Fear of dying during a heart attack is linked to increased inflammation

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Intense distress and fear of dying, which many people experience when suffering the symptoms of a heart attack, are not only fairly common emotional responses but are also linked to biological changes that occur during the event, according to new research published online today in the *European Heart Journal* [1]. These changes, in turn, are associated with other biological processes during the following weeks that can predict a worse outcome for patients.

Acute coronary syndrome (ACS) is a medical emergency arising from blockage of the coronary arteries, resulting either in a myocardial infarction (heart attack) or unstable angina. The symptoms are varied, but often include pain in the chest, shortness of breath, sweating, nausea and vomiting. ACS patients are at risk of further heart problems and a worse quality of life in the future.

Researchers in London (UK) set out to discover whether there was an association between the intense emotional responses of patients suffering ACS and levels of a cell-signalling molecule – tumour necrosis factor alpha (TNF alpha) – that is involved in inducing systemic inflammation. They also wanted to see whether the emotional response and TNF alpha correlated with indicators of worse biological function (and, therefore, worse prognosis) three weeks later.

A total of 208 patients admitted to St George's Hospital (London, UK) between June 2007 and October 2008, with a diagnosis of ACS were included in the study. The researchers assessed the patients' level of

distress and fear of dying and measured levels of TNF alpha within two to three days of hospital admission. Around three to four weeks after the hospital admission researchers made a home visit to record heart rate variability (HRV) and the stress hormone cortisol. Low levels of cortisol may lead to a failure to control inflammation, while low HRV indicates that the heart is functioning poorly and is a predictor of future cardiac problems [2].

Professor Andrew Steptoe, Head of the Department of Epidemiology and Public Health and British Heart Foundation Professor of Psychology at University College London (UK), said: "We found that, first of all, fear of dying is quite common among patients suffering a heart attack; it was experienced by one in five patients. Although survival rates have improved tremendously over the last few decades, many patients remain quite frightened during the experience.

"Secondly, fear of dying is not just an emotional response, but is linked into the biological changes that go on during acute cardiac events. Large inflammatory responses are known to be damaging to the heart, and to increase the risk of longer-term cardiac problems such as having another heart attack. We found that, when compared with a low fear of dying, intense fear was associated with a four-fold increased risk of showing large inflammatory responses, measured by raised levels of TNF alpha. Interestingly, this was independent of demographic and clinical factors such as the severity of the cardiac event.

"Thirdly, fear of dying and inflammatory responses in turn predicted biological changes in the weeks following an acute cardiac event, namely reduced heart rate variability and alterations in the output of the hormone cortisol. These processes may contribute to poor outcomes in the longer term."

The level of distress was unrelated to any previous experience of having

a heart attack, but the research suggested that intense distress might be stimulated by worse or more painful symptoms during ACS, and then accentuated in patients who are more socially isolated and economically deprived.

Prof Steptoe and his co-authors say that processes underlying the association between the intense emotional responses and higher levels of TNF alpha are not fully understood. However, they may be connected as manifestations of an integrated biological and emotional response to severe injury to the heart.

The findings could suggest new avenues of research to improve the management of ACS patients. "This is an observational study, so we do not know whether helping people overcome their fears would improve the clinical outlook, or whether reducing the levels of acute inflammation would have beneficial emotional effects, but these are possibilities," said Prof Steptoe. "At the immediate clinical level, we would recommend that doctors talk to patients more about their emotional experience when having a heart attack, rather than just concentrating on the physical outcomes. The two are closely linked, and better information and reassurance could be of great benefit.

"Care for patients with acute heart disease has improved greatly over recent decades, but we are still concerned about people who recover in the short-term, but remain at risk for repeat heart attacks or other cardiovascular problems. This research is an illustration of how closely emotional, behavioural and biological responses are integrated. Patients' emotional responses are relevant to how they react biologically, and vice versa."

In an accompanying editorial [3], Susanne Pedersen, Professor of Cardiac Psychology at the University of Tilburg (Tilburg, The Netherlands), and colleagues describe Prof Steptoe's findings as

"seminal" and write that they "point towards an avenue worthwhile pursuing for the fields of translational cardiovascular medicine and behavioural cardiology".

They conclude: "In order to optimize the management and care of CHD [coronary heart disease] patients, we need to acknowledge that emotions carry independent additional risk, with particular subsets of patients dying prematurely due to their psychological vulnerability. Physiological mechanisms may provide part of the answer to the vicious cycle linking emotions to incident CHD and its progression. Behavioural mechanisms should not be forgotten, as there is an urgent need for more effective lifestyle management in these patients, due to increases in the prevalence of obesity and diabetes, and no change in the proportion of patients who smoke, despite an increase in the prescription of cardioprotective drugs. The issue of inadequate lifestyle management is unlikely to be resolved without attending to the emotions of our patients, as emotions such as depression play a pivotal role in compliance and adherence. This suggests that the 'one size fits all approach' to intervention in CHD patients is unlikely to work and that a personalized medicine approach is warranted."

More information: [1] "Fear of dying and inflammation following acute coronary syndrome". European Heart Journal. doi:10.1093/eurheartj/ehr132

[2] Heart rate variability (HRV): There are small variations in the time between each heart beat. The pace at which the heart beats is controlled by a branch of the nervous system called the autonomic nervous system. Heart rate variability is a measure of how effectively that system is operating. Low HRV is an indicator of poor functioning, and can predict future cardiac problems.

[3] "Heart and mind: are we closer to disentangling the relationship

between emotions and poor prognosis in heart disease?". European Heart Journal. doi:10.1093/eurheartj/ehr156