Metabolic control in diabetic immigrants

El control metabólico en pacientes diabéticos inmigrantes


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Abstract

Objective: To assess the degree of metabolic control and the presence of type 2 diabetes complications in diabetic immigrants. Methods: Cross-sectional case-control observational study, matched by age and sex. Cases: Hindustani diabetic immigrants (n=116) and non-Hindustani (n=113). Controls: native diabetic patients with type 2 diabetes (n=229). The relation male/female was 6.7, 0.8 and 2, respectively. Metabolic control and presence of chronic complications were assessed. Results: Compared to native diabetics, immigrant diabetics had a lower average age (51.9 vs. 60.7 years), with longer diabetes duration (5.5 vs. 4.4 years). Hindustani immigrants presented statistically significant higher HbA1c figures (8 vs. 7.4%). In general, diabetic immigrants presented a better lipid profile (LDL 120.4 vs. 146 and HDL 46.3 vs. 42.5 mg/dL) and better blood pressure figures (136/79 vs. 141/82 mmHg) than native diabetics (p <0.001). As well, immigrants had lower BMI (27.5 vs. 29.3). Considering age-adjusted complications, immigrant diabetics had fewer neuropathy than native (OR= 0.22; IC: 0.11-0.54) and considering non-Hindustani diabetics, fewer coronary heart disease (OR= 0.36; IC: 0.14-0.88).

Conclusions: Immigrant diabetics have a different metabolic risk profile compared to native diabetics, with poor glycaemic control, especially among Hindustani immigrants.

Keywords: diabetes, immigration, metabolic control.

Introduction

The diabetes mellitus (DM) is a metabolic multi-organic disease characterized by a sustained hyperglycemia condition that causes acute and chronic complications (macro/microvascular and neuropathic complications). The diabetes mellitus is one of the diseases with higher socio-sanitary impact, not only due to its high prevalence, but also due to the associated morbimortality and the costs it generates. In several studies, it has been demonstrated that an optimal metabolic control reduces the onset of these complications, and, therefore, the incapacity rate and early death. In 1985, it has been estimated that 30 million persons worldwide had DM. In 2000, there were more than 150 millions and for 2025 it is expected that this value will increase up to 380 millions, and that a fourth part of this amount is due to the population of Hindustani origin, authentic risk group. The immigration phenomenon and the adaptation of the ethnic minorities to the destination population causes spectacular increases of DM prevalence up to 8 times. On the other hand, they show physiopathology differences and a higher susceptibility for certain complications, either by genetic predisposition, by an inadequate access to the health system or by differences in the quality of care provided to the diabetic minorities. Especially in Spain, the prevalence of DM is higher to 10% of the adult population. The growing increase of the immigration in our country, as well as the peculiarities of the DM in this population group, obliges us to pay an individual attention and that it is fundamental in the management of these groups through the health system.
determine a different strategy regarding to the disease approach.\textsuperscript{11}

The objective of this study was to assess the level of the metabolic control and presence of T2D complications in immigrant patients compared to the autochthonous patients, analyzing the differences among those from the Hindustani region and the rest of the immigrants, for a later preparation of specific therapeutic plans.

**Material and methods**

A transversal study was performed in three groups of diabetic population as regards to their origin: Hindustani immigrants, non-Hindustani immigrants and autochthonous.

The study field was the population assigned to an urban primary care site of the city of Barcelona (EAP Raval Sud). The Raval is a central neighborhood, very depressed socio-economically and with high immigration rates. It officially has a population of 57,436 inhabitants\textsuperscript{12} and has an immigration rate of 53%. From the immigrants, 46.7% are Hindustanis (14,215 persons), 21.2% Latin Americans and 9.8% Maghrebians; the percentages corresponding to other origins are lower.\textsuperscript{13} It is quite possible that the real number of foreign patients is higher than the one stated by the statistics, due to the fact that the floating population which is not registered or censed.

The study population was made up of all the diabetic persons seen at the site during the period 2007-2008. Those who complied with the following inclusion criteria were included: diagnosis of T2D according to the ADA criteria and have at least one analytics performed during the mentioned period. The data were collected from the medical charts during the same period.

All the immigrant diabetic population seen during the study period was included (229 cases were evaluated on 234 patients seen). The cause of all the lost cases was the change of address before being able to complete the study.

The patients were divided in three study groups:

1. Hindustani immigrants (n= 116) or born in India, Bangladesh, Nepal, Pakistan or Sri Lanka.
2. Non-Hindustani immigrants (n= 113) grouped to the rest of the immigrants.
3. Autochthonous immigrants (n= 234) or born in Spain. A randomized sample was screened among those seen during the same period, stratifying per age and sex groups in a 1:1 ratio, compared to the two immigrant groups.

In the most unfavorable conditions (p=q= 0.5), the final sample size (n = 463) provides an absolute error level (e) of 4.5%.

The following variables have been studied.

- **Socio-demographic:** gender, age, origin country.
- **Analytics:** value of the glycosylated hemoglobin (HbA\textsubscript{1c}) determination, basal glycemia (mg/dL), lipid profile (total cholesterol, cHDL, cLDL and triglycerides [TG]) and renal profile (microalbuminuria [MAU] in morning urine). In the event of more than one determination, the mean of the values comprised in the study time have been estimated.
- **Clinics:** values of systolic blood pressure (SBP) and diastolic blood pressure (DBP), smoking habit, presence of complications and evolution years of the disease.

The analyzed complications were the peripheral, coronary or brain arteriopathy, the retinopathy, the nephropathy and the somatic neuropathy.

The metabolic control targets were based on the GEDAPS 2004 group\textsuperscript{14}, as they are the most spread ones in the primary care. An “adequate metabolic control” is considered if the following parameters are achieved HbA\textsubscript{1c} <7%, total cholesterol <200 mg/dL, cLDL <100 mg/dL, cHDL >40 mg/dL, TG <150 mg/dL, SBP/DBP ≤130/80 mmHg and no smoking.

The “intensification” of the control level is considered necessary according to the GEDAPS 2004 criteria. HbA\textsubscript{1c} >8%, total cholesterol >230 mg/dL, cLDL >130 mg/dL, cHDL <35 mg/dL, TG >200 mg/dL, SBP/DBP >140/90 mmHg and smoking.

Obesity was considered if the BMI was >30 for both genders.

The statistical analysis that describes the qualitative variables is based in the absolute and relative frequencies with the confidence interval of 95%.

In the quantitative variables the measurements of central tendency have been studied (mean, median) and the dispersion (standard deviation (SD)).

The analytical statistics is based in the comparison of two qualitative variables (test of the $\chi^2$), two quantitative variables (models of lineal regression) and qualitative and quantitative variable (ANOVA).

The level of metabolic control and the presence of diabetic complications were adjusted by age. A multivariate statistical test has been used (logistics regression with the introduction method) in order to detect relations between the control variables and the complications, adjusting by the variables that were relevant in the bivariant analysis. The association of these variables was determined by means of odds ratio (OR) and the CI of 95%.

**Results**

The final studies sample was of 463 individuals: 234 autochthonous (50.5%), 116 Hindustani immigrants (25.1%) and 113 non-Hindustanis (24.4%).

Table 1 describes the values of the principal socio-demographic and clinical variables of the study. The age mean of the diabetic immigrants is relevantly higher than the autochthonous (51.9 vs. 60.7 years; p <0.001). The group of Hindustani immigrants is made up mostly of men (87%) with a mean age of 49.5 years old (the lowest of the 3 groups; p <0.001). The mean HbA\textsubscript{1c} of the total of immigrants is slightly higher than the autochthonous (7.65 vs. 7.4%; not relevant), especially among the Hindustanis 8%; p <0.01).

The total of the diabetic immigrants show relevantly lower averages of SBP (135 vs. 141 mmHg), DBP (78.9 vs. 82 mmHg), total cholesterol (203 vs. 226 mg/dL), cLDL (120 vs. 146 mg/dL) and cHDL (46.3 vs. 42.5 mg/dL) than the autochthonous diabetics (p <0.001). In general, the diabetic immigrants are also thin-
ner (BMI of 27.5 vs. 29.3; p < 0.001) and smoke less (25.9 vs.
34.6 lack of magnitude; p <0.05).

The cHDL (± SD) of the diabetic immigrant males was of 42.5 ±
11.9 mg/L and of women of 53.8 ± 23.8 mg/dL, compared to
the autochthonous diabetics (41.9 ± 21 and 50.6 ± 31.9 mg/dL,
respectively).

Table 2 analyzes the level of metabolic control in each of the
study groups according to the categories of the GEDAPS criteria.
The diabetic immigrants show a worse glycemic control (only
47.2% have an HbA1c <7%), especially the Hindustanis (on-
ly 38%). However, the pressure control is better among the im-
migrants (28.2% has a BP <130/80 mmHg, versus 16.4% of the
autochthonous). Likewise, they show a relevantly adequate lipid
control (28.3% have a cLDL <100 mg/dL and 65.4% a cHDL
>40 mg/dL).

The presence of diabetic complications is analyzed in table 3.
As regards to the diabetic autochthonous, the immigrants have
a lower prevalence of ischemic cardiopathy (5.7 vs. 15%),
cerebrovascular disease (2.6 vs. 7.7%), peripheral arthropathy
(13 vs. 23.2%) and neuropathy (6.8 vs. 30.8%). There are no
relevant differences as regards to the microvascular complica-
tions (retinopathy and nephropathy). However in the previous
differences, when adjusted by age, it can be stated that the dia-
betic immigrants only have a lower risk of having a neuropathy
(Hindustanis: OR= 0.27; CI of 95%: 0.11-0.68; non Hindusta-
nis: OR= 0.17; CI of 95%: 0.06-0.49) and ischemic cardiology
(non Hindustanis: OR= 0.36, CI of 95%: 0.14-0.88).

Discussion
The immigration from depressed regions is a growing phenome-
on in all the occidental countries, Spain among them. Several ep-
idemiology studies and estimations of diabetology societies have
stated that the prevalence of the DM is very high in their countries
of origin (probably due to the genetic causes) and it increases
greatly with the migration and the adaptation to the occidental cul-
ture. Thus, possibly, there will be a higher number of diabetic im-
migrants each day in the consultations of the Spanish physicians.

On the other hand, known difficulties that entail the medical
visit of the patients with different languages, different perception
of the health or different life habits are known, mainly to control
their asymptomatic chronic pathologies. Some previous stud-
ies have already shown the difference in the physiopathology of
the DM in immigrants, with a lower age of presentation and a
higher percentage of difficult to classify diseases.
### Table 2. Metabolic control of the T2D in the study groups

<table>
<thead>
<tr>
<th></th>
<th>DM in Hindustani immigrants</th>
<th>DM in non-Hindustani immigrants</th>
<th>DM in autochthonous</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HbA1c (%)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>&lt;7</td>
<td>38</td>
<td>56.6</td>
<td>52.8</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>7-8</td>
<td>17.6</td>
<td>10.1</td>
<td>17.1</td>
<td></td>
</tr>
<tr>
<td>&gt;8</td>
<td>44.4</td>
<td>33.3</td>
<td>30.1</td>
<td></td>
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<tr>
<td><strong>Total cholesterol (mg/dL)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;200</td>
<td>65.2</td>
<td>47.2</td>
<td>29.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>200-230</td>
<td>14.3</td>
<td>25.5</td>
<td>30.6</td>
<td></td>
</tr>
<tr>
<td>&gt;230</td>
<td>20.5</td>
<td>27.4</td>
<td>40.1</td>
<td></td>
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<tr>
<td><strong>cHDL (mg/dL)</strong></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>&gt;40</td>
<td>56.1</td>
<td>75</td>
<td>52.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>40-35</td>
<td>24.3</td>
<td>13.5</td>
<td>19.3</td>
<td></td>
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<tr>
<td>&lt;35</td>
<td>19.6</td>
<td>11.5</td>
<td>28.4</td>
<td></td>
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<tr>
<td><strong>cLDL (mg/dL)</strong></td>
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<td></td>
<td></td>
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<td>&lt;100</td>
<td>32.4</td>
<td>24.1</td>
<td>8.7</td>
<td>&lt;0.001</td>
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<tr>
<td>100-130</td>
<td>38.2</td>
<td>37.9</td>
<td>23.7</td>
<td></td>
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<tr>
<td>&gt;130</td>
<td>29.4</td>
<td>37.9</td>
<td>67.6</td>
<td></td>
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<td><strong>Triglycerides (mg/dL)</strong></td>
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<tr>
<td>&lt;150</td>
<td>45.5</td>
<td>51.1</td>
<td>48.7</td>
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<tr>
<td>150-200</td>
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<td>17.3</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>&gt;200</td>
<td>35.5</td>
<td>26.5</td>
<td>30.4</td>
<td></td>
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<tr>
<td><strong>SBP/DBP (mmHg)</strong></td>
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<td></td>
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<tr>
<td>&lt;130/80</td>
<td>31.2</td>
<td>25.2</td>
<td>16.4</td>
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<tr>
<td>130-139/80-89</td>
<td>26.6</td>
<td>20.6</td>
<td>28.9</td>
<td></td>
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<tr>
<td>&gt;139/89</td>
<td>42.2</td>
<td>54.2</td>
<td>54.7</td>
<td></td>
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<tr>
<td><strong>Tobacco consumption</strong></td>
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<td>76.2</td>
<td>71.9</td>
<td>65.4</td>
<td>NS</td>
</tr>
<tr>
<td>Yes</td>
<td>23.8</td>
<td>28.1</td>
<td>34.6</td>
<td></td>
</tr>
</tbody>
</table>

DM: diabetes mellitus; BMI: body mass index; DBP: diastolic blood pressure; MAU: microalbuminuria; NR: not relevant; SBP: systolic blood pressure; T2D: diabetes mellitus type 2.

All the values represent the percentages of patients on the total of the column.

### Table 3. Prevalence of the diabetic complications in the study groups

<table>
<thead>
<tr>
<th></th>
<th>Prevalence (CI of 95%)</th>
<th>(OR adjusted by the age as regards to the DM in autochthonous)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hindustani immigrants</td>
<td>Non-Hindustani immigrants</td>
</tr>
<tr>
<td><strong>Ischemic cardiopathy</strong></td>
<td>6 (1.6-10)</td>
<td>5.3 (1.2-9.4)</td>
</tr>
<tr>
<td><strong>Cerebrovascular disease</strong></td>
<td>1.7 (0.4-1)</td>
<td>3.5 (0.1-6.9)</td>
</tr>
<tr>
<td><strong>Peripheral arteriopathy</strong></td>
<td>9.9 (4.5-15)</td>
<td>16.2 (9.4-23)</td>
</tr>
<tr>
<td><strong>Retinopathy</strong></td>
<td>13.6 (7.4-20)</td>
<td>16 (9.2-23)</td>
</tr>
<tr>
<td><strong>Nephropathy</strong></td>
<td>15.7 (9.1-22)</td>
<td>16.4 (9.6-23)</td>
</tr>
<tr>
<td><strong>Neuropathy</strong></td>
<td>7.4 (2.6-16)</td>
<td>6.2 (1.8-11)</td>
</tr>
</tbody>
</table>

CI: confidence interval; DM: diabetes mellitus; OR: odds ratio.
Among the possible slants of this study, besides the statistical method itself, the difficulty to see the immigrants has to be added. Possibly, the most conscious persons as regards to their disease attend the consultation and, therefore, the real problem is greater, so there are many cases without diagnosis and with a worse metabolic control. The neighborhood Raval of Barcelona has some special characteristics, as more than half of the inhabitants are immigrants, and approximately 1 out of 4 inhabitants are of Hindustani origin. Therefore, this neighborhood is suitable to obtain socio-demographically big sample sizes, though their characteristics are hardly reproducible in other areas of Spain.

Regarding to the metabolic control, it has been observed that the diabetic immigrants of Hindustani origin have a worse glycemic control (HbA1c of 8%) than the diabetic autochthonous (HbA1c of 7.4%) and even than other immigrants (HbA1c of 7.3%). This fact has already been proved in other studies. However, we have proved that the diabetic immigrants usually have better controls as regards to the values of the BP and the lipid profile (excepting the TG, that genetically are higher in the Hindustanis) in order to avoid future complications, as it is the worst non-in which the high rate of Muslims and their religious principles have an influence. All these characteristics make up a special risk profile for these subjects, where an inadequate glycemic control predominates, which in the future the presence of microvascular complications might increase. A higher risk of microvascular complications has not been observed in our study because a higher time of disease evolution is needed (with an average in our study of 5.47 years for the immigrants).

Though they apparently have a lower prevalence of macrovascular complications, when adjusted per age, we observe that there are no relevant differences in these territories.

We have observed that the diabetic immigrants show a higher risk of neuropathy (OR=0.22) that we are not able to understand, as the physiopathology of the diabetic neuropathy is complex and has an influence of factors that we have not quantified in our study. As conclusion, it has to be pointed out that it is necessary to pay special attention on the glycemic control (especially in Hindustanis) in order to avoid future complications, as it is the worst risk factor.

Finally, it has to be pointed out that, once the need of special and customized care to the diabetic immigrants should be stated in order to try that the metabolic control is at least similar than in the autochthonous diabetics, it is necessary to start new studies that evaluate, among other things, the efficiency of several anti-diabetic treatments in the different ethnics or the efficiency of different education interventions.

Declaration of potential conflicts of interest

There is no conflict of interest that might have influenced in this work.

References