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*Heart* 2010 96: 27-29 originally published online September 10, 2009
doi: 10.1136/hrt.2009.170183

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Out-of-hospital cardiac arrest in South Asian and white populations in London: database evaluation of characteristics and outcome

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ABSTRACT

Objective: To compare out-of-hospital cardiac arrest (OOHCA) characteristics in white and South Asian populations within Greater London.

Methods: Data for OOHCA cases were extracted retrospectively from patient report forms completed by LAS crews from April 2005 to March 2007. Primary study variables included age, sex, ethnicity, response times from 999 call to ambulance arrival, initial cardiac rhythm, whether bystander cardiopulmonary resuscitation was provided before arrival of the London Ambulance Service (LAS) NHS Trust crew, whether the arrest was witnessed (bystander or LAS crew) and hospital outcome, including survival to hospital admission and discharge.

Results: Of 13 013 OOHCA cases of presumed cardiac cause, 3161 (24.3%) had ethnicity codes assigned. These comprised 63.1% (n = 1995) white and 5.8% (n = 183) South Asian people, with the remainder from other backgrounds. White patients were on average 5 years older than South Asians (69.5 vs 64.6, p < 0.005). Response time (7.48 min vs 7.46 min), bystander cardiopulmonary resuscitation (34.4% vs 29.7%), initial cardiac rhythm (29.5% vs 30.4%) and survival to admission (22.2% vs 22.5%) and discharge (8.7% vs 8.9%) were comparable between the two ethnic groups. South Asians were slightly more likely to have a witnessed OOHCA than their white counterparts (OR = 1.1, 95% CI 1.0 to 1.2).

Discussion: The quality of care provided was comparable between white and South Asian populations. The data support the emerging view that South Asians’ high mortality from coronary heart disease reflects higher incidence rather than higher case fatality. South Asians had an OOHCA at a significantly younger age. The study demonstrates the importance of ethnic coding within the emergency services.

Sudden cardiac arrest is a leading cause of cardiovascular mortality. Factors increasing survival after out-of-hospital cardiac arrest (OOHCA) include younger age, ventricular fibrillation/ventricular tachycardia (VF/VT) as the initial cardiac arrest rhythm, having a witnessed cardiac arrest, bystander cardiopulmonary resuscitation (CPR) and short emergency medical response times. Differences between ethnic groups in the incidence of cardiovascular diseases have been reported. Coronary heart disease is higher in Asian groups, with Pakistanis and Bangladeshis having the highest rates compared with the population as a whole. A few studies, mainly in the USA, have investigated ethnicity and OOHCA. Becker et al reported that black populations have comparatively low survival rates and high occurrences of less favourable factors (including low rates of witnessed arrest, bystander CPR and initial rhythm other than VF/VT). Cowie et al showed that the black population is twice as likely to have an OOHCA as the white population and less likely to survive an OOHCA. Feero et al showed that low to median income rather than race or population density was associated with higher cardiac arrest rates. This evidence was supported by Chu et al, who investigated survival after an OOHCA and its association with ethnic group, with the role of socioeconomic status as a confounding factor. In a suburban affluent community controlled for socioeconomic status, ethnicity was not a predictor of an adverse OOHCA outcome.

London is a very ethnically diverse city accommodating 45% of the UK’s non-white ethnic minority population, with South Asians being the largest ethnic minority group. This report compares OOHCA characteristics in the white and South Asian populations within London, using for the first time routinely collected ethnic coding data.

METHOD

The London Ambulance Service (LAS) NHS Trust provides a rapid response to out-of-hospital medical emergencies in the Greater London area. It responds to over one million calls for medical help each year and attends over 900 000 emergency incidents, of which over 10 000 are OOHCA. Resuscitation is attempted on about 4000 of these patients. Details of each of these cases are recorded by the attending LAS crew.

Data for OOHCA cases were extracted retrospectively from patient report forms completed by LAS crews from April 2005 to March 2007. Primary study variables included age, sex, ethnicity, response times from 999 call to ambulance arrival and first defibrillation, initial cardiac rhythm, whether bystander CPR was provided before arrival of the LAS, whether the arrest was witnessed (bystander or LAS crew) and hospital outcome, including survival to hospital admission and discharge. Survival to hospital admission meant that patients were assessed in accident and emergency and admitted to a downstream bed. This does imply that they had a restoration of circulation sufficient to sustain them to the point of transfer. For all patients who received an LAS resuscitation attempt which was not stopped on-scene by the LAS, their survival status to hospital admission and to hospital discharge was obtained by gaining confirmation from the hospital or interrogating the NHS national tracing database.
Ethnicity codes for OOHCA were assigned at the scene by LAS crew members. Patients choose from a list the ethnic group that best describes them. Separate codes (Z1–Z4) are used if patients are unable or unwilling to state their ethnicity. Recording ethnicity within the NHS is difficult and incomplete, and for obvious reasons, is particularly difficult during an emergency. Patients were categorised into one of two major ethnic groups—white (including white British, white Irish, and white from any other background) and South Asian (including Indian, Pakistani and Bangladeshi). (See appendix table A1 for a comparison of those with and without an ethnicity code.)

All patients who had resuscitation efforts made by the LAS for an OOHCA of a presumed cardiac cause were eligible for inclusion in the study. Patients for whom resuscitative efforts were not instigated owing to clinical signs of irreversible death or patients with an arrest secondary to a non-cardiac cause, including haemorrhage, trauma and drug overdoses were excluded. The time to return of spontaneous circulation (ROSC) in the presence of LAS crew was available for 34.5% of patients—206 white and 14 South Asian.

Descriptive statistics were carried out for most cardiac characteristics grouped by ethnic group. \( \chi^2 \) Tests and odds ratios (ORs) with 95% confidence interval were used for categorical data and t tests for continuous data to test for differences in the OOHCA characteristics between the two ethnic groups. The survival rates were adjusted for age using the direct method and using the London population structure.

### Ethics

The data were analysed as part of in-service evaluation by the LAS. Only anonymous statistical data were shared with the researchers (ASS, RB). No ethical approval was required.

### RESULTS

The LAS attempted to resuscitate 13,013 OOHCA patients between April 2003 and March 2007. Of these, 3,161 (24.3%) cases had specific ethnicity codes assigned. The study therefore comprised 3,161 OOHCA patients, of whom 63.1% (n = 1,995) were white, 5.8% (n = 183) were South Asian and the remaining 31.1% (n = 983) comprised other ethnic backgrounds. The survival rates were adjusted for age using the direct method and using the London population structure.

The study also showed some barriers of respondents to performing CPR, specifically in London. Approximately 30% of the overall study population in London had been trained in CPR. The study also showed some barriers of respondents to performing CPR. These included respondents’ unwillingness.

### DISCUSSION

This study provides rare data on OOHCA of presumed cardiac aetiology by ethnicity in the UK. Few studies have investigated sociodemographic variables and race or ethnicity affecting survival after an OOHCA. Most of these studies have concentrated on comparing black and white populations within the USA. We are unaware of any published studies on OOHCA in the UK comparing South Asian and white populations.

This study shows that South Asians have an OOHCA at a younger age than the white population, probably reflecting the younger age structure of the underlying population. Without accurate and complete data by ethnic group and the underlying population, it is not possible to verify this with age-specific rates.

There was no statistically significant difference in bystander CPR, VF/VT as initial rhythm, response times and rate of survival to hospital admission or discharge between the white and South Asian populations. The overall rate of bystander CPR remained low despite more than 50% of OOHCA being witnessed. A relatively recent study looked at public perception of CPR, specifically in London. Approximately 30% of the overall study population in London had been trained in CPR. The study also showed some barriers of respondents to performing CPR. These included respondents’ unwillingness.

### Table 1: Baseline and cardiac arrest characteristics of each ethnic group

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>White (n = 1995)</th>
<th>South Asian (n = 183)</th>
<th>p Value or OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years), mean (95% CI)</td>
<td>69.5 (52.7 to 86.3)</td>
<td>64.6 (46.4 to 82.4)</td>
<td>p = 0.005</td>
</tr>
<tr>
<td>Age (years) men, mean (95% CI)</td>
<td>66.8 (50.4 to 83.1)</td>
<td>63.0 (46.3 to 79.7)</td>
<td>p = 0.014</td>
</tr>
<tr>
<td>Age (years) women, mean (95% CI)</td>
<td>74.3 (57.8 to 90.8)</td>
<td>67.8 (47.1 to 88.5)</td>
<td>p = 0.005</td>
</tr>
<tr>
<td>Male (%)</td>
<td>63.6</td>
<td>67.2</td>
<td>OR = 0.98 (0.7 to 1.3)</td>
</tr>
<tr>
<td>Response times (min), mean (95% CI)</td>
<td>7.48 (3.05 to 11.88)</td>
<td>7.46 (4.22 to 10.7)</td>
<td>p = 0.335</td>
</tr>
<tr>
<td>Witnessed arrest (%)</td>
<td>62.3</td>
<td>69.9</td>
<td>OR = 1.1 (1.0 to 1.2)</td>
</tr>
<tr>
<td>Bystander CPR (%)</td>
<td>34.4</td>
<td>29.7</td>
<td>OR = 1.2 (0.9 to 1.7)</td>
</tr>
<tr>
<td>Initial arrest rhythm (VF/VT)</td>
<td>29.5</td>
<td>30.4</td>
<td>OR = 1.0 (0.7 to 1.3)</td>
</tr>
<tr>
<td>Survival to admission (%)</td>
<td>22.2</td>
<td>22.5</td>
<td>OR = 0.98 (0.98 to 0.99)</td>
</tr>
<tr>
<td>Survival to discharge (%)</td>
<td>8.7</td>
<td>8.9</td>
<td>OR = 0.98 (0.98 to 1.00)</td>
</tr>
</tbody>
</table>

Results are shown as means or proportions with 95% CIs, odds ratios and p values. CPR, cardiopulmonary resuscitation; VF, ventricular fibrillation; VT, ventricular tachycardia.

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to perform mouth-to-mouth resuscitation for fear of contracting “disease”, lack of confidence in performing CPR and fear of doing “more harm than good”.14 Witnessed arrests were slightly commoner in the South Asian population than in the white population. This may reflect the South Asian family structure. According to the 2002 statistics from the Office of National Statistics, South Asian families tended to be larger than those from other minority ethnic groups. Additionally, Asians were least likely to live in lone-parent communities than the white population.15 The Northern Ireland Public Access Defibrillation study attempted to examine all OOHA in urban and rural areas and used first responders trained in Automated external defibrillation. The study showed that although first responders improved the call to response interval in rural areas, there was no significant improvement in survival.16

Among UK South Asians, mortality and morbidity from coronary heart disease is higher but case-fatality rates are probably lower.17–22 Our work supports the view that mortality rates are high because of higher incidence and not higher case fatality.

There were several limitations to this study. First, a large proportion of patients were not assigned to an ethnic group, which reflects the reality of ethnic group coding in the NHS (and in most of Europe).15–22 There is no reliable way to assess selection biases. The data in appendix table A1 show a worse outcome in those without an ethnic code. This probably reflects the difficulty of capturing this information in the most seriously ill people. Although our study did not show any survival difference between the two ethnic groups, this could potentially represent a type 2 error due to the small number of survivors compared in each group. Larger studies are required. Future studies should also examine the effects of comorbidity, particularly prior coronary heart disease and diabetes, and also other outcomes—for example, neurological recovery, for which we did not have reliable data. This study adds to previous research that overall survival following OOHA remains poor. Our work shows the potential value of ethnic coding of data by the emergency services and provides evidence in favour of an equitable standard of service across the two ethnic groups studied. The findings are important to the NHS which is committed by law and policy to providing an equal service.

Competing interests: None declared.

Provenance and peer review: Not commissioned; externally peer reviewed.

### Table A1

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Ethnicity present (n = 3161)</th>
<th>Ethnicity absent (n = 9852)</th>
<th>p Value or OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (%)</td>
<td>61.9</td>
<td>66.9</td>
<td>OR = 0.94 (0.91 to 0.97)</td>
</tr>
<tr>
<td>Age (years), mean (95% CI)</td>
<td>68.9 (51.1 to 86.7)</td>
<td>66.9 (48.5 to 85.3)</td>
<td>p = 0.001</td>
</tr>
<tr>
<td>Response times (min), mean (95% CI)</td>
<td>7.51 (3.2 to 11.9)</td>
<td>7.58 (2.3 to 12.9)</td>
<td>p = 0.347</td>
</tr>
<tr>
<td>Witnessed arrest (%)</td>
<td>57.9 (n = 1831)</td>
<td>62.1 (n = 6121)</td>
<td>OR = 0.93 (0.90 to 0.96)</td>
</tr>
<tr>
<td>Bystander CPR (%)</td>
<td>33.0 (n = 1041/3153)</td>
<td>31.6 (n = 3115)</td>
<td>OR = 1.04 (0.98 to 1.11)</td>
</tr>
<tr>
<td>Initial arrest rhythm (VF/VT) (%)</td>
<td>24.5 (n = 724/2960)</td>
<td>28.2 (n = 2605/9250)</td>
<td>OR = 0.86 (0.80 to 0.93)</td>
</tr>
<tr>
<td>Survival to admission (%)</td>
<td>20.3 (n = 610/3006)</td>
<td>12.0 (n = 691/2877)</td>
<td>OR = 1.69 (1.55 to 1.86)</td>
</tr>
<tr>
<td>Survival to discharge (%)</td>
<td>6.3 (n = 188/3008)</td>
<td>3.8 (n = 312/2620)</td>
<td>OR = 1.66 (1.39 to 1.98)</td>
</tr>
</tbody>
</table>

CPR, cardiopulmonary resuscitation; VF, ventricular fibrillation; VT, ventricular tachycardia.

### REFERENCES


