

## Ethnic South Asian Radiologists: Their Increasing Prevalence and Geographic Distribution

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### Abstract

Since the passage of the Hart-Celler Immigration and Naturalization Act of 1965, the entry of South Asians seeking citizenship into the United States has continued unabated, first predominantly from India, but now also from Pakistan and Bangladesh. Their presence together has become increasingly important in medicine in general and in radiology in particular. The prevalence of South Asians among American radiologists is assessed by our analysis of the membership panel of image interpreters of One Call Medical, a broker of CT and MRI for workers compensation cases, which encompasses more than 19,000 radiologists. From that list, by analysis of Hindu surnames, Americans of Indian nativity and ancestry constitutes 4.8% of all members. A parallel analysis of Americans having Muslim surnames common in South Asia, including those with familial ties to India, Pakistan, and Bangladesh, yielded another 2.3%. Therefore, collectively South Asians make up 7.1% of all radiologists in this group, which includes nearly half of all American radiologists. Hence, the percentage of South Asians as radiologists in the United States now far exceeds their percentage in the general American population.

**Keywords:** South Asians; Surname analysis; Radiologists

### Introduction

The passage of the Hart-Celler Immigration and Naturalization Act of 1965 initiated the flow of South Asians to the United States [1]. Today the ethnic South Asian community not only encompasses immigrants and their offspring from India, but also increasing numbers of individuals from Pakistan, Bangladesh and their descendants. This investigation quantifies both in number and percentage the characteristics of ethnic South Asian radiologists among the large sample encompassing nearly half of all those practicing in their specialties in the United States.

### Materials and Methods

One-call medical (OCM) is a specialized preferred provider organization (PPO) that brokers diagnostic imaging services associated with reimbursement from worker's compensation organizations, group health companies, and the auto insurance industry. It has been in business since 1995 and operates in 47 of 50 states. The source of our database is the cumulative membership list of all enrollees from the time of the company's inception to 2013. In its roster of imaging providers OCM records the last name, first name, middle name, professional degrees, and the state of practice for each of the radiologists in its network. The number of radiologists in OCM's panel was 19,347, a sizeable fraction of the approximately 30,000 to 40,000 radiologists who are in or were in practice from 1995 to the present.

Two researchers, each of Indian origin, surveyed this membership list to identify, by analysis of last names, radiologists of South Asian ancestry and nativity. Among those recognized to be of Hindu origin, the provincial specificity of their surnames permitted the assigning of each to a particular Indian state, which was the likely provenance of the radiologist or his or her forebears. Assessment of the first name was used in cases in which the Indian state of origin was unclear based only on the last name. The absolute number of radiologists and their percentage per Indian state was calculated, as was the fraction of all Hindu-surnamed radiologists in OCM's membership list.

Muslim Radiologists having surnames common in South Asia, were also identified from the cumulative membership list. No

distinction could be made as to the national origin of each of them, as they could have been from Pakistan, Bangladesh, or India. Both the Hindu-identified and the Muslim-identified members of OCM's panel were disaggregated according to their current state of residence.

To compare the percentage of radiologists of South Asian origin to all radiologists comprising OCM's panel and relate it to the percentage of South Asians among all those who have achieved citizenship the United States, information about Indian-Americans from the decennial censuses from 1960 to 2010 was recorded. The total number of foreign-born American citizens of Indian, Bangladeshi and Pakistani background was collected from the 1990, 2000 and 2010 censuses. For both the Indian surnamed radiologists and those with identifiable South Asian concentrated Islamic last names, the six American states having the highest number of such radiologists was charted. For comparison purposes, the US six states in which radiologists of Muslim origin was also recorded.

### Results

An examination of the US census data from 1990 to 2010 revealed that the number of foreign born Indian-Americans had increased each decade from 12,296 in 1990 to 450,406 in 2000 [2,3]. The size of this cohort increased further to 1,780,322 by the year 2010 [4]. The sum of the number of Indian-Americans born in India and the number of Indian-Americans born in the United States was 570,000 in 1990 [5]. In 2010 it had more than quadrupled to 2,843,391 [6]. From these data we were able to calculate that the number of Indian Americans born in

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America was 119,574 in 1990, and had increased to 1,065,069 by 2010 (Tables 1-4).

In comparison, of the 19,347 radiologists registered in OCM’s panel, 906 (4.8%) had Hindu surnames. The distribution of these radiologists including immigrants and American born descendants of immigrants was not evenly distributed with respect to the Indian state of origin. As was seen in previous studies, Gujarat, a state of average population size, made a disproportionate contribution to the pool of American-based ethnic Indians. In previous studies Andhra Pradesh ranked second but now it was supplanted in that regard by radiologists with familial ties to the province of Punjab [7-9].

Collectively US census data as since 1990 included estimations of foreign born American-Pakistanis and foreign born Bangladeshi-Americans-Both of which are populous ok whose citizenry are predominantly Islamic in religious orientation. The census data from the number of foreign-born Bangladeshi american increased from 4,989 in 1990 to 153,691 in 2010 [10]. Foreign-born Pakistani Americans also showed a similar trend, increasing from 1,708 in 1990 to 299,581 in 2010 [10].

In comparison, of the 19,347 radiologists on OCM’s panel, 431 (2.3%) Muslim surnames characteristic of South Asian origin were identified. However, from the list one cannot determine the specific nationality of each, as they could be from Pakistan, Bangladesh, or even India. The population of Pakistan is 176.7 million [11] and the population of Bangladesh is 150.5 million [11] of the 1.2 billion citizens of India 14.6% are Muslim as well [12]. Together, combining the percentage of Hindu surnamed and Muslim surnamed radiologists 7.1% of all the enrollees in OCM’s panel were South Asian by nativity or ancestry.

Indian surnamed radiologists are most likely to reside in six states. They are California, New York, Florida, Texas, Illinois, and New Jersey. These six states also were most favored by South Asians Muslim radiologists. Moreover, the relative popularity of residence of these radiologists, in declining order is the same for them as it for the Hindu surnamed radiologists.

## Discussion

The number of Americans of Indian ethnicity has risen steadily since 1965. Initially, the increase was occasioned primarily by the influx of immigrants from the subcontinent who typically were educated in home country, but came to the United States for either work or further

training, and then stayed to participate first as permanent residents, and then later as citizens functioning as productive members of American society. As the number of emigrants increased, they brought their offspring with them, who then were educated in the United States. Now even as the migration tide continues to flow from India towards our shores, the composition of this enlarging ethnic group more and more consists of American born individuals of Indian ancestry.

A similar pattern of steadily increasing migration and gradual incorporation into the American multiethnic fabric is taking place with former residents of the two other large South Asian countries-Pakistan and Bangladesh-whose numbers are increasing in the general population, and also in the complement of radiologists who are members of OCM’s panel of imaging interpreters.

The first study on the characteristics of immigrant Indian Radiologists was published in 1984 [13]. It assessed the cohort of board certified radiologists who graduated from Indian medical schools and were now in the United States, as derived from the files of the Directory of Medical Specialists in 1980. Many members of this group also responded to a questionnaire about their origin and present location. The data revealed the prominence of self-identified Gujaratis followed by Andhra Pradesh is among all respondents. It was surmised at that time that the passage of the Professional Assistance Act of 1976 (public law 94-284) would gradually restrict the entry of foreign doctors who were allowed to practice in the United States. Therefore it would also serve to reduce the number of individuals of Indian ancestry as well.

A follow up study published in 2002 regarding the cohort of Indian Medical graduates seeking training and settlement in the United States demonstrated that by 1996, 598 radiologists were Indian educated [14], a figure nearly two and a half times the 199 who fit that designation up to 1980. During this period, the number of radiologists had nearly doubled from 1,674 to 32,788. Hence the decline predicted earlier did not materialize (Figure 1).

A further investigation published in 2007 revealed continued increases in the number of Indian radiologists in the United States, or more precisely those with Hindu surnames.

By 2002 they comprised 5.5% of all RSNA members. Now the predominant contributors to this group were radiologists who had graduated from American medical schools. At present, expansion of the cadre of Indian radiologists by nativity or ancestry now comes

	1960	1970	1980	1990	2000	2010
India [10]	12,296	51,000	206,087	450,406	1,022,552	1,780,322
Bangladeshi [4,10,12]	NIA	NIA	4,989	21,414	103,341	153,691
Pakistani [10,12,13]	1,708	6,182	30,774	91,889	253,193	299,581

Table 1: Number Foreign Born Indian-, Bangladeshi-, and Pakistani-Americans.

	Absolute Number of Indians Per Total Number of Hindu Origin Surnames	Percentage of Indians Per Total Number of Hindu Origin Surnames	Absolute Number of Muslims Per Total Number of Muslim Origin Surnames	Percentage of Muslims Per Total Number of Muslim Origin Surnames
California	121	13.4%	85	19.8%
New York	98	10.8%	63	14.7%
Florida	89	9.8%	32	7.4%
Texas	68	7.5%	23	5.3%
Illinois	51	5.6%	20	4.7%
New Jersey	51	5.6%	16	3.7%

Table 2: States in Which South Asian Radiologists Practice In.

Total Number of Radiologists As Per One Call Medical (OCM)	19,347
Total Hindu Origin Radiologists Registered in OCM	906
Percentage of Hindu Origin Radiologists in OCM	4.8%
Total Muslim Origin Radiologists Registered in OCM	431
Percentage of Muslim Origin Radiologists Registered in OCM	2.3%
Total Number of Hindu Origin and Muslim Origin Radiologists Registered in OCM	1337
Percentage Hindu Origin and Muslim Origin Radiologists Registered in OCM	7.0%

Table 3: Summary of Data Surveyed from One Call Medical.

	1990	2000	2010
Indian Americans born in India [10,12,13]	450,406	1,022,552	1,780,322
Indian Americans born in India and the US [9,12,13]	570,000	1,678,765	2,843,391
Indian Americans born in the US	119,574	656,223	1,065,069

Table 4: Indian Americans born in the USA.

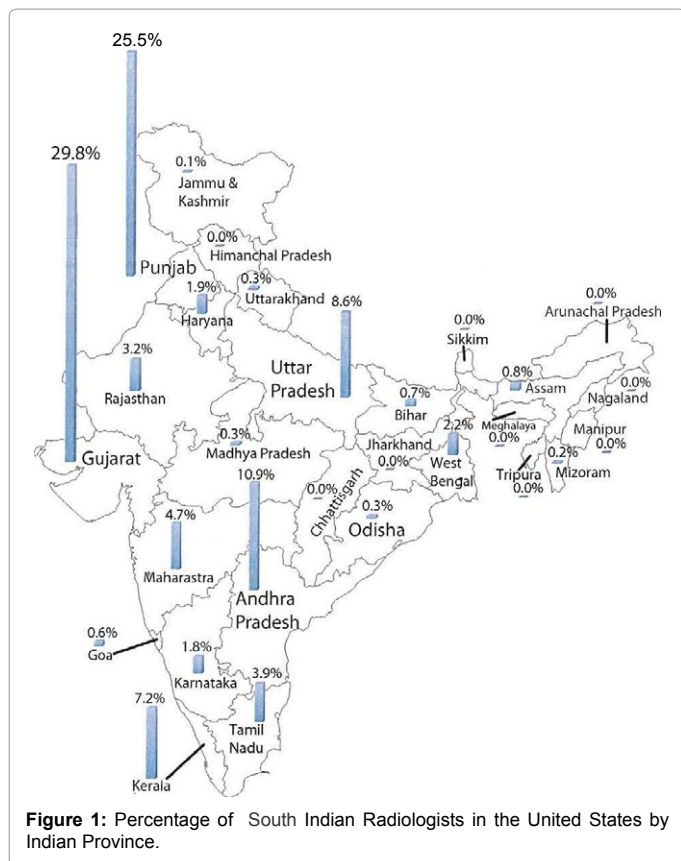


Figure 1: Percentage of South Indian Radiologists in the United States by Indian Province.

increasingly from those born in the United States or those who came here before adulthood.

Each of these previous investigations selected radiologists with Indian surnames to serve as a proxy for all Indian radiologists. Yet, while predominantly Hindu by religion, India also consists of 177 million Muslim citizens, as well as lesser populations of Christians and Buddhists [15]. Hence, a full assessment of the scope of Indian immigration in the United States must then take into account the participation by members of minorities, particularly those who are

recognized by name as being Islamic. The available census data does not make this distinction possible quantitatively, but a sense of their proclivity to relocate to the United States can be inferred from the general increases in the number of migrants from Pakistan, Bangladesh, and India who have characteristic South Asian surnames.

It is likely that as the percentage of Americans of South Asian background continues to grow, their participation in radiology residencies will also become greater. In 2007, Indian surnamed radiologists constituted 13.3% of all trainees in American Residency programs [15]. Their expected increase plus the contribution of those who by birth or pedigree can be considered as South Asian Muslims should result in further expansion in the number and percentage of ethnic South Asian trainees of either religion.

Hindu and Muslim immigrants together with their progeny, show a striking similarity in the choice of place of residence in the United States. The same six states are the most common for each. Moreover, the ranking of these states, in terms of members, in declining frequency, follows the same pattern for both. Although from different religious backgrounds, Hindus and Muslims were likely to settle in similar locations across the continental United States.

A study based on last name analysis brings with it a series of limitations that must be acknowledged. Even accounting for common Hindu and Muslim names, some ethnic Indians will be missed. The sizeable Christian population of Kerala and the propensity for some to migrate may go undetected by this means of discovery. To lesser extent, perhaps, Portuguese surnames common in Goa will also be missed. Not everyone with a provincially focused last name will have parents or ancestors who actually came from there. On the other hand, this method of analysis does take into account those American based radiologists who were born outside of India or are descendants of those who did not come directly from India to the US, but were born and raised in the Indian diaspora, including the countries of East and South Africa, the Caribbean, Mauritius, Fiji, and Canada, and Australia. They too are descendants of ancestors of parents or grandparents whose surnames were geographically definable within India even though they resided for a generation or two beyond them.

Finally, the size of the group of present and former enrollees in One Call Medical's panel presents some ambiguity. Those who left their participation as OCM members may be different ethnically from those who are current members. However no consistent distinctions between the two are apparent. The differences if any are most likely not related to their choice of residence or any other factor aside from increasing age and decreasing propensity to work.

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