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Letter to Editor

Toxic Threats to Heart Health: The Heavy Metal-Atherosclerosis Connection

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Letter to the Editor: We are writing to illuminate an intriguing avenue of research that has the potential to revolutionize our approach to cardiovascular health: the Heavy Metal-atherosclerosis connection.

Atherosclerosis-related diseases represent a significant global public health burden, particularly in adults. This progressive condition, characterized by the accumulation of plaques within arterial walls, is a primary contributor to events such as heart attack, stroke and other vascular complications. According to the WHO, cardiovascular diseases (CVDs) remain the leading cause of death worldwide, claiming an estimated 17.9 million lives annually[1]. Well-established risk factors for atherosclerosis include increasing age, male sex, smoking history, hypertension and hypercholesterolemia, among others[2].

With the increasing prevalence of atherosclerosis, researchers are shifting their attention toward uncovering unconventional risk factors. Recent studies highlight environmental exposure to heavy metals-such as lead, cadmium and mercury-as significant contributors to the onset and progression of atherosclerosis. Gaining insight into this toxic interplay is essential for devising effective strategies to curb the escalating cardiovascular disease burden.

A systematic review reported that exposure to nonessential heavy metals such as Cadmium (Cd), Mercury (Hg) and Arsenic (As) was highly associated with coronary vascular diseases (CVDs)[1]. This finding is consistent with the findings of a study by A.Lamas who reported that Lead, cadmium and arsenic are associated with subclinical atherosclerosis, coronary artery stenosis and arterial calcification, as well as elevated risks for ischemic heart disease, stroke, left ventricular hypertrophy, heart failure and peripheral artery disease. These toxic metals contribute to vascular and cardiac dysfunction, exacerbating cardiovascular disease progression[3].

In addition, Cadmium exposure has been linked to a 41% higher risk of cardiovascular mortality, according to a NHANES 1999-2006 study[4]. Another European study revealed an association between mercury levels in hair and a 30% increased risk of carotid plaque formation, a precursor to atherosclerosis[5].

Research has focused on finding how these heavy metals affect the cardiovascular system. Some studies suggest that they induce oxidative stress and promote inflammation, which damages the endothelial lining of blood vessels, leading to atherosclerosis. Moreover, they interfere with nitric oxide production, impairing vasodilation and causing hypertension. Heavy metals also cause DNA damage (genotoxicity), further exacerbating inflammation and vascular dysfunction[5].

Thus, low-level environmental metal contamination remains a significant risk factor for atherosclerotic vascular disease, particularly in vulnerable populations[3]. Reducing cardiovascular mortality from atherosclerosis depends on public health efforts

to limit metal exposure through interventions such as improved monitoring, healthcare initiatives and treatments such as metal chelation. Recognizing the role of metals in atherosclerosis can stimulate advances in drug development to counteract their effects. Policymakers must establish comprehensive measures to address contamination in water, air and food, supported by cost-benefit analyses of health impacts. Further prospective studies and public awareness are essential for mitigating the burden of metal-related cardiovascular disease.

Conflict of interest

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Declaration of ethical approval

None.

Declaration of use of AI

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