our study which showed high prevalence (78.8%) of dyslipidemia, out of which 14.1% subjects had mixed dyslipidemia. Mithal et al have also reported similar results [14].

Obesity and dyslipidemia are responsible for increased cardiovascular morbidity and mortality association with diabetes. Among obese diabetics, dyslipidemia was significantly more frequent among females [15,16] that is also compatible with our study results.

The current study revealed the possible predictor variables for dyslipidemia by univariate analysis. Associated factors with dyslipidemia in the present study were age and family history of dyslipidemia along with lipid profile. In contrast, residential status, height, weight, BMI, duration of diabetes, were not related with dyslipidemia. The association of dyslipidemia with age was consistent with previous studies [7,17,18]. Additionally, Najafipour H et al. concluded in their study that family history has a very strong role in the development of dyslipidemia [19], the similar findings have been reported in this study. Diabetic dyslipidemia is mainly associated with high level of triglycerides and LDL- cholesterol and decreased level of HDL-cholesterol [20]. Our results, in multivariate analysis suggested the similar findings. This study has some limitations. One of the main limitation is the cross-sectional

study design. Therefore, it only reflects the casual association between dyslipidemia and risk factors, but unable to perceive prospectively. Further studies involving more potential predictor variables are needed in order to control measures.

Table 1. Basic characteristics of study participants

	Male	Female	Overall	P-value
n	163	214	377	
Age (years)	49.39±10.06	47.36±9.26	48.24±9.65	0.042
Height (cm)	163.56±9.79	153.77±8.61	158.01±10.34	<0.0001
Weight (kg)	80.08±10.39	71.8±8.46	75.38±10.2	<0.0001
BMI (kg/m ²)	29.92±2.73	30.43±3.56	30.21±3.24	0.127
Residential status				
Rural	57(35.0%)	38(17.8%)	95(25.2%)	<0.0001
Urban	106(65.0%)	176(82.2%)	282(74.8%)	
Dyslipidemia				
Yes	121(74.2%)	176(82.2%)	297(78.8%)	0.06
No	42(25.8%)	38(17.8%)	80(21.2%)	
Mixed dyslipidemia				
Yes	20(12.3%)	33(15.4%)	53(14.1%)	0.383
No	143(87.7%)	181(84.6%)	324(85.9%)	
Family history of dyslipidemia				
Yes	112(68.7%)	150(70.1%)	262(69.5%)	0.773
No	51(31.3%)	64(29.9%)	115(30.5%)	
Duration of Diabetes (years)	6.48±4.2	6.08±3.74	6.26±3.94	0.333
Cholesterol (mg/dL)	187.91±40.63	199.08±38.43	194.25±39.73	0.007
Triglyceride (mg/dL)	195.89±80.91	198.61±76.44	197.43±78.31	0.739
LDL (mg/dL)	115.15±31.91	122.49±32.41	119.32±32.36	0.029
HDL (mg/dL)	42.75±7.53	42.81±7.5	42.79±7.5	0.934

Table 2. Univariate analysis

Parameters	Exp (β)	95 % confidence interval	P-value
Age (years)*	1.039	1.012-1.065	0.004
Residential status	1.474	0.856-2.538	0.162
Gender	0.622	0.379-1.022	0.061
BMI (kg/m ²)	0.948	0.864-1.039	0.253
Duration of DM (years)	1.003	0.942-1.067	0.936
Height (cm)	1.020	0.995-1.045	0.119
Weight (kg)	1.009	0.986-1.034	0.439
Cholesterol (mg/dL)*	0.965	0.955-0.975	<0.0001
Triglyceride (mg/dL)*	0.953	0.943-0.964	<0.0001
LDL (mg/dL)*	0.961	0.949-0.973	<0.0001
HDL (mg/dL)*	1.056	1.020-1.094	0.002
Family history of Dyslipidemia*	0.019	0.008-0.042	<0.0001

Table 3. Binary logistic regression

Parameters	Exp (β)	95 % confidence interval	P-value
Age (years)	1.04	0.98-1.11	0.192
Cholesterol (mg/dL)	1	0.97-1.03	0.938
Triglyceride (mg/dL)*	0.95	0.93-0.97	<0.0001
LDL (mg/dL)*	0.95	0.92-0.98	<0.0001
HDL (mg/dL)	1.06	0.95-1.19	0.278
Family history*	0.004	0.001-0.021	<0.0001

5. CONCLUSION

Dyslipidemia is highly prevalent among obese type 2 diabetics regardless of the duration of diabetes and residential status. Whereas, it is slight predominant in females and influenced by age and family history. Further large scale community based surveys are required to ascertain the findings of this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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