ABSTRACT

Background: Few studies have investigated the association between exposure to fine particulate matter (PM2.5) and infant mortality in developing countries, especially for the health effects of specific PM2.5 constituents. **Objective:** We aimed to examine the association of long-term exposure to specific PM2.5 constituents with infant mortality in 15 African countries from 2005 to 2015. **Methods:** Based on the Demographic and Health Surveys (DHS) dataset, we included birth history records from 15 countries in Africa and conducted a multicounty cross-sectional study to examine the associations between specific PM2.5 constituents and infant mortality. We estimated annual residential exposure using satellite-derived PM2.5 for mass and a chemical transport model (GEOS-Chem) for its six constituents, including organic matter (OM), black carbon (BC), sulfate (SO_4^{2-}), nitrate (NO_3^-), ammonium (NH_4^+), and soil dust (DUST). Multivariable logistic regression analysis was employed by fitting single-constituent models, the constituent-PM2.5 models, and the constituent-residual models. We also conducted stratified analyses by potential effect modifiers and examined the specific associations for each country. **Results:** We found positive and significant associations between PM2.5 total mass and most of its constituents with infant mortality. In the single-constituent model, for an IQR increase in pollutant concentrations, the odds ratio (OR) of infant mortality was 1.03 (95 %CI; 1.01, 1.06) for PM2.5 total mass, and was 1.04 (95 %CI: 1.02, 1.06), 1.04 (95 %CI: 1.02, 1.05), 1.02 (95 %CI: 1.00, 1.03), 1.04 (1.01, 1.06) for BC, OM, SO_4^{2-}, and DUST, respectively. The associations of BC, OM, and SO_4^{2-} remained significant in the other two models. We observed larger estimates in subgroups with older maternal age, living in urban areas, using unclean cooking energy, and with access to piped water. The associations varied among countries, and by different constituents. **Conclusions:** The carbonaceous fractions and sulfate play a major important role among PM2.5 constituents on infant mortality. Our findings have certain policy implications for implementing effective measures for targeted reduction in specific sources (fossil fuel combustion and biomass burning) of PM2.5 constituents against the risk of infant mortality.

Keywords: Infant mortality, Demographic and Health Surveys, Fine particulate matter, Constituents Multicountry study.