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Case Control Study for Biochemical Abnormalities in Diabetic Cardiovascular Patients of South Punjab Pakistan

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ABSTRACT: To assess association of serum lipid profile in populace of diabetic cardiac with diabetes in southern Punjab. Lipid profile was considered in two hundred and four patients with or without cardiac disease conceded in a similar hospital. The questioner of subjects, previous serum biochemical result was contemplated with consent of subjects. Anthropometric measurements were significantly higher in diabetic cardiovascular. Time duration of diabetes and prevalence of cardiovascular disease among subjects with cardiac compared with subjects without cardiac were significantly greater ($p < 0.05$). The total cholesterol, LDL-C, triglycerides, HDL-C, and LDL-C / HDL-C proportion were significantly higher in diabetic subjects contrasted with cardiac group. Subjects among type 2 diabetes ought to be screened for lipid profile and demographic measurement as significant lipid abnormality are identified with control glycemic level and assumptive a significant role in contributing to cardiovascular disease. These can be improved with dietary administration and insulin treatment. The salient features of the cardiometabolic disease and risk factor epidemic at the beginning of the 21st century are high blood pressure and an increasing effect of obesity and diabetes. The mortality burden of cardiometabolic risk factors has shifted from high-income to low-income and middle-income countries.

Keywords: Dyslipidemia, biochemical parameters, cardiovascular disease risk reduction, hypercholesterolemia

I. INTRODUCTION

Diabetes mellitus (DM) is a assorted group of metabolic disorder described by increased glycaemia with disturbing influences of carbohydrates, protein and fat digestion brought about by either absence of insulin discharge or diminished affectability of tissues to insulin [1]. Epidemiological investigations have shown that type 2 diabetes mellitus (DM) is an outstanding risk factor for the advancement of cardiovascular illness, cerebrovascular ailment, and fringe vascular disease [2]. Adjustments in lipid and lipoprotein profile add to atherosclerosis in type 2 diabetes [3]. As in Pakistan a ton of changes in individual's lifestyle happen which decreased physical movement and increment weight. Type 2 Diabetes (T2D) is related with different hazard factors for example (age, weight, Body Mass Index (BMI), family ancestry with allude to diabetes, stoutness, past history of gestational diabetes and a few others. Over 80% of type 2 diabetics are being overweight [4] . In Pakistan, prevalence in 2000-2025 is 5.3 million and by 2025 will increment to 14.5 million [5], and diabetes is more incessant in ladies than in man in Pakistani populace [6].

Cardiovascular disorder (CVD) is driving reason for death in everywhere throughout the world. It is evaluated that 17 million individuals bite the dust with CVD all through the world [7]. In Pakistan the predominance of cardiovascular illness hazard factor is significantly higher, where 29% of men are smoker, 18% experiencing hypertension and 13% have more elevated cholesterol level [8].

Albeit recent analysis have recommended a less stamped impact, most specialists think about diabetes to give in any event a twofold overabundance hazard, autonomously from other ordinary hazard factors [8, 9]. In type 2 diabetes an expanded cardiovascular hazard frequently exists for a long time before the beginning of biochemical hyperglycemia. During this period obesity and insulin resistance are regularly present, related with hypertension and dyslipidemia, normally alluded as metabolic disorder [10]. These hazard components may

prompt the early improvement of Coronary Heart Disease (CHD) and may represent the expanded rate of diabetes in the period following a conclusion of cardiovascular sickness [11]. An early mediation to standardize coursing lipids has been appeared to diminish cardiovascular entanglements and mortality [12]. Type II diabetic patients for the most part show prevalence of littler/denser LDL-C segments, which presumably builds the general indications of atherogenicity in the blood [13]. Glycated hemoglobin (HbA1c) has been proposed as analytic check for the Patients suffering from diabetes mellitus by American Diabetes Association (ADA). This investigation gauges the run of the mill blood glucose levels for the last a few months. It is a useful and remarkable indicator of the appearance of diabetes and its threats in the puberty along these lines can be utilized to recognize pre-diabetes in the off springs explicitly for the diabetes mellitus of type II [14]. The clinical deviation Dyslipidemia is seen in the patients having diabetes mellitus. The wide range term hyper-lipidemia used to allude to ceaseless heights of cholesterol and triglycerides, in the fasting blood levels. However dyslipidemia is characterized as the blend of hereditary, natural or patho-physiological elements that can meet together to unconventionally change the blood lipids and lipoprotein focuses. Type 2 diabetes is regularly connected with stoutness, lipid irregularities, hypertension and cardiovascular sickness. The different hazard factors for the improvement of type 2 DM are stoutness, ethnicity, stationary way of life, sex, family ancestry, hypertension and smoking [15]. Diabetes is second just to cardiovascular Disease(CVD) as a well being trouble in Pakistan [16].

Dyslipidemia was characterized as: Total Cholesterol (TC) ≥ 200mg/dl, Low Density Lipoprotein Cholesterol (LDL-C) ≥ 130 mg/dl, High Density Lipoprotein Cholesterol (HDL-C) below 40mg/dl, Triglyceride Cholesterol (TG) ≥ 150 mg/dl, and Very Low Density Lipoprotein Cholesterol (VLDL-C) ≥ 30 mg/d [17].

Type 2 diabetic patient frequently show an atherogenic lipid profile i.e low HDL and High TG which significantly expands their danger of CVD contrasted and individuals without diabetes [18]. As of late, patients with type 2 diabetes conveying apolipoprotein were found to have a more noteworthy cardiovascular hazard inferable from metabolic variety in lipid digestion prompting more elevated cholesterol and LDL [19, 20]. Similarly examined essentially more significant levels of hyper-cholesterolemia and hyper-lipidemia in type 2 diabetic patients with CVD when contrasted with diabetic patients without CVD. The present study aimed to assess the potential risk of cardiovascular diseases and related complication in the diabetic patients

The point of study is to investigate the biochemical association in a group of cardiovascular patients and compared with non-cardiovascular patient in Pakistani populace. With the goal that future bearings can be made for its control and maintain a strategic distance from the difficulties in risk patients and giving the path for the improvement of explicit therapeutics for CVD patients. To discover the pervasiveness of dyslipidemia in diabetic patients. However, despite the known association of obesity and inactivity with diabetes-related morbidity and mortality, there is limited national data reporting the independent association of each risk factor with the prevalence of diabetes and related cardiovascular comorbidities in the Pakistani population.

II. METHODS AND MATERIALS

A. Study Design and study Population

According to the present diagnostic criterion of WHO for diabetes, the population of 204 diabetic patients (20-60 years old) with and without the cardiac disease and related complications were studied to evaluate the risk factor of cardiovascular diseases in diabetic patients in Southern Punjab pollution. The study considered the control of cardiovascular-diabetic patients and healthy individuals for comparison. The study undertook the clinical profiles of the patients visiting Nishtar Hospital, Multan, Pakistan from May 2017 to May 2018. 95% confidence level, power of 90% and 0.05 alpha were applied to calculate the sample size with magnitude of 40.4 ± 4.1 and 43.7 ± 6.6 mg/dl HDL-C in diabetic patients with and without a specific co-morbidity (cardiovascular). The following formula was used to calculate through the sample size [21]:

$$n_1 = \frac{(\sigma_1^2 + \sigma_2^2/K)(z_{1-\alpha/2} + z_{1-\beta})^2}{\Delta^2}$$

where,

$\Delta = |\mu_2 - \mu_1|$ = absolute difference between two means

σ_1, σ_2 = variance of mean #1 and #2

n_1 = sample size for group #1

n_2 = sample size for group #2

α = probability of type I error (usually 0.05)

β = probability of type II error (usually 0.2)

z = critical Z value for a given α or β

k = ratio of sample size for group #2 to group #1

B. Questionnaire and Patients' Records

A dichotomous questionnaire based on family history of Diabetes, duration of diabetes, age, diet and smoking was filled by the patients. Where the patients' record from the hospital were read to confirm the clinical data. The BMI was noted as Kilogram (kg) body mass/height in meter squared.

C. Blood Sampling and Biochemical Analysis

The blood samples (approx. 10 ml) were collected and centrifuged at 4,000 rpm/10 min. The Serum was later utilized for analyzing Fasting Blood Glucose (FBG) [22], Lipid Profile Panel: Test-Serum Total cholesterol(TC), HDL-cholesterol (HDL-C), Triacylglycerol (TAG) [23], Risk proportion (TC/HDL-C) by utilizing Mindray BA-AT 80 (Human Diagnostics Reagents, Germany) and Indirect LDL-cholesterol and Non-HDL Cholesterol(Non HDL-C) was determined by Friedwald and Frederickson formula [24]. NCEP-ATPIII rule was used for serum lipid reference level: hyper cholesterolemia is characterized as TC>200 mg/dl, high LDL-C when value >100 mg/dl, hyper triglyceridemia as TAG >150 mg/dl and low HDL-C when its value is <40 mg/dl [25].

D. Data Analysis

MS excel was used for data entry and statistical analyses were performed using GraphPad InStat 3 windows version (GraphPad Software, San Diego, CA). Autonomous samples t-test was utilized to compare means for various parameters. Estimation of HbA1c was

given as level of total hemoglobin and all other parameter were given in mg/dl. The tukey test was performed to estimate the 95% CI values and the percentage difference was calculated. Findings are communicated as mean ± standard deviation of mean and were considered non-significant when p > 0.05.

E. Ethical Consideration

The study was put in motion after the approval of institutional ethical committee letter no: WUM/UREC/000/3 as well the consent of the subjects was taken.

III. RESULTS AND DISCUSSION

A. Clinical and Demographic

50.6 ± 6.2 years was the average age of diabetic patients, and the average BMI was 39.34 ±6.62 and 27.49 ± 3.95. The percentage of patients is 36 % with 5-10 years duration with diabetes, 64% had for more than 10 years. Cardiovascular diseases (CVDs) in 114 patients (66%) without cardiac and 84% with cardiac were smokers, 83 (80%) had a family history of diabetes.

B. Clinical and Demographic characteristics of Patients with and without CVD

There were moderate significant differences between patients with and without Cardiovascular disorder for age and BMI (p <0.01, p <0.05) (Table 1). Significantly more patients with DC [87 (84%)] compared with those without cardiovascular [69 (66%)] ($\chi 2$ = 7.410 and p = 0.0065) were smokers. More patients with DC [83 (80 %)] had a family history of diabetes compared with patients without cardiovascular disorder [61 (58 %)] ($\chi 2$ = 9.953 and p = 0.0016).

C. Metabolic Profile of Diabetic Patients with and without DCV

Fasting serum glucose (* p<0.05), Cholesterol (*** p<0.001), and LDL-C (** p<0.01) were significantly higher and HDL-C (*** P<0.001) was significantly lower with slightly significant in triglycerides (* p<0.05) between patients with DC compared with patients without DC (Table 2).

Table 1: Clinical and demographic characteristics of the study population.

Characteristic	Diabetic Patients		Test	*p*-Value
	No Cardiac diseases (n=104)	With Cardiac diseases (n=104)		
Age (years) (Min-max)	50.34± 10.08	55.64 ± 10.67	t = 3.286	** P<0.01
	27- 76	35- 75		
BMI (kg/m^2) (min-max)	29.34 ±6.62	27.49 ± 3.95	t = 2.820	* P<0.05
	19.81- 46.78	20.06- 37.56		
Smoking			$\chi 2$= 7.410	* P<0.05
Yes	69 (66%)	87 (84%)		
No	35 (34%)	17 (16%)		
Family history			$\chi 2$= 9.953	* P<0.05
Yes	61(58%)	83(80%)		
No	43 (42)	21 (20%)		
Duration of diabetes			$\chi 2$ = 11.868	** P<0.01
5-10 years	42 (36%)	69 (60%)		
>10 years	72 (64%)	45 (40%)		

People with BMI = 18.5–24.9 were considered to have normal weight, people with BMI = 25.0–29.9 were classified overweight and people with BMI ≥ 30.0 were considered obese [26].

Table 2: Serum glucose and lipid profile of Diabetic Patients with and without Cardiac diseases.

Parameters	Diabetic Patients				% Difference	t-Test	p-value
	No Cardiac diseases (n=104)		With Cardiac diseases (n=104)				
	Mean ± SD	95% CI	Mean ± SD	95% CI			
Glucose	188.10 ± 83.26	171.89, 204.32	212.02± 31.90	(196.50, 227.61)	-23.951	2.827	* P<0.05
Cholesterol	233.23± 63.32	220.90, 245.56	183.88±33.4	173.83, 192.48	50.077	7.534	*** P<0.001
Triglyceride	165.87± 53.65	155.42, 176.31	186.62± 37.73	179.27, 193.96	-20.750	3.132	* P<0.05
HDL-C	46.62± 12.62	44.16, 49.07	33.51± 6.90	32.17, 34.85	13.112	4.544	*** P<0.001
LDL-C	151.91± 46.06	142.94, 160.88	133.30± 40.72	125.38, 141.23	18.605	3.427	** P<0.01

Parameters	Patients				% Difference	t-Test	p-value
	Control		Cardiac				
	Mean +/- SD	95% CI	Mean+/- SD	95% CI			
Glucose	92.11± 24.42	87.35, 96.86	122.02± 31.90	115.81, 128.24	-29.917	3.531	** P<0.01
Cholesterol	207.58± 42.04	199.40, 215.77	168.88± 33.44	162.37, 175.40	38.702	5.823	*** P<0.001
Triglyceride	155.65±54.36	145.06, 166.23	188.53± 43.269	180.10, 196.95	-32.885	4.964	*** P<0.001
HDL-C	57.67± 38.44	50.18, 163.60	33.50± 6.89	32.16, 34.84	24.162	8.374	*** P<0.001
LDL-C	117.83± 43.21	109.42, 126.25	103.11± 21.95	98.83, 107.38	14.733	2.714	* P<0.05

The present study aimed to assess the potential risk of cardiovascular diseases and related complication in the diabetic patients in light of clinical and metabolic factors. 328 people were selected for the study of which 208 were subjects of Diabetics with and without cardiovascular diseases. The study also took in the consideration 60 healthy individuals and 60 individuals with cardiovascular diseases without diabetes. 31.7% prevalence of DC was found in our sample which is comparable to the similar studies in Sweden which drew the relation of cardiovascular risk factors in diabetic patients [27].

Clinical and demographic characteristics of the Diabetes patients with and without cardiovascular diseases are listed in Table 1. There was found less significant difference ($p<0.05$) in the two groups in terms of BMI (kg/m^2), Smoking and Family history with considerably low significant difference ($p<0.01$) in age and duration of diabetes. Smoking has been reported as a major negative living habit in the diabetic patients in Punjab, leading to co-morbidities and low quality of health [28] whereas smoking has been found a repetitive habit with strong correlation in the cardiovascular diseases' patients in Punjab [29]. Our sample had 69% diabetics patients who smoker and 87% of cardiovascular patients showing a relative correlation in the lifestyle of the groups.

Average BMI of 29.34 ±6.62 and 27.49 ± 3.95 for Diabetic patients and Diabetic Cardiovascular patients was found to be relatively high, residing in range of obesity which is in agreement to correlation of BMI of potential of diabetic patients develop cardiovascular complications [30, 31]. Moreover as strong inverse relation of BMI and the risk of mortality in patients with type 2 diabetes for acute heart-failure has been reported previously [32]. The duration of diabetes is an important factor in learning about the development of co-morbidity such as cardiomyopathy and retinopathy [33]. The present study found that the duration of diabetes with comorbidity of cardiovascular disease was less suggesting that development of cardiovascular comorbidity along with diabetes is higher paced event.

The data (Table 2) represents that the blood glucose level has no significant difference ($p>0.05$) among the diabetic with and without cardiovascular disorder.

Lipid metabolism is an important parameter in relation to cardiovascular complications in diabetes [34].

Triglycerides did not differ significantly among these either. It means that these risk factors can be considered which contribute in disease outcomes. In addition to medication, different distinctive fraction of several risk factors occurs which depends on correlation of coverage and size modification. In different countries findings of total cholesterol and LDL cholesterol show that both these are comparable risk factors [35]. The long-tenure studies would be supportive for reducing the growing burden of disease through diagnose in time and minimize the cost efficacy for national healthcare system of delicate and low-income country. The comparative correlation between biochemical factors and BMI in the three groups in Fig. 1.

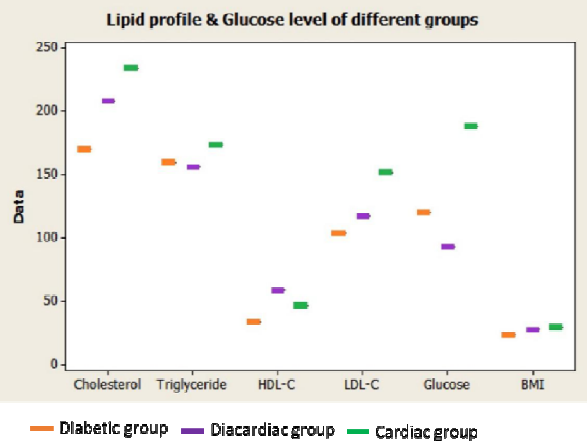

Fig. 1. The clustering of Diabetic patients, Dia-cardiac patients and cardiac patients.

IV. CONCLUSION

In this study we found the Lipid profile (triglycerides, HDL, LDL, and cholesterol) to be important parameters to predict the risk factor of cardiovascular disease complication in diabeties-2 patients and is a cheap diagnostic indicator in third world country. Diabetes is basic disease in south Punjab populace and still no adequate information is accounted for filling the hole. The drastically expanding epidemics of obesity and diabetes are notable threats to general health in the Pakistan. The consistent independent association among obesity and physical inactivity and increased prevalence of diabetes and diabetes-associated cardiovascular comorbidities seen in this nationally representative study is disturbing. It is imperative to

concentrate on these patterns and battle them with weight the executives and active work interventions.

Conflict of interest: The authors declare that they do not have conflict of interests with respect to publication of this paper.

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