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Impact of Ozone on Kidney Transplant Outcomes

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Objectives : Earlier work has shown adverse air pollution effects on kidney disease outcomes, yet the specific impact of ozone (O_3) on kidney transplant (KT) recipients remains unclear. We investigated the long-term O_3 exposure effects on KT outcomes employing a multipollutant model.
Methods : This multicenter, longitudinal cohort study included 4,799 adult KT recipients who underwent transplantation during 2002–2020 at three major hospitals in South Korea. O_3 and fine particulate matter ($PM_{2.5}$) exposures were estimated using residential-ZIP-code-based high-resolution machine learning models. Associations between O_3 exposure and all-cause mortality or death-censored graft failure (DCGF) were evaluated via time-varying Cox proportional hazards models adjusted for poteintial confounders, including $PM_{2.5}$.
Results : The mean annual O_3 and $PM_{2.5}$ concentrations from one year posttransplant were 39.14±6.8 μg/m^3 and 26.67±11.3 μg/m^3, respectively. A 5-ppb increase in O_3 was associated with elevated risks of DCGF (hazard ratio [HR]=1.19; 95% confidence interval [CI]=1.04–1.37) and all-cause mortality (HR=1.39; 95% CI=1.15–1.69) after adjusting for $PM_{2.5}$ and other confounders. These associations remained consistent across subgroup and sensitivity analyses.
Conclusions : Chronic O_3 exposure significantly increases mortality and graft failure risk in KT recipients, highlighting the critical need for targeted strategies to mitigate air pollution's impact on vulnerable transplant populations.