Diabetes and hypertension in South African Indians

A community study

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Summary

A community survey was done to assess the prevalence of diabetes and hypertension in Indians living in Durban. Each subject, selected by systematic cluster sampling, had blood pressure measured and a glucose tolerance test. Diagnoses of diabetes mellitus and of hypertension were based on World Health Organization criteria. Of the 1064 subjects studied, 9% had diabetes and 14.2% hypertension; diabetes mellitus was more common in women (10.5%) than men (7%), whereas the prevalence of hypertension was similar in both sexes (women 13.5%, men 14.7%). Hypertension was found in 45.8% of the diabetic subjects, 31.4% of those with impaired glucose tolerance and 9.9% of those with normal glucose tolerance. Although hypertension was more common in women (63.3%) than men (37.9%) in the diabetic group, there was no significant difference in the sex distribution in the subjects with impaired glucose tolerance and those with normal glucose tolerance. Of the subjects with hypertension, 29.1% had diabetes; there was no significant difference in the sex distribution.

The mean age-adjusted body mass indices were significantly higher in the hypertensive subjects with all degrees of glucose intolerance than in normotensive subjects. There was a trend towards elevation of both systolic and diastolic blood pressure with increasing degrees of glucose intolerance and increasing age.

The association between hypertension and diabetes was noted over 60 years ago, but it has only been in the last two decades that detailed information on the two entities has become available. 1-4 Data from a few case-control studies 4, 5 and several community-based surveys 6 have now focused attention on the increased prevalence of hypertension in diabetic subjects even after controlling for age and to some extent for body weight. 3-10 Thus, Pell and D’Alonzo 6 reported an over 50% increase in hypertension in diabetic subjects compared with matched controls, while in the Framingham 8 and Bedford 9 studies higher mean systolic pressures were found in diabetic subjects compared with normal controls of the same age group.

Virtually all these studies have been performed in predominately Caucasian population groups. 2 South African Indians have a very high prevalence of diabetes (9.8%), hypertension (19%) and coronary artery disease. 11, 12 However, no study has addressed the equally important question of the prevalence of hypertension in diabetic South African Indians.

This study was undertaken as a community survey to evaluate the prevalence of and factors associated with hypertension in subjects with diabetes mellitus, impaired glucose tolerance (IGT) and normal glucose tolerance.

Subjects and methods

The subjects for this study were selected by systematic cluster sampling. Streets in various suburbs of the city of Durban were chosen at random and every 4th house was visited by a social worker. The head of the household was asked for permission to study all residents over the age of 15 years.

The study was carried out on Sunday mornings when, after an overnight fast, a modified glucose tolerance test was performed. Blood samples were taken for plasma venous glucose estimation before and 2 hours after a 75 g glucose load. In addition, blood pressure was measured in the fasting state and, if found to be elevated, a repeat measurement was done 2 hours later. Height and weight were also measured.

The diagnosis of diabetes mellitus and IGT was based on the revised World Health Organization criteria, viz: 0 minute level of glucose of ≥ 7.8 mmol/l and/or a 120 minute level of ≥ 11.1 mmol/l for diabetes mellitus and a 0 minute level of glucose of < 7.8 mmol/l and 120 minute level of 7.8 - 11 mmol/l for IGT. 13

Hypertension was also diagnosed according to WHO criteria, viz: a systolic pressure of 160 mmHg and/or a diastolic pressure 95 mmHg, the 5th phase being used for the latter. 14 Body mass index (BMI) was calculated in all subjects according to the formula:

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\text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2 \text{(m)}}
\]

The plasma glucose level was measured by the glucose oxidase method.

Results

Of the 420 households selected, consent for the study was obtained in 323, giving an overall response rate of 77%. The total number of subjects studied was 1064 (630 women and 434 men).

The overall prevalence of diabetes mellitus was 9.0% and of hypertension 14.2%. Whereas diabetes mellitus was more common in women (10.5%) compared with men (7%), the prevalence of hypertension showed similar sex distribution (women 13.5%, men 14.2%). All the diabetics were classified as non-insulin-dependent.

Prevalence of hypertension in the various categories of glucose tolerance

Forty-four (45.8%) of the diabetic subjects had hypertension, which was more common in men (63.3%) than women (37.9%). Of
the 51 patients with IGT, 16 (31.4%) had hypertension with no significant differences in the sex distribution.

Subjects with normal glucose tolerance had the lowest prevalence of hypertension (9.9%), with women and men showing similar prevalence rates.

**Prevalence of diabetes in hypertensive subjects**

Of the 151 subjects with hypertension 44 (29.1%) had diabetes mellitus. The prevalence of diabetes in the male hypertensive subjects (28.1%) was not very different from that in women hypertensive subjects (30.0%).

**Age-adjusted BMI and hypertension**

The mean age-adjusted BMIs were significantly higher in hypertensive subjects with all degrees of glucose tolerance than in their normotensive counterparts (Table I). In addition, the presence of diabetes or IGT in hypertensive subjects was associated with a higher BMI compared with those with normal blood pressure.

**Mean blood pressure and age**

Fig. 1 illustrates the effect of glucose tolerance on the mean systolic and diastolic blood pressures in the various age groups. There is a trend toward elevation of both systolic and diastolic blood pressure with increasing degrees of glucose intolerance. However, the differences in the systolic blood pressure between the diabetic patients and subjects with normal glucose tolerance only became significant in the age groups 40 - 49 years ($P < 0.001$) and 50 - 59 years ($P < 0.05$). The IGT group, when compared with those with normal glucose tolerance, showed a significantly higher systolic blood pressure only in the 40 - 49 years age group ($P < 0.01$).

In respect of diastolic blood pressure, both the diabetic and the IGT groups showed significantly higher levels in the 40 - 49 years age group ($P < 0.01$ and $P < 0.05$ respectively) than subjects with normal glucose tolerance.

**Partial correlation between plasma glucose level and systolic and diastolic blood pressure**

There was a significant, though weak, correlation between both the systolic blood pressure ($r = 0.155$) and the diastolic pressure ($r = 0.097$) on the one hand and the 120 minute plasma glucose levels.

**Discussion**

Published data on the prevalence of hypertension in diabetic subjects have shown rates ranging from less than 10% to as high as 80% in different population groups. Differences in the population groups studied, experimental design, study condition and definition of diabetes and hypertension could account for such conflicting findings. For example, studies done in outpatient clinics or twins have not shown an increased prevalence of hypertension among diabetic subjects, whereas community studies have shown a definite association between the two entities.

In this study there was an almost four-fold increase in the prevalence of hypertension among diabetic subjects compared with those with normal glucose tolerance.

This observation is in agreement with data recorded for most of the community studies done in the USA and the UK where hypertension was 2-3 times more frequent in diabetic subjects. Whereas female diabetic subjects showed a greater prevalence of hypertension than their male counterparts in the majority of these studies, the converse was seen in the present study in which the rate for men was almost twice that for women. In the Carolina Health Survey (USA) hypertension was also more common in male diabetic subjects.

Studies relating blood pressure to IGT, although far fewer than those pertaining to diabetes, have also found a consistently higher prevalence of hypertension in this entity, a similar finding was noted in the Indian subjects reported in this study. Moreover, as in the other studies, the prevalence rate for hypertension in IGT was more or less intermediate between diabetes mellitus and normal glucose tolerance.

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**TABLE I. MEAN AGE-ADJUSTED BMIs OF SUBJECTS**

<table>
<thead>
<tr>
<th></th>
<th>Normal blood pressure</th>
<th>Hypertensive subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Diabetes</td>
<td>18.5 ± 1.1 (1)</td>
<td>23.7 ± 1.0 (2)</td>
</tr>
<tr>
<td>IGT</td>
<td>21.7 ± 0.7 (5)</td>
<td>22.9 ± 0.6 (6)</td>
</tr>
<tr>
<td>Normal glucose tolerance</td>
<td>20.1 ± 0.3 (9)</td>
<td>22.4 ± 0.3 (10)</td>
</tr>
</tbody>
</table>

1 x 3, $P < 0.01$; 2 x 4, $P < 0.02$; 5 x 7, $P < 0.001$; 6 x 8, $P < 0.001$; 9 x 11, $P < 0.001$; 10 x 12, $P < 0.001$. 

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**Fig. 1. Relationship between blood pressure and glucose tolerance in the various age groups.**
Previous studies have focused attention on the role of obesity in explaining the increased prevalence of hypertension in diabetic subjects. Support for such a hypothesis in this study could be found in the observation that the mean age-adjusted BMIs were much higher in (i) hypertensives with all categories of glucose tolerance compared with their normotensive counterparts; and (ii) diabetics with hypertension compared with hypertensive subjects, with normal glucose tolerance. However, the fact that male diabetic subjects have a higher prevalence of hypertension in spite of a lower age-adjusted BMI compared with female subjects would tend to argue against such an explanation.

It is a well-known fact that blood pressure rises with age. Therefore it may be argued that the increased prevalence of hypertension in diabetes could be explained on the basis of this parameter, since diabetes too has been shown to be much more common after the age of 40 years in Indians and other population groups. However, as can be seen in this study, both diabetes mellitus and IGT are associated with higher mean systolic and to a lesser extent diastolic blood pressures compared with subjects with normal glucose tolerance values seen in the corresponding age groups, particularly after the age 40 years. Such a trend was also seen in the Bedford and Whitehall studies in all age groups.

In conclusion, this community study, having highlighted the high prevalence of hypertension in South African Indians with diabetes mellitus and IGT, has raised questions in terms of the importance of vigorous treatment for controlling these two diseases in the hope of preventing microvascular and possibly macrovascular complications.

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REFERENCES


Endometrial cytology — the Endo-pap direct endometrial sampler

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Summary

A study was designed to assess the clinical characteristics and diagnostic cytological accuracy of an endometrial sampler, the Endo-pap (Monoject;Sherwood Medical, St Louis, Mo., USA), a disposable plastic curette. The Endo-pap was compared with the Accurette (Rolon, Watford, UK), another plastic endometrial sampler used for histological investigation. Microcolpohysteroscopy was also employed as part of the procedure. Fifty symptomatic patients, median age 50 years, were studied; the majority (55.6%) had been referred for postmenopausal bleeding. The Endo-pap yielded adequate specimens in 90% of patients compared with 82% with the Accurette. In 7 patients, endometrial carcinoma was correctly diagnosed with all three diagnostic methods and no false-positive diagnosis was made.

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