ACE gene I/D polymorphism in type 2 diabetes: the Gujarat population
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British Journal of Diabetes & Vascular Disease 2011 11: 153
DOI: 10.1177/1474651411412662

The online version of this article can be found at:
http://dvd.sagepub.com/content/11/3/153
**ACE** gene I/D polymorphism in type 2 diabetes: the Gujarat population

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Table 1. Distribution of alleles and genotypes for the intron16 I/D polymorphism of **ACE** gene in people with and without type 2 diabetes

<table>
<thead>
<tr>
<th></th>
<th>Observed genotype counts (%)</th>
<th>Observed allele frequencies</th>
<th>Expected genotype counts</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N I/I I/D D/D</td>
<td>I D</td>
<td>I/I I/D D/D</td>
<td></td>
</tr>
<tr>
<td>No diabetes</td>
<td>445 139 (31.24) 199 (44.72) 107 (24.04)</td>
<td>0.536 0.464</td>
<td>127.72 221.17 95.68</td>
<td>0.102</td>
</tr>
<tr>
<td>Type 2 diabetic</td>
<td>290 76 (26.21) 108 (37.24) 106 (36.55)</td>
<td>0.448 0.552</td>
<td>58.29 143.55 88.45</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>p-value</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No diabetes versus type 2 diabetes using the chi-square test with 3 × 2 contingency table.</td>
<td></td>
</tr>
<tr>
<td>No diabetes versus type 2 diabetes using the chi-square test with 2 × 2 contingency table.</td>
<td></td>
</tr>
</tbody>
</table>

*Values are significant at \( p \leq 0.05 \).

Key: D = deletion; I = insertion.

We wish to draw attention to the increased frequency of **ACE** I/D (angiotensin converting enzyme insertion/deletion) polymorphisms in type 2 diabetic patients in the Gujarat region of India. The gene-encoding **ACE** is located on chromosome 17q23 and known to show I/D polymorphism of a 287 bp Alu-1-repetitive sequence (NCBI: AF118569; repeat region 14094–14381) in intron 16. This accounts for half of the variance of serum **ACE** levels in individuals homozygous for the insertion allele (II genotype) who have lower **ACE** levels than carriers of the deletion allele (ID and DD genotypes).1 Association studies of **ACE** I/D polymorphisms in people with type 2 diabetes of different ethnicities have yielded conflicting results,2 so we undertook a case control study to investigate the association of **ACE** I/D polymorphism with type 2 diabetes in subjects from Gujarat.

Genomic DNA was isolated from whole blood of 290 (132 males and 158 females) type 2 diabetic patients (fasting blood glucose >180 mg/dl) and 445 (205 males and 240 females) ethnically matched non-diabetic individuals. The **ACE** I/D polymorphism was genotyped and scored by polymerase chain reaction (PCR).3

Significant differences in the genotype frequencies of I/I, I/D and D/D genotypes were observed between diabetic and non-diabetic subjects (\( p=0.001 \)) suggesting an association of the **ACE** I/D polymorphism with type 2 diabetes. The allele frequencies for I and D alleles also differed significantly between diabetic and non-diabetic subjects (\( p=0.001 \)). The type 2 diabetic population deviated from the Hardy-Weinberg equilibrium for the polymorphism (\( p=0.0001 \)) and the non-diabetic population followed genetic equilibrium (\( p=0.102 \) (table 1)).

A recent meta-analysis of **ACE** I/D polymorphism in type 2 diabetic showed significant association with the D allele in those of Caucasian and East Asian ethnicities.2 Our study in the

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populace of Gujarat (western India) together with others suggests a strong link between ACE I/D polymorphism and type 2 diabetes at least in South Asian and Southwest Asian populations. Due to the metabolic and haemodynamic role of ACE, ACE I/D polymorphisms may be implicated in the pathogenesis of type 2 diabetic, especially in these Asian populations.

References

Diary dates

27-31 August 2011
ESC 2011 Congress of the European Society of Cardiology Paris, France
Web: http://www.escardio.org/congresses

12-16 September 2011
EASD 47th Annual Meeting Lisbon, Portugal
E-mail: diabetes@easd2011-lisbon.org
Web: www.easd2011-lisbon.org

2-5 October 2011
Men’s Health World Congress 2011
Austria Centre Vienna, Vienna, Austria
Web: http://www.menshealthworldcongress.org/en/

19-22 October 2011
2011 Cardiometabolic Health Congress
Sheraton Boston Hotel, Boston, MA, USA
Web: http://www.cardiometabolichealth.org/

3-5 November 2011
Heart, Vessels & Diabetes Hilton Athens Hotel, Athens, Greece
Web: http://www.hvd-euroconference.com/conference_2011/index.html#

11-13 November 2011
STOCK 2011
Danubius Hotel Helia, Budapest, Hungary
Web: http://www.iaso.org/events/stock-conferences/stock-2011/

27-30 November 2011
Royal Australian New Zealand College of Obstetricians and Gynaecologists (RANZCOG) Annual Scientific Meeting Melbourne Convention Centre, Melbourne, Australia

30 November - 3 December 2011
World Congress on Human Reproduction Melbourne Convention Centre, Melbourne, Australia
Web: http://www.humanreproduction2011.com/

1-4 December 2011
Fixed Combination 2011. 4th international conference on fixed combination in the treatment of hypertension, dyslipidaemia and diabetes mellitus
Marriott Rive Gauche Hotel, Paris, France

4-6 December 2011
ICI 2011. Innovations in Cardiology Interventions
David InterContinental Hotel, Tel Aviv, Israel
Web: http://www.icimeeting.com/