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Evaluation of Factors Associated With Inadequate Glycemic Control and Some Other Health Care Indicators among Patients with Type 2 Diabetes in Ramallah, Palestine

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ABSTRACT

Inadequate glycemic control among patients with type 2 diabetes constitutes a major public health problem and major risk factor for the development of diabetes complications and evaluation of factors associated with such inadequate control among patient with type 2 diabetes in the Arab world, including Palestine is not very well known. Assessment ofthe factors associated with inadequateglycemic control and some other health care indicators among patients with type 2 diabetes who attended the Palestinian Centre for Non-Communicable Diseases (PCNCD) in Ramallah, Palestine. A random sample of 450 patients was selected from all patients with type 2 diabetes from PCNCD in Ramallah over a period of 6 months in 2012. A pre-structured questionnaire was used to collect information about sociodemographic, clinical characteristics of participants. Weight, height, and waist circumference, and blood pressure readings were measured. Participant's available last readings of glycatedhemoglobin (HbA1c) and lipid profile (Total Cholesterol, Low Density Lipoprotein , Triglycerides, High Density Lipoprotein) were abstracted from all patients' records included in the study. Poor or inadequate glycemic control of the sample pooled was defined as HbA1c ≥6.5%. Of the total 450 type 2 patients included in the study, 70.9% (95%CI; 66.7-75.1) had HbA1c≥6.5%. The majority of patients 408 (90.7%) (95%CI; 81.5-99.9) were classified as either overweight or obese (BMI≥25kg/m^2). High proportion of the sample pooled (207; 46%) reported that they were not physically active and almost three quarter 328 (72.9%) and 392 (87.1%) were with hypertension and dyslipidemia respectively during the study period. There were a significant differences in HbA1c and some other health care indicators among patients with diabetes who were married, employed, non smokers, physically active, non obese, and no history of hypertension or dyslipidemia. Despite the fact of a significant correlation (r=0.737; p<0.001) between diabetic hypertension patient and their use of anti hypertension medications, 44.2% of patients were not able to control their high blood pressure during the study period. The proportion of inadequateglycemic control, over weighted or obese, physically inactive, had hypertension or dyslipidemia was high in the patients under investigation, which was nearly comparable to that reported elsewhere. More restricted management with an educational program that emphasizes lifestyle modification and with importance of adherence to treatment plan designed according to the international clinical guidelines would be of great benefit in glycemic control of our patients.

Keywords:Type 2 diabetes, inadequate glycemic control, Palestine, Obesity

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INTRODUCTION

According to the current predictions of diabetes, 371 million people globally had diabetes and this will have risen to 552 million by the year 2030[1].TheInternational Diabetes Federation (IDF) predicted the future diabetes increase in the Middle East-North Africa region by 93.9% between 2010 and 2030; however, this region already has some of the highest rates of diabetes in the world [2]. For the prevalence of chronic diseases in Palestine, the reported rate of DM was 7.2% among individuals aged between 40 and 49 years, 19.1% among ages between 50-59 years, and 24.8% among advanced age individuals (60 years and older) [3].The increasing prevalence of diabetes mellitus, particularly type 2 DM, is well documented[4]. Type 2 DM is currently estimated to account for over 90% of the global diabetes burden [5]. Even though, several studies have established the benefits of intensive diabetes management in reducing microvascular and macrovascularcomplications [6;7], higher proportions of patients withtype 2 diabetes remain uncontrolled [8].Glycemic control remains themajor therapeutic objective for the prevention of diabetes complications [9].This study aimed to assessthe factors associated with inadequateglycemic control and some other health care indicators among patients with type 2 diabetes who attended the Palestinian Centre for Non-Communicable Diseases (PCNCD) in Ramallah, Palestine.

MATERIALS AND METHODS

Study sample and population:

A random sample of 450 patients was selected from all patients with type 2 diabetes from PCNCD in Ramallah over a period of 6 months in 2012.Patients with type 1 diabetes, pregnant women, patients in wheel chair, and patients visited the center for the first time, were excluded from the study.

Data collection:

A pre-structured questionnaire was used to collect information about sociodemographic, clinical characteristics of participants. Weight, height, and waist circumference, and blood pressure readings were measured. Participant's available last readings of glycatedhemoglobin (HbA1c) and lipid profile (Total cholesterol, LDL, triglycerides, HDL) were abstracted from all patients' records included in the study.

Definition of variables:

Poor or inadequate glycemic control of the sample pooled was defined as HbA1c ≥6.5%[10].Hypertension was defined as systolic/diastolic blood pressure levels ≥130/80 mmHg, or the use of antihypertensive medications [10]. Dyslipidemia was defined as the presence of one or more of the following abnormalities, or the use medication for any: LDL level ≥ 100mg/dl, HDL level < 40 mg/dl in males and < 50 mg/dl in females, triglyceride level ≥ 150 mg/dl, and total cholesterol level ≥ 200 mg/dl [10]. BMI was categorized as normal with BMI <

25 Kg/m^2, overweight with BMI 25-29.9 Kg/m^2, and those with BMI ≥ 30 Kg/m^2[11]. Abdominal obesity was measured for males with WC ≥ 94 cm, and for females with ≥ 80 cm [12]. Physical activity was defined as performing moderate intensity aerobic physical activity for at least 150 min/week, or performing vigorous aerobic physical activity for 75 min/week, or any physical activity that is equivalent to both [10].

Statistical Analysis:

Statistically Package for Social Science (SPSS), version 20, was used for data entry and analysis. Non-parametric tests and comparative means tests (T-test; ANOVA) were used for the analysis and evaluation. Spearman's test was used for correlations. P-value<0.05 was considered statistically significant.

Strength and limitations:

This study is among the first studies conducted in Palestine (West Bank) that target the assessment of type 2 diabetes control.The process of selection of study sample was not intended representative sample of all diabetic population in Palestine (West Bank). However, people did not feel it ease when were asked about their income.

RESULTS

Of the 450 patients with type 2 DM, 225 (50%) were females. Two hundred eighty (62.2%)of the total participants were aged 55 years and more, and 188 (41.8%) were diagnosed with type 2 DM for 10 years and more. The majority 438 (97.3%) were married and 198 (44%) had college certificates. During the period of this study, more than the half (298; 66.2%) were engaged with work and 126 (28%) were classified as current smokers. High proportion of the sample pooled (207; 46%) reported that they were not physically active (Table 1).

Table 1: Some clinical characteristics of the 450 participants under investigation.

Variable	n=450	95% CI
BMI <25	42 (9.3)	4.7 – 13.9
25-29.9	206 (45.8)	41.2 – 50.4
≥30	202 (44.9)	40.3 – 49.5
WC < 94(Males)/80(Females)	11 (2.4)	1.1 – 3.9
≥ 94(Males)/80(Females)	439 (97.6)	96.1 – 98.9
Dislipidemia		
Yes	392(87.1)	84.0 – 90.2
No	58(12.9)	9.8 – 16.0
Hypertension		
Yes	328(72.9)	68.8 – 76.9
No	122(27.1)	23.1 – 31.2
HbA1c (%)		
< 6.5	131 (29.1)	24.9 – 33.3
≥ 6.5	319 (70.9)	66.7 – 75.1

According to the HbA1c levels of diabetic patients in this study, patients with HbA1c≥6.5 had higher averages of total cholesterol (175.4±36.3), triglyceride (191.9±90.4) and LDL (95.1±21.7) (Table 2).

Table 2: Difference in HbA1c levels in term of lipid profile and other health care indicators among 450 Type 2 diabetic patients under investigation.

	HbA1c(%)<6.5 (319) Mean±SD	HbA1c(%)≥6.5 (131) Mean±SD	P value
TCH (mg/dl)	157.5±29.7	175.4±36.3	**<0.001***
LDL (mg/dl)	88.4±14.2	95.1±21.7	**0.005***
HDL (mg/dl)	48.9±10.5	43.6±8.1	**<0.001***
TG (mg/dl)	139.8±69.8	191.9±90.4	**<0.001***
Waist circumference (cm)	121.8±19.7	123.3±21.3	0.514*
Body Mass Index (Kg/m^2)	29.2±4.1	30.1±4.6	**0.009***
Systolic blood pressure (mmHg)	122.4±10.1	130.5±12.8	**<0.001***
Diastolic blood pressure (mmHg)	75.8±8.4	78.6±8.1	**<0.001***

TCH, Total cholesterol; LDL, Low Density lipoprotein; HDL, High Density lipoprotein; TG, Triglycerides; WC, Waist circumference; BMI, body mass index; HbA1c, glycated hemoglobin.
T-test: * Mann-Whitney Test [The significance level is 0.05]

Lower levels of BMI (29.7±4.4 Kg/m^2) reported by married patients than single patients (34.3±4.0 Kg/m^2) and the difference was statistically significant (P<0.001). Patients with type 2 diabetes holding college degrees had higher levels of HDL (P=0.017) and diastolic blood pressure (P<0.001) compared to the illiterate or those patients with high school certificate. A higher levels of triglyceride (193.6±108.8) was found in those who reported that they are currently smokers than those with a past smoking (157.3±77.0) and none smoking (174.9±77.7) history (P=0.023).

The impact of physical activity on the HbA1c level and other health care indicators of the pooled sample were obvious throughout the study period (Table 3).

Despite the fact of the weak correlation in most of the medications to treat different diabetes comorbidities in the studied patients, a significant correlation(r=0.737; P<0.001) was observed between hypertension disease among 267 type 2 diabetic patients and the use of antihypertensive agents during the study period(Table 4).

Table 3: Difference in physical activity in term of lipid profile and other health care indicators among 450 Type 2 diabetic patients under investigation.

	Physical Activity Yes (243) Mean±SD	Physical Activity No (207) Mean±SD	P value
TCH (mg/dl)	166.5±38.7	174.6±30.7	**<0.001***
LDL (mg/dl)	91.4±19.9	95.3±20.0	**0.015***
HDL (mg/dl)	47.6±8.9	42.3±8.7	**<0.001***
TG (mg/dl)	154.9±58.1	202.3±108.4	**<0.001***
Waist circumference (cm)	119.5±19.2	126.9±21.8	**<0.001***
Body Mass Index (Kg/m^2)	28.7±3.7	31.2±4.9	**<0.001***
HbA1c (%)	7.1±1.2	7.6±1.3	**<0.001***
Systolic blood pressure (mmHg)	125.8±11.3	130.7±13.7	**<0.001***
Diastolic blood pressure (mmHg)	77.5±7.4	78.1±8.8	0.474*

TCH, Total cholesterol; LDL, Low Density lipoprotein; HDL, High Density lipoprotein; TG, Triglycerides; WC, Waist circumference; BMI, body mass index; HbA1c, glycated hemoglobin.
T-test: * Mann-Whitney Test [The significance level is 0.05]

Table 4: Correlation between selected health problems and their treatments among the pooled sample of 450 Type 2 diabetic patients.

	Lipid lowering agents (250)		Antihypertensive agents (267)		Diabetes treatment (450)	
	Correlation coefficient (r)	P value	Correlation coefficient (r)	P value	Correlation coefficient (r)	P value
Dyslipidemia	0.430	**<0.001***	0.195	**<0.001***	0.103	**0.030***
Hypertension	0.340	**<0.001***	0.737	**<0.001***	0.332	**<0.001***
Type 2 DM	0.333	**<0.001***	0.336	**<0.001***	0.203	**<0.001***

* Spearman's Test [The significance level is 0.05]

DISCUSSION

The data obtained from this study clearly showed a substantial high prevalence of obesity, dyslipidemia, and hypertension. In this study, overweight or obesity are quite highly prevalent among Palestinian national type 2 diabetic adults, this may be due to increase food consumption, and concomitant adoption of a sedentary lifestyle with lack of physical activity in the pooled sample.

Patients with HbA1c ≥ 6.5% have significantly higher averages of LDL, TG, TCH, and lower average HDL levels and this is similar to the findings of another study[13]. This indicates that HbA1c does not only benefit in the long term glycemic control, but also it predicts the lipid profile and thus helpful in identifying patients who are at greater risk of CV complications.

Being an important part of the diabetes management plan, regular physical activity has been shown to improve glucose control, contribute to weight loss, and reduce risk of CVD [10]. Physically active diabetic patients in this study show better HbA1c level compared to inactive patients, although it is still above the target level. This result is similar to that reported in other studies [12]. Moreover, the better lipid profile, and the lower BMI and WC among physically active diabetic patients under investigation would reduce their risk of developing CVD. In contrast, another study has reported no significant weight loss nor significant changes in the lipid profile among the physically active patients [14].

In spite of the significant correlation between hypertension disease and the use of anti-hypertension agent; the elevated blood pressure is still common among diabetic patients. It is believed that endocrinologists need to restrict more to the updated treatment guidelines to provide better diabetes control and better management for comorbidities. In addition, patients play an important role in the success of the therapy of their disease by the adherence to medication and enrollment in healthy life habits.

CONCLUSION

The proportion of inadequateglycemic control, over weighted or obese, physically inactive, had hypertension or dyslipidemia was high in the patients under investigation, which was nearly comparable to that reported elsewhere. More restricted management with an educational program that emphasizes lifestyle modification and with importance of adherence to treatment plan designed according to the international clinical guidelines would be of great benefit in glycemic control of our patients.

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