

LONG-TERM COMPLICATIONS OF TYPE 1 DIABETES MELLITUS IN THE WESTERN AREA OF SAUDI ARABIA

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SUMMARY

The objective of the study was to assess the prevalence of long-term complications and of major risk factors for the development of these complications in subjects with type 1 diabetes mellitus from the western area of Saudi Arabia. A total of 100 files of patients with type 1 diabetes mellitus, 38 male and 62 female, seen between June and December 2000 at Doctor Bakhsh's hospital in the north of Jeddah, a western area of Saudi Arabia, were analyzed. All patient records were reviewed for long-term complications, i.e. retinopathy, nephropathy, neuropathy (microvascular complications), and for cardiovascular, cerebrovascular and peripheral vascular diseases (macrovascular complications), according to the following variables: patient age, sex, duration of diabetes, blood pressure and blood glucose. Survey of 100 patient files revealed 40 patients to be free from complications, whereas various complications were present in 60 patients: retinopathy in 7, nephropathy in 2, neuropathy in 6 patients; 9 patients had multiple microvascular complications, and 30 patients had both microvascular and macrovascular complications; 4 patients had cardiovascular complication only; 1 had cerebrovascular complication, and 1 had peripheral vascular complication only. Accordingly, the prevalence of diabetic complications was within the range of complications reported from other parts of the world, from the region and from different studies conducted

elsewhere in Saudi Arabia. The presence of diabetic complications correlated with the duration of diabetes, glycemic control, body mass index and hypertension, most of which are modifiable risk factors.

INTRODUCTION

Diabetes is a chronic disease which needs continuing medical care to prevent long-term complications. More than 135 million people worldwide have diabetes mellitus and their number is expected to reach approximately 300 million people by 2025, 10% of them having type 1 diabetes. With 1.7 children *per* 1000 afflicted with the disease, diabetes is second only to asthma in the prevalence of chronic childhood illnesses in the United States.

Diabetes mellitus (DM) is a progressive disease with risk factors for both macrovascular and microvascular complications. The long-term effects of DM include progressive development of specific long-term complications of retinopathy with potential blindness, nephropathy that may lead to end-stage renal failure, and/or neuropathy with the risk of foot ulcers, amputation, Charcot's joints, and feature of autonomic dysfunction, including sexual dysfunction. The complications of peripheral vascular and cerebrovascular disease lead to significant disability and in many cases premature mortality, and the disease

imposes significant human and financial cost on the patients and the communities. DM is becoming a major health problem in Saudi Arabia; it has become more evident in the last two decades as the result of dramatic changes in the Saudi population lifestyle (1-3). Al Hazmi *et al.* (4) report on a higher prevalence of hyperglycemia (8.9%-15%) in different regions of the Kingdom. The present study was focused on the presence of and risk factors for long-term complications in subjects with type 1 DM from the western area of Saudi Arabia.

MATERIAL AND METHODS

This retrospective study of type 1 DM was conducted at a private general hospital in Jeddah, Saudi Arabia. A total of 112 files of type 1 DM patients were surveyed, and 100 files were included in the study. The inclusion criteria were regular visits to the hospital diabetic clinic; outpatient or inpatient examination within not more than three months; and availability of all data needed for study analysis. All patients with type 1 DM, age range 5 to 70 years, attending the outpatient clinic or treated as inpatients, were screened for long-term complications of diabetes (nephropathy, neuropathy, retinopathy, peripheral vascular disease, and macrovascular complications, cardiovascular disease and cerebrovascular complications).

Patients were considered to have retinopathy if one or more of the following were present: microaneurysms, dot and blot hemorrhages, hard exudates, soft exudates, neovascularization, and vitreous hemorrhage.

Patients were considered to have nephropathy if one of the following was present: microalbuminuria, proteinuria, and impaired renal function.

Patients were considered to have neuropathy if one of the following was present: symptoms of pain anesthesia, paresthesia, muscular weakness, muscular atrophy, loss of tendon reflexes, and impaired vibration sense.

Patients were considered to have autonomic neuropathy if one of the following was present: postural hypotension, impotence, and diarrhea and/or constipation.

Table 1. Risk factors for type 1 diabetes mellitus (IDDM)

Risk factor	IDDM (N=100)	%
Sex: male	38	38
female	62	62
Age (yrs)	43.1 (\pm 15.5)	
Marital status: married	27	27
single	73	73
Body mass index (kg/m ²):		
>30	61	61
<30	39	39
Duration of diabetes (yrs)		
>10	29	29
<10	71	71
Glycemic control		
Good	30	30
Poor	70	70
Hypertension:		
BP \geq 145/95 mm Hg	25	25
BP <140/90 mm Hg	75	75
Parental consanguinity:		
Absent	71	71
Present	29	29
Family history of diabetes:		
Positive	33	33
Negative	67	67

Table 2. Long-term microvascular and macrovascular complications

Complication	N = 100	
	n	%
None	40	40
Microvascular:		
Retinopathy	7	7
Nephropathy	2	2
Neuropathy	6	6
More than one microvascular	9	9
Macrovascular:		
Cardiovascular	4	4
Cerebrovascular	1	1
Peripheral vascular	1	1
More than one macrovascular	0	0
Micro- and macrovascular	30	30
Total	100	100

Patients were considered to have cardiovascular disease (CVD) if there was abnormal ECG finding suggestive of ischemia or myocardial infarction (MI). Peripheral vascular disease was considered if one of the following was present: foot ulceration, amputation due to gangrene, and intermittent claudication of lower limb.

In all patients, the following variables were recorded: age, sex, year of diagnosis, height, weight, body mass index (BMI), marital status, parental consanguinity, glycemic control based on HbA1c measurement (poor glycemic control if HbA1c >7.5%), and blood pressure (BP; hypertension if systolic BP >140 mm Hg or diastolic BP >95 mm Hg).

RESULTS

A total of 100 files were screened for complications of diabetes, 38 male and 62 female, mean age 43.1 (SD 15.6) years, 29 of them with diabetes duration of more than 10 years and 71 of less than 10 years. Only 30 patients had good glycemic control, whereas the rest of 70 patients had poor glycemic control. Positive family history of DM was recorded in 33 and negative family history of DM in 67 patients (Table 1).

Of 100 patients, 40 (40%) had no diabetes complications, while the rest of 60 (60%) patients had different kinds of complications (Table 2).

Microvascular complications were present in 24 (24%), retinopathy alone was present in seven (7%), nephropathy alone in two (2%) and neuropathy alone in six (6%) patients. Nine (9%) patients had more than one microvascular complication and six (6%) had macrovascular complication alone, four (4%) of them cardiovascular complication, one (1%) cerebrovascular disease and one (1%) peripheral vascular complication. Thirty (30%) patients had both micro- and macrovascular complications.

The major risk factors for the development of long-term complications were glycemic control, BMI, hypertension, and duration of diabetes (Tables 3-6).

Table 3. Complications according to diabetes duration

Complication	Diabetes duration			
	<10 years		≥10 years	
	n	%	n	%
None	24	80	18	25.7
Microvascular	4	13.3	18	25.7
Macrovascular	2	6.7	3	4.3
Micro- and macrovascular	0	0	31	44.5
Total	30	100	70	100

p=0.0004

Table 4. Complications according to body mass index (BMI)

Complication	BMI			
	BMI <30 kg/m ²		BMI >30 kg/m ²	
	n	%	n	%
None	27	45	13	32.5
Microvascular	11	18.3	12	30
Macrovascular	4	6.7	2	5
Micro- and macrovascular	18	30	13	32.5
Total	60	100	40	100

p=0.0001

Table 5. Complications according to hypertension

Complication	Hypertension			
	Normotensive BP <140/90		Hypertensive BP >145/95	
	n	%	n	%
None	38	50.6	2	8
Microvascular	18	24	5	20
Macrovascular	4	5.4	2	8
Micro- and macrovascular	15	20	16	64
Total	75	100	25	100

p=0.0000

Table 6. Complications according to glycemic control

Complication	Glycemic control			
	Good		Poor	
	n	%	n	%
None	12	40	30	42.9
Microvascular	6	20	16	22.9
Macrovascular	2	6.7	3	4.2
Micro- and macrovascular	10	33.3	21	30
Total	30	100	70	100

p=0.0000

Table 7. Complications according to sex

Complication	Sex			
	Male		Female	
	n	%	n	%
None	17	43.5	25	41
Microvascular	4	10.3	18	29.5
Macrovascular	3	7.7	2	3.3
Both	15	38.5	16	26.2
Total	39	100	61	100

p=0.86

DISCUSSION

The long-term complications of DM are a major health problem. All types of DM are associated with the development of diabetes specific microvascular pathology in the retina, glomeruli and peripheral nerves. Diabetes is also associated with accelerated atherosclerotic macrovascular disease affecting arteries that supply the heart, brain, and lower extremities. Diabetes is the leading cause of blindness in the people aged 24-74 and the leading cause of end-stage renal disease. Diabetes increases the risk of cardiovascular complications 2 to 6 times. Our study demonstrated the main risk factors for the development of long-term complications to be duration of DM, elevated blood pressure, increased BMI, and uncontrolled diabetes. These findings are consistent with other studies from different parts of the world and from the area (5-7,9,10). Large prospective clinical studies show strong relationship between glycemia and microvascular complications in both type 1 and type 2 diabetes (12,13).

The present study revealed the prevalence of diabetic retinopathy to be comparable with the studies conducted in Australia by the Australian Diabetic Society Sub-Committee (14,15), Finland and Netherlands (16), but lower than the figures reported from Libya (17) and Jordan (18), which may be due to better diabetes control.

The study showed a lower prevalence of diabetic neuropathy than previous reports from Saudi Arabia and from Sweden, which may be due to different diagnostic criteria used in different studies. Both were prospective studies, however, using different methods to detect neuropathy before the symptoms may have developed (8,9,11). The results on diabetic

nephropathy showed a lower prevalence than in a study from India, however, a study from former Yugoslavia reported results similar to ours (19).

Cardiovascular disease is the major cause of death in patients with DM. Arteriosclerosis accounts for approximately 80% of overall mortality in patients with diabetes, and more than 75% of hospitalizations for complications of diabetes are attributable to cardiovascular disease. The mortality from coronary artery disease is approximately 3- to 10-fold in patients with type 1 DM (20,21). In our study, 36% of patients had different kinds of macrovascular complications. In the Framingham study, the patients with type 1 DM had cumulative mortality due to coronary disease of 35% by age 55, as compared to 4%-8% in patients without diabetes (22). In the present study, only 30% of patients had very strict control and 70% had very poor control, thus by enforcing the very strict control in our patients the rate of long-term complications could be reduced. On the other hand, the other major risk factors in this study were high blood pressure and high BMI, both of them being modifiable factors. Therefore, the rate of long-term complications could also be significantly reduced by encouraging weight reduction and strict blood pressure control.

In conclusion, our study had many limitations because it looked for complications in a special group of patients attending a private hospital, who may have also visited other subspecialties at other clinics or hospitals for their complications. We propose that a nation-wide study be conducted to look for long-term complications of diabetes and their risk factors, as this appears to be the only and most appropriate way to successfully reduce the rate of long-term complications and patient suffering, thus also reducing the disease related economic burden.

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