

Low-dose radiation linked to increased lifetime risk of heart disease

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Exposure to low doses of ionizing radiation is associated with a modestly increased excess risk of heart disease, finds an analysis of the latest evidence published by *The BMJ* today.

The researchers say these findings "have implications for patients who

undergo [radiation exposure](#) as part of their medical care, as well as [policy makers](#) involved in managing [radiation risks](#) to radiation workers and the public."

A linked editorial suggests that these risks "should now be carefully considered in protection against radiation in medicine and elsewhere."

It's well recognized that exposure to high dose radiation can damage the heart, but firm evidence linking low dose radiation to [heart disease](#) (e.g., scatter radiation dose from radiotherapy or working in the nuclear industry) is less clear.

To address this knowledge gap, an international team of researchers examined scientific databases for studies evaluating links between a range of cardiovascular diseases and exposure to radiation (mostly radiotherapy and occupational exposures).

They excluded uninformative datasets or those largely duplicating others, leaving 93 studies, published mainly during the past decade, suitable for analysis. These studies covered a broad range of doses, brief and prolonged exposures, and evaluated frequency (incidence) and mortality of various types of vascular diseases.

After taking account of other important factors, such as age at exposure, the researchers found consistent evidence for a dose dependent increase in cardiovascular risks across a broad range of radiation doses.

For example, the relative risk per gray (Gy) increased for all cardiovascular disease and for specific types of cardiovascular disease, and there was a higher relative risk per dose unit at lower dose ranges (less than 0.1 Gy), and also for lower dose rates (multiple exposures over hours to years).

At a [population level](#), excess absolute risks ranged from 2.33% per Gy for a current England and Wales population to 3.66% per Gy for Germany, largely reflecting the underlying rates of cardiovascular disease mortality in these populations.

This equates to a modest but significantly increased excess lifetime risk of 2.3-3.9 cardiovascular deaths per 100 persons exposed to one Gy of radiation, explain the authors.

Substantial variation was found between studies, although this was markedly reduced when the authors restricted their analysis to higher quality studies or to those at moderate doses (less than 0.5 Gy) or low dose rates (less than 5 mGy/h).

The authors suggest that mechanisms for these cardiovascular effects are poorly understood, even at high dose.

They also acknowledge that few studies assessed the possible modifying effects of lifestyle and medical risk factors on radiation risk, particularly major modifiable risk factors for cardiovascular disease like smoking, obesity, diabetes, [high blood pressure](#) and high cholesterol, and say further research is needed in this area.

In conclusion, they say their findings support an association between acute high dose and (to a lesser extent) chronic low dose radiation exposure and most types of cardiovascular disease and suggest that "radiation detriment might have been significantly underestimated, implying that radiation protection and optimization at low doses should be rethought."

This view is supported by Professor Anssi Auvinen at Tampere University in Finland in a linked editorial, who points out that while inconsistencies and gaps remain in the evidence linking vascular disease

to low dose radiation exposure, "evidence for [cardiovascular disease](#) will soon need to be added to the existing list of [radiation](#)-induced health risks."

This will involve revisiting concepts and standards in radiological protection, while more stringent standards for justification and optimization, especially for high dose procedures, will have to be considered, he explains.

Their implementation will also require training to improve awareness, knowledge, and understanding of the risks associated with specific procedures and cumulative exposure, as well as risk communication for patients and the public, he concludes.

More information: Ionising radiation and cardiovascular disease: systematic review and meta-analysis, *The BMJ* (2023). [DOI: 10.1136/bmj-2022-072924](#)

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