



# Gender bias in cardiology: are there differences between men and women?

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*Women are more likely to die of heart disease than men, yet are often under-diagnosed and presented with fewer management options and their treatment may result in greater complications. The reasons may include physiological differences between the sexes, a lack of physician knowledge and unconscious gender bias.*

A 'heart attack' is frequently thought of as a male disease: a common scene in film and television drama (as well as in many medical teaching case histories) depicts a portly gentleman of middle years clutching his chest in pain and falling backwards in a sweat. A US study, which assessed the attitudes of 500 primary care physicians, obstetricians and cardiologists regarding cardiovascular risk assessment and prevention, showed that fewer than one in five physicians knew that more women die of cardiovascular disease (CVD) than men.<sup>1</sup> The physicians in the study also assigned female cases with intermediate cardiac risk to a lower risk category, and chose less active management than was appropriate for the degree of risk.

High CVD risk is as common in women as in men, especially

## Key points

- Younger women have almost double the risk of dying of heart disease than men.
- Differences in presentation can make diagnosis of heart disease in women more difficult.
- The Framingham risk score underestimates cardiac risk in women.
- Women at higher risk of CVD are treated with fewer therapeutic interventions; they are treated suboptimally with medication, catheterisation and revascularisation.
- Cardiac symptoms may have a different physiological basis in women.

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in younger age groups, and women are at greater risk of short-term mortality and complications after revascularisation.<sup>2,3</sup> Surprisingly, women under 40 years of age presenting with acute coronary syndrome are at highest risk of cardiovascular death compared with men of the same age, irrespective of risk factors.<sup>3</sup>

Paradoxically, these studies suggest that the high-risk factors are not recognised and not treated adequately in young women, and that coronary angiography and revascularisation are performed more often in men. The evidence pointing to gender bias in heart disease diagnosis, treatment and management is increasing but the underlying reasons need to be understood.

### **Why is there less urgency to treat women with heart disease?**

A lack of knowledge is likely to be one factor in doctors' lack of urgency to treat women with cardiac disease. One study reports that the ambulance took significantly longer to answer calls to a female than to a male with suspected coronary syndrome, despite one-year mortality being the same in potential acute coronary cases transported by ambulance, regardless of gender.<sup>4</sup> The treatment in hospital emergency departments for the ill-fated female coronary case is also not as prompt as for men.<sup>4</sup>

Women are at greater risk for worse outcomes associated with acute coronary syndrome than men, but intervention is less likely.<sup>5</sup> An analysis of observational data on 32,888 patients suggests that men are more likely than women to receive coronary intervention and to be medically treated when presenting with evidence of non-ST-segment myocardial infarction, even when data were controlled for age, cardiac catheterisation findings and biochemical evidence of myocardial infarction.<sup>5</sup>

### **Do women with coronary disease present differently?**

There are reports, however, that women and men do not present with acute coronary syndrome in an identical manner and this may contribute to the disease in women being underdiagnosed, even though women have a higher relative mortality rate from myocardial infarction, particularly in youth, than men.<sup>6</sup> Although studies suggest that women with CVD have more hypertension and diabetes at the time of presentation, they are ill-served by use of the Framingham risk score, which omits family history and underestimates risk in women, finding 92% of nondiabetic women at 'low risk' of CVD.<sup>6</sup>

Although a literature review found women were less likely to report central chest pain or discomfort than men in an acute coronary syndrome, in a large multinational study one in 12 of all patients did not report chest pain.<sup>7,8</sup> Women with acute stroke also experience greater emergency department delays than men, which are not attributable to differences in presenting symptoms, time of arrival, age or other confounders.<sup>9</sup> Campaigns to educate both the public and the physician about recognising heart attacks have been instituted in several countries, including Australia; however,

awareness of breast cancer remains far greater, despite women being 5.5 times more likely to die from heart disease.

### **Contributory risk factors not managed as well in women**

High-risk factors for heart disease such as diabetes are also less vigorously treated in women than men, despite carrying a higher fold associated relative mortality risk for CVD: 2.6 in women compared with 1.8 in men.<sup>10</sup> Hypertension holds a two to threefold higher risk of coronary events in women than men.<sup>8</sup> Women with diabetes and a history of CVD tend to have more poorly controlled modifiable risk factors (systolic blood pressure and LDL-cholesterol) than do men, which may contribute to the overall gender disparity in CVD mortality trends.<sup>10</sup>

#### **Obesity**

Obesity (which has been called the 'new tobacco' as a lifestyle risk factor) carries greater stigma for females from early life, with more adverse impact throughout life socially and economically.<sup>11</sup> However, when asked about treating common obesity-related conditions in a study offering female and male case studies for management, physicians said they would treat the obesity in the male patients but overlooked the obesity in the female cases.<sup>12</sup> Instead, they were more inclined to suggest weight loss to females who were not obese.

#### **Smoking**

Disturbing data regarding the increase in lifestyle risk factors in women comes from a large Scandinavian study of educational inequalities and cardiovascular risk factors in men and women from 1984 to 2008.<sup>13</sup> In women, smoking frequency had increased for all educational groups, mostly among those with a primary level of education, although for men there was a decline in all groups, especially those with tertiary education.

One attraction of smoking for women within our weight-obsessed society may be its demonstrated effect on weight loss, where physical appearance, not consideration of health, is likely to be the motivation, especially in the younger woman. Unless the issue of increased rates of smoking among women is specifically targeted, the negative impact of smoking on future cardiac (and other) disease in women could be devastating.

### **Women not on top yet? Research possibilities**

More than a quarter of a million women die each year in industrialised countries from CVD.<sup>14</sup> However, female cardiac patients are still treated suboptimally with medication, catheterisation and revascularisation. Gender differences persist in acute and chronic ischaemia in terms of perceived clinical manifestations, use of investigation, mode of treatment and referral for rehabilitation.

Women have been under-represented in research studies of coronary surgery with most reports including no more than 30% females.<sup>6</sup> However, as more female studies are conducted, it is possible that the adverse baseline risk profile may prove the major



determinant of the reported poor outcome in women, as the mortality rate for women is improving with more recent studies.

### Women have a different type of atheroma

Recent data offer another possibility that requires more investigation. Although atherosclerotic plaques in women have less necrotic core volume and are less prone to rupture, a different underlying mechanism may lead to ischaemic symptoms and cardiac events in women.

A large, prospective, multicentre study described higher-risk plaque characteristics in women, including less calcium and a smaller mean lumen area with significantly less total fibrous volume.<sup>15</sup> These characteristics may help explain the similar rates of cardiac death and myocardial infarction during the three years of study follow up, despite women apparently having less extensive coronary atherosclerosis by conventional imaging.<sup>15</sup> If these results are confirmed in future studies, assessment of coronary disease risk by standard investigations may need further adjustment for the gender of the patient, so as not to underestimate female risk.

### Gender of the physician

The gender of the physician may additionally influence the treatment outcome of female patients. A large Kaiser Permanente study suggested female patients with diabetes who see female physicians have better control over their HbA<sub>1c</sub> than female patients of male physicians.<sup>16</sup>

### Conclusion

There is no question that the dearth of suitable research in cardiac disease in women must be rectified and that studies with equivalent numbers of women need to be conducted.<sup>17</sup> It is possible that both the process of atheroma formation and the appropriate treatment may differ in females and males and that both factors contribute to worse outcomes for women.

Meanwhile, physicians and patients alike need to take heart disease in women more seriously. Both the general public and

medical practitioners need further education regarding the likelihood of disease, presentation and need for early and sustained treatment. This will save lives. **CT**

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