Glucose, Lipid, and Blood Pressure Control in Australian Adults With Type 2 Diabetes

The 1999–2000 AusDiab Study

The risk of diabetes complications can be reduced by tight control of blood glucose (1), serum lipids (2), and blood pressure (3,4). However, evidence from a limited number of studies (5–9) indicates that many people with type 2 diabetes do not achieve recommended targets for these factors. We examined levels of glucose, lipid, and blood pressure control in participants with type 2 diabetes taking part in the national population-based Australian Diabetes, Obesity, and Lifestyle Study (AusDiab) (10) conducted during 1999–2000.

**RESEARCH DESIGN AND METHODS** — AusDiab was a national population-based survey of the general population and has been described in detail earlier (10). Diagnosis of diabetes was based on self-reported physician diagnosis of diabetes confirmed either by self-reported use of hypoglycemic drugs or results from a 75-g oral glucose tolerance test (11). Participants who started insulin treatment within 2 years of diagnosis were classified as having type 1 diabetes (if diabetes onset was at age ≥40 years; BMI also had to be <27 kg/m²). All other cases were classified as type 2 diabetes.

Fasting (≥9 h) serum total cholesterol, LDL and HDL cholesterol, and triglycerides were measured (Olympus AU600 analyzer; Olympus Optical, Tokyo, Japan). Total glycated hemoglobin analysis used high-performance liquid chromatography (Bio-Rad Variant Hemoglobin Testing System; Bio-Rad, Hercules, CA) with standardized conversion to HbA1c values (normal range 4.2–6.3%). Blood pressure measurements were performed in a seated position after rest for ≥5 min (12). Interviewer-administered questionnaires ascertained medication use.

Data were weighted to match the age and sex distribution of the 1998 resident population of Australia aged ≥25 years. The percentages of participants failing to achieve the accepted national clinical targets recommended for diabetes management in place at the time of the survey (HbA1c levels <7.0%, LDL <3.5 mmol/l, HDL ≥1.0 mmol/l, triglycerides <2.0 mmol/l, total cholesterol <5.5 mmol/l [13,14], blood pressure <140/90 mmHg [15,16], and more recent American Diabetes Association [ADA] targets [17–19]) were determined. The study was approved by the local ethics committee. Participants gave written consent.

**RESULTS** — Of 11,247 participants, 439 had previously diagnosed type 2 diabetes. The means ± SD and median (25th–75th percentile) HbA1c levels were 7.3 ± 1.8% and 6.8% (6.1–8.0), respectively. The percentage of individuals not meeting glucose, total cholesterol, and blood pressure targets differed significantly by treatment category (Table 1). The combination of the “good control” targets was achieved by 13% (n = 60) of participants. ADA targets for LDL (2.6 mmol/l) and blood pressure (130/80 mmHg) were not met by 80 and 81% of participants, respectively. All three ADA targets were achieved by 2% (n = 11).

**CONCLUSIONS** — Only half the population met the individual glycemic, lipid, and blood pressure targets recommended at the time of the survey, and approximately one in seven met all three targets. Achievement of more stringent levels recommended by the ADA for lipids and blood pressure was considerably worse, and there was evidence, especially for lipids and blood pressure, of underuse of drug therapy. By comparison, U.S. data show that 44% in NHANES III (National Health and Nutrition Examination Survey III) and 37% in NHANES 1999–2000 had HbA1c <7.0% (noting that the normal range for the HbA1c assays used in AusDiab was very similar to the normal range reported in the U.S. surveys) (6).
Beaton et al. (8) identified 7,114 adults with diabetes through a U.S. managed care organization and found that few attained ADA goals for HbA1c, LDL cholesterol, and systolic blood pressure. A Danish study (7) reported that >60% of people with type 2 diabetes had HbA1c values >6.3%.

The progressive nature of diabetes (1) usually requires escalating therapy. Poor glycemic control in the AusDiab type II diabetic population was twice as prevalent among those on oral hypoglycemic agents (without insulin) as in those using dietary regimes alone. This suggests that in the face of poor glycemic control, there is greater delay in adding insulin to oral hypoglycemic agents than in adding oral hypoglycemic agents to dietary regime. However, achieving tight glycemic control can be difficult, and even in clinical trials such as the UKPDS (U.K. Prospective Diabetes Study), a large proportion of participants receiving intensive therapy remained above target (1). Moreover, the goal of an HbA1c <7.0% may be impractical in long-duration type 2 diabetes, as attempts to achieve it are often complicated by hypertension (1).

Aggressive management of cholesterol (2) and blood pressure (4) are effective in preventing macrovascular disease in type 2 diabetes. The observations reported here, however, suggest that opportunities for cardiovascular disease risk reduction are being missed, as a significant proportion of individuals (including those on medication) were not meeting targets for both cholesterol and blood pressure.

In conclusion, this population-based study found that in >400 people with type 2 diabetes, there was evidence of under-use of medication leading to suboptimal achievement of glucose, lipid, and blood pressure national therapeutic targets, with only one in seven people achieving all three targets. In addition to behavioral modifications such as diet and exercise, increased use of insulin, multiple antihypertensive therapy, and lipid-lowering drugs are likely to be required.

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References


Table 1—Proportions not meeting HbA1c, total cholesterol, and blood pressure targets according to treatment category

<table>
<thead>
<tr>
<th>Treatment Category</th>
<th>Percentage in each treatment category</th>
<th>Percentage not achieving target*</th>
<th>P value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diet regime only</td>
<td>32.4 (130)</td>
<td>21.5 (27)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Oral hypoglycemic agents</td>
<td>58.0 (259)</td>
<td>49.5 (126)</td>
<td></td>
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<tr>
<td>Insulin‡</td>
<td>9.6 (49)</td>
<td>76.1 (33)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100 (438)</td>
<td>43.0 (186)</td>
<td></td>
</tr>
<tr>
<td>Total cholesterol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipid-lowering treatment</td>
<td>35.9 (154)</td>
<td>29.0 (47)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>No lipid-lowering treatment</td>
<td>64.1 (279)</td>
<td>57.1 (157)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100 (433)</td>
<td>47.2 (204)</td>
<td></td>
</tr>
<tr>
<td>Blood pressure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood pressure treatment</td>
<td>42.5 (211)</td>
<td>67.8 (136)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>No blood pressure treatment</td>
<td>57.5 (224)</td>
<td>45.3 (98)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100 (435)</td>
<td>54.7 (234)</td>
<td></td>
</tr>
</tbody>
</table>

Data are weighted % (actual n). *The % (n) of people above target for HbA1c (≥7%), total cholesterol (≥5.5 mmol/L), and blood pressure (≥140/90 mmHg) according to treatment category. †P value for difference in proportions not achieving target between treatment groups. ‡Included people taking either insulin alone (n = 35) or insulin and oral hypoglycemic agents (n = 14).
Control targets in type 2 diabetes


15. NSW Health Department: *The Principles of Diabetes Care and Guidelines for the Clinical Management of Diabetes Mellitus in Adults*. Sydney, NSW Health Department, 1996


