

## INTERHEART: Nine Factors That Could Save Your Life

No matter where you live, how old you are or what you look like, health researchers have recently discovered that 90% of the most common cardiovascular event, the first heart attack (myocardial infarction), can be attributed to nine modifiable risk factors.

The risk factors include: cigarette smoking, an abnormal ratio of blood lipids, high blood pressure, diabetes, abdominal obesity, stress, a lack of daily consumption of fruits and vegetables, as well as a lack of daily exercise.

### The Study

INTERHEART, a Canadian-led global study that focuses on cardiovascular disease (CVD) and was co-funded by the Canadian Institutes of Health Research (CIHR), the Heart and Stroke Foundation of Ontario and 37 other funding sources, involved 15,000 patients with a first acute myocardial infarction (AMI) and 15,000 asymptomatic control subjects (age and sex matched) drawn from 262 centres in 52 countries throughout Asia, Europe, the Middle East, Africa, Australia and North and South America.

Structured questionnaires were administered and physical examinations were undertaken similarly in patients and controls. Information was gathered relating to demographic factors, socioeconomic status, lifestyle, personal and family history of CVD and psychosocial factors. Non-fasting blood samples were taken from every individual and frozen immediately at  $-20^{\circ}\text{C}$  or  $-70^{\circ}\text{C}$  after processing. Waist measurements and hip circumferences were recorded.

Current smokers were defined as individuals who smoked any tobacco in the previous 12 months and included those who had quit within the past year. Former smokers were defined as those who had quit more than a year earlier.

All of this information was collected and sent to the Population Health Research Institute, McMaster University and Hamilton Health Sciences for quality control and statistical checks.

### Determinations

A strong and graded relationship was noted between numbers of cigarettes smoked and the risk of myocardial infarction, with the risk increasing at every increment, so that individuals smoking greater than 40 cigarettes per day had an odds ratio of 9.16 (99% CI 6.18–13.58). The ApoB/ApoA1 ratio (ratios of proteins from “bad” and “good” cholesterol, respectively) also showed a graded relation with myocardial infarction risk, with no evidence of a threshold, with an odds ratio of 4.73 (99% CI 3.93–5.69) for the top versus the lowest decile of ApoB/ApoA1 ratio (Yusuf et al. 2004: 10).

Together, current smoking, hypertension and diabetes increased the odds ratio for acute myocardial infarction to 13.01 (99% CI 10.69–15.83) as compared to those without

these risk factors, and they accounted for 53% of the population attributable risk (PAR) or acute myocardial infarction (Yusuf et al. 2004: 10).

Addition of ApoB/ApoA1 ratio (top versus lowest quintile) increased the odds ratio to 42.3 (33.2–54.0), and the PAR for these four risk factors together (top four quintiles of ApoB/ApoA1 ratio versus lowest quintile) was 75.8% (99% CI 72.7–78.6). Addition of abdominal obesity (top two tertiles versus lowest tertile) further increased the PAR to 80.2% (77.5–82.7) (Yusuf et al. 2004: 10–11).

Incorporation of all nine independent risk factors indicates an odds ratio of 129.20 (99% CI 90.24–184.99), as compared with not having any of these risk factors (Yusuf et al. 2004: 11).

Collectively, all nine risk factors accounted for 90% of the PAR in men and 94% in women (Yusuf et al. 2004: 12).

In all regions, the nine risk factors account for between three-quarters and virtually all PAR for acute myocardial infarction. The relative importance of every risk factor varied and was largely related to its prevalence. However, abnormal blood lipids, smoking and psychological factors were the most important risk factors in all regions of the world.

### Conclusions

INTERHEART shows that nine easily measured and potentially modifiable risk factors account for an overwhelmingly large proportion (~ 90%) of the risk of an initial acute myocardial infarction. The effect of these risk factors is consistent in men and women, across different geographic regions and by ethnic group, making the study applicable worldwide.

This landmark work was published in the September 11, 2004 edition of *The Lancet*. Among implications of the study, the concept of a uniform preventative strategy for heart attack across the world appears very attractive and of great potential impact. The ways in which the heart attacks that follow from the nine risk factors reflect the interplay of environmental and constitutional (genetic) influences remain to be further explored.

### References

Salim, Yusuf, Steven Hawken, Stephanie Ôunpuu, Tony Dans, Alvaro Avezum, Fernando Lanas, Matthew McQueen, Andrzej Budaj, Prem Pais, John Varigos, Liu Lisheng. 2004. “Effect of Potentially Modifiable Risk Factors Associated with Myocardial Infarction in 52 Countries (the INTERHEART study): Case-Control Study.” *The Lancet* 364(9438).

### About the Author

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