

## ORIGINAL ARTICLES

**Is hypertension well controlled in hypertensive diabetics**

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**ABSTRACT**

**Objectives:** To determine the degree of blood pressure (BP) control in hypertensive diabetics and to study the types of antihypertensive agents used for BP control.

**Methods:** A cross-sectional study was carried out on hypertensive diabetics followed in the outpatient clinic of King Abdul-Aziz University Hospital, Jeddah, Kingdom of Saudi Arabia from January 2000 to February 2001. Patient's age, sex, duration of diabetes and its control, duration of hypertension and the type of antihypertensive agents used, were noted. Patients were classified according to the degree of systolic and diastolic BP control into 4 groups: systolic group-I (140 mm Hg); diastolic group-I (90 mm Hg).

**Results:** A total of 230 patients were included with a mean age of 61 years and an equal male to female ratio. Mean duration of diabetes was 14 years and 9 years for hypertension. Five of 230 (2.2%) were in systolic group-I, 28/230 (12%) in group-II, 94/230 (41%) in group-III, 103/230 (44.8%) in group-IV; while 7/230 (3%) were in diastolic group-I, 30/230 (13%) in group-II, 92/230 (40%) in group-III, and 101/230 (43.9%) in group-IV. Angiotensin converting enzyme-inhibitors were used in 163/230 (70.9%) followed by diuretics in 99/230 (43%), Calcium channel-blockers in 62/230 (27%), and B-blockers in 25/230 (10.9%).

**Conclusions:** Only a small percentage of hypertensive diabetics met the recommended BP for diabetics. Efforts should be made by both patients and physician to achieve better BP control.

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Hypertension in diabetics is a common problem, and it constitutes one of the most rapidly increasing disorders in the world.<sup>1,2</sup> Hypertension doubles the already elevated risk of future cardiovascular events in diabetics.<sup>3,4</sup> Data from the recent United Kingdom prospective Diabetes Study (UKPDS) hypertension study<sup>5,6</sup> and the Hypertension Optimal Treatment (HOT) trial<sup>7</sup> demonstrated that aggressive lowering of diastolic blood pressure (BP) in diabetics to levels <85 mm Hg and 80 mm Hg, were accompanied by reduction of macrovascular events by one-third and one-half. The aim of our work is to determine the degree of BP control in hypertensive diabetics and to study the types of antihypertensive agents used to control the BP.

**Methods.** This study was conducted at King Abdul-Aziz University Hospital, Jeddah, Kingdom of Saudi Arabia, (KSA) a teaching hospital in the West Coast of KSA. We included hypertensive diabetic patients being followed in the medical outpatient clinic from January 2000 to February 2001. Patients are followed with a mean follow-up period of 6-8 weeks depending on their blood pressure and blood glucose control. Hypertension was diagnosed as blood pressure >140/90, the patient is known hypertensive or receiving antihypertensive agents, with no obvious cause for secondary hypertension. The mean systolic and diastolic BP reading of the last 3 clinic visits were calculated. The following data was reported from the study group; age, sex, duration of diabetes and its degree of control (good blood glucose control was defined as glycosylated



hemoglobin <8%, fasting blood glucose <8 mmol/l, 2 hours post-prandial blood glucose <11 mmol/l), duration of hypertension as well as the type of antihypertensive agents used. Patients were classified according to the degree of their systolic and diastolic BP control into 4 groups: systolic group-I (<120 mm Hg), group-II (121-130 mm Hg), group-III (131-140 mm Hg), group-IV (>140 mm Hg) and diastolic group-I (<80 mm Hg), group-II (81-85 mm Hg), group-III (86-90 mm Hg) group-IV (>90 mm Hg). The degree of BP control was determined, and comparison was made between the groups according to the type of antihypertensive agents used and the degree of blood glucose control.

The data was analyzed using the SPSS-9. The mean  $\pm$  SD was determined for qualitative data, and frequency for categorical variables. Chi-square was used to analyze group differences for categorical variables, and a P value of <0.05 was considered significant.

**Results.** A total of 230 patients were included in the study with a mean age of  $61 \pm 11$  years and equal male to female ratio. The mean duration of diabetes was 14 years (range 4 months to 40 years), 216/230 (93.9%) were poorly controlled. The mean duration of hypertension was 9.1 years (range 6 months to 39 years). Only a small percentage of patients had systolic and diastolic BP in group-I and II, in those angiotensin converting enzyme (ACE)-inhibitors was the most frequently used agent (Tables 1, 2, 3). Almost half of the patients were using a single antihypertensive agent for BP control. Angiotensin converting enzyme inhibitors were the most frequently used agents followed by diuretics (Table 4). Angiotensin converting enzyme-inhibitors were used as a single agent in 70/163 (42.9%) while 93/163 (57%) used it combined with other agent ( $p=0.01$ ). Patients with systolic BP group-III and IV were more likely to be on combined antihypertensive agents compared to group-I and II, 35/94 (37.2%) and 55/103 (53.4%) versus 1/5 (20%) and 3/28 (11%) ( $p=0.01$ ). The same was observed in patients with diastolic hypertension, 34/92 (37%) and 53/101 (52.5%) versus 1/7 (14.3%) and 3/30 (10%) ( $p=0.02$ ). Patients with uncontrolled systolic and diastolic BP (group-III and IV) were more likely to have poorly controlled blood glucose (Table 5).

**Discussion.** It has been reported that the prevalence of hypertension in diabetics varies from 39-46%.<sup>8,9</sup> Several studies showed that, compared to placebo, treatment of hypertension in type-2 diabetics prevents major clinical complications. Results from the Systolic Hypertension in the Elderly Program [SHEP]<sup>10</sup> and Systolic Hypertension in Europe (Sys-Eur) trials,<sup>11</sup> favored the aggressive antihypertensive treatment of diabetics with isolated systolic hypertension. A review of 1137 hypertensive diabetics<sup>12</sup> showed that only 21% of them met the currently recommended BP for diabetics of <130/85 mm Hg. A lower frequency was noted in our study where only 2% had systolic BP of <120 mm Hg, 12% between 121-130 mm Hg and 3% had diastolic BP <80 mm Hg, 13% between 81-85 mm Hg. Angiotensin converting enzyme-inhibitors were found to be the most frequently used antihypertensive agent followed by diuretics. Recent comparative trials have suggested that for the prevention of cardiovascular events, ACE-inhibitors may be superior to alternative antihypertensive agents.<sup>13,14</sup> The cumulative results of 3 trials, the Appropriate Blood Pressure Control in Diabetes [ABCD],<sup>15</sup> the Captopril Prevention project [CAPPP],<sup>16,17</sup> and the Fosinopril versus Amlodipine Cardiovascular Events Randomized Trial [FACET]<sup>18</sup> showed a significant benefit of ACE-inhibitors on the outcome of acute myocardial infarction (63% reduction,  $p<0.001$ ), cardiovascular events (51% reduction,  $p<0.001$ ), and all-cause mortality (62% reduction,  $p=0.01$ ).<sup>19</sup> Results of the Heart Outcome Prevention Evaluation [HOPE] study<sup>20,21</sup> showed that reduction of cardiovascular events with ACE-inhibitors was much greater than that expected for BP reduction alone compared with placebo, which supports the view that additional mechanisms may contribute to the prevention of cardiovascular events with ACE-inhibitors. These mechanisms are; improvement of whole-body glucose uptake,<sup>22</sup> improvement of endothelial dysfunction,<sup>23</sup> reduction of inflammation,<sup>24</sup> promotion of fibrinolysis<sup>25,26</sup> attenuation of sympathetic nerve activity<sup>27</sup> and improvement in



coronary reserve.<sup>28</sup> Angiotensin converting enzyme-inhibitors have favorable effects not only on cardiovascular events but also on renal and quality of life as compared with other regimens.<sup>29-31</sup> Therefore, it may be considered as the first line agent in hypertensive diabetics. The guidelines for the management of hypertension issued by the World Health Organization (WHO), recommend ACE-inhibitors along with diuretics, b-blockers, calcium-channel blockers and angiotensin receptor II antagonist as suitable first line agents.<sup>32</sup> However, in the absence of renal disease, diuretics and b-blockers can be used as initial therapy as recorded by the 6th Joint National Committee in United States of America.<sup>33</sup> There was under use of beta-blockers in our study. Physicians may be reluctant to treat diabetics with beta-blockers due to they are afraid of masking hypoglycemic symptoms. Many studies had confirmed the benefits of beta-blockers in diabetics.<sup>34,35</sup> In a prospective study of therapy of hypertension in diabetics; the incidence of hypoglycemia were similar on captopril and atenolol group.<sup>36</sup> As shown in our study and others<sup>12</sup> only small percentage of hypertensive diabetics met the recommended BP goal of <130/85 mm Hg. The greatest block for good BP control is non-compliance. The Canadian Coalition for Blood Pressure Control<sup>37</sup> reported non-compliance rate of 50%. Non-adherence is the major cause of treatment failure. Patients seen in our hospital are of low to moderate income and education. They may have poor insight into this dangerous chronic asymptomatic disease; they may feel well and so they are not motivated to adhere to daily medication regimen. They may get fed up from taking long time medication for their BP and blood glucose control. We observed that the mean duration of hypertension and diabetes is 9 and 14 years, and most of the patients with uncontrolled hypertension have poorly controlled blood glucose. Another reason for poor compliance is inability to afford the medications. Compliance of the patients, in addition to their education regarding their disease and its significance through media and possible supply of medications, depends in a large part on the confidence the patients have in their physicians. A major factor in gaining this confidence is to achieve goal BP promptly and efficiently. A recent survey showed that 82% of physicians failed to raise doses of medications when indicated.<sup>38</sup> Physician's education with regards to the importance of BP control promptly and efficiently should be considered.

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