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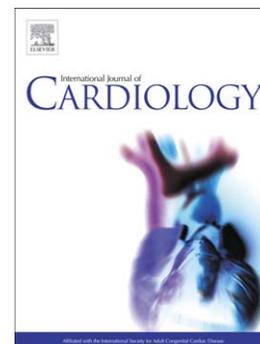
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Length of hospital stay is shorter in South Asian patients with Ischaemic Stroke**Short Communication to Editor – International Journal of Cardiology**

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Short title: - Ethnicity and duration of hospital stay in Ischaemic Stroke

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Dear Editor,

Ischaemic stroke is a global healthcare issue and in the UK one percent of all admissions to National Health Service (NHS) hospitals were due to stroke¹. It is the leading cause of disability, with more than half of the survivors left dependent on others, of which 11% are newly admitted to care homes. The majority of survivors will require rehabilitation and additional care in the community^{2,3}. These additional needs culminate with longer hospital admissions, with a mean length of hospital stay (LOS) of 20 days³. These studies have predominantly been conducted on Caucasian population groups and there is a dearth of research investigating LOS amongst ethnic minority groups. In the UK, NHS hospitals serve large multi-ethnic populations and further research in this field is essential. We aimed to explore the effect of ethnicity on LOS in patients presenting with ischaemic stroke from a large catchment area in the North West of England, UK.

Using completely anonymous data, we traced adult patients admitted with ischaemic stroke across seven hospitals in the North West of England using the ACALM (Algorithm for Comorbidities, Associations, Length of stay and Mortality) study protocol between 1st January 2000 and 31st March 2013. The ACALM study used the International Classification of Disease, Version 10 (ICD-10) diagnosis codes and Office of Population Censuses and Surveys Classification of Interventions and Procedures (OPCS-4) to trace patients. Study participants admitted with a diagnosis of any type of ischaemic stroke, as defined by ICD-10 codes (including subsets), were examined by LOS, ethnicity, age, gender, co-morbidities and type of admission. The Caucasian population was used as a reference group, in comparison to other ethnic groups classified as South Asian, Afro-Caribbean, Oriental, mixed ethnicity, other ethnicity, and unknown ethnicity. The presence of co-morbidity was defined by the presence of any of the top eight causes of mortality in the UK apart from cerebrovascular disease, namely Ischaemic Heart Disease, Heart Failure, Lung Cancer, Breast Cancer, Dementia, Chronic Kidney Disease, Chronic Obstructive Airways Disease.

Data analysis was performed using SPSS Version 20.0. Variation in the LOS between ethnic groups was analysed by means of a logistic regression model adjusted for age, sex and co-morbidity with the Caucasian ethnic group as the reference. Completely anonymous patient data was used and processed in accordance with local ethical research and development policy. The methodology has been previously described and used by our group and similar methodology has been used by other groups.⁴⁻¹⁴

Within the study period, there were 929465 patients admitted. Of these, 17 415 (2.7%) were coded for ischaemic stroke using the International Classification of Disease (ICD) codes 433-434, inclusive of all subsets of these codes. Our results showed nearly equal proportion of male and female patients with ischaemic stroke amongst all groups combined (49% Male, 51% Female%). However, ethnic variations were present; Ischaemic stroke being more common amongst males in the South-Asian and Afro-Caribbean populations and more common amongst females in the Oriental and Mixed ethnic groups as shown in Table 1. 95.5% of the patients were admitted as an emergency and the average length of stay was 19.6 days. This is in keeping with the national data of mean 20 days³. Admissions from the black and ethnic minority population comprised 7.8% of total admissions with ischaemic stroke and these patients were also younger than the Caucasian population. The LOS was strikingly shorter in the South Asian ethnic group with a mean hospital stay of 12 days which compared with the Caucasian population after adjusting for age, gender and co-morbidity ($p < 0.01$). LOS was significantly longer in Afro-Caribbean patients. Full results are shown in table 1.

Our main findings were 1) Significantly shorter LOS in the South Asian ethnic group compared to the Caucasian group, even after modeling for differences in age, gender and co-morbidities. 2) Significantly longer LOS in Afro-Caribbean ethnic group (Table 1). Such ethnic disparities in LOS with ischaemic stroke warrant further investigation. Our data sets did not allow us to examine for any association with the presence of community based specialist discharge facilities, a factor which was previously recognised to support discharge and improve outcome for patients¹⁵.

Although the reasons for the shorter LOS are unknown, there is evidence which suggests that less support is offered to the ethnic minority populations at the time of discharge and/or that they may be discharged prematurely and consequently have a greater chance of readmission¹⁶. Similar findings were revealed in a recent study from Birmingham, UK, looking at LOS in patients with Diabetes⁵ and three other studies by our group in the North West of England looking at length of hospital stay for patients post Myocardial Infarction, Pulmonary Embolism and Aortic Valve Disease^{6,8}. A further two studies by our group looking at the LOS post coronary artery bypass grafting and cardiomyopathy showed that South Asians, Far-East Asians and Afro-Caribbean's respectively, have a longer length of stay⁷. The reason for these disparities is not clear but there is evidence that a more supportive home environment amongst the South Asian and mixed ethnicity groups allows for early discharge^{5,6,8}. However, the possibility of an inappropriate early discharge warrants further investigation.

To assess the potential ethnic inequities in hospital care in the National Health Service, further studies with defined outcomes such as discharge support, the availability of community discharge facilities and the rate of adverse events are required. We believe the results of the study, alongside the issues highlighted will pave the way to better inpatient care with safe and appropriate discharges in centers with large multi-ethnic populations.

Despite awareness of inequities in health care quality, little is known about strategies that could improve the quality of healthcare for ethnic minority populations. We believe that the results of this study and the issues it raises may help design and improve care of inpatients with ischaemic strokes in regions with large multi-ethnic populations.

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Conflicts of Interest/Disclosure

All authors declare no conflicts of interest. All authors do not have any relevant disclosures.

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Table 1 - Characteristics of admissions for patients with Ischaemic Stroke

Ethnicity	n(%)	Mean Age (yrs)	F:M Ratio	%admitted as emergency	%with co-morbidity	Mean LOS (days)	ODDs ratio for length of stay*
All Groups	17415	73.8	1:1	95.5	57.2	19.6	-
Caucasian	14586 (83.8)	74.2	1:1	95.7	58.5	19.3	1
South Asian	764 (4.4)	65.1	0.8:1	92.8	53.8	12.8	0.993 (0.989– 0.996) #
Afro-Caribbean	275 (1.6)	66.9	0.7:1	83.6	46.2	25.6	1.003 (1.001-1.005) #
Oriental	59 (0.3)	73.5	1.3:1	88.1	37.3	24.1	1.002 (0.998-1.007)
Mixed	31(0.2)	58.6	1.2:1	87.1	54.8	12.3	0.993 (0.978-1.009)
Other	234(1.3)	70.9	1:1	94.9	44.0	26.9	1.004 (1.001-1.006) #
Unknown	1466 (8.4)	75.7	1.1:1	97.5	51.2	24.5	1.003 (1.001-1.006) #

LOS = Length of hospital stay *adjusted for age, sex, co-morbidity, # statistically significant, p<0.05