

# Epidemiology of coronary artery disease in South Asians

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Coronary artery disease is a major cause of death all over the world. South Asians have been found to have the highest mortality rates due to coronary artery disease amongst all ethnic groups so far studied. Data suggests that not only are the South Asians prone to develop the manifestations of the disease at an earlier age compared to the other ethnic groups, they also seem to respond less well to the same treatment administered. Also, invasive investigations reveal that they have more extensive coronary artery narrowing than their Western counterparts. While the conventional risk factors of the disease, namely, high cholesterol, smoking and high blood pressure do not explain all the differences in mortality due to this disease, South Asians do tend to suffer more from diabetes, higher insulin levels, abdominal obesity, low high density lipoprotein levels, higher triglyceride levels, lower levels of physical exercise and higher lipoprotein (a) levels. While the exact cause of this increased rate of mortality due to coronary artery disease has yet to be established, it appears that both genetic and environmental factors play a role. For a start, greater public awareness, adoption of a healthier lifestyle and vigorous control of risk factors need to be advocated in an attempt to come to terms with this problem.

CARDIOVASCULAR disease is a major cause of death globally. Though in most industrialized countries, mortality in general and cardiovascular mortality in particular have shown decreasing trends since 1970, following stagnation or increases observed during the 1950s and 1960s (ref. 1), in most countries it is still responsible for nearly half of the deaths in men<sup>2</sup>. How do the South Asians (namely, people hailing from the Indian subcontinent, including India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan and Afghanistan<sup>3</sup>) fare when compared to this global trend? There have been no longitudinal or long-term studies performed in the Indian subcontinent which can throw light on this subject. A majority of the data available on this topic comes from studying disease patterns among the South Asians living abroad and comparing them with the natives of the country in which they are resident.

It is only in the latter half of this century that it came to light that the South Asians living abroad are more likely to die because of coronary artery disease than any other ethnic groups so far studied<sup>4</sup>. This high mortality due to coronary artery disease has been consistently documented among a large number of South Asians residing in a number of countries all over the world<sup>3</sup>. While the first generation South Asians have a risk of dying due to coronary artery disease intermediate between that of the country of origin and the country to which they have immigrated, amalgamation with the dominant culture is complete by the second or third generation. This increased risk of dying due to coronary artery disease is not only confined to South Asian men<sup>3</sup>. In fact, South Asian women seem to have a greater propensity of dying due to this disease than their South Asian male counterparts<sup>5</sup>.

## Magnitude of the problem

What is the magnitude of the problem of coronary artery disease in the Indian subcontinent and are there any perceived differences between various geographical regions? Studies done in India suggest that the prevalence of coronary artery disease is about 10% (ref. 6), a figure about four times the prevalence of coronary artery disease in the United States of America<sup>7</sup>. South India shows still higher rates of coronary artery disease with a prevalence of 14% in Trivandrum<sup>8</sup>. This prevalence rate is very similar to the rates prevailing in the affluent South Asians overseas. However, these prevalence rates are more applicable to the urban population of India. Prevalence of coronary artery disease is lower in rural India compared to the urban population but still shows an increasing trend, having increased from 1.7% in 1974 to 5% in recent times<sup>9</sup>. Even this figure of 5% is about twice that of the prevalence of coronary artery disease in the United States of America.

Therefore, it is beyond doubt that the prevalence of coronary artery disease in the Indian subcontinent is higher than in other countries and that as an ethnic group, South Asian men and women are more prone to die of coronary artery disease than others.

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### Clinical presentation

How does the presentation of coronary artery disease differ in the South Asians from the other ethnic groups? For a start, one notices a difference in the age groups of the affected populations. Generally, the propensity of an individual to suffer from coronary artery disease increases with increasing age. Coronary artery disease tends to affect the younger South Asian population more commonly than other ethnic groups. The relative risk of dying due to coronary artery disease between the ages of 20 and 29 years is 3.13 as opposed to 1.36 for all age groups in the United Kingdom<sup>3</sup>. Similarly in Singapore, the relative risk of dying due to coronary artery disease among South Asians in the 30–39 years age group was found to be 12.5 compared to 3.0 among Chinese men aged 60–69 years<sup>10</sup>. This is reflected in the increased incidence of hospitalizations due to coronary artery disease among South Asians. Hospitalizations for coronary artery disease are two- to four-fold higher at all ages among South Asians and five- to ten-fold higher in those South Asians under 40 years of age than populations of other countries<sup>11</sup>.

The other difference is in the incidence of hospitalization due to an acute myocardial infarction or a heart attack. Data from the United Kingdom shows that South Asians were twice as likely to be admitted to hospital with heart attack than the native Caucasian population<sup>12</sup>. South Asians thus admitted were not only younger than the Whites to whom they were compared, but in spite of receiving the same or better treatment were more likely to die because of their heart attacks in the ensuing six months. Similar trends have also been confirmed from the Far East, namely, Singapore<sup>13</sup>.

When the South Asians were studied by coronary angiography to determine the pattern of involvement due to coronary artery disease, it was found that the anatomical distribution of the coronary atherosclerosis was no different than other ethnic groups to which they were compared<sup>11</sup>. What did differ was the fact that South Asians, as compared to ethnic groups, had more severe and more extensive atherosclerotic narrowing in their coronary arteries<sup>14</sup>.

### Analysis of risk factors

Atherosclerotic coronary artery disease is more prone to occur in individuals with risk factors for this disease, namely, cigarette smoking, high cholesterol levels, high blood pressure, diabetes mellitus and obesity.

#### *Smoking*

The use of tobacco, whether in cigarette or beedi form, is strongly associated with an increased incidence of coronary artery disease the world over. Data from India

also confirms this finding, with the smoking of 10 or more cigarettes or beedis per day being associated with almost a seven-fold higher incidence of coronary artery disease<sup>15</sup>. However, when we compare the prevalence of smoking in the Indian subcontinent with other ethnic groups, we find no significant difference in the prevailing rates<sup>9</sup>. Therefore, though smoking continues to be an important risk factor for coronary artery disease and proscribing its use should continue to be emphasized, it does not account for the increased mortality due to coronary artery disease found among the South Asians all over the world.

#### *Serum cholesterol*

Within and between populations, a clear association between cholesterol levels and the rate of coronary artery disease has been demonstrated. Both the Framingham study<sup>16</sup> and the British Regional Heart Study<sup>17</sup> demonstrated an increased risk of coronary artery disease within a population proportional to the serum cholesterol, with men in the highest quartile carrying a three-fold risk than those in the lowest quartile. So how do the serum cholesterol levels among the South Asians compare with those of the other ethnic groups?

Paradoxically, the serum cholesterol levels among South Asians have been found to be lower than the other ethnic groups so far studied. While this finding does not take away the merit from reducing elevated cholesterol in those South Asians who suffer from coronary artery disease, it does not, however, explain the finding that more South Asians are likely to die because of coronary artery disease than other ethnic groups.

#### *Hypertension*

The importance of elevated blood pressure as a risk factor for coronary artery disease in both men and women has been demonstrated in a large number of epidemiological studies. In fact, elevated blood pressure was the first risk factor to become the subject of specific recommendations by various bodies all over the world. Does elevated blood pressure among the South Asians account for the increased propensity for this ethnic group to succumb to coronary artery disease? Unfortunately, no. The prevalence of high blood pressure among the South Asians is no higher than Caucasians<sup>1</sup> and like smoking and serum cholesterol, does not throw any light as to why the South Asians should be more prone to coronary artery disease than other ethnic groups.

#### *Diabetes mellitus*

The first difference between the South Asians and the other ethnic groups is in the prevalence of diabetes

mellitus. The propensity of the South Asians to develop diabetes mellitus, in particular, noninsulin-dependent diabetes mellitus has been recognized for many years and was reported over seventy years ago by McCay<sup>18</sup>, who recognized a higher average blood sugar in Bengali men compared with the Caucasians. The prevalence of noninsulin-dependent diabetes mellitus among the South Asians is up to 20%, 3–4 times higher than the Caucasians<sup>19</sup>. Therefore, is diabetes mellitus the culprit for the high coronary artery disease rates in the South Asians? Data about prevalence rates of coronary artery disease among the other ethnic groups with a high prevalence of diabetes, namely, Hispanic-Americans, African-Americans and native Americans, does not substantiate this theory<sup>3</sup>. Even the higher prevalence of impaired glucose tolerance found in the South Asians (equal to the prevalence of diabetes in this population) does not fully explain the increased mortality due to coronary artery disease amongst this ethnic group.

### *Obesity*

Though South Asians as a group are not more obese than other ethnic groups as assessed by their Body Mass Index, what certainly distinguishes the South Asians from the other ethnic groups is their predilection to develop abdominal obesity, resulting in an increased waist-to-hip ratio<sup>19</sup>. Abdominal obesity, therefore, appears to be a strong independent risk factor for coronary artery disease among the South Asians and may go some way in explaining the high mortality due to coronary artery disease in this ethnic group.

Turning our attention to the other risk factors for coronary artery disease, the finding of a low high density cholesterol level in the blood combined with a high triglyceride level occurs in the South Asians more often than by chance<sup>20</sup>. Also, Lp (a), a genetically-determined lipoprotein, which not only promotes the early development of atherosclerosis but also of thrombosis, has been found to exist in higher proportions among the South Asians than the other ethnic groups and is considered to be a strong independent risk factor for coronary artery disease<sup>21</sup>. The finding that the South Asians are comparatively less physically active than the other ethnic groups also contributes in a small way to increase mortality from coronary artery disease among this ethnic group.

### *Insulin resistance syndrome*

From the discussion above it is apparent that no specific risk factor can be singled out to explain this increased coronary mortality and morbidity in South Asians. However, when a few of these risk factors are combined to-

gether, we have a potentially atherogenic situation, namely, the 'insulin-resistance syndrome'. The insulin resistance syndrome is characterized by impaired glucose tolerance or noninsulin-dependent diabetes mellitus, increased waist to hip ratio, hypertriglyceridemia, low high density cholesterol levels, hypertension and an increased predilection for coronary artery disease. In the principal author's (J. Dhawan) own experience, the South Asian patients and the controls in the United Kingdom showed a correlation of this syndrome with an increased risk of coronary artery disease compared to Caucasians<sup>22</sup>. This predisposition to insulin resistance and its metabolic abnormality seemed to be genetically determined with environmental changes after migration having only a small additional effect.

### **Conclusion**

Summarizing the data available on this subject, one comes to the firm conclusion that the South Asians as a whole are more prone to suffer and die due to coronary artery disease than any other ethnic group so far studied. Moreover, this finding affects both sexes belonging to the South Asian community and tends to occur at younger ages than other ethnic groups. Apart from diabetes mellitus, the other conventional risk factors of smoking, high cholesterol and high blood pressure are not higher amongst the South Asians than other ethnic groups and so are not helpful in explaining the increased rates of coronary artery disease suffered by them. What does distinguish them from the other ethnic groups is the higher prevalence of the 'insulin resistance syndrome', higher levels of Lp (a) and lower levels of physical activity.

While one unifying factor does not explain these differences, it appears that both genetics and environment play their roles in causing this disease with increased frequency in this ethnic group. Higher prevalence of insulin resistance states appear to be genetically determined<sup>23</sup> as are the higher levels of atherogenic Lp (a). However, increasing westernization of our lifestyles<sup>24</sup> as evidenced by lower levels of physical activity and higher coronary artery disease rates in urban India also lends a helping hand to increase the burden of coronary artery disease in this population group.

The lessons to be learnt from the available scientific data are that not only do the conventional risk factors need to be treated more vigorously in those in whom they are present, but also to look for the risk factors more often encountered in this ethnic group, and treat them appropriately. For a start, important lifestyle changes need to be advocated for a majority of the younger and middle-aged population of the South Asians in order to provide them with some protection from coronary artery disease. Further treatment modali-

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ties can only be unearthed from ongoing research in this area and would be a welcome development for all who are prone to suffer from this disease.

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