

# Prevalence and Control of Hypertension in Iraqi Diabetic Patients: A Prospective Cohort Study

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**Abstract:** *Objectives:* Diabetes and hypertension are major risk factors for cardiovascular disease, a leading cause of death in humans. The aim of our study was to determine the prevalence of hypertension, and hypertension control among adults with diabetes in Basrah (Southern Iraq).

*Methods:* A prospective cohort study was conducted at Al-Faiha Diabetes and Endocrine Center in Basrah. It was started in August 2008 to April 2011. The total number of recruited patients with diabetes was 5578.

*Results:* Hypertensive diabetic patients constituted 89.6% of this study cohort, with 45.3% of them newly discovered in the center. From hypertensive patients, 48.2% achieved the target blood pressure of less than 130/80 mmHg. The results of the multivariate analyses showed that the factors independently associated with the hypertension were aged > 50 years (odds ratio, 0.4; 95% CI, 0.3 to 0.5;  $p < 0.001$ ), body mass index equal or more than 25 (odds ratio, 0.5; 95% CI, 0.4 to 0.6;  $p < 0.001$ ), insulin use (odds ratio, 0.6; 95% CI, 0.5 to 0.8;  $p < 0.001$ ) and duration of diabetes > 5 years (odds ratio, 0.6; 95% CI, 0.5 to 0.7;  $p < 0.001$ ).

*Conclusion:* This study confirmed that hypertension was seen in ~90% of diabetic patients in Iraq, and approximately half of them were achieving target blood pressure level.

**Keywords:** Diabetes mellitus, hypertension, control, prevalence, Iraq.

## INTRODUCTION

Diabetes and hypertension are major risk factors for cardiovascular disease, a leading cause of death in humans [1]. Insulin resistance and hyperglycemia combine to make hypertension more prevalent in the type 2 diabetic patient [2]. Approximately 15% of hypertensive patients are diabetic and approximately 75% of Type 2 diabetic patients are hypertensive [3].

The American Diabetes Association (ADA) in 2002, defined hypertension in diabetic patients as blood pressure (BP)  $\geq 140/90$  mmHg and a target BP goal of  $< 130/80$  mmHg is reasonable [4]. For the first time the ADA and the Canadian Diabetes Association in 2008 stated that repeat systolic BP  $\geq 130$  mmHg or diastolic BP  $\geq 80$  mmHg confirms a diagnosis of hypertension in patients with diabetes mellitus [5,6].

The goal for BP in the type 2 diabetic patients is  $< 130/80$  mmHg, and when significant proteinuria is present at 120/75 mmHg or below [7-9]. Control of hypertension in the diabetic patient to the recommended level of below 130/80 mmHg has been shown to decrease both the microvascular and macrovascular complications of diabetes [2].

The aim of the study was to determine prevalence of hypertension, and hypertension control among adults (18 years of age and above) with diabetes in Basrah (Southern Iraq).

## METHODS

### Setting

A prospective cohort study was conducted at Al-Faiha Diabetes and Endocrine Center in Basrah. This center is the only center for this specialty in Southern Iraq. Its tertiary referral center received diabetic patients with failure of oral antihyperglycemic drugs from primary health care centers and hospitals in Basrah. This center started in August 2008 to concentrate on hypertension control besides glycemic and lipid control in patients with diabetes mellitus. Patients age  $< 18$  years, those with less than 6 months of follow-up, defaulters for more than 6 months or pregnant women, were excluded. The total recruited patients with diabetes were 5578, until end of April 2011. The patients were visiting the center every 2 months, and during each visit anthropometric studies were done with measurement of BP and blood glucose and HbA1c according to the indication.

### Definitions of the Variables

Duration of diabetes was calculated as the patient's age at the time of the registration in the center minus age at onset of diabetes. Body Mass Index (BMI) was calculated as weight in kg divided by the square of height in m.

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Current smokers were defined as those who reported smoking >100 cigarettes during their lifetime and were currently smoking every day or some days. Ex-smokers were defined as ever smokers who no longer smoked.

BP was measured by a nurse trained in the method using a mercury sphygmomanometer and appropriately sized arm cuffs after patients rested for 5 min seated.

Hypertension in diabetic patients was confirmed if systolic BP was equal or more than 130 mmHg and or diastolic BP equal or more than 80 mmHg on 2 occasions separated by at least 1 day or more, or on medications for hypertension [10].

For new hypertensive patients with a systolic BP of 130 - 139 mmHg or a diastolic BP of 80 - 89 mmHg, treatment was given as lifestyle/behavioral therapy alone for a maximum of 3 months and then, if targets are not achieved, they were treated pharmacologically with agents that block the renin-angiotensin system. Patients with hypertension (systolic BP  $\geq$  140 mmHg or diastolic BP  $\geq$  90 mmHg) were given drug therapy in addition to lifestyle/behavioral therapy [10]. Drug therapy was titrated according to algorithms used by most centers [2]. In brief patients started candesartan 8 mg once daily gradually increased dose until 16 mg once daily or enalapril 10 mg twice daily, gradually increased dose to 20 mg twice daily over 2-6 months. If this failed to achieve the target, hydrochlorothiazide 12.5 mg once daily was added, gradually increasing the dose to 25 mg daily. Patients still having a BP control out of target were given amlodipine 5 mg daily as third drug. Patients on beta-blockers for associated ischemic heart disease or furosemide for heart failure were continued. Patients already hypertensive and on medication other than above therapies were changed to the above drugs gradually. Single agents were enough to control BP in 15% of patients, 2 drugs needed in 55% and 3 drugs ultimately needed in 30%. Drugs were supplied free of charge.

Data analysis was done after April 2011. Any patients with systolic BP < 130 mmHg and or diastolic BP < 80 mmHg at the last visit were considered to have controlled BP.

## STATISTICAL ANALYSES

Statistical Package SPSS for Windows, version 18.0 (SPSS Inc), was used for statistical analysis. The mean  $\pm$  SD was determined for qualitative data, and frequency for categorical variables. The Chi-square test was used to analyze group differences for categorical variables, t-test for continuous variables and a p value of <0.05 was considered significant. Multivariate analyses using logistic regression was used to study factors independently associated with hypertension.

## RESULTS

More women (Table 1) were included in this study (55.6 vs 44.4%). The mean age was 51.4  $\pm$  13.7 years, with 56.3% of them aged more than 50 years. About 70.6% of our patients were either overweight or obese. Current smokers constituted 12.8%. Most of the patients were on insulin (71.8%), because of the duty of the center that is explained

**Table 1. Baseline Characteristics**

Variables		n (%)
Gender	Men	2477(44.4)
	Women	3101(55.6)
Age (Years)	Mean $\pm$ SD	51.4 $\pm$ 13.7
	$\leq$ 50	2434(43.7)
	>50	3144(56.3)
BMI (kg/m <sup>2</sup> )	Mean $\pm$ SD	27.9 $\pm$ 5.9
	Normal weight <25	1632(29.2)
	Overweight 25-29.9	1906(34.1)
	Obesity $\geq$ 30.0	2040(36.5)
Smoking	Current	715(12.8)
	Ex-smoker	409(7.3)
	Never	4454(79.8)
Type of diabetes	Type 1	536(9.6)
	Type 2	5042(90.4)
Insulin use		4007(71.8)
Duration of diabetes (years)	Mean $\pm$ SD	8.7 $\pm$ 6.9
	$\leq$ 5	2104(37.7)
	>5	3474(62.2)
Hypertension		5003(89.6)
New hypertension		2529 (45.3)
Controlled hypertension		2414 (48.2)*

\* of hypertensive patients.

in the methods. The mean duration of diabetes was 8.7  $\pm$  6.9 years and 62.2% had diabetes for > 5 years. Hypertensive patients constituted 89.6% of this study cohort, of which 45.3% were newly discovered in the center. From hypertensive patients, 48.2% achieved the target of BP < 130/80 mmHg. There was no statistically significant difference between the 2 hypertension groups (controlled vs non-controlled) as regards prevalence of cardiovascular diseases, proteinuria (overt) or mean HbA1c.

Table 2, shows variables associated with hypertension. Hypertension was higher among women than men (91.0 vs 88.0%,  $p < 0.001$ ). The mean age and BMI were higher in the hypertensive group (52.3  $\pm$  13.1 vs 43.5  $\pm$  15.9 and 28.2  $\pm$  5.9 vs 25.2  $\pm$  5.7, respectively,  $p < 0.001$ ). Insulin was used more in the hypertensive group (72.2 vs 68.1%,  $p = 0.03$ ). The duration of diabetes was more in the hypertensive group (8.9  $\pm$  6.9 vs 7.0  $\pm$  6.3,  $p < 0.001$ ).

The results of the multivariate analyses showed that the factors independently associated with the hypertension (Table 3) were age more than 50 years (OR, 0.4; 95% CI, 0.3 to 0.5;  $p < 0.001$ ), BMI  $\geq$  25 (OR, 0.5; 95% CI, 0.4 to 0.6;

**Table 2. Variables Associated with Hypertension**

	Hypertension n (%)	No Hypertension n (%)	P
Men	2180(88.0)	297(51.6)	<0.001
Women	2823 (91.0)	278(48.3)	
Age	52.3±13.1	43.5±15.9	<0.001
BMI (kg/m <sup>2</sup> )	28.2±5.9	25.2±5.7	<0.001
Smoking	626 (12.5)	89(15.4)	0.06
Insulin use	3615(72.2)	392 (68.1)	0.03
Duration of diabetes (years)	8.9±6.9	7.0±6.3	<0.001
Total	5003	575	

**Table 3. Multivariate Analyses for Factors Associated with Hypertension**

	Odd Ratio	95% Confidence Interval	P
Women	1.1	0.9-1.3	0.3
Age (years) > 50	0.4	0.3-0.5	<0.001
BMI ≥ 25 (kg/m <sup>2</sup> )	0.5	0.4-0.6	<0.001
Smoking	0.9	0.7-1.2	0.8
Insulin use	0.6	0.5-0.8	<0.001
Duration of diabetes (years) >5	0.6	0.5-0.7	<0.001

p <0.001), insulin use (OR, 0.6; 95% CI, 0.5 to 0.8; p < 0.001) and duration of diabetes more than 5 years (OR, 0.6; 95% CI, 0.5 to 0.7; p < 0.001).

## DISCUSSION

Hypertension was seen in 89.6 % of our patients, using definition of systolic BP of 130 mmHg or above and or diastolic BP 80 mmHg or above, which is one of the highest reported prevalence. Among patients with diabetes mellitus in Jordan [11,12], hypertension was seen in 70-72.4% (70.9% of males and 73.9% of females). The definition of hypertension in that study was BP values of > 130 mmHg systolic or > 80 mmHg diastolic.

Among 1952 Saudi type 2 diabetes mellitus patients, hypertension was present in 78.1% (80.5% of men and 75.8% of women) using the definition of hypertension based on a pre-existing history of hypertension or systolic BP > 130 mmHg and/or a diastolic BP > 80 mmHg [13]. In US adults with diabetes there was an increased prevalence to 77% if hypertension was defined as ≥130/80 mmHg [14].

Of hypertensive diabetic patients in this study, 48.2% had controlled BP with the ADA target < 130/80 mmHg.

Although the large majority reported being treated for hypertension, BP was controlled to the currently recommended level of < 130/80 mmHg in only 30-40% of hypertensive, diabetic patients [15,16]. In 2001-2002 more than two-thirds of adults with diabetes in the U.S.-Mexico border region had uncontrolled BP [17]. In primary health care in Spain < 10% of diabetics actually attain BP goals [18]. This control of BP, was even better than glycemic control from the same center, where only 25.6 % of diabetics achieved a target of HbA1c < 7 % [19].

Current smokers in our study constituted 12.8% and 70.6% were overweight or obese, while 15% of diabetics from Jordan were current smokers, and 91% were either obese or overweight [12].

In our study, factors independently associated with hypertension were age > 50 years, BMI ≥ 25, insulin use and duration of diabetes > 5 years, but not with gender or smoking. In Jordan there was a positive and significant association between hypertension and the variables of age, BMI and duration of diabetes, but no significant association was found with gender, or smoking [12]. In patients with type 2 diabetes mellitus, insulin users are at higher risk for development of hypertension [20]. The strength of association showed an approximately 2-fold increase in odds ratios in patients using insulin for more than 10 years compared with non-users when analyzed in all patients in most of the logistic models. The study by Kern *et al.*, provided direct evidence for the development of insulin-induced hypertension [21]. The higher rate of hypertension reported among our study sample is perhaps related to the fact that most diabetic patients have longstanding diabetes and are on insulin.

Until the results of the 8<sup>th</sup> report of the Joint National Committee appear, we need to stick to BP targets in diabetic patients of < 130/80 mmHg, though new meta-analysis suggests a systolic BP treatment goal of 130 to 135 mmHg is acceptable [22].

## CONCLUSION

This study confirms that hypertension was seen in ~90% of diabetic patients in Iraq, and approximately half of them were achieving a target BP < 130/80 mmHg.

## CONFLICTS OF INTEREST

Declared none.

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