



# Salt and Cardiovascular Disease

## Introduction

Cardiovascular disease (CVD) is an umbrella term referring to strokes, coronary heart disease (CHD) and heart failure.

**Stroke:** A stroke occurs when part of the blood flow to the brain is cut off. This causes a break in the oxygen supply, causing cells to die. Stroke is the third most common cause of death in England and Wales<sup>1</sup>, with an estimated 150,000 strokes and mini strokes<sup>2</sup> and 67,000 deaths from strokes every year (BHF, 2005). This equates to 9% of male and 13% of female deaths.<sup>3</sup>

Stroke has a greater disability impact compared to any other chronic disease. The outcomes of strokes are wide ranging, but sufferers can experience paralysis, speech impediment and memory problems which can be highly frustrating and difficult for both the individual and the family. Over 300,000 people are living with moderate to severe disabilities as a result of stroke.<sup>4</sup> The direct cost of stroke to the NHS is estimated to be £2.8 billion.<sup>5</sup>

**Coronary heart disease (CHD):** CHD is the term used to describe what happens when the heart's blood supply is reduced or blocked. Raised blood pressure is a major risk factor for heart and circulatory diseases including heart attacks and heart failure. Over time, untreated high blood pressure can lead to a thickening of the heart muscle which can reduce the effectiveness of the heart pumping action.

CHD is the UK's biggest killer, with one in every four men and one in every six women dying from the disease. In the UK, approximately 300,000 people have a heart attack each year.<sup>6</sup>

## Who is most at risk of cardiovascular disease?

Older people, people with high blood pressure, diabetics, people of black and South Asian descent and smokers are all at increased risk of having a stroke or heart attack.

## How does salt contribute?

Raised blood pressure is a major cause of cardiovascular disease, responsible for 62% of stroke and 49% of coronary heart disease. Importantly, the risk of CVD increases throughout the range of blood pressure, starting at 115/75 mmHg.<sup>7</sup> Salt is the major factor that increases blood pressure and is therefore responsible for many strokes and heart attacks every year.<sup>8</sup> From the blood pressure reduction seen in a meta-analysis<sup>9</sup>, it was estimated that a reduction of 6 g of salt per day would reduce stroke by 24% and coronary heart disease by 18%. This would prevent approximately 35,000 stroke and CHD deaths a year in the UK and approximately 2.5 million deaths worldwide.<sup>10</sup>

Two large randomized trials (Trials of Hypertension Prevention (TOHP) I and II) looked at the long-term effects of salt reduction on CVD in more than 3000 participants over an 18month (TOHP I) or 36-48 month (TOHP II) period. Compared with the control group, individuals in the intervention groups reduced their salt intake by 25% to 30% from an average of approximately 10 g/d, resulting in a fall in BP of 1.7/0.9 mm Hg in TOHP I and 1.2/0.7 mm Hg in TOHP II. A follow-up study 10 - 15 years later showed that individuals who were originally allocated to the reduced salt group had a 25% lower incidence of cardiovascular events.

A recent meta-analysis<sup>11</sup> of 19 independent cohort samples from 13 studies, with 177,025 participants showed that a high salt intake is associated with a significant increase in risk of CVD. A reduction in salt intake from 10g to 5g per day, would reduce stroke rate by 23% and overall CVD by 17%. This would save 0.25million deaths from strokes and almost 3 million deaths from cardiovascular disease **each year**. These

**Salt and Stroke**

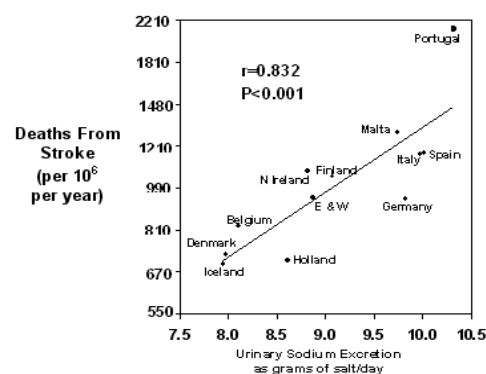


Figure 1 - Relationship between salt intake and stroke mortality in Western Europe. Adapted from: Perry et al 1992.

results support the role of a substantial reduction in population salt intake for the prevention of cardiovascular disease.

In June 2010, the National Institute for and Health and Clinical Excellence (NICE) published a report on the prevention of cardiovascular disease which highlighted salt reduction as the number one priority as a cardiovascular preventative measure. It also highlighted that we should be aiming for a salt intake of 6g by 2015 and 3g by 2025.<sup>12</sup>

### Direct effect on stroke

Evidence suggests that a high salt intake also has a direct effect on strokes, independent of the effect of salt on blood pressure.<sup>8,13,14</sup> When different populations are compared, there is a very close correlation between salt intake and stroke mortality independent of blood pressure (Fig 2).<sup>13</sup> Another study has confirmed this within a single country.<sup>8</sup>

### Direct effect on left ventricular mass

Salt intake can directly and independently lead to enlargement of the heart (Fig 2). Reducing salt intake has been shown to reduce left ventricular hypertrophy<sup>15</sup>, which is a major risk factor for cardiovascular disease.

A number of cross-sectional studies have shown a positive correlation between 24-h urinary sodium and left ventricular mass.<sup>15-17</sup> A reduction in salt intake has been shown to decrease left ventricular mass in hypertensive individuals.<sup>18-21</sup>

### Direct effect on capillary density

Recent research has provided further evidence that a high salt intake has a direct damaging effect on capillary density independent of and additive to the effect it has on blood pressure. A study in individuals with mildly raised BP found that a modest reduction in salt intake can increase skin capillary density, and the greater the reduction of salt, the greater the increase in the number of capillaries.<sup>22</sup>

### Current salt intake & dietary advice

Almost everyone in the UK (and the rest of the Western world) eats too much salt. The daily recommended amount in the UK is no more than 6 grams a day; the current average salt intake is 8.6g salt a day although many people are eating more than this.

It has been shown that a high salt intake, a low consumption of fruit and vegetables (which corresponds to a low potassium intake), obesity, excess alcohol intake and lack of physical exercise all contribute to the development of high blood pressure. However, the diversity and strength of the evidence is much greater for salt than for other factors. People with, or considered at risk, of stroke or heart disease should take extra care to ensure that they keep their salt intake below the recommended maximum of 6g.

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### Salt and Left Ventricular Mass

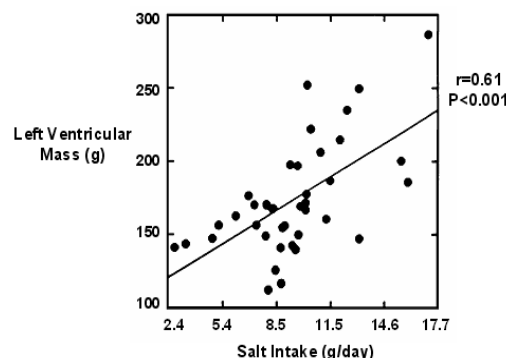


Figure 2 - Relationship between salt intake and left ventricular mass in individuals with systolic blood pressure >121 mmHg. Adapted from: Schmieder et al, 1988.

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