

Hypertension and Type 2 Diabetes: A Cross-sectional Study in Hospitalized Patients in Quchan, Iran

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Abstract

Objective: Diabetes and hypertension are among the commonest diseases in developed countries, and the frequency of both diseases rises with age. By progression of diabetes the incidence of hypertension become higher than the age-matched general population.

Materials and Methods: A cross-sectional study was carried out on 300 type 2 diabetic patients who were admitted to medical ward of Moosabne Jafar hospital in Quchan for follow-up from April 2011 to August 2012. The structured questionnaire was used to gather information on sociodemographic variables, history of hypertension, use of anti-hypertensive medications and duration of diabetes. Anthropometric measurements including weight and height were measured by trained staff. Blood pressure was measured using standardized sphygmomanometers.

Results: Two hundred and ten out of 300 subjects had hypertension, thus giving a prevalence rate of 70%. One hundred males (47.6%) were hypertensive compared with 110 (52.4%) females, but this difference was not significant ($\chi^2=0.1$, $df=1$, $P>0.05$). The mean age of them was 62.9 years. One hundred and fifty subjects (50%) had reported at least one problem in past history like heart disease, CVA, DVT, CRF, retinopathy, diabetic foot and paresthesia. The most common problem in past history was heart disease (37%).

Conclusions: According to the results, 70% of the diabetic patients had hypertension. It is necessary to inform the patients to control their diabetes in order to prevent its complications.

Keywords: Quchan City, Iran, diabetes, hypertension, prevalence

Introduction

Type 2 diabetes is estimated to affect over 150 million people worldwide. This prevalence is increasing rapidly, partly through changes in case ascertainment and diagnostic criteria, but mainly through lifestyle changes in developing countries.

Type 2 diabetes is also associated with an increased risk of premature death due to cardiovascular disease (CVD), stroke and renal disease. Hypertension is a major risk factor for cardiovascular disease, stroke and ischemic heart disease. Therefore, this factor

represents one of the most preventable causes of morbidity and premature mortality in developed as well as developing countries. Hypertension and diabetes mellitus (DM) frequently coexist (1). There is a considerable evidence for an increased prevalence of hypertension in diabetic persons. The prevalence rate of hypertension among type 2 diabetic patients is higher than that of age- and sex-matched patients without diabetes, ranging between 32% and 82% (2).

It has also been shown that hypertension in diabetic persons is associated with accelerated progression of both microvascular (retinopathy, nephropathy and neuropathy) and macrovascular (atherosclerotic) complications (3). Macrovascular disease accounts for the majority of deaths in patients with Type 2 diabetes mellitus. The prevalence of hypertension in this type of diabetes is associated with a fourfold to fivefold increase in mortality, predominantly from coronary artery disease and stroke (4). Cardiovascular disease is the most costly complication of DM and is the cause of 86% of deaths in patients with DM (5).

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) has recommended a downward shift in target blood pressure to <130/80 mm Hg in diabetic patients, thus operatively setting a new threshold level for the definition of hypertension at 130/80 mmHg (6).

In this study, we aimed to find out the prevalence of hypertension amongst patients with DM admitted to medical ward of Moosabne Jafar hospital in Quchan for follow-up during the period of April to August 2012.

Materials and Methods

A cross-sectional study was carried out on 300 type 2 diabetic patients admitted in medical ward of Moosabne Jafar hospital in Quchan for follow-up during the period of April 2011 to August 2012. A structured questionnaire

was used to gather information on sociodemographic variables (gender, age and level of education), smoking status, history of hypertension, use of anti-hypertensive medications, and duration of diabetes. Anthropometric measurements including weight and height were measured by trained staff. Blood pressure was measured using standardized mercury sphygmomanometers. A trained nurse performed the procedures while the subject was in a sitting position with the arm at the level of the heart and after 5 minutes rest. Two blood pressure readings were taken from each patient and their average reading was used. The patient was labeled as having hypertension if systolic blood pressure ≥ 130 mmHg or diastolic blood pressure ≥ 80 mmHg, or if the patient was on antihypertensive medications.

The weight was recorded in kilograms to the nearest 0.1 kg using a weighing scale, and the height was recorded in meters to the nearest 0.05 m. The body mass index (BMI) was calculated as weight in kilograms divided by squared height in meters (7,8). BMI was categorized as underweight (<18.5 kg/m²), normal (18.5-24.9 kg/m²), overweight (25-29.9 kg/m²), and obesity (≥ 30 kg/m²) (7,8).

Classification of patients as type 2 DM was based on clinical grounds of non-dependence on insulin for survival (9).

Data analysis was done using SPSS version 14. Comparison of means was done using the Student's t test and chi-square. The level of statistical significance was taken as $P < 0.05$.

Results

The prevalence rate of hypertension was 70%. Table 1 presents the sociodemographic characteristics of study population according to hypertension status. There was a positively and statistically significant association between hypertension and the variables of age, BMI and duration of diabetes. But no significant association was found with level of education, physical activity and smoking status.

Table 1- Sociodemographic characteristics of study population

Sociodemographic characteristics	Total n (%)	Hypertension		P
		Yes n (%)	No n (%)	
Age (years)				
less than 50	75 (25)	33 (44.5)	41 (55.5)	0.001
50-60	90 (30)	68 (75)	22 (25)	
≥60	135 (45)	115 (85)	20 (15)	
Educational level				
Uneducated	225 (75)	158 (70)	67 (30)	≥0.05
Primary school	45 (15)	25 (55)	20 (45)	
Guidance school	25 (8.5)	15 (60)	10 (40)	
High school	5 (1.5)	2 (40)	3 (60)	
BMI (Kg/m²)				
<18.5	8 (2.7)	6 (75)	2 (25)	0.02
18.5-25	76 (25.3)	49 (65)	27 (35)	
25-30	136 (45.3)	95 (70)	41 (30)	
30-35	80 (26.7)	60 (75)	20 (25)	
Smoking status				
Current Smokers	30 (10)	12 (40)	18 (60)	≥0.05
Ex-smokers	51 (17)	32 (62)	19 (38)	
Non smokers	219 (73)	165 (75)	54 (25)	
Physical activity				
More than 3 times / week	24 (8)	13 (51)	11 (49)	≥0.05
1-2 times / week	36 (12)	25 (70)	11 (30)	
No physical activity	240 (80)	180 (75)	60 (25)	
Duration of diabetes				
< 5 years	150 (50)	98 (65)	52 (35)	0.01
5-10 years	78 (26)	64 (82)	14 (18)	
≥ 10 years	72 (24)	58 (80)	14 (20)	

The prevalence of hypertension increased with age ($P=0.001$). Compared to the age group less than 50 years, the risk of hypertension increased by four times among the 50-59 age group ($P<0.05$) and by eight times among the subjects aged 60 years old and more ($P<0.05$).

Compared to the normal BMI group, the risk of hypertension increased by threefold among the obese group ($P<0.05$). Compared to patients with duration of diabetes less than 5 years, the risk of developing hypertension increased by three times among patients suffering from diabetes for 5-10 years ($P=0.01$).

Obese and underweight subjects had significantly ($P=0.02$) higher rate of hypertension than overweight and normal weight groups.

Table 2 represents the Association between hypertension and gender of the patients. The prevalence among men was similar to women ($P=0.2$). Two hundred and ten out of 300 subjects (144 males, and 156 females) had hypertension; thus, the prevalence of

hypertension (BP >130/80 or on medication for high blood pressure) was 70%. One hundred males (47/6%) were hypertensive compared to 110 (52/4%) females; but this difference was not significant ($\chi^2 = 0.1$, $df = 1$, $P > 0.05$).

One hundred and fifty subjects (50%) had reported at least one problem in past history like heart disease, CVA, DVT, CRF, retinopathy and diabetic foot. The most common problem in past history was heart disease (37%).

Table 3 shows the condition of using anti-hypertensive medications. It shows that the most common medication used is ACE agent.

Discussion

Hypertension is twice as prevalent in diabetics as in non-diabetic individuals (1). Hypertension is also associated with accelerated progression of both microvascular and macrovascular complications in diabetic patients (2). In patients with type 1 diabetes mellitus, hypertension is generally not present

Table 2- Frequency of hypertension in the study subjects by gender

Gender	hypertensive n (%)	Normotensive n (%)	Total n (%)
Female	110 (36/6)	46 (15/4)	156 (52)
Male	100 (33/4)	44 (14/6)	144 (48)
Total	210 (70)	90 (30)	300 (100)

at diagnosis, but develops as renal insufficiency which progresses and exacerbates the progression to end-stage renal disease. In type 2 DM, many patients are already hypertensive at the time of diagnosis (10). The frequency of hypertension in type 2 DM is related to the degree of obesity, advanced age and extreme atherosclerosis that is present in these patients. Hyperglycemia and increase in total body exchangeable sodium leading to extracellular fluid accumulation and expansion of the plasma volume contributes to the pathogenesis of hypertension in diabetes mellitus (11).

The prevalence of hypertension in diabetic patients is variable worldwide. Hypertension and diabetes mellitus are independent risk factors for microvascular and macrovascular diseases. Earlier, Osuntokun et al. (12) in 1972, reported a prevalence rate of hypertension in DM of 25% in Ibadan, Nigeria; while Okesina et al. (13) reported a prevalence rate of 30% in Ilorin in Nigeria. Kumwenda et al. (14) and Swai et al. (15) in their reports recorded a prevalence rate of 37% and 45%, respectively. A more recent study by Chuhwak et al. (16) conducted in Jos, Nigeria, reported a prevalence rate of 35%.

The high prevalence rate of 70% in our study as opposed to the earlier reports may be due to the lower threshold criteria now being used to diagnose hypertension as opposed to the earlier reports (9).

Kabakov et al. reported the prevalence of hypertension in type 2 diabetic patients was 60.2%, 76.5%, and 85.8% at blood pressure thresholds of 140/90, 130/85, and 130/80 mmHg, respectively. Hypertension prevalence increased with age, reaching a rate of 94.4% in patients aged 80 years or more when the cutoff value of 130/80 mmHg was used. At this cutoff, 93.3% and 86.6% of patients with a

Table 3- Frequency of using anti-hypertensive medications

anti-hypertensive medication	N (%)
ACE agent	105 (50)
Ca Blocker	63 (30)
Beta blocker	36 (18)
Methyldopa	4 (2)
Total	210 (100)

body mass index over or less than 30 kg/m², respectively, were diagnosed with hypertension (6).

Other reports have been in keeping with this high prevalence of hypertension in persons with diabetes (17,18). In our study, the majority of subjects with type 2 DM had hypertension. In type 2 DM, hypertension may be present at the time of diagnosis or even before the development of hyperglycemia and approximately 20-60% of patients with type 2 DM will present with hypertension (19).

Berraho et al. reported the prevalence of hypertension of 70.4% in patients with type 2 DM in Morocco (20).

Compared to Arab population, the prevalence rate of hypertension reported among patients with type 2 diabetes in this study (70%) is comparable to 64.5% and 72.4% rates, respectively reported in Qatari (21) and Jordanian diabetics (22). In other Arab populations, the prevalence of hypertension is moderate: 53% in Saudi (23), 44% in Omani (24) and 38% in Bahraini diabetics (25).

Hypertension amongst type 2 diabetic patients was associated with age; this association agrees with research literatures and with the findings of other studies (26,27).

Our study also showed that obese and overweight patients have a higher risk of hypertension than ones with normal BMI. This is in agreement with research literatures and with the findings of other studies (27). In addition, the coexistence of diabetes, hypertension and obesity or overweight increases the risk of cardiovascular complications and other morbidities (28,29).

Our data indicated that hypertension is associated with the duration of diabetes. Duration of diabetes is positively associated with the severity of macro- and microvascular complications, both of which contribute to the

development of renal and/or atherosclerotic hypertension (1,30,31).

Our study showed that there is no significant association between hypertension and smoking. This finding is in contrary with findings reported in the research literature (32). This situation may be explained by the lack of smokers in our study and the minority of male participants.

Uncontrolled hypertension in diabetic patients causes microvascular and macrovascular complications (3). Diabetic nephropathy affects 30% of patients with type 1 DM and 10-20% of type 2 DM patients, and is now the leading cause of end-stage renal failure in the western world; in addition, control of hypertension with antihypertensive agents has been shown to retard its progression (7). Also, retinopathy is closely associated with hypertension, epidemiologically and various studies have shown that there was a significant reduction (34%) in the number of patients requiring photocoagulation and a 47% in the risk of decreasing vision in both eyes with tight blood pressure control (5). In the UKPDS

study, each 10 mmHg decrease in mean systolic blood pressure was associated with relative risk reduction of 12% for any complication of diabetes, 15% for deaths related to diabetes, 11% for myocardial infarction and 13% for microvascular complications (7).

Conclusions

The prevalence of hypertension among persons with DM in this study was high. According to the results, 70% of the diabetic patients had hypertension. The relatively higher rate of hypertension reported in this study is related to the fact that most diabetic patients were aged 60 years old and over. It is necessary to inform the patients to control their diabetes in order to prevent its complications.

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