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South Asian strokes: lessons from the St Mary's stroke database

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Summary

Background: South Asians comprise the largest ethnic minority population in the UK. This subgroup is known to have an elevated risk of stroke. However, there is limited data on patterns of cerebrovascular disease and associated risk factors in this population.

Aim: The aim of this study was to analyse differences in stroke subtype and risk factor profile between South Asian and White stroke patients admitted to a central London teaching hospital.

Design: Prospective database of all admissions to the St Mary's Hospital stroke unit.

Methods: We examined ethnicity, stroke subtype and risk factor profile of consecutive patients admitted to the stroke unit between 8 October 2003 and 14 February 2007.

Results: A total of 811 patients were identified of whom 736 had strokes. Four hundred and ninety-six (67%) occurred in the White subgroup, and

72 (10%) in the Asian subgroup. The South Asian subgroup was significantly younger (65 vs. 73 years in the White subgroup; $P < 0.001$). They had higher rates of hypertension (age adjusted frequency 87% vs. 64%; $P < 0.0001$), diabetes (54% vs. 15%; $P < 0.0001$), and hyperlipidaemia (70% vs. 45%; $P = 0.001$). There were lower rates of smoking (15% vs. 33%; $P < 0.0001$). There was a trend towards more lacunar infarcts and less total anterior circulation infarcts in South Asians, although after age adjustment this was not significant at the 5% level.

Conclusions: The South Asian subgroup has shown important differences in risk factor profile compared with the White population. The higher frequency of hypertension, diabetes and hyperlipidaemia seen in this subgroup are an important consideration in designing secondary prevention programmes tailored specifically to this community.

Introduction

Different ethnic groups have differing risk factor profiles and rates of cerebrovascular disease. Differences between the White and Black stroke populations have been well documented on both

sides of the Atlantic.^{1,2} However, there are limited data on patterns of cerebrovascular disease in the South Asian ethnic population.

The UK is an ideal setting to study the South Asian population, in view of its multi-ethnic population. South Asians (Indian, Pakistani, Bangladeshi and

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Sri-Lankan origin) make up the largest ethnic minority population in the UK. Studying this subgroup within the UK allows direct comparisons to other ethnic groups, and therefore overcomes limitations of studies from the Indian subcontinent.

Ethnic minorities make up 7.9% of the total UK population. The 2001 UK Census reported South Asians make up 50% of the ethnic minority population of the UK (total ethnic minority population of 4.6 million, of which 2.3 million are South Asians). This subgroup is known to have a higher prevalence of coronary artery disease, and a 1.5 times greater mortality from heart disease and stroke, compared with the general population.³ The reasons for the elevated stroke risk amongst the South Asian population remain unclear and poorly studied. In the studies of the general population, classical risk factors for stroke such as blood pressure are raised in some but not all South Asian subgroups, compared with the ethnic White population.⁴

The aim of this study was to analyse ethnicity, stroke subtype and risk factor profiles among stroke admissions to a Central London Teaching Hospital. Detailed analysis of the South Asian subgroup was made, and comparisons made to the White population.

Methods

The St Mary's stroke database is an ongoing prospective database of all patients admitted to the stroke unit at St Mary's Hospital, London (including those who died following admission). Data on demographic details including ethnicity, risk factors and stroke subtype [according to the Oxford Community Stroke Project (OCSP) Classification], as well as results of investigations are recorded on the database. These data are entered by a specialist registrar in stroke medicine, and all new entries reviewed on a weekly basis by a consultant stroke physician and a consultant neurologist.

London is the most ethnically diverse region in the UK, with South Asians making up 12% of the total population, compared with an average of 4% across the rest of the country (UK Census 2001). St Mary's Hospital serves an ethnically and economically mixed population of approximately 300 000, mainly from the London boroughs of Westminster, Kensington and Chelsea and Brent. The proportion of South Asians in these boroughs is 9, 5 and 28%, respectively.

Consecutive patients admitted into the St Mary's Stroke Unit between 8 October 2003 and 14 February 2007 were studied. Patients with a diagnosis of subarachnoid haemorrhage, transient

ischaemic attack, migraine, epilepsy or other non-stroke diagnoses were excluded from the analysis. Exclusions were made on the basis of clinical and radiological criteria.

Ethnicity was subdivided as follows: (i) White; (ii) Black or Black British (includes African and Caribbean origin); (iii) Asian or Asian British (includes Indian, Pakistani, Bangladeshi and Sri-Lankan origin); (iv) Chinese or others (includes South-East Asian origin and Middle-Eastern); and (v) Mixed. Ethnicity was coded on the basis of self-report, or patient appearance if no clear record existed.

Stroke risk factors were determined as follows. Hypertension was defined as BP >140/90 on more than two occasions (at least 2 days post-admission), or on the basis of past medical history (self-reported or previously documented in case notes) or medication list on admission. Diabetes was defined as fasting blood glucose >7.0 mmol/l or random blood glucose >11.1 mmol/l, on at least two occasions (at least 2 days post-admission), or on the basis of past medical history (self-reported or previously documented in case notes) or medication list on admission. Hyperlipidaemia was defined as a total cholesterol >5.0 mmol/l, or defined on the basis of past medical history (self-reported or previously documented in case notes) or medication list on admission. Peripheral vascular disease was defined on the basis of past medical history (self-reported or previously documented in case notes). Cardiac history included self-reported or documented history of ischaemic heart disease, heart failure or valvular heart disease. Atrial fibrillation was defined on the basis of past medical history (self-reported or previously documented in case notes), or 12-lead electrocardiogram results since admission.

Differences were analysed using χ^2 -test, Fisher's exact test and *t*-test, where appropriate. Logistic regression was used to obtain age adjusted *P*-values for the differences between ethnic groups. *P* < 0.05 was taken to denote statistical significance.

Results

A total of 811 patients were identified, of whom 736 had a confirmed stroke. Seventy-five patients were excluded from the analysis, on the basis of the pre-defined exclusion criteria. Four hundred and ninety-six strokes (67%) occurred in the White subgroup, 127(17%) in the Black subgroup and 72(10%) in the Asian subgroup (Table 1). The remaining 6% included the Chinese/other and mixed subgroups.

Table 1 Patient characteristics and stroke subtype (OCSF classification), according to ethnicity

	White	South Asian	<i>P</i> -value	Age-adjusted <i>P</i> -value	Age-adjusted odds ratio	Age-adjusted 95% confidence intervals
Total strokes, <i>n</i>	496	72				
Mean age (years) (SD)	73 (13.4)	65 (13.2)	<0.001			
Male sex, <i>n</i> (%)	268 (54)	39 (54)	0.9			
Haemorrhagic strokes, <i>n</i> (%)	55 (11)	14 (19)	0.05	0.09	1.76	0.91–3.42
Ischaemic strokes, <i>n</i> (%)	441 (89)	58 (81)	0.05	0.09	0.57	0.29–1.10
Total anterior circulation infarcts, <i>n</i> (%) ^a	57 (12)	2 (3)	0.03	0.10	0.29	0.07–1.25
Partial anterior circulation infarcts, <i>n</i> (%) ^a	136 (31)	13 (22)	0.22	0.35	0.73	0.38–1.41
Lacunar infarcts, <i>n</i> (%) ^a	140 (32)	26 (45)	0.05	0.11	1.60	0.91–2.80
Posterior circulation infarcts, <i>n</i> (%) ^a	87 (20)	15 (26)	0.30	0.54	1.22	0.64–2.32
Undetermined ischaemic subtype, <i>n</i> (%) ^a	21 (5)	2 (3)	1.0	0.89	0.90	0.20–4.05

^aPercentages are expressed as a proportion of number of ischaemic strokes.

Table 2 Comparison of age-adjusted risk factor frequencies between White and South Asian subgroups

	White	South Asian	Age-adjusted <i>P</i> -value	Age-adjusted Odds Ratio	Age-adjusted 95% Confidence Intervals
Total strokes, <i>n</i>	496	72			
Hypertension (%)	64	87	<0.0001	4.80	2.25–10.00
Diabetes (%)	15	54	<0.0001	6.90	3.94–11.93
Previous stroke (%)	23	29	0.14	1.54	0.86–2.74
Smoking history (%)	33	15	<0.0001	0.20	0.09–0.43
Hyperlipidaemia (%)	45	70	0.001	2.60	1.46–4.62
Peripheral vascular disease (%)	8	5	0.26	0.5	0.15–1.70
Cardiac history (%)	36	39	0.32	1.33	0.76–2.34
Atrial fibrillation (%)	23	12	0.29	0.66	0.30–1.45

The South Asian subgroup was significantly younger with a mean age of 65 years (SD 13.2) vs. 73 years (SD 13.4) in the White subgroup ($P < 0.001$). There were no significant gender differences.

There were more haemorrhagic strokes in the South Asian cohort. Amongst ischaemic strokes, there was a trend towards more lacunar infarcts and less total anterior circulation infarcts in South Asians, although after age adjustment, this was not significant at the 5% level (Table 1). Any differences in stroke subtype between the South Asian and White subgroups appeared to be explained by age difference.

Age adjusted risk factor profiles of the White and South Asian stroke subgroups are documented in Table 2. The South Asian group had higher rates of hypertension ($P < 0.0001$), diabetes ($P < 0.0001$) and hyperlipidaemia ($P = 0.001$). There were lower rates of smoking ($P < 0.0001$).

Discussion

This is one of the first papers to examine stroke subtypes and risk factor profiles amongst South Asian stroke patients, and is to our knowledge the first such London-based study. This subgroup has shown important differences in risk factor profile compared with the White population. South Asians were younger, with significantly higher rates of hypertension, diabetes and hyperlipidaemia.

A study of stroke mortality amongst South Asian stroke patients conducted in the West Midlands (UK) found similar patterns of risk factor profile.⁵ This study of 242 South Asian ischaemic stroke patients found similar high rates of hypertension and diabetes to our study. They did, however, show considerably lower rates of hyperlipidaemia (7% vs. 70% in our study), which may reflect the retrospective nature of their data collection, and reliance on documentation in case notes. It may also reflect a

different South Asian subpopulation in the West Midlands, compared with that in London.

The elevated risk of coronary heart disease in the UK migrant South Asian population has been extensively studied. Elevated levels of glucose intolerance, central obesity, fasting triglyceride and insulin in comparison to the native White population have been found.⁴ The reason for increased susceptibility to insulin resistance is probably related to a combination of genetic and environmental factors, including urban migration and an associated mismatch between early and later life metabolism.^{6–8}

Our finding of significantly higher rates of diabetes and hyperlipidaemia amongst the South Asian stroke subgroup would be in keeping with the above observations. A UK-based study of insulin resistance amongst South Asians with stroke found that insulin resistance has significant metabolic and thrombotic associations in this subgroup.⁹ It has been hypothesized that fibrinolytic and coagulation factors may contribute to accelerated and premature atherosclerosis in South Asians through insulin resistance.

Comparisons of OCSF stroke subtype found a higher proportion of lacunar infarcts in the younger, more insulin resistant and more hypertensive South Asian group, though these differences were not significant after age adjustment. There was a lower proportion of total anterior circulation strokes in the South Asian subgroup, which is in keeping with the finding of less atrial fibrillation.¹⁰ In addition, there were a higher proportion of haemorrhagic strokes which would be compatible with the significantly higher rates of hypertension in the South Asian subgroup. These differences, however, were not significant after age adjustment.

Studies looking at Black stroke patients in the UK show some similarities to our results. The South London Ethnicity and Stroke Study (SLESS), comparing Black and White stroke patients, has shown significant differences in risk factor profile and stroke subtype between the two groups.¹¹ In particular, there were higher rates of hypertension and diabetes and an excess of lacunar infarcts in the Black subgroup, similar to the findings in our South Asian cohort. There are likely to be aetiological differences between Black and South Asian stroke patients. However, these two studies are not directly comparable due to differences in study design.

It is important to note that the South Asian UK population is a heterogeneous group comprising people from different geographical, religious and linguistic backgrounds. They have differing lifestyles and dietary habits, and study of coronary heart disease risk factors amongst these groups have shown important differences.¹² The South Asian group in

our study had lower rates of smoking compared with the White population; smoking rates are known to differ amongst different subgroups within the South Asian community. Further population-based study of the South Asian UK stroke population is warranted to examine aetiological differences between the different subgroups, as well as comparisons with the ethnic White population.

Research on coronary heart disease amongst migrant South Asians has also focussed on comparisons to non-migrant patients within the Indian subcontinent.⁶ This is yet to be done in the stroke population, and may reveal important effects of urbanization as well as migration. A population-based study of stroke subtypes in India has revealed a higher proportion of haemorrhagic strokes (32%) than we would expect in the West (19% in our South Asian subgroup).¹³ Direct comparisons in a well-designed study are therefore imperative.

This study has a number of limitations. The absolute numbers within the subgroup analyses are relatively small, and our study is likely to be underpowered to detect differences in stroke subtypes between the two groups, despite the trends seen. Use of the clinical OCSF for stroke subtyping has been shown to be associated with overestimation of lacunar infarcts within the White stroke population.¹¹ An aetiological classification system such as the pathophysiological Trial of Org 10172 (TOAST)¹⁴ criteria would have added useful data for comparison with the OCSF subtyping, and furthermore may have shed light on aetiological differences between the two groups. Our database does not collect data on the TOAST criteria, though it has been subsequently updated to include this. Finally, the lack of data on ethnic subgroups within the South Asian population is a further drawback of this study.

Summary

In conclusion, our study has revealed important differences of the South Asian stroke population. Differences in stroke subtype and prevalence of risk factors in this group warrant further study, in order to shed light on likely aetiological differences. It is now well recognized that different ethnic minority populations may require specific targeted strategies in order to reduce the burden of stroke in these communities. Our findings are an important consideration in designing primary and secondary preventative programmes tailored specifically to this subgroup, the largest minority population in the UK.

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