Prevalence and Risk Factors of Erectile Dysfunction in Iranian Diabetic Men

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Abstract- Erectile dysfunction (ED) is an important impediment to quality of life. Diabetes mellitus is one of the most common causes of ED. However, it has been one of the most neglected complications of diabetes mellitus. Our objective was to study the prevalence of ED and its risk factors in Iranian diabetic men. During 2002-2004, 700 diabetic men aged 20-69 years were interviewed to report on their experience of ED as defined in the National Institutes of Health Consensus Conference 1993. ED was found in 246 (35.1%) of this population. Prevalence of ED was increased with age from 9.7% in men aged 20-39 years to 43.4% in those aged over 60 years ($P < 0.001$). Men with type I diabetes reported ED less frequently than did men with type II diabetes ($P = 0.037$). In comparison with patients with reported diabetes lasting ≤ 5 years (25.4%), the prevalence of ED was less than in those with diabetes of 6-11 years (34.3%) and of 12-30 years (43.5%, $P < 0.001$). ED increased significantly in those who had poor glycemic control. Prevalence of ED in patients with good, fair and poor glycemic control was 28.4%, 39.9% and 44.4% respectively ($P = 0.004$). Type of treatment (diet alone, oral agents, insulin and insulin plus oral agents) had significant association with ED and its severity ($P < 0.001$). ED is common in Iranian diabetic men but its prevalence can be reduced with good glycemic control.

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Key words: Diabetes mellitus, erectile dysfunction, prevalence, risk factors

Introduction

According to the National Institutes of Health (NIH) Consensus Conference 1993, erectile dysfunction (ED) is defined as the inability to achieve and maintain an erection sufficient for satisfactory sexual performance. Similar to the NIH, the DSM-IV diagnostic criteria have required a 'persistent or recurrent inability to attain, or to maintain until completion of the sexual activity, an adequate erection' (1). Penile erection is predominantly a vascular event under the control of the autonomic nervous system (2). ED is approximately three times more common in diabetic than non-diabetic men, and diabetic men develop ED approximately 5–10 years earlier than age matched non-diabetic subjects (3). The etiology of ED in diabetes is multifactorial, but appears to be predominantly a result of a failure of NO-mediated smooth muscle relaxation due to both autonomic neuropathy and endothelial dysfunction (2). Sexual health and function are important determinants of quality of life. Despite of this fact, ED has been one of the most neglected complications in diabetes mellitus (DM) (4). Diabetics with poor glycemic control and higher glycosylated hemoglobin, are also more likely to develop ED (5). Factors recognized to increase the risk of ED in DM include duration of diabetes and progression of retinopathy, proteinuria, ischemic heart disease, delayed nerve conduction, orthostatic intolerance, and attenuated heart rate variability (6). In other studies, it was shown that smoking, aging, type of diabetes and hypertension are associated with male ED (1, 7, 8). The aim of this study was to determine the prevalence of ED in diabetic men and its importance in diabetic health care and to assess risk factors of ED in diabetic men.

Patients and Methods

In a cross sectional study (2002-04), diabetic patients were interviewed in the endocrinology outpatient clinic

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at Sina hospital and Abozhar health center in Tehran, Iran. Patients who were eligible and willing to participate in the study were assessed. The study was approved by the university ethics committee. Consent forms were signed by patients. The eligibility criteria included an age of 20-69 years old, married state, and a stable relationship with a wife for at least the past 6 months. Patients were excluded from the study if they had penile anatomic disorders impairing erectile function (EF), major medical illness (e.g. severe renal, hepatic or cardiovascular disease), a major psychiatric disorder, or a history of alcohol or drug abuse. A total of 700 diabetic men, aged 20–69 years, were included in the study.

According to the NIH Consensus Panel on ED, we selected the EF domain of the international index of erectile function (IIEF) for evaluation of baseline erectile function (EF). Severity of ED was classified into four diagnostic categories: no ED (EF score = 26-30); mild (EF score = 17-25); moderate (EF score = 11-16); and severe ED (EF score = 6-10) (9). Diagnostic criteria for DM were as follows: (1) symptoms of DM plus a random plasma glucose concentration of at least 200 mg/dL (11.1 mmol/L); (2) a fasting plasma glucose level of 126 mg/dL (7.0 mmol/L) or higher; or (3) a two-hour plasma glucose level of 200 mg/dL or more during an oral glucose tolerance test (10). The diagnosis of type of diabetes is based on history, therapy, and clinical judgment. Type 1 diabetes usually starts before thirties; type 2 diabetes typically affects individuals older than 40 years. Patients with type 1 diabetes are dependent on a continuous source of exogenous insulin and carbohydrates for survival. Patients with type 2 diabetes may not need treatment for hyperglycemia during periods of fasting or decreased oral intake. A patient whose diabetes is controlled with diet or an oral antidiabetic agent clearly has type 2 diabetes. A lean patient who has had diabetes since childhood, who has always been dependent on insulin, or who has a history of Diabetic ketoacidosis (DKA) almost certainly has type 1 diabetes. Positive family history of DM is also most commonly seen in type 2 diabetes (11). Metabolic control has been rated as follows: 1) good, glycosylated hemoglobin (HgA1c) < 7.5%; 2) fair, HgA1c: 7.5 - 9%; 3) poor, HgA1c > 9% (12). A patient was considered a smoker if he had smoked 1 cigarette per day for at least 1 year (12).

Data were collected and analyzed with Chi-squared (χ^2) test using SPSS software. $P \leq 0.05$ was considered significant.

Results

Prevalence of ED

The overall prevalence of ED was 35.1%. The prevalence of ED increased with age (Table 1), with those aged 60–69 years (ED prevalence 43.4%) being 4.5 times more likely than those aged 20–39 years (ED prevalence 9.7%) to have ED **(***P* < 0.001**)**. The prevalence of ED also increased with the duration of DM, ranging from 25.4% for DM lasting < 5 years to 43.5% for DM of 12-30 years (Table 2). Patients with ED had a longer duration of DM than those without (*P* < 0.001). ED was more prevalent in patient with diabetes type 2 than who had diabetes type 1 **(***P* =0.037; Table 2).

As shown in Table 2, in men with poor metabolic control (ED prevalence 44.4%) ED was reported more frequently than in those with fair metabolic control (ED prevalence 39.9%) and good metabolic control (ED prevalence 28.4%) (*P* = 0.004).

The prevalence of ED was associated with treatment method (Table 2), being 11.5%, 29.9%, 58.3% and 58% in treatment with diet alone, oral agents, insulin and insulin plus oral agents respectively (*P* < 0.001). The prevalence of ED in smokers (50.7%) was significantly higher than those who had never smoked (31.3%, *P* < 0.001; Table 2**).** The prevalence of ED in men who had smoked ≥ 20 years (60.7%) was more than those reporting < 20 years of smoking (43.9%, *P* = 0.05). The prevalence of ED in men smoking 15 cigarettes per day (46.8%) was less than those smoking over 15 cigarettes per day (55.9%). However, no significant association was found between the number of cigarettes smoked per day and prevalence of ED (*P* = 0.290).

Table 1. Prevalence and severity of erectile dysfunction (ED) by age in Iranian diabetic men

Age (years)	Number of Subjects	with ED (N/%)	Severity of ED (N/%)		
			Mild	Moderate	Severe
20-39	62	6 (9.7)	4(6.5)	2(3.2)	-(0.0)
40-49	105	24 (22.9)	6(5.7)	15(14.3)	3(2.9)
50-59	231	85 (36.8)	11(4.8)	53(22.9)	21(9.1)
60-69	302	131 (43.4)	18(6.0)	67(21.5)	46(15.9)
Total	700	246 (35.1)	39(5.6)	137(19.3)	70(10.3)
P-value		<0.0001			

Severity of ED

Among the 246 patients with ED, it was defined as mild in 15.8%, moderate in 55.6% and severe in 28.4%, the severity increasing with age ($P < 0.001$). The incidence of severe ED ranged from 15.9% in patients aged 60-69 years, down to 2.9% in patients aged 40–49 years. The percentage of patients with mild ED decreased from 6.5% among those aged 20–39 years to 6.0% among those aged 60–69 years (Table 1).

Similarly, severity increased with the duration of DM ($P < 0.001$). The percentage of patients with severe ED increased from 0.4% among those who had DM for < 5 years to 21.9% among patients who had DM for >12-30 years; the proportion with mild ED decreased from 12.9% among those who had DM for < 5 years to 0.4% among those who had DM for 12-30 yrears (Table 3). Poor glycemic control resulted in a higher risk of developing severe ED compared with mild and moderate ED (Table 3).

A significant association was found between the severity of ED and the treatment method used for diabetes ($P < 0.001$; Table 3).

Table 2. Risk factors associated with the prevalence of erectile dysfunction (ED) in Iranian diabetic men

	With ED (N/%)	***P***
Duration of diabetes (years)		
1-5 (n=224)	57 (25.4)	*<0.001*
6-11 (n= 198)	68 (34.3)	
12-30 (n= 278)	121 (43.5)	
Type of diabetes		
Type 1(n=97)	25 (25.8)	*0.037*
Type 2 (n=603)	221 (36.7)	
Glycemic control (HgA1c%)		
Good: HgA1c<7.5 (n=27)	79 (28.4)	*0.004*
Fair : HgA1c= 7.5-9 (n=183)	73 (39.9)	
Poor: HgA1c>9 (n=99)	44 (44.4)	
Treatment method		
Diet alone (n=104)	12 (11.5)	*<0.001*
Oral agents (n=344)	103 (29.9)	
Insulin (n=96)	56 (58.3)	
Insulin plus oral agents (n=50)	29 (58)	
Smoking		
NonSmoker (n=562)	176 (31.3)	*<0.001*
Smoker (n=138)	70 (50.7)	

Table 3. Significant factors associated with the severity of erectile dysfunction (ED) in diabetic men, when examining one variable at a time

	Severity of ED (N/%)			**Severe vs. mild**	**Moderate vs. mild**	**Severe vs. moderate**
	Mild	**Moderate**	**Severe**	***P-value***	***P-value***	***P-value***
Duration of diabetes (years)				*<0.001*	*<0.001*	*<0.001*
1-5	29(12.9)	27(12.1)	1(0.4)			
6-11	9(4.5)	51(25.8)	8(4.0)			
12-30	1(0.4)	59(21.2)	61(21.9)			
Glycemic control (HgA1c%)				*<0.001*	*<0.05*	*<0.001*
Good: HgA1c < 7.5	22(7.9)	51(18.3)	5(1.8)			
Fair : HgA1c = 7.5-9	6(3.3)	45(24.6)	22(12.0)			
Poor: HgA1c > 9	3 (3.1)	12(12.2)	29(29.6)			
Treatment method				*<0.001*	*<0.001*	*<0.001*
Diet alone	10(9.6)	2(1.9)	-(0.0)			
Oral agents	14(4.1)	63(18.3)	26(7.6)			
Insulin	-(0.0)	15(16.7)	41(45.6)			
Insulin plus oral agents	-(0.0)	9(18)	20(40)			

Table 4. Main results from selected epidemiological studies on the relation between history of diabetes and ED

Reference	Study sample			
	Number	Age(years)	ED%	Type of diabetes
Rubin and Babbott, 1958, U.S. (14)	198	16-92	55	NA*
Schöffling 1960, Germany (15)	314	-	51	NA
Montenero and Donatone, 1962, Italy (16)	436	-	52	NA
Ellemberg, 1971, U.S. (17)	200	-	59	NA
Faerman et al., 1972, Argentina (18)	299	18-50	40	I & II
Kolodny et al., 1973, U.S. (19)	175	>18	49	I & II
Neubauer and Schoffling, 1977, Germany (20)	146	-	43	NA
Lester et al., 1980, U.K. (21)	83	15-60	23	NA
McCulloch et al., 1980, U.K. (22)	541	20-59	35	I & II
Nathan et al., 1986, U.S. (23)	125	55-74	71	II
Cavan et al., 1987, U.K. (24)	292	20-59	23	NA
Modebe, 1990, Nigeria (25)	38	-	58	I & II
Feldman et al., 1994, U.S. (26)	52	40-79	28	NA
Brunner et al., 1995, Austria (27)	59	-	49	I
Klein et al., 1996, U.S. (28)	359	21-76	20	I
Fedele et al., 1998, Italy (12)	9868	20-69	36	I & II
Sius et al., 2001, Hong Kong (7)	500	21-80	64	I & II
El-Sakkai et al. 2003, Saudi Arabia (16)	562	27-84	86	II

* Data not available.

Discussion

The prevalence of ED in Iranian diabetic men (35.1%) is very high.

There was no previous study for prevalence of ED in Iranian diabetic men. We found only one study concerning ED in Iran. In the survey of Safarinejad (2003) on 2674 men aged 20-70 years 18.8% (460) reported ED. A history of diabetes (Odds Ratio = 3.5) was significantly associated with ED (13). The summary of the other studies on the relationship between history of diabetes and ED is shown in Table 4. The differences between prevalence rate estimates are likely because of different definitions, criteria of sexual dysfunctions, and cultural and ethnic factors (1).

We found ED to be significantly associated with age. All the previous studies demonstrated a strong age-related incline of ED in normal population and patients with DM (29).

In our study, the prevalence of ED increased with the duration of DM, from 25.4% for < 5 years of DM to 43.5% for 12-30 years. Similar results were reported by Siu et al (2001) in Hong Kong (7). In the present study, duration of diabetes also had a significant association with severity of ED. Diabetes is a chronic metabolic disorder with many complications and associated factors that will predispose to erectile problems including psychological stresses of living with diabetes; penile disorders, namely Balanitis, phimosis, Peyronies disease, etc.; premature aging (degeneration) of the corpora cavernosal and other penile tissues.; metabolic abnormalities: hyperglycemia, excessive protein glycosylation; sensory and autonomic neuropathy; microvascular disease; macrovascular disease; hypertension and antihypertensive drugs. This association is likely to intensify as lower targets for blood pressure control and more intensive drug regimes are used, and other associated endocrine disorders. These factors improved with age and duration of diabetes (30). In the present study, ED was more prevalent in patients with diabetes type 2 than who had diabetes type 1 ($P = 0.037$). ED is most common in type 2 (Non-Insulin-Dependent) diabetes (NIDDM), because of the age of the patients and other associated cardiovascular disorders and risk factors, and may occur at any stage at or after diagnosis of the diabetes. In type 1 (Insulin Dependent) diabetes (IDDM) it will tend to occur later, being more related to the duration of the diabetes and the development of microvascular and other complications (30).

We found that poor glycemic control had a significant association with the prevalence of ED and its

severity. Similar results were reported in other studies (6, 7, 12, 31, 32).

The significant association of ED with diabetic oral agents, oral agents plus insulin and insulin rather than diet alone found in this study may be partially due to the poor metabolic management and longer lasting diabetic pathology in patients needing drugs. The risk was greater in patients taking oral agents plus insulin. This therapy is usually started after oral agents have failed and often after many years of diabetes in men with poor control of the disease, which is in agreement with Fedel *et al.* (12).

An association between cigarette smoking and risk of ED has been reported. We observed an increased risk of ED in smokers; the risk increased with duration of smoking and number of cigarettes smoked per day. Similar result was reported with Fedel et al (12). Smoking also has been shown to increase the risk of ED in nondiabetic men (1, 33–35).

In conclusion, this cross sectional study offers a quantitative estimate of the prevalence of ED among Iranian diabetic men. It demonstrates the importance of more attention to ED in diabetic health cares.

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