



# Ethnicity and pre-hospital care for people with suspected cardiac pain: cross-sectional study

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## Abstract

**Objectives** Few studies have investigated the quality of pre-hospital care by ethnicity. We aimed to investigate ethnic differences in pre-hospital ambulance care of patients with suspected cardiac pain.

**Methods** We conducted a cross-sectional analysis of retrospective electronic clinical data for patients with suspected cardiac pain over one year (August 2011 to July 2012) extracted from a single regional ambulance service. This included patient demographic data, clinical measurements, drugs administered and outcomes, such as transportation to hospital or referral to primary care. We used multivariate regression to investigate differences in care by ethnicity comparing non-White with White patients.

**Results** There were 7046 patients with suspected cardiac pain, with 4825 who had ethnicity recorded including 4661 (96.6%) White and 164 (3.4%) non-White. After correcting for age, sex, socio-economic status and whether transported to hospital, non-White patients were significantly more likely to have temperature [odds ratio (OR) 2.96,  $P=0.007$ ], blood glucose (OR 3.95,  $P=0.003$ ), respiratory rate (OR 4.94,  $P=0.03$ ) and oxygen saturation (OR 2.43,  $P=0.006$ ) recorded. Non-White patients were significantly less likely to be transported to hospital (OR 0.43,  $P=0.03$ ).

**Conclusion** There were significant differences in pre-hospital ambulance care for non-White compared with White patients with suspected cardiac pain. These differences could be due to differences in clinical condition or case-mix, language and cultural barriers, limited understanding of appropriate use of health care services, recording bias or true differences in provider management. Further analysis should involve larger and more complete data sets to explore ethnic differences in greater detail.

## Introduction

Equity, irrespective of ethnicity, is a fundamental ethical principle for quality health care [1]. It has risen up the policy agenda in recent years as modern health services are required to respond to increasing ethnic diversity within the populations they serve. In the UK, minority ethnic groups comprise 8 million people or 14% of the population, and this proportion is growing [2]. A number of UK statutes over the past 50 years culminated in the Equality Act 2010, requiring public and voluntary bodies to eliminate discrimination and promote equality of opportunity in service delivery [3]. The National Health Service (NHS), in response, has introduced guidance through its Equality Delivery System to ensure compliance with the Equality Act 2010 [4,5].

Minority ethnic groups have different patterns of illness in the UK, including higher rates of coronary heart disease and type 2 diabetes in South Asians (patients from the Indian sub-continent

[6–9] as well as stroke in Black Caribbeans [10]. Although previous studies showed small and narrowing ethnic health disparities for cardiovascular diseases in primary [1,11] or secondary care settings [8], few studies have focused on the quality of pre-hospital ambulance care for conditions including cardiovascular presentations in minority ethnic patients in the UK.

Some South Asian groups were more likely than White patients to seek immediate medical help for suspected cardiac pain [12]. Another study found that South Asians experiencing chest pain were less likely to arrive by ambulance [13]. This finding is reinforced by Smith *et al.*'s US study (2010), which found that Mexican-Americans who had suffered a stroke were 40% less likely to arrive by Emergency Medical Services (EMS) than non-Hispanic Whites [14].

Some minority ethnic groups are more likely to delay or even refuse seeking treatment. In the US, Galea *et al.* (2007) [15] found two main reasons why African-Americans delayed seeking help for out-of-hospital cardiac arrests – previous negative, usually

discriminatory, experiences of health care professionals and limited symptom awareness. Delaying or refusing treatment can lead to poorer health outcomes or excess morbidity and mortality [15,16].

Owing to limited research in this area, we aimed to investigate differences in pre-hospital ambulance care delivered to minority ethnic patients with suspected cardiac pain.

## Methods

We conducted a cross-sectional analysis of retrospective electronic clinical data extracted from a large single regional ambulance service for patients with suspected cardiac pain from August 2011 to July 2012.

### Study population

This study included patients recorded as having suspected cardiac pain attended by East Midlands Ambulance Service NHS Trust (EMAS). EMAS answers emergency 999 calls providing urgent and emergency services for 4.4 million people in Derbyshire, Leicestershire, Rutland, Lincolnshire, Northamptonshire and Nottinghamshire (Table 2) [17]. The East Midlands is a largely rural region in the UK, with the major cities being Leicester, Nottingham and Derby, each of which have populations in excess of 200 000. They are surrounded by many small market towns. The City of Leicester local authority area has the highest minority ethnic population in the East Midlands. According to the 2011 Office for National Statistics (ONS) Census, 37% of its population of around 330 000 were Asian, up from 30% in 2001 [18].

### Data analysis

We accessed patient demographic data including ethnicity, age, sex, socio-economic deprivation [as measured by the Index of Multiple Deprivation (IMD)], and urban or rural place of residence. Clinical measurements usually undertaken for patients with suspected cardiac pain were extracted including rates of recording of blood pressure, respiratory rate, pain assessment, temperature, blood glucose, oxygen saturation and electrocardiogram. We considered rates of drugs administered by paramedics, including aspirin, nitroglycerin, Entonox and morphine for these patients. Finally, data on care outcomes, including rates of transportation to hospital (termed 'see and convey'), treatment at home followed by discharge ('see and treat') or referral to primary care ('see and refer') were also analysed.

We also compared ambulance data for patients attended to by the ambulance service from August 2011 to July 2012 with ONS population estimates for East Midlands in 2012 to investigate differences between rates of presentation to the ambulance service compared with ethnicity in the resident population [2]. Ambulance service staff are required to record ethnicity data for patients under the Equality Act 2010.

We used multivariate regression to investigate differences in care by ethnicity comparing non-White with White patients adjusting for age, sex, socio-economic and urban/rural status. Analysis was conducted using Stata 12 [19].

## Results

There were 7046 patients with suspected cardiac pain attended to by EMAS between August 2011 and July 2012. Of these, 4825 had ethnicity recorded, of whom 96.6% were White. Ethnicity data were missing for 2221 (31.5%) patients. Non-White patients were similar to White patients in relation to gender ( $P=0.63$ ) and socio-economic status ( $P=0.08$ ) but were significantly younger ( $P<0.001$ ) (Table 1).

Of the 75 non-White patients for whom we had IMD data for, 74 (98.7%) lived in less sparse urban areas. By contrast, the corresponding figure among the 1569 White patients for whom we had such data was 1273 (81.1%). The ONS population data for the East Midlands [17] by ethnicity showed that ambulance services were proportionately more likely to attend White than non-White patients (Table 2).

Bivariate analysis comparing non-White to White patients showed a number of differences. Non-White patients were significantly more likely to have blood glucose (78.7% vs. 69.4%,  $P=0.011$ ) and temperature recorded (77.4% vs. 69.8%,  $P=0.035$ ) than White patients. For unadjusted drug administration, non-Whites were only significantly more likely to receive aspirin than Whites (14.0% vs 8.7%,  $P=0.018$ ). There were no significant differences between non-White and White patients in those 'treated and discharged', 'referred to primary care', 'refused treatment', 'not treated' and 'electrocardiogram (ECG) or cannulation performed'. There were no significant differences in aspirin, nitroglycerin, Entonox or morphine administration, adjusting for age, sex, socio-economic status, urban/rural status, whether transported to hospital or treated and discharged (Table 3).

Additional multivariate logistic regression, adjusting for age, sex, socio-economic status, IMD, urban/rural status, whether transported to hospital or treated and discharged, showed that non-White patients were similar to White patients in recording of blood pressure, pain score, cannulation and ECG. However,

**Table 1** Demographic information for White and non-White patients attended with cardiac chest pain

Demographic characteristics	Ethnic group		<i>P</i> -value (chi-squared test)
	Non-White* <i>n</i> = 164 (%)	White <i>n</i> = 4661 (%)	
<b>Age</b>			
≤19	2 (1.2)	37 (0.8)	
20–39	21 (12.9)	278 (6.0)	
40–59	62 (38.0)	1295 (27.9)	<0.001
60–79	55 (33.7)	1958 (42.2)	
≥80	23 (14.1)	1076 (23.2)	
<b>Sex</b>			
Female	70 (43.8)	1910 (41.8)	0.63
Male	90 (56.3)	2655 (58.2)	
<b>Index of multiple deprivation quintile</b>			
1	35 (46.7)	527 (33.6)	
2	12 (16.0)	336 (21.4)	
3	7 (9.3)	287 (18.3)	0.077
4	11 (14.7)	254 (16.2)	
5	10 (13.3)	165 (10.5)	

\*Non-Whites are defined as all those who are non-Caucasian.

**Table 2** Ambulance attendances by ethnic group compared with population estimate

	Ambulance attendance in East Midlands by recorded ethnicity		ONS population estimate for East Midlands region by ethnic group*	
	<i>n</i>	(%)	<i>n</i>	(%)
Asian	1873	(1.8)	280 000	(6.3)
Black	798	(0.8)	71 000	(1.6)
Mixed/other	1011	(1.0)	40 000	(0.9)
White	102 663	(96.4)	4 043 000	(91.2)
Total	106 345	(100.0)	4 434 000	(100.0)

\*Office for National Statistics (2012) Census gives insights into characteristics of the East Midlands' population.

**Table 3** Assessment, drugs administered and treatment outcome comparing White and non-White patients with suspected cardiac chest pain attended by ambulance

Measure	Ethnic group		<i>P</i> -value (chi-squared test)
	Non-White <i>n</i> = 164 (%)	White <i>n</i> = 4661 (%)	
<b>Assessment</b>			
Pain score before treatment	132 (80.5)	3745 (80.3)	0.97
Pain score after treatment	124 (75.6)	3499 (75.1)	0.88
Two pain scores	119 (72.6)	3449 (74.0)	0.65
Temperature	127 (77.4)	3252 (69.8)	<b>0.035</b>
Diastolic blood pressure	139 (84.8)	3810 (81.7)	0.33
Systolic blood pressure	139 (84.8)	3819 (81.9)	0.36
Respiratory rate	144 (87.8)	3947 (84.7)	0.27
Blood glucose	129 (78.7)	3233 (69.4)	<b>0.011</b>
Oxygen saturation	140 (85.4)	3761 (80.7)	0.14
ECG	8 (4.9)	143 (3.1)	0.19
Cannulation	0 (0.0)	1 (0.0)	0.85
<b>Drugs administered</b>			
Aspirin	23 (14.0)	405 (8.7)	<b>0.018</b>
Nitroglycerin (glyceryl trinitrate)	9 (5.5)	413 (8.9)	0.13
Entonox	2 (1.2)	80 (1.7)	0.63
Morphine	1 (0.6)	85 (1.8)	0.25
<b>Treatment outcome</b>			
Transported to hospital	153 (93.3)	4401 (94.4)	0.54
Treated and discharged	3 (1.8)	62 (1.3)	0.59
Referred to primary care	1 (0.6)	29 (0.6)	0.98
Refused treatment	0 (0.0)	5 (0.1)	0.68
Not treated	1 (0.6)	5 (0.1)	0.073

Totals do not equal 4825 because of missing ethnicity data in some cases.

non-Whites were significantly more likely than Whites to have their oxygen saturation [odds ratio (OR) 2.43,  $P=0.006$ ] temperature (OR 2.96,  $P=0.007$ ), respiratory rate (OR 4.94,  $P=0.03$ ) and blood glucose (OR 3.95,  $P=0.003$ ) recorded (Table 4).

A multivariate logistic regression adjusting for ethnicity, age, sex, socio-economic status and urban or rural status showed that non-Whites were 57% ( $P=0.03$ ) less likely to be transported to

**Table 4** Multivariate logistic regression for clinical assessment comparing White and non-White patients attended by ambulance with suspected chest pain

Clinical assessment by ethnicity*	Odds ratio	<i>P</i> -value
	(95% confidence interval)	
Oxygen saturation	2.43 (1.29–4.59)	0.006
Temperature	2.96 (1.34–6.53)	0.007
Respiratory rate	4.94 (1.19–20.42)	0.027
Blood glucose	3.95 (1.57–9.92)	0.003

\*Adjusted for age, sex, treated and transported, treated and discharged, deprivation (IMD) and rural/urban. White was the reference group.

**Table 5** Multivariate regression for patients transported to hospital by ambulance with suspected cardiac chest pain

Transportation to hospital	Odds ratio	<i>P</i> -value
	(95% confidence interval)	
Ethnicity	0.43* (0.21–0.91)	0.027
Age	0.98 (0.78–1.24)	0.89
Sex	1.76** (1.17–2.67)	0.007
Deprivation (IMD quintile)	1.01 (0.86–1.18)	0.92
Rural/urban	0.93 (0.67–1.28)	0.66

\*White was the reference group.

\*\*Female was the reference group.

hospital after adjusting for age, sex, IMD and urban/rural setting. Men with suspected cardiac pain were 76% more likely to be transported to hospital than women (Table 5).

## Discussion

We found similarities in pre-hospital ambulance care for non-White compared with White patients with suspected cardiac pain. However, non-White patients were more likely to have a number of clinical assessments recorded and less likely to be transported to hospital. Women with suspected cardiac pain were also less likely to be transported than men. The finding that non-White patients were significantly more likely than White patients to have blood glucose recorded could be explained by higher levels of diabetes among the former.

Delaying or refusing medical treatment may increase the risk of preventable morbidity and mortality in conditions such as cardiac disease [15,20]. In some minority ethnic groups, such delays or refusals can be because of a number of inter-related factors including, different cultural norms, perceived discrimination, language and communication problems and limited knowledge of how and when to appropriately use health care services. Cultural norms and beliefs can influence health and help-seeking behaviour, for example, in some minority ethnic groups, it is not considered 'masculine' to seek help or express pain [20,21]. There is also a greater reliance on the family to manage illness in some ethnic groups [22]. For example, the family is a key agency in seeking medical help [20,23] in some South Asian families in the UK who are more likely to live in large households with an extended family network to call upon [24].

Clinicians need to be aware of differences in how patients report their symptoms and to consider the impact of language, culture and gender on the assessment process [21]. Low levels of cultural understanding among staff can lead to discriminatory experiences that can reduce trust and lead to future reluctance to use services [14,16,25].

People from minority ethnic groups who have lower levels of acculturation, that is, shorter residencies, limited language skills and awareness of the different health structures and systems, and so on, may also find it more difficult to access health care services [25,26]. Access to appropriate health care services may be reduced further by a lack of knowledge of symptoms [16,20]. Limited understanding of symptoms together with the complexity of a new health care system allied to lack of information about how health care works can lead to people using services that are inappropriate to their needs, which can lead to increased pressure on pre-hospital ambulance care [16,27].

Language and communication problems are another reason why there is under-use of pre-hospital ambulance care among some minority ethnic groups. For example, language can be a significant barrier for patients when trying to communicate their symptoms over the telephone to emergency call handlers [26]. Interpreting services are available for ambulance staff but may be inaccessible at certain times or unable to provide necessary languages or dialects [28]. This places a greater reliance on family members to translate, which also has its drawbacks [28,29]. Language barriers can also lead to miscommunication of diagnosis and treatment resulting in preventable morbidity and mortality [26,30].

While previous literature suggests that some ethnic groups are reluctant to seek help for medical conditions, evidence also suggests that they may be taken less seriously by health care professionals or perceived as inappropriately frequent users of health services. In the UK, GPs sometimes perceive that their South Asian patients take up more time in the surgery presenting with 'trivial' disorders [31].

The significant proportion of patients for whom ethnicity data was missing also raises issues for ambulance services, especially as they strive towards their statutory equality duties set out in the Equality Act 2010. Paramedics are required to collect ethnicity data from patients, but ambulance services may not record such information accurately or at all. For example, in 2013/2014, one ambulance service reported recording only 47% of patient ethnicity data [32]. There are a number of reasons for the incompleteness and inaccuracy of ethnicity data recording. Given the emergency nature of the situations, paramedics may focus on patients' clinical conditions rather than recording ethnicity. Paramedics may also feel uncomfortable asking the patient their ethnicity as they are worried how this question may be perceived by the patient, who may be reluctant to disclose their ethnicity. This problem is heightened by the lack of consistency of ethnicity coding between ambulance services [6]. The incompleteness of ethnicity data is likely to hinder progress towards reducing ethnic health inequalities [33].

### Implications for future practice and research

These findings call for further studies utilizing larger and more complete data sets to explore ethnic differences in pre-hospital ambulance care. Qualitative studies could also be used to explore

the experiences of minority ethnic patients and other groups of patients with suspected cardiac pain or other conditions where differences in pre-hospital management are found. A better understanding of the cultural factors affecting expression and choice of treatment could improve the quality and equity of pre-hospital ambulance care for minority ethnic patients suffering from suspected cardiac pain or other conditions.

### Strengths and weaknesses

Our analysis showed significant differences for ethnic groups in the way that some aspects of pre-hospital ambulance care were delivered to patients with suspected cardiac pain. Although we used a large data set, almost one-third of patients had missing ethnicity data. This could be due to language barriers, time constraints, patient reluctance to disclose ethnicity and paramedics prioritizing the improvement of clinical conditions rather than ethnicity data recording. The missing ethnicity data may have been a source of bias and led to overestimation or underestimation of the differences by ethnicity. The low numbers of minority ethnic patients also prevented ethnic group analysis, which limits the extent to which our findings can be generalized. Also, variation in diagnostic codes used by paramedics could have led to differences by ethnicity.

### Conclusion

This is the first study showing differences in pre-hospital ambulance care for people with suspected cardiac pain according to ethnic status. The ethnic differences in the treatment of suspected cardiac pain could be due to recording bias, differences in the clinical conditions presented or real disparities in clinical management. Ethnic differences in treatment for suspected cardiac pain may also arise through cultural differences, discriminatory experiences, language and communication problems and a limited patient awareness of symptoms and how to use health care services appropriately. There may also be issues about local variations in ethnic classifications, which may lead to paramedics being unsure of how to record patient ethnicity data. When attending emergency situations, paramedics may not prioritize the recording of patient ethnicity data as their primary focus will often be on trying to improve the patient's clinical condition. We also found that women with suspected cardiac pain were less likely to be transported to hospital compared with men. Such differences merit further quantitative investigation with larger, more complete data sets. If these differences are confirmed, qualitative exploration of reasons why they exist is needed.

### Conflict of interest

The authors declare no conflict of interest.

### Ethical Approval

This study was approved by the Ethics Committee of the University of Lincoln. Approval for Research Management and Governance was sought and gained from East Midlands Ambulance Services NHS Trust.

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## Data Sharing Statement

No additional data available.

## Authors' Contributions

ANS conceived the original idea for the study. ZA conducted the statistical analysis. All authors contributed to the design and conception of the paper. ZA wrote the first draft of the paper. All authors contributed to the discussion and final paper. ANS is guarantor for the study.

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