

Study identifies pathway linking socioeconomic status to cardiovascular risk

25 June 2019

A biological pathway previously found to contribute to the impact of stress on the risk of cardiovascular disease also may underlie the increased incidence of such disease experienced by individuals with lower socioeconomic status. The report from investigators at Massachusetts General Hospital (MGH), published online in the *Journal of the American College of Cardiology*, is a follow-up to a 2017 *Lancet* paper by some of the same authors that, for the first time in humans, linked activity of the stress-responsive brain structure the amygdala to elevated risk of events such as heart attack and stroke.

"This new study identifies a potentially modifiable biological pathway that contributes to the increased burden of cardiovascular disease that encumbers socioeconomically disadvantaged individuals," says Ahmed Tawakol, MD, director of Nuclear Cardiology in the MGH Division of Cardiology, lead author of the paper. "These observations point to a mechanism that may be an attractive target for future therapies aimed at reducing disparities in [health outcomes](#)."

The increased incidence of cardiovascular disease among those of lower socioeconomic status is well known. While some of that risk can be attributed to known [risk factors](#)—including rates of smoking and obesity and limited access to care—the greater risk persists even after adjusting for those factors, indicating that additional biological factors may be in play. The 2017 [study](#) used PET/CT brain imaging with a radiopharmaceutical that measures both activity within the brain and arterial inflammation to define a pathway that led from amygdala activation, to elevated production of immune cells, to increased arterial inflammation resulting in an increased risk of [heart attack](#), stroke or angina among 293 individuals who had brain imaging for cancer screening.

The current study focused on 289 of the participants in the 2017 study for whom data was

available reflecting their socioeconomic status, based on census data covering their home ZIP codes. The team's analysis revealed that individuals from neighborhoods with lower household incomes or higher crime rates had a significantly increased risk of experiencing a major adverse cardiac event—such as a heart attack, unstable angina, heart failure or cardiac death—in the four years after imaging. While many of those experiencing a cardiovascular event had traditional risk factors, living in a low-income neighborhood was strongly associated with increased resting amygdalar activity, elevated immune cell production and arterial inflammation. A similar association of those factors with neighborhood crime rates was observed, although it was not statistically significant.

"These results provide further support for considering socioeconomic status when assessing an individual's risk for cardiovascular disease and suggest new approaches to helping reduce cardiovascular risk among those patients," says Tawakol, an associate professor of Medicine at Harvard Medical School (HMS). "The multiple nodes of the biological pathway that we have defined—brain stress centers, immune cell production and arterial inflammation—could each be targeted by lifestyle approaches such as sufficient sleep, exercise and meditation; statins to reduce arterial inflammation, and novel treatments targeting this path."

He and his team hope to further define this [biological pathway](#), evaluate interventions that could reduce its activity and investigate the resiliency observed in a few individuals with low socioeconomic status who were found to have lower than average amygdalar activity and cardiovascular risk.

Katrina Armstrong, MD, chief of the MGH Department of Medicine and senior author of the *Journal of the American College of Cardiology*

paper, says, "These analyses highlight the incredible opportunity we have to apply recent advances in the understanding of human biology to addressing disparities in health." Armstrong is the Jackson Professor of Clinical Medicine at HMS.

More information: Ahmed Tawakol et al, Stress-Associated Neurobiological Pathway Linking Socioeconomic Disparities to Cardiovascular Disease, *Journal of the American College of Cardiology* (2019). [DOI: 10.1016/j.jacc.2019.04.042](https://doi.org/10.1016/j.jacc.2019.04.042)

Provided by Massachusetts General Hospital

APA citation: Study identifies pathway linking socioeconomic status to cardiovascular risk (2019, June 25) retrieved 21 November 2022 from <https://medicalxpress.com/news/2019-06-pathway-linking-socioeconomic-status-cardiovascular.html>

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