An Examination of Stroke Risk and Burden in South Asians

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Background: South Asians (India, Pakistan, Sri Lanka, Bangladesh, Nepal, and Bhutan) are at a disproportionately higher risk of stroke and heart disease due to their cardiometabolic profile. Despite evidence for a strong association between diabetes and stroke, and growing stroke risk in this ethnic minority—notwithstanding reports of higher stroke mortality irrespective of country of residence—the explanation for the excess risk of stroke remains unknown. *Methods:* We have used extensive literature review, epidemiologic studies, morbidity and mortality records, and expert opinions to examine the burden of stroke among South Asians, and the risk factors identified thus far. *Results:* We summarize existing evidence and indicate gaps in current knowledge of stroke epidemiology among South Asian natives and immigrants. *Conclusions:* This research focuses attention on a looming epidemic of stroke mainly due to modifiable risk factors, but also new determinants that might aggravate the effect of vascular risk factors in South Asians causing more disabling strokes and death. **Key Words:** Stroke—race and ethnicity—immigrants—South Asians—special populations—epidemiology.

Introduction

Immigrants from South Asia (India, Pakistan, Bangladesh, Bhutan, Nepal, and Sri Lanka) living in developed countries represent a unique and growing population with high prevalence of premature atherosclerosis.[1-5] Comprising 25% of the world's population, South Asians are a rapidly growing immigrant group in Northern America with current estimates of 4.8 million in the United States and 1.6 million in Canada.[6] Many South Asians immigrated to developed countries between 1965 and 1985; these immigrants have now reached an age when stroke and dementia occurrence is a major health concern. For over 50 years, it has been known that native and immigrant South Asians are at increased risk for diabetes mellitus with major stroke risk at epidemic proportions. For natives, stroke mortality is high[7] and not fully explained by poverty and low stroke awareness. For immigrants, stroke mortality is equally concerning; however, epidemiologic data pertaining to this particular population are scarce because South Asians are rarely distinguished from East Asians in most national health surveys and hospital-based stroke registries. In fact, current stroke treatment and prevention guidelines rely heavily on clinical trials that have enrolled too few South Asian immigrants for meaningful subgroup analyses. In order to adequately understand and serve this growing ethnic population in developed countries, there must be more and better data on stroke burden and risk in South Asian immigrants. The present article examines evidence from studies on stroke risk factors, burden, subtypes thus far, and ongoing investigations in South Asian immigrants.

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Stroke Epidemiology, Types, and Subtypes in South Asians

There are few well-designed, population-based studies reporting stroke burden in South Asians. Most data come from India,[8-12] with an annual incidence of 123-145 per 100,000 and the age-adjusted prevalence of 84-262 per 100,000 in rural and 334-424 per 100,000 in urban areas.[11] In Pakistan, annual stroke incidence as derived from hospital-based studies, and thus likely a low estimate, is 250 per 100,000.[13,14] The estimated prevalence of stroke in Sri Lanka is as high as 9 per 1000.[15] The numbers from Bangladesh are similarly alarming, ranging from 3 to 10 per 1000 population.[16-18] Data from other South Asian countries such as Afghanistan, Bhutan, and Nepal are not available. Therefore, although there may be high prevalence in these countries, we are unable to come to any conclusions about epidemiology due to lack of data. Ultimately, there is a critical lack of epidemiologic data on stroke in South Asian natives in addition to that in immigrants.

Understanding the prevalence of different types of stroke (hemorrhagic versus ischemic) is necessary for appropriate risk modification. Community-based studies from India, Pakistan, and Bangladesh reported high rates (20%-46%) of hemorrhagic strokes compared with Western countries. Hemorrhagic stroke is known to be associated with a greater mortality rate despite being less prevalent than ischemic stroke. Similarly, although the prevalence of cerebral venous thrombosis (CVT) worldwide is lower than that of ischemic stroke, CVT prevalence in South Asia is the highest in the world.[19-21] Moreover, CVT accounts for a large portion of stroke in young women in the region.[9,22-28] Stroke remains to be the leading cause of death among South Asian women over age 60[29] and is common during pregnancy and the postpartum period.[30]

The prevalence of various subtypes of ischemic stroke in South Asians versus Western natives suggests another area of necessary investigation. Extracranial atherosclerosis is common in the West; intracranial atherosclerosis in both anterior and posterior circulations appears to predominate among South Asians.[2,31,32] However, differences in the extent of etiologic testing in South Asia versus developed nations may account for some of the reported differences in stroke mechanisms. Atrial fibrillation in this population may be infrequent, despite its role as one of the main risk factors of stroke in Caucasians.[33-35]

Lacunar stroke is the most common ischemic stroke subtype in South Asians living in the United States and attributes to a higher prevalence of diabetes in this group.[3] South Asians with ischemic stroke are also more likely to have intracranial atherosclerotic stenosis (ICAS), as compared with whites,[36] yet the predictors of ICAS other than reports of clustering of traditional stroke risk factors have not been fully examined. Compared with other ethnic groups, the pattern of ICAS described in South Asians is more diffuse and involves multiple cerebral arteries in addition to the symptomatic artery.[4,33] Whether or not the presence of metabolic risk factors in South Asians exacerbates the effects of ICAS on cerebral vasculature and the brain parenchyma is yet to be determined. Ultimately, predictors of ICAS have yet to be fully examined. Silent cerebral ischemia, indicating stroke risk, and brain atrophy, indicating cognitive decline, in the symptomatic territory are frequently associated with ICAS.[31] ICAS is thus a potential early marker of stroke risk and cognitive decline.[34] According to a hospital-based neuroimaging study, ICAS occurs in 1 out of 3 asymptomatic Pakistanis with modifiable vascular risk factors. Longitudinal observational studies, such as this, are therefore needed to assess the natural history of ICAS in this racial/ethnic group.

Stroke Incidence and Mortality in South Asian Immigrants

Indeed, South Asia is the biggest contributor of stroke deaths in the world.[37,38] In this region, stroke mortality might be as high as that of coronary artery disease (CAD),[39] and both stroke and CAD occur about a decade earlier in South Asia than in wealthy countries.[12,40] The following several studies investigate the estimation of stroke incidence and stroke mortality in South Asian immigrants.

In a population-based study, the incidence of stroke among South Asians living in the UK was estimated to be 111 per 100,000 persons, comparable with the incidence among Caucasians.[41] Stroke mortality in South Asians living in the United Kingdom, however, was 1.5 times higher than the general population.[42-44] The stroke risk profile, such as hyperlipidemia, has increased fivefold among South Asians, compared with Caucasians. For South Asian immigrants living in the United Kingdom, higher stroke mortality is consistent with reports of higher risk of CAD. In the United States, a small, community-based study determined stroke prevalence in South Asians to be 2.8% in 1991,[1] which is similar to the age-adjusted stroke prevalence in other racial/ethnic groups. Stroke mortality among South Asian U.S. residents is 2-3 times higher than their Caucasian counterparts.[45] South Asian immigrants living in America have the highest ischemic heart disease mortality rate among the top 6 racial/ethnic groups.[46] There is no evidence to support such an assertion on the links between stroke and CAD among South Asians living in the United States.

The SABRE (Southall and Brent Revisited) study is a longitudinal tri-ethnic, community-based cohort with a 20-year follow-up from London examining ethnic differences in cardiovascular disease (CVD) and stroke (see Table 1).[47] Compared with Europeans, South Asians experienced more strokes (age- and sex-adjusted Standardized Hospitalization Ratio: 1.45 [95% confidence interval [CI]: 1.17 to 1.80, $P = .001$]), made worse by the presence of diabetes (age-adjusted Standardized Hospitalization Ratio: 1.97 [95% CI: 1.16 to 3.35, $P = .038$ for interaction]).[47]