Assessment of Cardiovascular Markers Inpatients with Type 2 Diabetes Who Smoke Cigarette

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Abstract

Background: diabetes and smoking were known serious factors for developing cardiovascular and other abnormalities threaten wellbeing.

Objective: to estimate the impact of smoking and diabetes on cardiovascular disease (CVD) markers.

Methods: 44 type 2 diabetes never smoke compared to 32 type 2 diabetes currently smoking and 30 healthy subjects, lipids, apolipoprotein, lp(a), CK-MB Troponin, MDA, and MPO were measured in participants.

Results: FPG, Lp(a) and MDA were higher in patients than controls ($p>0.01$). In addition, Lp(a) and MDA were higher in SDM than DM ($p>0.05$). Moreover, CVD markers were higher in smoker's patients with diabetes (SDM) who were overweight or hypercholesterolemia than others ($p>0.01$). Furthermore, Lp(a) was increased gradually and correlate directly with diabetes in all three-period settings in the study ($p>0.05$).

Conclusion: smoking increased the risk of CVD in Sudanese type diabetes, the risk was increased with overweight, hypercholesterolemia and become serious in a long period of diabetes.

Keywords: *Smoking, diabetes, CVD, and cardiovascular.*

Introduction

Diabetes mellitus (DM) is a group of metabolic impairments characterized by chronic hyperglycemia due to low or complete absence of insulin, DM has increased recently worldwide because of the globalization of Western lifestyle. Diabetes mellitus disorders and complications were associated with the cardiovascular system and affected in both, microangiopathy and macroangiopathy vascular. microvascular complications are including coronary artery diseases, and microvascular complications including nephropathy in the kidney, retinopathy in the eye, and neuropathy[1].

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Cigarette smoking (CS) consider to be a major health threatening, it is predisposing factor for many diseases including cancer and atherosclerosis, it is leading significantly to CVD mortality, CS increases all stage of atherosclerosis since endothelial dysfunction until acute clinical events.CS is one of the most important risk factor increased risk of DM, smoking gives many toxins including reactive oxygen species which leading to oxidative stress and atherosclerosis[2].

Cardiovascular diseases (CVD) are contributing a leading cause of death globally[3]. According to International Diabetes Federation, the number of diabetes is 347 million in 2008 and 366 million in 2011 and will be increasing to 552 million by 2030 in 10 countries[4].

DM in Sudan was estimated in 2001 as 3.4%[5] and increased to 7.7% in 2015 and expected 10.8% in 2035[4]. Sudan consider a developed country with difficult living

and health conditions particularly in rural, so the number of research was scarce, but there is much research in adult and pediatric regarding diabetes, metabolic syndrome, and other risk factors associated with the risk of CVDs through many stages and complications in Sudan and others[6-20](5-19).In Sudan we look to many factors that help to decreases the risk of cardiovascular in populations, including the use of local herbals that well documented to decreasing risk factors such as mint[21], and caffeine in coffee[22], but the utilization of smoking is increased especially among young age[23]. Still, we need more researches to focus on the real number of diabetes, smoking, and other risk factors for CVD.

Methods

Subjects:

Forty-four patients with type 2 diabetes (26 male) who never smoke compared to 32 type 2 diabetes who smoke cigarettes (all of them were male) were recruited from Jabir Abu Aliz Diabetes Center (Khartoum, Sudan). The patients were compared to 30 healthy subjects (19 male) as a control group. The inclusion criteria for selecting patients were fasting blood glucose ≥ 7 mmol/l. exclusion criteria were those with failure of kidney and liver, acute illness, anemia, and thyroid disease. The permission of this study was taken from the local research ethics committee which follows the standard criteria of the declaration of Helsinki. Written consent was signed by participants after the description of study aims.

Anthropometricand Biochemical parameters:

Body mass index (BMI) was measured as mentioned before[24].

Fasting blood samples were collected from the participants in plain tubes and the serum separated close to the time of collection. Blood glucose and lipids were measures by enzymatic endpoint reaction with commercial kits as mentioned before[16]. Apo A1, apo B, and Lp(a) were measured based on the immunoturbidimetric method using automated analyzer Roche/Hitachi 902 fully-automated analyzer[9,25]. Urea and creatinine were measured according to enzymatic reaction[26]. Malondialdehyde (MDA) determined by the protocol as mentioned before[27]. The activity of Myeloperoxidase (MPO) was measured spectrophotometrically with the use of o-dianisidine (Sigma-Aldrich) and hydrogen peroxide as mentioned before[28].

Statistical Analysis

Done by using SPSS software version 19 (IBM Corporation, Armonk, NY, USA). Values were shown as mean±SD. ANOVA and t-test were applied when appropriate for calculation of p-value which considers significant if $p<0.05$.

Results

Table 1 shows basic characteristics of study subjects, in which there were no significant differences between DM, SDM, and controls in all biochemical or anthropometric parameters except in FPG, Lp(a), and MDA levels, which were higher in patients both groups than in control ($p>0.01$). In addition, Lp(a) and MDA were higher in SDM than DM ($p>0.05$).

Table 2 shows a comparison of CVD markers among different characteristics in patients with diabetes and smokers, no significant difference between male and female, but CK and Troponin were higher in overweight and hypercholesterolemia subjects than others ($p>0.01$).

Table 3 shows a correlation between the duration of diabetes and markers in SDM, in which, Lp(a), CVD, and inflammatory markers were increased significantly in a long period ($p>0.01$). Lp(a) was increased gradually and correlate directly with diabetes in all three-period settings in the study ($p>0.05$).

Table1: basic characteristics of participants

	DM	SDM	Controls	P value
No.	44	32	30	-
Age	30.9±14.3	42.1±19.7	37.9±16.5	0.06
Gender (male, female)	26, 18	32, 0	19, 11	-
BMI (kg/m2)	23.5±3.9	24.4±4.8	22.1±2.1	0.8
FPG (mmol/l)	8.2±1.2	8.3±1.9	5.2±0.5	0.001**
TC (mmol/l)	4.2±1.6	4.5±1.8	4.0±1.1	0.39
TG (mmol/l)	1.51±0.4	1.6±0.9	1.48±0.3	0.74
LDL (mmol/l)	3.3±1.1	3.6±1.2	3.1±0.9	0.18
HDL (mmol/l)	1.28±0.7	1.25±0.4	1.41±0.7	0.53
Apolipoprotein A1 (g/L)	1.49±0.8	1.45±0.8	1.57±0.9	0.84
Apolipoprotein B (g/L)	10.2±4.9	10.8±5.1	9.1±2.9	0.33
Lp(a) mg/dl	33.2±9.2	38.7±12.1*	18.9±4.9	0.001**
CK-mb (ng/ml)	2.2±0.9	2.4±1.1	1.9±0.7	0.11
Troponin (ng/ml)	0.019±0.03	0.022±0.03	0.008±0.01	0.09
MDA (mg/dl)	0.9±0.1	1.0±0.1*	0.5±0.1	0.001**
MPO (ng/ml)	32.1±12.8	32.7±11.2	26.5±7.8	0.06
Urea (mg/dl)	20±5.2	22±8.1	17±2.2	
Creatinine (mg/dl)	0.8±0.1	0.9±0.2	0.7±0.2	
Smokers	9	17	0	-
Non-smokers	13	23	26	-

DM: diabetes mellitus patients. SDM: smokers with diabetes mellitus patients.Data set as mean±SD. *significant p>0.05. **significant p>0.01.

Table 2: CVDs markers in smoker diabetic patients

	CK-mb	**Troponin**
Gender		
Males (n=40)	2.4±0.8	0.023±0.01
Females (n=22)	2.2±0.4	0.020±0.01
BMI		
Normal (20)	3.1±0.4**	0.021±0.01
Overweight (42)	2.5±0.3	0.029±0.01**
Total cholesterol		
Normal (48)	2.6±0.9	0.021±0.01
High level (14)	3.9±0.9**	0.037±0.01**

Data set as mean±SD. **significant p>0.01.

Table 3: Pearson correlation between duration of diabetes and markers in SDM:

	Duration		
	< 10 years	**10-20 years**	**> 20 years**
Lp(a) mg/dl	0.29*	0.5*	0.78**
CK-mb (ng/ml)	0.04	0.12	0.61**
Troponin (ng/ml)	0.08	0.19	0.71**
(MDA) nmol/g	0.06	0.12	0.41*
MPO (ng/ml)	0.06	0.10	0.32*

*: significant (p<0.05). **: significant (p<0.01).

Discussion

In this study, cardiovascular markers were measured in Sudanese patients with type 2 diabetes. In which, lipids, apoA1 and B, lp(a), CK-MB, Troponin, MDA, and MPO were assessed and a major finding was increased of Apo B, lp(a), CK-MB, Troponin, and MDA in diabetic smoker than diabetic non-smokers. It's well documented that diabetes mellitus is commonly associated with cardiovascular abnormalities, similarly, smoking is correlated with the increase of the pathogenesis of many diseases such as atherosclerosis and cancers because it is a source of many toxins including free radicals and reactive oxygen species which they are playing a serious role in damaging tissues and increasing oxidative

stress[29-31].

The combination of smoking and hyperglycemia can cause harmful consequences that may enhance vascular damage, there are various ways by which smoking elevated the risk of type 2 diabetes, among these, the chemicals in cigarettes cause bad effect on the human body and may interfere with tissues functions by increases of inflammation and reduces the effectiveness of insulin because of high inhaled levels of nicotine which lead to the severity of diabetes that may lead to heart, kidney, eye, and nerve complications[32]. In addition, strong evidence said that smoking can cause type diabetes[33]. Smoking can affect many surface molecules which help keep human cells in inflammatory conditions[34], thus a lot of studies demonstrate the association between smoking and diabetes[35-37].

It is widely known that smoking is substantially elevated the risk for both micro and macrovascular complications in type 2 diabetes because smoking released many radicals[33] (38), this finding supporting to the present study in which Lp(a) and MDA were increased in SDM than in DM.

We recommend to the cessation of smoking to decreases the risk of cardiovascular and other abnormalities induced by smoking especially in diabetes and those with Familial hypercholesterolemia[38], and overweight subjects.

In conclusion, smoking increased the risk of CVD in Sudanese type diabetes, the risk was increased with overweight, hypercholesterolemia and become serious in a long period of diabetes.

Conflict of interest: The author has nothing to declare.

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