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Hypertension and Dyslipidemia in Type 2 Diabetes Mellitus in United Arab Emirates

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RESEARCH

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Abstract

Background
In United Arab Emirates (UAE), the prevalence of Diabetes Mellitus was 19.6% in 1998-2000. Co-morbidity with Hypertension (HT) and Dyslipidemia (DL) increases the probability of cardiovascular complications, and hence the study of the distribution of HT and DL in patients with type 2 Diabetes Mellitus (DM) and their control.

Method
Source of data was the records of one private and one government hospital in Northern Emirates, UAE. 294 patients with type- 2 DM, who attended the hospitals from September to November, 2009 were included. A checklist was used for collection of data. Relevant data were collected from the records, entered on Microsoft Excel spreadsheet and analyzed using PASW 17.0 statistics. Proportions and Chi-square tests were used for assessing the co-morbidity of HT and DL, and control of DM with respect to socio-demographic variables.

Results
Of the total type 2 DM patients, 50.7% were males, 95% married, 76.5% of Middle East origin and only 12.6% were paying patients. The most common (49%) age group was 40-59 years. 8.6% of the type 2 DM patients did not have HT or DL or, 69.6% had DL, 88% had HT, and 66.1% had both. There was a statistically significant ($p<0.05$) association between age and DL and nationality and DL, but not with HT. Duration of HT and DL were similar to that of type 2 DM. Only 32% had type 2 DM under control. As for control of DL, 60.2% had triglyceride under control, 59.5% LDL and 7.4% HDL. 39.3% had systolic and 52.7% diastolic blood pressure under control.

Conclusion
Co-morbidity with HT and DL is found to be high in the patients with type-2 DM. The poor control of all three conditions highlights the importance of all levels of prevention to reduce the risk of cardiovascular complications.

Key Words
Hypertension, Dyslipidemia, Type2 Diabetes Mellitus, United Arab Emirates

Background

Diabetes mellitus is a heterogeneous group of metabolic diseases, characterized by high blood glucose levels[1]. The social and financial burden of diabetes is mainly due to the complications[2]. An estimated 2.5 to 15% of health care budgets worldwide are devoted to diabetes[3]. Increasing incidence in the developing countries, especially in the younger age group, affecting mainly the people in the productive years of their lives is also of great concern[4].

The major complications of diabetes are cardiovascular problems like ischemic heart disease, hypertension, stroke; diabetic neuropathies, retinopathy, renal complications, skin ulcers; sexual and urologic problems like erectile dysfunction, and oral problems[5]. Diabetes leads to reduced life expectancy; about 50% die of cardiovascular disease (CVD). The CVDs that accompany diabetes include angina, myocardial infarction (heart attack), stroke, peripheral arterial disease, and congestive heart failure (CHF). It could be due to the direct toxic effects of hyperglycemia, and in addition the impact of hypertension, dyslipidemia and abnormalities of small blood vessels[2].

By the WHO data, the prevalence of diabetes among citizens of the United Arab Emirates is 350,000 in a population of 684,000, ranking it the second highest in the entire world[6]. Punnoose et al recognizes the increase in prevalence of type 2 DM and suggests that when there is a

high prevalence of type 2 DM in adults, the disease may be seen in the paediatric population also. He highlights the importance of screening Arab and Asian children for type 2 DM[7]. A national diabetes survey between years 1998 and 2000 reported a prevalence of 19.6%, 24% among nationals and 17.4% among expatriates; the percentage increased with age to 40 per cent in the age group 60 and above[8]. In a study on prevalence of type 2 DM and its complications in a population-based sample in Al Ain, the prevalence rates for retinopathy, neuropathy, nephropathy, peripheral vascular disease and coronary heart disease (CHD) were 54.2, 34.7, 40.8, 11.1 and 10.5% respectively in patients with diagnosed type 2 DM. A significant proportion of subjects with undiagnosed type 2 DM and prediabetes also had micro- and macro-vascular complications[9].

Eledrisi[10] states that about 60% of patients with diabetes are diagnosed with hypertension, carrying up to 300 times higher risk than people without diabetes. According to Gehani[11] diabetic women have twice the mortality of diabetic men, quadrupling if having myocardial infarction whereas it only doubles in men. The report of a multinational study comparing complications of Type 1 DM identified wide variation and geographic patterns in prevalence of complications not dependent on glycemia alone but blood pressure correlating with neuropathy and microalbuminuria[12]**.** International Diabetes Foundation reviewed the studies from various countries and found that the complications varied greatly in the different places. The comparisons were limited by the variations in definitions used, data collection methods and the differences due to clinical and population studies. The reviewers report that observations from clinic populations are influenced by the local referral patterns, the severity of the condition, and quality and type of diabetic care. Population studies give more of a true picture but with the shortcoming of self reporting. The prevalence of CHD in those with diabetes (both type 1 and type 2) was 1.0% - 25.2% in clinic-based populations and 1.8% - 43.4% in population-based studies; whereas stroke 1% - 11.3% and 2.8% - 12.5%[2].

Inadequately controlled hypertension and dyslipidemia are two co-morbidities that contribute to the development of CAD and stroke. Type 2 DM is an independent risk factor for coronary artery disease, hypertension, and dyslipidemia[13]. Incidence of CHD is higher among diabetics and even in subjects with impaired glucose tolerance (IGT), especially with hyperinsulinaemia, at a younger age and in women. Angina pectoris is less while painless infarct is 20-40% more frequent[14]. The prevalence of lower extremity amputations ranged from 0.2% - 4.8%, and the annual incidence 46.1 - 936 per 100,000 diabetic population. Populations from Europe had higher heart disease and stroke, and Indian immigrants to Fiji and Mauritius had higher rates of heart disease[2]. HbA_{1c} concentration of 7.0% is found to reduce microvascular complication rates by 25%, Metformin, macrovascular complications and reduction in blood pressure the cerebrovascular accidents and diabetes-related deaths[15].

The main relevance of diabetic complications in a public health perspective is the relationship to human suffering and disability, and the huge socio-economic costs through premature morbidity and mortality[16].
Early detection of DM and its complications, and their control are of great public health concern. The complications vary in the different countries depending on various factors like socioeconomic factors, lifestyle factors, and access to health care [2].

A study undertaken in the UK in the context of the trend to move long-term management of diabetes from specialist centers to primary care[17] showed that a fifth of the post-graduate trainee doctors would not actively identify the cardiovascular risk factors.

The UAE has already taken initiative to arrest the trend of rising prevalence of DM. The Ministry has formed an independent body of local scientists and experts which prepares guidelines for management of DM and public awareness programs. Training is being given to the medical professionals. Screening activities are also undertaken[9].
At this juncture, the knowledge of the level of control and common complications seen in the different population subgroups is essential to initiate prevention, early detection and early intervention. As a preliminary investigation a hospital record based study was undertaken to obtain an estimate of the cardiovascular complications of Type 2 diabetes mellitus such as hypertension and dyslipidemia, among a clinical population in the Northern Emirates of the United Arab Emirates (UAE).

Method

The present hospital record based study was undertaken in one government and one private hospital in the Northern Emirates of UAE. The UAE has a multiethnic population with 80% expatriates and 20% nationals[18]. The government hospital caters to the nationals and the private to all. The source of the information was the hospital files of 294 patients with type 2 DM, who attended the Internal Medicine outpatient department of the two hospitals during the period September to November, 2009. An Excel spread sheet was designed to collect data on all the variables required to satisfy the objectives of the study. The history of DM and DL, and blood pressure measurements and laboratory values for fasting blood sugar and lipid profile within one month were collected from the records along with the socio-demographic details. All values were evaluated as per the UAE guidelines as given below[8]. A systolic blood pressure value of 130 mm of Hg and a diastolic blood pressure of 80 mm of Hg. were taken as under control. Fasting blood sugar (FBS) value of 80-120mg/dl was taken as within normal limits. As for lipid profile, triglyceride (TG) <150mg/dl, low density lipoprotein (LDL) <100mg/dl, and high density lipoprotein (HDL)> 45mg/dl for men and > 55mg/dl for women were taken as normal[8]. The information was transferred from the individual patient files to the Excel sheet and transferred to the PASW 17.0 version program for analysis. Proportions

were used to compare the co-morbidity of HT and DL, their control in the various subgroups, and their duration when compared to type 2 DM. Chi square test was applied for assessing the association of age, gender or nationality with the co-morbid conditions and the control of type 2 DM.

Results

Of the 294 patients with type 2 DM included in the study, 149 (50.7%) were males and 145 females; 95% married, 76.5% of Middle East origin of whom 97.8% were Emiratis, 15.3% Asians and of the 24 others, 19 were Africans. Only 12.6% were paying patients and the others were either covered under insurance or received free treatment.
Table 1 shows the distribution of the study group by socio-demographic factors such as age, gender and nationality and the presence of dyslipidemia. The patients in the age group 40 -59 years have lower proportion with DL. Patients of Middle East origin have the highest proportion with DL (77.34) and Asians had least (54.5%). Both age and nationality showed a statistically significant association with dyslipidemia. No gender difference is observed. In total, 69.6% of the study group has DL.

In Table 2 it is found that HT is seen most in the 40-59 age group and in those in the others group who are mostly from African countries (94.7%). Both males and females are equally affected. Overall, 88% of the 292 in the study group have HT. Both DL and HT coexist in two-third (193) of the study group.

From Table 3 it is seen that the control of DM as per the latest FBS results is compared for the different age groups, gender and nationalities. Overall in a total of 266 patients where FBS was available, only 32% had DM under control (FBS 120mg/dl) as per the UAE guidelines 2009. The control of DM is relatively lower in the 40-59 years age group. No gender difference is seen in the control of DM. Control is least among those of Middle East origin, majority of this group were UAE nationals. There is no statistically significant association demonstrated between the control of DM and age, gender or nationality.

The study group had least number of patients of less than one year duration and more patients with duration 5-10 years (Figure 1.). The duration of DL is same as that of DM in all those with duration less than one year and in 87% for those 1-5 years. But in DM of longer duration than that, the diagnosis of DL does not correspond as much. Figure 2 shows that there is a trend that the duration of HT is mostly similar to the duration of DM in all the different groups.

On analyzing the control of dyslipidemia against control of DM, of the 246 DM patients whose TG values were available, 60.2% are currently under control but 35.2% have both uncontrolled; of the 227 who have their LDL values, 59.5% are controlled and 37.3% have both uncontrolled and among 212 who have the HDL values recorded, only 7.4% have it within normal limits and 92.9% have both uncontrolled. In the case of HT, the recent record of blood pressure was available for 262 patients of whom 39.3% had SBP under control, but 61.5% had both DM and SBP uncontrolled and 52.7% have DBP under control but 45.8% have uncontrolled DM and DBP. All values were evaluated according to the recommendations in National Diabetes Guidelines UAE 2009[8].

Discussion

The prevalence of complications in diabetes mellitus type 2 DM depends on patient characteristics, health services and utilization. In a country like UAE, with a the recent increase in prevalence of type 2 DM, and the decreasing age of onset, the preventive efforts are taking high momentum to control this modern epidemic which attacks the productive years of life. The present study among 294 patients with type 2 DM, examined the recorded cardiovascular risk factors hypertension and dyslipidemia, duration of the three disease conditions and control of diabetes in an attempt to identify the factors to be considered for improving the success of the local programs. There was no gender difference seen in this clinical population whereas in a community study in Al Ain, more men were diagnosed to have type 2 DM, majority type 2 DM but more females had undiagnosed DM and impaired glucose tolerance[9]. The higher proportion of Emiratis in the study group is due to a larger number of patients attending the government hospital which serves the nationals.

It is encouraging to note that all except two patients have had their blood pressure recorded and all except one the lipid profile. This may be because it was affordable due to the free or insured health care in all except 12.6% of the study group. The study group had 88.8% HT and 69.6% DL. Only 29.6% were hypertensive in a study from Sudan, but was categorized so when blood pressure was more than 160/95 mm of Hg. or on treatment whereas in our study it was by medical history in the records and by the UAE guidelines of 130/80 mm of Hg. and may be that is the reason for lower proportion showing control[19].

More than three fourth of the patients less than 40 years and those more than 59 years had co-morbidity with DL, whereas HT was commoner in the 40-59 years group. It may be seen that control of DM is also less in this age group. Though comparisons with other studies become difficult due to different study settings, different methodology and criteria, the reports are that dyslipidemia is commoner in older age group and those with type 2 DM [20]. DL was lowest (54.5) among Asians in this study group whereas those from Middle East have the highest proportion (77.3%). This profile being an analysis of available record, the possible reasons could not be explored. However the local studies from Al Ain as well as other studies suggest low physical activity and obesity as two major factors responsible. Risk factors for DL in the region need further exploration. DM is less common in countries where the diet has fewer calories like in the non-Western countries but adapting to the Western lifestyles has led to weight gain and DM in these countries[21].

In our study group, we did not find any difference with age though other investigators report that in adults, hypercholesterolemia or DL increases with advancing age[22-23]. There was more DL among men. One study[24] suggests that women are more aware of DL therefore they follow appropriate management and treatment and that could be the reason why the percentage of females is lower than that of men. Comparing the values with other reports from the region, 46% in Saudi Arabia[25], 50% in Sudan[19] and 87% in Nigeria[26] among patients with Type 2 diabetes, 69.7% DL in the present study is on the higher side. HT was more or less equally seen in the different age groups and nationality, with minimal increase in the middle age group and among African nationals (grouped into others), these were not statistically significant variations.

The present study showed a 32% control of DM by FBS level, with least control among those of Middle East origin. It is even lower than that seen in one report from Al Ain, 37.6% with good glycaemic control (HbA_{1C}<7%). The above study showed 34.4% elevated total cholesterol and 25.2% elevated triglycerides at the time of the community survey[27] whereas another report from the same region gave 33.3, 30.8 and 42.1% for control of DM (HbA1c <7%), LDL-C (<2.6 mmol/l) and blood pressure (<130/80 mmHg) respectively[9]. This hospital study had more patients with type 2 DM of 1-5 years of duration, whereas the community study in Al Ain where majority of patients were from primary health centres had more patients of more than 10 years of duration[27]. It could be because more patients came to the outpatient department of a hospital in the middle years of life when diabetes related problems set in. HT seems to have the same duration as DM, detected probably at the same time or onset was at the same time. In Al Ain study it was seen that even in patients with IGT, co-morbidities were detected. DL seems to correspond less in those with longer duration of type 2 DM. It cannot be ascertained whether it reflects the trend of investigation or the trend of disease conditions.

While the control of type 2 DM is important in prevention of complications, it is becoming increasingly more aware now that control of HT and DL are equally important. Though HbA_{1C} is better indicator of long term control of type 2 DM, in our study setting it did not seem to be as widely investigated as FBS, so we had to resort to FBS as the indicator for control of type 2 DM. It is evident from table 3 that control of type 2 DM was similar for all age groups and both genders. Those of Middle East and Asian origin showed 31.7% and 34.4% of control but the remaining group which was mostly of African origin there was 56.3% control of type 2 DM. A study in Sudan found that 54% had satisfactory control by FBS and males better than females, but the criteria was <8mmol/L whereas our study used 6.6 mmol/L as the upper limit[19].

Almost half of those with type 2 DM under control also, did not have TG and LDL under control. It is alarming that more than 90% did not have HDL controlled, even those who had type 2 DM under control. Only 8.1% of those with type 2 DM under control had HDL under control. One Nigerian study reported reduced HDL-C and elevated LDL-C to be the prevalent lipid abnormalities in their patients with DM and only few were on treatment[26]. Reduced HDL-C was the most prevalent (88.0%) and raised TG the least (25.0%) abnormalities respectively. In US on examining 1999-2000 national data on control of risk factors for vascular disease among adults with previously diagnosed diabetes states, found that only 7.3% of adults with diabetes in NHANES 1999-2000 attained HbA_{1c} < 7%, blood pressure less than 130/80 mm Hg, and total cholesterol level less than 200 mg/dL (5.18 mmol/L). 37.0% had DM under control, 35.8% had HT under control and 51.8% DL as per these targets[28]. Katan et al. suggests that in patients with diabetes depression is an important risk factor for poor patient adherence to medications and thereby poor disease control may not be the lack of treatment intensification by physicians[29]. This also needs to be explored.

Conclusion

The high level of co-morbidities and the low level of control necessitate a direct patient survey to identify risk factors for these conditions and barriers to the control, which can contribute to a patient-centered approach for health promotion practice. The study shows the urgent need for greater efforts for a comprehensive approach to control of type 2 DM, DL and HT and their determinants.

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PEER REVIEW

Not commissioned. Externally peer reviewed.

CONFLICTS OF INTEREST

None

Figures and Tables

Table 1
DM and DL by Age, Gender and Nationality

Variables		Dyslipidemia (N=293)					Significance
		Present		Absent		Total	
		No	%	No	%		
Age (in years)	<40	40	75.3	13	24.7	53	P<0.05
	40-59	90	63.0	53	37.0	143	
	60+	74	76.3	23	23.7	97	
Gender	Female	96	66.2	49	33.8	145	Not significant
	Male	108	73.0	40	27.0	148	
Nationality	Middle East	164	77.3	61	22.7	225	P<0.05
	Asian	24	54.5	20	45.5	44	
	Others*	16	66.7	8	33.3	24	
	Total	204	69.6	89	30.4	293	

*All except five were African nationals

Table 2
DM and HT by Age, Gender and Nationality

Variables		HT (N=292)					Significance
		Present		Absent		Total	
		No	%	No	%		
Age (in years)	<40	45	84.1	8	15.9	53	Not significant
	40-59	128	90.9	14	9.1	142	
	60+	84	86.6	13	13.4	97	
Gender	Female	128	88.9	16	11.1	144	Not significant
	Male	129	87.2	19	12.8	148	
Nationality	Middle East	197	87.9	27	12.1	224	Not significant
	Asian	37	84.1	7	15.9	44	
	Others	23	94.7	1	5.3	24	
	Total	257	88.0	35	12.0	292	

Table 3
Control of DM by Age, Gender and Nationality

Variables		Control of DM (according to FBG)					Significance
		Controlled		Uncontrolled		Total	
		No	%	No	%		
Age	<40	18	36.7	31	63.3	49	NS
	40-59	38	29.9	89	70.1	127	
	60+	29	32.2	61	67.8	90	
Gender	Female	38	30.9	85	69.1	123	NS
	Male	47	32.9	96	67.1	143	
Nationality	Middle East	63	29.6	150	70.4	213	NS
	Asian	11	34.4	21	65.6	32	
	Others	11	52.4	10	47.6	21	
Total		85	32.0	181	68.0	266	

Table 4
Control of DL and HT according to Control of DM

Control of DL and HT		Control of DM					
		Controlled		Uncontrolled		Total	
		No.	%	No.	%	No.	%
TG	C	41	50.6	107	64.8	148	60.2
	UC	40	49.4	58	35.2	98	39.8
	Total	81	100.0	165	100.0	246	100.0
LDL	C	39	52.7	96	62.7	135	59.5
	UC	35	47.3	57	37.3	92	40.5
	Total	74	100.0	153	100.0	227	100.0
HDL	C	6	8.1	11	7.1	17	7.4
	UC	68	91.9	144	92.9	212	92.6
	Total	74	100.0	155	100.0	229	100.0
SBP	C	34	41.0	69	38.50	103	39.30
	UC	49	59	110	61.5	159	60.7
	Total	83	100.0	179	100.0	262	100.0
DBP	C	41	49.4	97	54.2	138	52.7
	UC	42	50.6	82	45.8	124	47.3
	Total	83	100.0	179	100.0	262	100.0

*C= controlled *UC= uncontrolled

Figure 1. Percentage bar graph showing the distribution of the study group by duration of DM and DL.

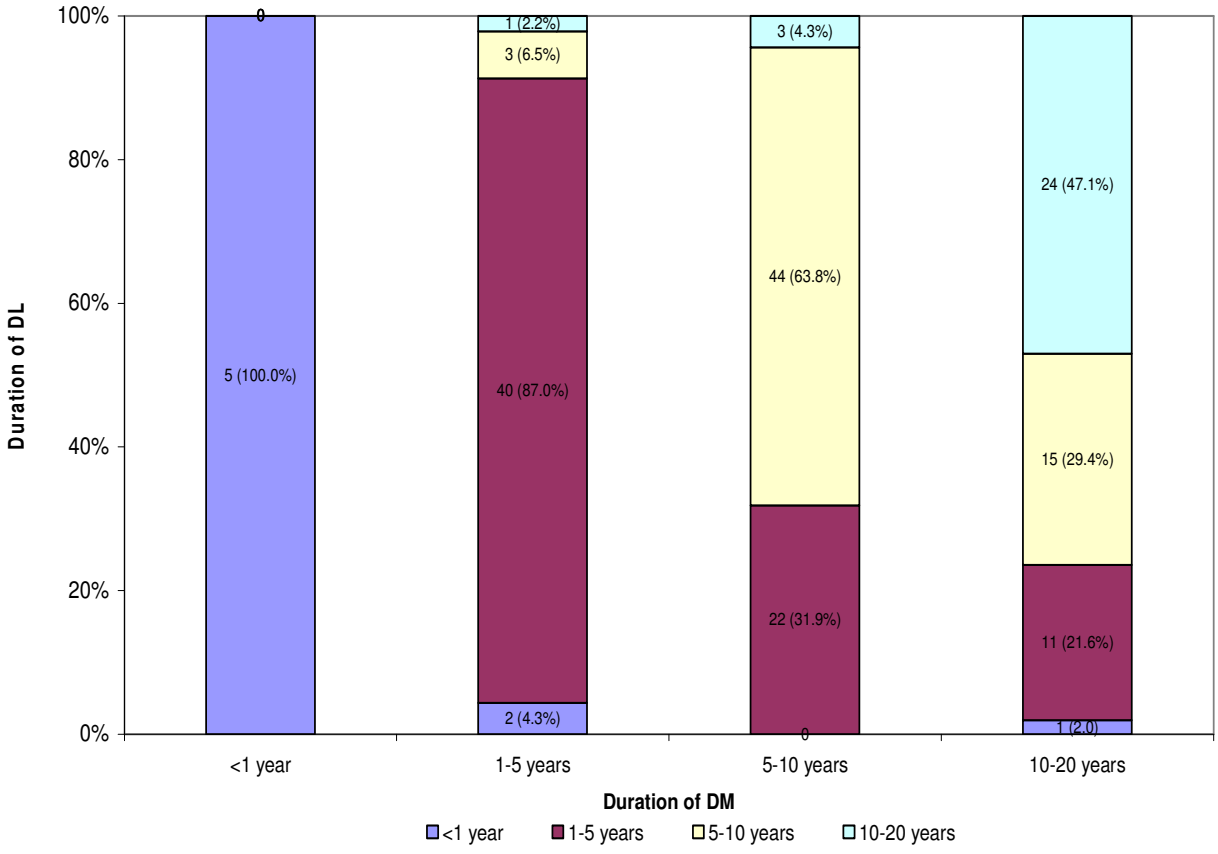

Figure 2. Percentage bar graph showing the distribution of study group by the duration DM and HT.