

LEADING CAUSES OF MORTALITY OF ASIAN INDIANS IN CALIFORNIA

Objective: Asian Indians had one of the highest population growth rates in California between 1990 and 2000. However, few studies have examined common causes of death in this ethnic group in California. We examined leading causes of mortality in Asian Indians in California and analyzed differences across age and sex.

Design/Setting: Linear interpolation of 1990 and 2000 US Census data were used to calculate population sizes. California mortality data were examined to determine total number of Asian Indian deaths, and analyzed to determine causes of death across age (25–44, 45–64, ≥65) and sex subgroups.

Main Outcome Measures: International Classification of Diseases, 9th and 10th revision codes were used to aggregate causes of mortality into disease categories of cardiovascular diseases, cancers, diabetes, traumas/accidents/suicides, infections, and other conditions.

Results: Cardiovascular diseases were the leading cause of death for both sexes. Cancers were the second leading cause of death for both sexes. Diabetes and traumas/accidents/suicides were the next most common cause of mortality for females and males respectively. However, differences were found between age groupings across the sexes.

Conclusion: This analysis confirms leading causes of death found in other densely-populated Asian Indian regions. It also sheds light on emerging conditions in this population in California. Although contributors to causes of mortality are discussed, more research is needed to understand the unique biological and socio-cultural determinants of disease in Asian Indians. Translation of this research into intervention strategies will reduce the burden of these diseases in this rapidly-growing population in California and the United States. (*Ethn Dis.* 2010;20:53–57)

Key Words: Asian Indian, Death Rate, Mortality Determinants, Health Disparities, California

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INTRODUCTION

More than 1.6 million Asian Indians currently live in the United States. As of 2000, almost one quarter of those lived in California, making up 1% of the state's population. Between 1990 and 2000, the population of Asian Indians in California increased by 92%, one of the highest ethnic population growth rates.^{1,2}

Although the growth rate is high compared to other minorities, few health data are available for Asian Indians in California. Causes of mortality, health indicators, risk factor profiles, and accessibility of health services for this group are relatively unknown. Research studies and health surveillance systems often focus on aggregated Asian/Pacific Islanders with whom Asian Indians are often grouped. Because of this aggregation, various surveys are unable to provide mortality data or disease incidence/prevalence rates for Asian American subpopulations. With recent disaggregation of Asian Indians from the larger Asian/Pacific Islander category in mortality records, it is now possible to collect information on causes of death for the rapidly growing Asian Indian population. The primary purpose of this article is to report the most common causes of mortality of Asian Indians in California and to examine differences across age and sex.

METHODS

We examined US Census data from 1990 and 2000 and California mortality

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data from 1990 to 2000 and identified 4,452 Californian Asian Indian deaths. Population sizes were calculated by linear interpolation between data collected in the 1990 and 2000 Census (Table 1). The purpose of this linear interpolation is to estimate the Asian Indian population in California in the intervening years of the Census (between 1990 and 2000). The sum of these interpolated years provides the person-years at risk used in the denominators for Table 2. The primary cause of death was identified on mortality records using International Classification of Diseases, 9th revision (ICD-9) classification numbers for 1990–1998, and 10th revision (ICD-10) in 1999 and 2000. Self-reported ethnicity data were obtained from Census data in 1990 and 2000. Ethnicity is recorded on death certificates by the funeral director using state guidelines. Both census and death certificates ask a question on Hispanic ethnicity, followed by one on race. The classification of race differs slightly between census and death tapes in that several small subpopulations (eg Bangladeshi, Pakistani, and Sri Lankan) are excluded from the group titled Asian Indian on the census but are included in the Indian category (which excludes American Indians) on death certificates. Over 90% of South Asians in California

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Table 1. Number of Asian Indian deaths in California by gender and age from 1990–2000 using California mortality data

Gender	Age	Total number of deaths	Number of deaths per 100,000 person-years
Females	All	1702	233
	25–44	177	36
	45–64	492	264
	≥65	1033	1840
Males	All	2750	314
	25–44	493	83
	45–64	1005	432
	≥65	1252	2460

are Asian Indian, so we expect very few people identified as Asian Indian on death certificates to not identify themselves as Asian Indian on the census.² This slight risk of misclassification may overestimate the overall percentage of deaths attributable to Asian Indians when compared to other ethnic groups. However, in this analysis, solely Asian Indians are being examined, and this slight overestimate would be without bias across disease categories within the Asian Indian group.

Major causes of death for each age-sex group were determined by grouping ICD-9 and 10 codes in each disease area, and summing over the 11-year period. Death rates were calculated by stratifying the population by sex and age (25–44, 45–64, ≥65+, and ≥25 years). There were seldom any deaths among Asian Indians aged <25 years; the small numbers in these cohorts would lead to weak estimates for death-rates and we therefore excluded mortality data for Asian Indians among this age group. Age-specific death rates for the specified intervals were calculated to detect any important age-related differences. Rates are expressed per 100,000 person-years.

RESULTS

The median age of Asian Indians (AI) increased slightly between 1990 and 2000 while the percentage of women and men remained approximately the same.^{2,3} There were 86,333 AI men and 73,640 AI women in the

1990 census, and 163,698 AI men and 143,407 AI women in the 2000 census. Men comprised 55% of the study population, and accounted for 62% of the observed deaths during this period.

Among women, 61% of all deaths occurred in those aged ≥65 years (Table 1). In contrast, men aged ≥65 accounted for only 46% of male deaths, and men aged 45–64 accounted for 37% of male deaths. Men had higher death rates in every age category.

Table 2 shows the most common causes of mortality among Asian Indians. The three leading causes of death for women aged ≥25 years were cardiovascular diseases (38%), cancers (22%), and diabetes (4%). For women aged ≥65, the leading causes of death were cardiovascular diseases (48%), cancers (15%), and pneumonia (6%). For women aged 45–64, the most common causes were cancers (34%), cardiovascular diseases

Table 2. Number of Asian Indian deaths in California by cause of mortality

Cause of death	Age-specific number of deaths per 100,000 person-years at risk (actual number of deaths)			
	Total	25–44	45–64	≥65
Females				
Cardiovascular diseases	90 (655)	2 (10)	83 (154)	875 (491)
1. Coronary heart disease*	76 (551)	1 (6)	65 (121)	755 (424)
2. Cerebrovascular disease†	14 (104)	1 (4)	18 (33)	119 (67)
Diabetes‡	10 (73)	1 (4)	13 (25)	78 (44)
Cancers§	52 (366)	9 (42)	97 (165)	283 (159)
Traumas/accidents/suicides**	8 (56)	8 (39)	6 (11)	10 (6)
Infections	9 (67)	1 (3)	2 (3)	109 (61)
1. HIV††	0 (1)	0 (0)	0 (0)	2 (1)
2. Pneumonia‡‡	9 (64)	1 (3)	2 (3)	103 (58)
Liver disease and cirrhosis§§	2 (14)	1 (3)	2 (4)	12 (7)
Obstructive lung disease***	8 (56)	1 (4)	10 (18)	61 (34)
Males				
Cardiovascular diseases	138 (1204)	17 (101)	205 (476)	1233 (627)
1. Coronary heart disease	123 (1073)	14 (85)	186 (433)	1091 (555)
2. Cerebrovascular disease	15 (131)	3 (16)	19 (43)	142 (72)
Diabetes	10 (85)	0 (2)	12 (29)	106 (54)
Cancers	26 (378)	8 (46)	66 (154)	350 (178)
Traumas/accidents/suicides	20 (175)	19 (114)	19 (44)	33 (17)
Infections	10 (91)	2 (13)	7 (17)	120 (61)
1. HIV	2 (17)	2 (12)	1 (3)	4 (2)
2. Pneumonia	8 (74)	0 (1)	6 (14)	116 (59)
Liver disease and cirrhosis	8 (74)	5 (28)	16 (37)	18 (9)
Obstructive lung disease	8 (68)	0 (2)	6 (14)	102 (52)

* ICD-9 codes: 402, 410, 414, 425, 427–429 ; ICD-10 codes: I12.0, I21.9, I25.0–I25.1, I25.9

† ICD-9 codes: 430–431, 436 ; ICD-10 codes: I60.7, I61.9, I62.9, I64, I69.4

‡ ICD-9 codes: 250 ; ICD-10 codes: E14.9

§ ICD-9 codes: 140–208; ICD-10 codes: C00.0–C96.6

** ICD-9 codes: 812, 814–816, 910, 955, 965 ; ICD-10 codes: V04.1, V09.2, V89.9

†† ICD-9 codes: 42; ICD-10 codes: none

§§ ICD-9 codes: 480, 486; ICD-10 codes: J18.0, J18.9; 571; ICD-10 codes: none

*** ICD-9 codes: 493, 496; ICD-10 codes: J44.9, J46, J84.1, J84.9

(31%), and diabetes (5%). For young women, aged 25–44, cancers (24%) and accidents (22%) were almost equal as the most frequent cause of death. Over 84% of the cardiovascular disease deaths in women aged ≥ 65 were due to coronary heart disease.

Almost half of all deaths in Asian Indian males were due to cardiovascular disease. Cardiovascular disease deaths ranged from 20% in the youngest age group to over half of all deaths in the oldest. Coronary heart disease accounted for about 89% of male cardiovascular disease deaths in all age groups. For all males aged ≥ 25 years, cancers (14%) and accidents (6%) were also common causes of death. Accidents accounted for 23% of deaths in those aged 25–44, and 4% of all deaths in those aged 45–64. Cancers were the second leading cause of death in those aged 45–64 (15%) and in those aged ≥ 65 (14%).

DISCUSSION

The vast majority of Californian Asian Indian deaths were due to cardiovascular diseases. Cancers appeared to be the second leading cause for Asian Indian men and women aged ≥ 25 years. Recent reports suggest that Asian Indians have the highest life expectancy of all Asian subgroups in California, which may represent a healthy migrant effect.^{4–7} It is important to examine major causes of death for this recent immigrant group to inform further research and intervention efforts, and to promote health in this rapidly-growing population.

Cardiovascular Diseases

For both Asian Indian men and women aged ≥ 45 years, the most common cause of mortality was cardiovascular disease (CVD). For Asian Indian men aged 25–44, CVD was also a major cause of death. This result is consistent with other studies examining cardiovascular deaths of Asian Indians,

both abroad as well as in the United States.^{8–12} The 1992 National Center for Health Statistics (NCHS), whose participants were drawn from California, Hawaii, Illinois, New Jersey, New York, Texas, and Washington, also showed that, of the two subclasses of CVD, coronary heart disease was the leading cause of death for Asian Indians aged ≥ 45 .¹³ Similar to our results, 38.7% of all Asian Indian deaths from the NCHS sample were attributable to diseases of the heart, compared to 41.8% of deaths in our examination. For Asian Indians aged 45–64, the rate was 42.6% in the NCHS sample,¹⁴ compared to 42.1% in our study.

Asian Indian immigrants, regardless of destination (as well as Asian Indians residing in urban India), appear to be at a higher risk for coronary heart disease compared with other ethnic groups.¹⁴ Studies examining coronary artery disease death rates among Asian subgroups in California found that while overall mortality was low in Asian Indians, the age-adjusted proportion of deaths due to coronary disease was considerably higher than in other ethnic groups.^{15,16} Our study confirms coronary disease as the leading cause of death among Asian Indians.

The finding of a low proportion of cardiovascular deaths due to cerebrovascular disease was also confirmed in a California ethnic comparison study, as well as in England and Canada.^{16–18} Between 1985 to 1990, Asian Indian age-standardized death rates per 100,000 population for cerebrovascular disease were 33 for men and 45 for women, compared to 60 and 49 for their White counterparts.¹⁶ However, little is known about cerebrovascular disease prevalence in indigenous Indian populations. Some studies suggest that there may be increased atherosclerosis or abnormal vascular wall function in healthy Asian Indians.^{14,19,20}

Cancers

Cancers were the second leading cause of death of Asian Indian men

and women in all age groupings, with the exception of males aged 25–44 years and females aged 25–44 (with the latter having cancers as the primary cause of mortality). Our results also found that rates of cancer mortality, as a percentage of deaths, were higher for Asian Indian women than men across all age intervals. It should be noted that this mortality category is an aggregated total of all cancer types.

A study examining site-specific cancers among the general US population in 1997 found breast cancer to be the leading cause of site-specific cancer deaths for females aged 20–39 and 40–59 years, while lung cancer was the leading cause of site-specific cancer deaths for women aged ≥ 60 . Our results found the same patterns for Asian Indian females aged 25–44 and 45–64; breast cancer was also the leading site-specific cancer death for Asian Indian women aged ≥ 65 .²² Two studies examined breast cancer incidence among Asian Indians in the United States; rates were higher than native Asian Indians but lower than Caucasian Americans.²³ This pattern was also confirmed for Californians of South Asian origin, and the rates of both breast and cervical cancer increased significantly between 1988 and 2000.^{24,25}

The top causes of site-specific cancer deaths in the general US population for men aged 20–39, 40–59, and ≥ 60 years were non-Hodgkin's lymphoma, lung, and lung, respectively. Our study found identical patterns and similar proportions for Asian Indian males aged 45–64 and ≥ 65 ; the only exception was for those aged 25–44 in which leukemia was found to be the leading site-specific cancer.

These findings highlight the need to examine cancer rates in Asian Indians, as this population group continues to grow in the United States. Monitoring patterns of cancer, one of the leading causes of death among Asian Indians,²⁶ is paramount to surveillance and intervention in this population group.

Diabetes Mellitus

The number of deaths due to diabetes mellitus increased with age for both Asian Indian men and women. Although age is positively associated with diabetes risk for all populations, the onset of diabetes is earlier for those of Asian Indian origin.²⁷ Our results identified diabetes as one of the top three leading causes of death for Asian Indian females in California in the 11-year span. However, our data only took into account deaths due to various conditions and not the prevalence of diabetes in the Asian Indian population. Diabetes as the primary cause of death is rare; however, increased blood glucose levels lead to circulatory system abnormalities and widespread organ damage.²⁸ Although type 2 diabetes (non-insulin dependent diabetes) is not commonly a direct cause of mortality, it serves not only as a precursor to elevated cardiovascular risk but leads to other micro- and macrovascular complications as well.^{29–32} Thus, the etiology and prevalence of type 2 diabetes and its precursor, pre-diabetes, are important to examine in context of their indirect contribution to Asian Indian mortality and morbidity.

HIV/AIDS and Other Infections

Infections were the third leading cause of death for Asian Indian men and women aged ≥ 65 years. The overwhelming majority of infection mortality in this age grouping was due to pneumonia. This finding is not surprising since pneumonia is a common infection which often exacerbates existing conditions prevalent in old age and often leads to death. Infections did not significantly contribute to mortality in the other age groupings.

Our results found that HIV/AIDS infections were not a significant cause of mortality for Asian Indians in California from 1990–2000.

Other Conditions

Leading causes of mortality, especially for younger Asian Indians, were

The analysis confirms CVD as the leading cause of death in Asian Indians...

traumas, accidents, and suicides. Though this category includes a variety of causes, the predominant contributors were vehicular deaths and homicides. Social issues leading to traumas, accidents, and suicides need to be critically examined within a cultural framework to better understand underlying determinants and to inform the design of better surveillance and culturally appropriate intervention strategies. Thus, more investigation is needed to understand the unique contributors to these causes of death in this population.

CONCLUSION

This analysis is the first to examine the most common causes of mortality among Asian Indians in California. The analysis confirms CVD as the leading cause of death in Asian Indians, and it has shed light on emerging health conditions of concern, such as cancers, diabetes, and traumas/accidents/suicides. These data also allow researchers to examine the burden of disease in an Asian Indian migrant community and offer direction for further research and intervention. They also provide valuable baseline information for analysis of trends.

One of the strongest limitations of this study is that it only analyzes death, rather than disease prevalence. Reporting of death may mask otherwise higher rates of existing conditions, as seen in the case of diabetes. This is especially important when considering deaths due to HIV/AIDS which may result in a longer interval of time between diagnosis and death. Thus, it is important to understand that the actual prevalence of many of these causes is most likely

higher than the causes of mortality reported here. Other limitations include aggregation of certain mortality groups, impeding the study of distinct behavioral and etiological determinants. This seems to be most pertinent for cancers although disaggregation of traumas/accidents/suicide may also have proved worthwhile. However, the rationale for aggregation was to elucidate the importance of these conditions as important causes of mortality. Low numbers in the subgroups may have led to inaccurate estimates.

Cardiovascular diseases, cancers, and accidents are leading causes of death in Asian Indians in California. Research in this ethnic group should be focused on reducing the burden of these diseases.

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