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Adeel Khoja

Aga Khan University, adeel.khoja@aku.edu

Fizzah Kazim

Aga Khan University

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Impact of Airborne Pollutants on Stroke

Adeel Khoja, MBBS, MSc,¹ Fizzah Kazim, MBBS²

¹The Aga Khan University, Karachi, Pakistan ²Dow University of Health Sciences, Karachi, Pakistan

TO THE EDITOR

The association of airborne pollutant exposure with cerebrovascular pathology is underrecognized. Air pollutants such as particulate matter have the potential to extend beyond pulmonary organs to the central nervous system.¹ People living in highly polluted environments are at risk of developing neurodegenerative diseases, neurocognitive decline, and stroke.¹ Stroke is one of the most common debilitating neurologic deficits. Each year, approximately 5 million people die from stroke, and it is a major cause of disability worldwide.²

Road traffic is one of the major contributors to outdoor air pollution and a major source of particulate matter, carbon monoxide, and nitrogen oxides.³⁻⁵ The level of nitrogen dioxide (NO₂) in the air is closely related to traffic-generated particles from car exhausts.³ Anderson et al showed a significant association between NO₂ and stroke incidence: a 12% increase in the incidence of stroke and a 33% increase in the incidence of fatal stroke.³ They concluded that reducing the level of NO₂ might reduce the burden of stroke.³ A study conducted in England and Wales showed that men living in proximity to a major roadway had a 7% higher stroke mortality compared to those living far away.⁴

Air pollution is more strongly associated with ischemic stroke than hemorrhagic stroke. Exposure to particulate matter is associated with a 21% increase in hospital admissions for mild ischemic stroke⁵ and a 12% increase in hemorrhagic stroke admissions.⁶

Literature on cardiovascular disease has linked air pollution through systemic inflammation and endothelial damage to acceleration of atherosclerosis and thrombus formation.⁷ Loane et al highlighted that particulate matter and ultrafine particulate matter play a role similar to tobacco smoke in accelerating coronary atherosclerosis that may lead to development of thrombotic stroke.¹ The magnitude of personal risk due to air pollution is lower compared to other well-established risk factors; however, substantial population risk exists as almost everyone is exposed.⁵

The potential role of air pollution in the incidence of stroke and its adverse impact on health cannot be ignored. The

stroke mortality rate continues to rise each year; moreover, millions of stroke survivors have serious, long-lasting disabilities. Air pollution is an important and modifiable risk factor for stroke, so public and environmental health policies aimed at curbing air pollution need to be implemented.

REFERENCES

1. Loane C, Pilinis C, Lekkas TD, Politis M. Ambient particulate matter and its potential neurological consequences. *Rev Neurosci*. 2013;24(3):323-335. doi: 10.1515/revneuro-2013-0001.
2. Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012 Dec 15;380(9859):2095-2128. doi: 10.1016/S0140-6736(12)61728-0.
3. Andersen ZJ, Kristiansen LC, Andersen KK, et al. Stroke and long-term exposure to outdoor air pollution from nitrogen dioxide: a cohort study. *Stroke*. 2012 Feb;43(2):320-325. doi: 10.1161/STROKEAHA.111.629246.
4. Maheswaran R, Elliott P. Stroke mortality associated with living near main roads in England and Wales: a geographical study. *Stroke*. 2003 Dec;34(12):2776-2780.
5. Andersen ZJ, Olsen TS, Andersen KK, Loft S, Ketznel M, Raaschou-Nielsen O. Association between short-term exposure to ultrafine particles and hospital admissions for stroke in Copenhagen, Denmark. *Eur Heart J*. 2010 Aug;31(16):2034-2040. doi: 10.1093/eurheartj/ehq188.
6. Chiu HF, Chang CC, Yang CY. Relationship between hemorrhagic stroke hospitalization and exposure to fine particulate air pollution in Taipei, Taiwan. *J Toxicol Environ Health A*. 2014;77(19):1154-1163. doi: 10.1080/15287394.2014.926801.
7. Brook RD, Rajagopalan S, Pope CA 3rd, et al; American Heart Association Council on Epidemiology and Prevention, Council on the Kidney in Cardiovascular Disease, and Council on Nutrition, Physical Activity and Metabolism. Particulate matter air pollution and cardiovascular disease: an update to the scientific statement from the American Heart Association. *Circulation*. 2010 Jun 1;121(21):2331-2378. doi: 10.1161/CIR.0b013e3181d8e1.