

Status of diabetes care in elderly diabetic patients of a developing country

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Abstract

Background: Diabetes is the most common metabolic disease that its prevalence increases with age. The prevalence of diabetes amongst elderly population of Iran is estimated 14%, yet precious little is known about status of their care. This study was designed to evaluate this issue.

Methods: This cross-sectional study sought to evaluate the diabetes care status of elderly diabetics who referred to a Diabetes Clinic of Tehran/Iran between 2007 and 2009. Data on the demographic, blood pressure, lipid profile, blood sugar, glycosylated hemoglobin (HbA1c), and treatment regimen used to control hyperglycemia and diabetes' complications were extracted from their medical records. Descriptive statistical methods were used.

Results: In total, 200 cases enrolled to the study that 130 were female. Oral hypoglycemic agents, medications for hypertension, dyslipidaemia or neuropathy were used by 72.5%, 81.5%, 72%, and 73% of patients, respectively. There was uncontrolled status in blood pressure, blood glucose, and lipid profile in over 50% of participants.

Conclusion: The status of diabetes care in our country is far from satisfactory. Given the rising prevalence of diabetes and also aging population, it is prudent that status of diabetes care in the elderly should be promoted because of the complexity of the process of diabetes care in this age group.

Keywords: Elderly, Diabetes, Diabetes care status, Iran

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Introduction

Diabetes is the most common metabolic disorder in the world with increasing prevalence. The World Health Organization (WHO) predicted that the number of diabetic patients in the age group ≥ 20 years old (adults) would rise from 194 million in 2003 to 333 million in the year 2025 (1). Diabetes has dangerous outcomes that proper control of hyperglycemia can delay or prevent of these complications (2). Currently, of the 290 million adult population in the Eastern Mediterranean Region (EMRO), of which Iran is a member, 22 million people are afflicted with diabetes and it is estimated that this figure will reach 30 million (one-tenth of the global statistics in similar years) in the year 2025 (3). There are different definitions for the elderly (aged ≥ 60 years or ≥ 65 years) (4). The prevalence of diabetes is liable to increase with age; the highest prevalence of diabetes is indeed usually in the oldest age group of any society (5, 6). The prevalence of diagnosed and undiagnosed diabetes in people ≥ 65 years old in the U.S. between 1999 and 2002 was approximately 22% (more than 7 million), creating a high burden of disease in this age group (7). Similarly, the prevalence and burden of diabetes are high in Iran (8, 9). According to various studies conducted between 1999 and 2005 in Iran (8, 10-12), the prevalence of diabetes in the elderly was at least 14%. Life expectancy has had a rising trend in Iran in the past few decades; consequently, it can be concluded that diabetes is a major problem amongst the elderly in the country and that information on the status of diabetes care in this particular age group is essential to plan diabetes control.

This study was designed to assess the status of diabetes care in the elderly diabetic patients of the Diabetes Clinic of Dr. Shariati Hospital of Tehran/Iran between 2007 and 2009.

Methods

This cross-sectional study that carried out between 2007 and 2009, evaluated the status of diabetes care in the diabetic patients ≥ 60 years old who referred to the Diabetes Clinic of Dr. Shariati Hospital of Tehran/Iran. Inclusion criteria were diabetes in persons aged ≥ 60 years with at least two clinical visits

and recorded information in order to extract data about the control of diabetes and its complications before the commencement of any therapeutic or diagnostic intervention. Exclusion criteria were incomplete records and impossibility of extracting necessary information.

Data were extracted from the patients' records on baseline information (age, sex, duration of diabetes, family history of diabetes, smoking, Body Mass Index (BMI), and blood pressure); current status or past history of diabetes complications; results of laboratory tests (fasting blood sugar, 2-hours postprandial blood sugar, HbA1c, and lipid profiles); and finally medications prescribed to control diabetes and its complications (diet with or without exercise, oral hypoglycemic agents, insulin, and combination therapy), medications prescribed to control blood pressure, dyslipidaemia, or neuropathy, and also aspirin. Criteria for controlled diabetes and its complications in the elderly were comprised quality of glycemic status based on HbA1c reference in every laboratory, blood pressure $< 130/85$ mmHg (13), and lipid profiles according to NCEP-ATPIII (total cholesterol < 200 mg/dl, LDL < 100 mg/dl, and TG < 150 mg/dl) (14).

This study was approved by the Ethics Committee of Tehran University of Medical Sciences. Statistical analysis was performed with statistical software SPSS version 15. Descriptive statistical methods were used for the analyses, and a P-value ≤ 0.05 was considered as statistically significant.

Results

From a total of 230 records of diabetic patients' age ≥ 60 years, 200 records were eligible for inclusion in the study and 103 were female. The basic characteristics of the study population are depicted in Table 1. The complications of diabetes and causes of hospitalization (past history or current event) are shown in Table 2. Concurrence of multiple complications was the most common complication of diabetes at referral, with the distribution of this event being different with respect to gender: the most frequent complication in the women was the presence of concurrent neuropathy and nephropathy, while cardiovascular complications in tandem

with nephropathy were the most common complication in men.

The results of the biochemical tests and medications of the patients are demonstrated in

Table 3 and Table 4, respectively. Table 5 presents the status of diabetes control and diabetes complications.

Table 1. Demographic characteristics of 200 elderly diabetic patients referred to Diabetes Clinic of Dr. Shariati Hospital, Tehran/Iran between years 2007 and 2009

Variable	Total (number (%))	Male (number (%))	Female (number (%))
Age (yrs)	67.31 ± 5.55	68.40 ± 5.33	66.29 ± 5.58*
Smoking (%)			
Non-smoker/quit smoking	146 (73)	58 (29)	88 (44)*
Smoker	12 (6)	8 (4)	4 (2)
unknown	42 (21)	31 (15.5)	11 (5.5)
Positive past family history (%)	149 (81)	71 (47.7)	78 (52.3)
Diabetes duration (yrs)	12.35 ± 8.90	12.02 ± 9.53	12.65 ± 8.32
BMI (kg/m ²)	26.41 ± 3.55	25.78 ± 3.24	26.98 ± 3.74*
SBP (mmHg)	138.22 ± 18.37	137.99 ± 19.43	138.45 ± 17.42
DBP (mmHg)	82.47 ± 10.26	83.19 ± 10.61	81.80 ± 9.92

BMI: Body Mass Index, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure

* P-value ≤ 0.05 is considered statistically significant between the sexes in chi-square analytic test.

Table 2. Status of diabetes complications in 200 elderly diabetic patients referred to Diabetes Clinic of Dr. Shariati Hospital, Tehran/Iran between years 2007 and 2009

Variable	Total (number (%))	Male (number (%))	Female (number (%))
Past hospitalization	48 (24)	31 (66)	16 (34) *
Reasons:			
CVD	33 (70.2)	19 (40.4)	14 (29.8)
Diabetic Foot	8 (17)	7 (14.9)	1 (2.1)
Eye disease	3 (6.4)	2 (4.3)	1 (2.1)
Eye disease + CVD	2 (4.3)	2 (4.3)	0 (0)
Hypoglycemia	1 (2.1)	1 (2.1)	0 (0)
Current Complication	186 (89.9)	89 (47.8)	97 (52.2)
Reasons:			
Neuropathy	48 (25.8)	15 (8.1)	33 (17.7)*
CVD	22 (11.8)	15 (8.1)	7 (3.8)
Diabetic Foot	10 (5.4)	8 (4.3)	2 (1.1)
Renal	10 (5.4)	7 (3.8)	3 (1.6)
Eye disease	3 (1.6)	2 (1.1)	1 (0.5)
More than one complication	93 (50)	43 (23.1)	50 (26.9)

CVD: cardiovascular diseases

* P-value ≤ 0.05 is considered statistically significant between the sexes in chi-square analytic test.

Table 3. Results of biochemical tests of 200 elderly diabetic patients in the Diabetes Clinic of Dr. Shariati Hospital, Tehran/Iran between years 2007 and 2009

Variable*	Total	Male	Female
FBS (mg/dl)	162.55± 62.35	164.54± 68.11	160.69± 56.67
BS2hpp (mg/dl)	248.02± 83.17	260.00± 77.50	236.65± 87.10**
Total Chol (mg/dl)	184.38± 42.97	177.44± 43.49	190.91± 41.64**
LDL (mg/dl)	101.35± 31.10	99.33± 32.65	103.25± 29.62
HDL (mg/dl)	44.54± 11.49	41.50± 11.51	47.40± 10.77**
TG (mg/dl)	166.34± 82.74	158.92± 85.15	173.39± 80.17

FBS: Fasting Blood Sugar, BS2hpp: Blood Sugar 2-Hour Postprandial, Total Chol: Cholesterol Total, LDL: Low Density Lipoprotein, HDL: High Density Lipoprotein, TG: Triglyceride

* All data are shown as Mean ± SD.

** P-value ≤ 0.05 is considered statistically significant between the sexes in paired T-Test analysis.

Table 4. Pharmaceutical applications related to diabetes in 200 elderly diabetic patients referred to Diabetes Clinic of Dr. Shariati Hospital in Tehran between years 2007 and 2009

Variable	Total (%)	Male (%)	Female (%)
Treatment of hyperglycemia			
Diet / exercise	3 (1.5)	1 (0.5)	2 (1)
Oral hypoglycemic agents	145 (72.5)	70 (35)	75 (37.5)
Insulin	26 (13)	15 (7.5)	11 (5.5)
Combination therapy	26 (13)	11 (5.5)	15 (7.5)
Antihypertension therapy	163 (81.5)	77 (47.2)	86 (52.8)
Antidyslipidemia therapy	144 (72)	67 (46.5)	77 (53.5)
Anti-neuropathy therapy	110 (73.3)	54 (49.1)	56 (50.9)
Aspirin	158 (79)	82 (51.9)	76 (48.1)

** P-value ≤ 0.05 is considered statistically significant between the sexes in chi-square analytic test.

Table 5- Status of diabetes care in 200 elderly diabetic patients referred to Diabetes Clinic of Dr. Shariati Hospital in Tehran between 2007 and 2009

Variable	Total (%)	Male (%)	Female (%)
BMI			
(Overweight ≥ 25 Kg/m ²)	122 (64.2)	53 (43.4)	69 (56.6)
Hypertension			
(Uncontrolled >130/85)	149 (74.5)	70 (47)	79 (53)
HbA1c			
(Uncontrolled; based on laboratory reference kit)	97 (53.6)	48 (49.5)	49 (50.5)
Total Chol			
(Uncontrolled >200mg/dl)	66 (33.3)	28 (42.4)	38 (57.6)
TG			
(Uncontrolled >150mg/dl)	102 (51.3)	41 (40.2)	61 (59.2)*
LDL			
(Uncontrolled >100mg/dl)	98 (51)	46 (46.9)	52 (53.1)

BMI: Body Mass Index, HbA1c: Glycosylated Hemoglobin (A1c), Total Chol: Cholesterol Total, TG: Triglyceride, LDL: Low

Density Lipoprotein

* P-value ≤ 0.05 is considered statistically significant between the sexes in chi-square analytic test.

Discussion

Female diabetics accounted for the bulk of the patient population in the present study. The highest rate of hospitalization, however, was found amongst male subjects; vascular heart disease was the main reason for hospitalization in both genders. At referral, over 98% of our patients were diagnosed with the chronic complications of diabetes, which was expected given the long-term duration of diabetes (mean: 12 years) and the fact that our center is a university referral center.

Although more than two-thirds of our patients were already receiving treatment for diabetes, hypertension, and dyslipidemia at referral, the status of the control of diabetes and cardiovascular complications was not desirable. In our study, the mean HbA1c was not possible to estimate, but based on reference kit of each laboratory, glycemic status in over half of our patients was not desirable.

The mean HbA1c in some Asian countries like China, India, and Vietnam (15) was 8.2%. Also in assessment of quality of diabetes care in Iran between years 2005 and 2007 in diabetic patients with aged groups 18-75 years old, the mean of HbA1c was 8.89% (16).

In diabetes care, in addition to the control of diabetes and treatment of acute complications, the prevention of chronic diabetes complications should also be considered. It has been observed in the elderly that different factors such disease duration, older age (17) and lack of combination therapy regimens influence diabetes care. Sometimes old people are inevitably forced to receive multiple medications for several diseases simultaneously besides diabetes (18). Other barriers include non-compliance in diabetic patients, inability of the treating physician to provide sufficient information on diabetes care to the patient, failure to refer the patient for follow-up, or failure to suggest further necessary assessments.

The most common (72.5%) treatment modality in our patients was oral hypoglycemic agents, that was similar to usage perceptions of these medications in Iranian diabetic patients with age groups 18-75 years old (16), but is higher than that in a study conducted in the U.S. on 482 elderly diabetics (41.1%) (18). Insulin therapy alone or in combination with oral

agents in our study was 26%, which is far less than that reported in the U.S. (35.7 %), but in compared with Iranian diabetic patients (16) seemed significant (7.6%). The amount of insulin used by our study population is similar to that reported in a study in Taiwan (19) but less than that reported in India (20). Since insulin users are mostly affected by diabetes complications, they show more cooperation and willingness to follow medical orders and thus enjoy more effective control of their diabetes. In our study, however, despite common diabetes complications, the amount of insulin used by our patients was lower. Therefore, it seems that inappropriate care in our patients stemmed from insufficient insulin use and fear of hypoglycemia in the wake of insulin use (21, 22).

Similar to Amini et al. study (16), in our study the status of diabetes care was worse in women. Of course, this may because most of our patients were women and sex distribution was unequal. In a study performed in the U.S. to compare diabetes care between the two age groups of 45-64 years and >65 years old (18), the number of the elderly men was less than that of the women. Nonetheless, an assessment of the quality of diabetes care in more than 4000 people aged 18-75 years in the U.S. in the 1990s (23) revealed that the percentage of poor blood sugar, lipid, and blood pressure control in the women was more than that in the men.

Generally, it is recommended that diabetic patients don't smoke or quit smoking to prevent or reduce diabetes complications (24). In a study in the U.S. (18), despite lower rate of smoking during elderly in comparison with younger age bracket (62% vs. 84%) and a high percentage of elderly patients with HbA1c < 8% compared with the younger patients, the percentages of cardiovascular diseases, hypertension, and hypercholesterolemia were higher in the old patients. A comparison between the elderly patients in aforementioned study and the present study shows that whereas the rate of smoking (62% vs. 7.5%) and rate of hypercholesterolemia (37.3% vs. 33.3%) were lower in the latter, the percentage of patients with poor glycemic control (53.6% vs. 42.4%) and the percentage of patients with cardiovascular diseases (>70 % vs. 41.5%) and hypertension (74.5% vs. 64.5%) were higher

in the former. Still, the status of diabetes care amongst the old patients compared with the young ones in the previous study was undesirable and cardiovascular diseases were the major cause of diabetes burden in the elderly (18). The study recommended that at the time of making medical decisions, special heed be paid to the age of diabetic patients and their performance status amongst other things (25).

Clinical trials have shown that a 1% reduction in HbA1c decreases the incidence of microvascular complications by 25 to 30% (26, 27); a 10-mmHg reduction in blood pressure reduces micro- and macrovascular complications and mortality rates in diabetic patients by 35% (28); and good control of lipid lowers the risk of cardiovascular heart diseases by about 25-55% and mortality risk by up to 43% (29, 30). In the other words, improvement in diabetes care can promote diabetic patients' health status.

A retrospective study of 30 university medical centers in the U.S. over a two-year period (31) revealed that only a small number of patients succeeded in attaining such treatment goals as HbA1c <7% (34%), blood pressure <130/80 mmHg (33%), total cholesterol <200 mg/dl (65/1%), and LDL <100 mg/dl (46/1%).

A comparison of the diabetes care in the U.S. between 1994 and 1998 and that between 1999 and 2000 demonstrated that in spite of improvement in care over time, the percentage of the uncontrolled cases was higher than that of the controlled ones. In the group aged between 65 and 75 years, 18.8% of the patients had HbA1c > 9%; 43% had LDL <130 mg/dl; and 55.8% had blood pressure < 140/90 mmHg. Additionally, the percentage of acceptable care was higher in the men than that in women (32).

The American Diabetes Association (ADA) recommends aspirin for the secondary prevention or even primary prevention of vascular events in high-risk diabetic patients. The rate of aspirin consumption was higher in the elderly than in other age groups (43.6% vs. 29%) in the U.S. (18). In our study, 79% of the patients consumed aspirin, but in Amini et al.

study (16) just one third of 2456 diabetic patients took aspirin. Even so, the elderly in both the U.S. study and ours had a high percentage of cardiovascular complications and uncontrolled hypertension, which is similar to the results of Amini et al. study (16). Overall, the quality of diabetes care in the world, regardless of any given country's level of development or health system status, is not desirable. Studies in Asian countries like Singapore (33), India (34), and Taiwan (19), Iran (16) and even studies in Europe (35) and America (23) emphasizes on this fact. It, therefore, seems that improvement in diabetes care requires more effective public and clinical interventions (36). As an effective strategy, follow-up of patients by one designated physician, especially a diabetes specialist can confer a better quality of care; this is more patent in diabetes clinics and improves blood indices such as total cholesterol (37).

First and foremost amongst the limitations of the present study is its small sample size. Our findings highlight the problems in the diabetes care amongst the elderly in Iran similar to most countries. Given the rising trend in diabetes prevalence and life expectancy in the country, we would recommend that the status of diabetes care be promoted through the provision of educational interventions, clinical guidelines, and diabetes clinics, not least for the elderly because of the complexity of the process of diabetes and also the presence of multifactorial problems such as simultaneous presence of other diseases in this age group (38). In this regard, the Endocrinology and Metabolism Research Institute (EMRI) of Tehran University of Medical Sciences (TUMS) has recently launched a virtual clinic website (<http://emri.tums.ac.ir>) for the promotion of diabetes awareness in various social groups.

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