10-year Incidence Rates of Major Cardiovascular Events in 697,690 Immigrants to Ontario, Canada: The CANHEART Study

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Background

- Canada is one of the world’s most ethnically diverse countries due to high rates of immigration.
- Little is known about the incidence rates of cardiovascular disease (CVD) in different ethnic groups living in Canada.
- Information on CVD by ethnic group is required to understand and improve the cardiovascular health of diverse populations.
- All legal immigrants to Ontario, Canada’s largest province receive universal access to health care services after a 3-month waiting period.
Study Objective

- To determine if there are significant disparities among immigrants to Ontario, Canada from 8 major ethnic groups in the:
  
  a. Prevalence of traditional cardiac risk factors
  
  b. 10-year incidence rates of major cardiovascular events
Methods

• Design
  – Retrospective cohort study of 697,690 immigrants from 196 countries of birth.
  – Identified from Citizenship and Immigration Canada’s Permanent Resident database, linked to 8 population-based health databases.

• Inclusion/Exclusion Criteria
  – All legal immigrants aged 30-74 years as of January 2000, who landed in Ontario between 1985 and 1998.
  – No known history of a major cardiovascular event prior to January 2000.

• Immigrants classified into 1 of 8 major ethnic groups, based upon their country of birth and mother tongue. *(Rezai M, Open Medicine 2013; 7(4):85-93)*
  – White-Western European (including US, Australia, New Zealand), White-Eastern European, East Asian, Black, Southeast Asian, Latin American, West Asian/Arab (Middle East), South Asian.
Data Sources

**STUDY COHORT**
- 697,690 immigrants
- 5,211,911 long-term residents†
- 30-74 years of age on January 1, 2000

**Socio-demographics:**
- Citizenship and Immigration Canada (CIC) Permanent Resident Database
- Ontario Registered Persons Database

**CVD risk factors:**
- Canadian Community Health Survey (smoking, BMI)
- Ontario Hypertension Database
- Ontario Diabetes Database
- Gamma-Dynacare Medical Laboratories (lipids)

**Health care utilization:**
- Ontario Health Insurance Plan Physician Claims Database
- CIHI Hospital Discharge Abstract Database*

**Clinical outcomes:**
- CIHI Hospital Discharge Abstract Database*
- Registrar General of Ontario Vital Statistics Database

* CIHI=Canadian Institute for Health Information
† Born in Canada or immigrated prior to 1985.
Primary Outcome

Age-standardized 10-year incidence rate of a major cardiovascular event (2000-2009)

Defined as a composite outcome consisting of:

- Acute myocardial infarction (AMI)
- Stroke
- Congestive heart failure (CHF)
- Percutaneous coronary intervention (PCI)
- Coronary artery bypass graft surgery (CABG)
- Cardiovascular (CVD) death

(All results standardized to the 2006 Ontario census population)
Study cohort includes immigrants from 196 countries of birth from around the world.
Baseline Characteristics of Immigrants
(in order of CVD risk among males)

<table>
<thead>
<tr>
<th>Variable/Ethnic Group</th>
<th>East Asian</th>
<th>White-Western European</th>
<th>Black</th>
<th>South-east Asian</th>
<th>Latin American</th>
<th>West Asian/Arab</th>
<th>White-Eastern European</th>
<th>South Asian</th>
<th>All Immigrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population size, n</td>
<td>139,275</td>
<td>76,348</td>
<td>79,635</td>
<td>66,167</td>
<td>56,575</td>
<td>60,053</td>
<td>103,687</td>
<td>116,220</td>
<td>697,690</td>
</tr>
<tr>
<td>Age on landing, years*</td>
<td>39</td>
<td>34</td>
<td>33</td>
<td>36</td>
<td>34</td>
<td>35</td>
<td>35</td>
<td>38</td>
<td>36</td>
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<tr>
<td>Age on Jan 1, 2000, years*</td>
<td>46</td>
<td>43</td>
<td>42</td>
<td>44</td>
<td>43</td>
<td>43</td>
<td>43</td>
<td>45</td>
<td>44</td>
</tr>
<tr>
<td>Females, %*</td>
<td>52</td>
<td>50</td>
<td>50</td>
<td>60</td>
<td>49</td>
<td>42</td>
<td>50</td>
<td>47</td>
<td>50</td>
</tr>
<tr>
<td>Completed university, %</td>
<td>22</td>
<td>18</td>
<td>8</td>
<td>27</td>
<td>10</td>
<td>29</td>
<td>28</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>No English or French, %</td>
<td>47</td>
<td>25</td>
<td>8</td>
<td>29</td>
<td>31</td>
<td>40</td>
<td>63</td>
<td>40</td>
<td>39</td>
</tr>
<tr>
<td>Immigration class, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic†</td>
<td>56</td>
<td>57</td>
<td>31</td>
<td>42</td>
<td>29</td>
<td>42</td>
<td>30</td>
<td>37</td>
<td>41</td>
</tr>
<tr>
<td>Family</td>
<td>36</td>
<td>42</td>
<td>52</td>
<td>47</td>
<td>50</td>
<td>28</td>
<td>30</td>
<td>48</td>
<td>41</td>
</tr>
<tr>
<td>Refugee</td>
<td>2</td>
<td>0</td>
<td>16</td>
<td>11</td>
<td>21</td>
<td>29</td>
<td>39</td>
<td>14</td>
<td>16</td>
</tr>
</tbody>
</table>

* Unadjusted results. All other results are age-/sex-standardized.
† Includes skilled workers, entrepreneurs, self-employed, live-in caregivers, investors and their dependents.
Prevalence of Risk Factors*

* Ordered from lowest to highest incidence rate of a major cardiovascular event in males. All results are age-/sex-standardized.
Incidence of a Major Cardiovascular Event*

<table>
<thead>
<tr>
<th>Males</th>
<th>Incidence rate (per 1000 person-years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Asian</td>
<td>2.4</td>
</tr>
<tr>
<td>White-Western European</td>
<td>4.8</td>
</tr>
<tr>
<td>Black</td>
<td>5.4</td>
</tr>
<tr>
<td>Southeast Asian</td>
<td>5.7</td>
</tr>
<tr>
<td>Latin American</td>
<td>7.0</td>
</tr>
<tr>
<td>West Asian/Arab</td>
<td>7.1</td>
</tr>
<tr>
<td>White-Eastern European</td>
<td>7.3</td>
</tr>
<tr>
<td>South Asian</td>
<td>7.3</td>
</tr>
<tr>
<td>All immigrants</td>
<td>5.7</td>
</tr>
<tr>
<td>Long-term Residents</td>
<td>9.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Females</th>
<th>Incidence rate (per 1000 person-years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Asian</td>
<td>1.3</td>
</tr>
<tr>
<td>White-Western European</td>
<td>2.4</td>
</tr>
<tr>
<td>Southeast Asian</td>
<td>2.5</td>
</tr>
<tr>
<td>White-Eastern European</td>
<td>2.9</td>
</tr>
<tr>
<td>West Asian/Arab</td>
<td>3.3</td>
</tr>
<tr>
<td>Black</td>
<td>3.6</td>
</tr>
<tr>
<td>South Asian</td>
<td>3.8</td>
</tr>
<tr>
<td>Latin American</td>
<td>3.9</td>
</tr>
<tr>
<td>All immigrants</td>
<td>2.7</td>
</tr>
<tr>
<td>Long-term Residents</td>
<td>4.2</td>
</tr>
</tbody>
</table>

*AMI, stroke, CHF, PCI, CABG surgery or cardiovascular death.
Incidence of Major Cardiovascular Events by 27 Countries of Birth (>5000 immigrants)

Males

East Asian
- Taiwan
- Hong Kong
- China
- South Korea

White-Western European
- United States
- Portugal
- United Kingdom

Black
- Ghana
- Somalia
- Jamaica
- Trinidad & Tobago
- Ethiopia

Southeast Asian
- Vietnam
- Philippines

Latin American
- El Salvador
- Guyana

West Asian/Arab
- Lebanon
- Iran
- Egypt
- Iraq

White-Eastern European
- Romania
- Yugoslavia
- Poland
- USSR/Russia

South Asian
- India
- Pakistan
- Sri Lanka

Incidence rate, per 1000 person-years

Females

East Asian
- Taiwan
- Hong Kong
- China
- South Korea

White-Western European
- United States
- Portugal
- United Kingdom

Black
- Ghana
- Ethiopia
- Somalia
- Jamaica
- Trinidad & Tobago

Southeast Asian
- Vietnam
- Philippines

Latin American
- El Salvador
- Guyana

West Asian/Arab
- Lebanon
- Iran
- Egypt
- Iraq

White-Eastern European
- Romania
- Yugoslavia
- Poland
- USSR/Russia

South Asian
- India
- Sri Lanka
- Pakistan

Incidence rate, per 1000 person-years
Association between Total/HDL Cholesterol Ratio and 10-year Incidence Rate of CVD events*

* Among countries of birth with >5000 immigrants (n=27).
Relative Risk of a Major Cardiovascular Event

* Adjusted for age, hypertension, diabetes, total/HDL cholesterol, smoking, immigration class, marital status, education, neighbourhood income quintile, age-risk factor interactions and income quintile-diabetes interaction.
Conclusions

- The 10-year incidence rate of major cardiovascular events is lower in male and female immigrants as compared with long-term residents of Ontario.

- Four-fold disparity in the incidence rate of major cardiovascular events among immigrants from 8 different ethnic groups.

- Variations in the prevalence of traditional risk factors / socio-demographic factors explains part, but not all, of these disparities.

- These data can be used to develop health promotion strategies aimed at improving the cardiovascular health of diverse multi-ethnic populations.

- Further research is needed:
  - To identify the contributions of behavioral and lifestyle factors, environmental, social and cultural, and genetic factors to these disparities.
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