

Health effects of PM2.5 sources on children's allergic and respiratory symptoms in Fukuoka, Japan

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Exposure to fine particulate matter (PM2.5) is a potential aggravating factor for respiratory and allergic diseases. However, which PM2.5 sources are associated with such diseases remains unclear. This study aimed to investigate the association of PM2.5 sources with allergic and respiratory symptoms in schoolchildren. PM2.5 samples were collected in Fukuoka during the spring in 2014 and 2015. Asian dust was observed in 2014. Ion components, elemental components, and organic components were analyzed. Positive matrix factorization (PMF) was conducted to calculate PM2.5 concentrations from each source. Mixed logistic regression analysis with a random intercept for each schoolchild was performed to evaluate the association of components and sources with symptoms. Among 2317 schoolchildren, the mean prevalence was 28.9%, 23.6%, 11.2%, and 11.4% for lower respiratory, nasal, ocular, and skin symptoms, respectively. PMF identified the following six PM2.5 sources “Secondary sulfate and coal combustion”, “Secondary nitrate”, “Heavy oil combustion”, “Sea salt”, “Soil” and “Traffic emission”. An interquartile range of PM2.5 mass was associated with nasal (Odds ratios 1.08, 95% confidence interval [1.03, 1.13]), ocular (1.10, [1.04, 1.16]), and skin symptoms (1.13, [1.06, 1.20]). Among the source factors, “Heavy oil combustion” was significantly associated with nasal symptom (1.11, [1.05, 1.18]) while “Sea salt” was associated with nasal (1.06, [1.02, 1.11]) and skin (1.073, [1.01, 1.14]) symptoms. We found “Soil”, which might be affected by Asian dust, was associated with ocular (1.07, [1.03, 1.10]) and skin (1.05, [1.01, 1.08]) symptoms. Further studies in other seasons or places are needed to clarify the influence of PM2.5 sources on children's health.

PM2.5発生源が呼吸器・アレルギー疾患に関連しているのかは不明である。PM2.5発生源と学童のアレルギー・呼吸器症状との関連を調査することを目的として、2014年と2015年の春に福岡で行われた。観測されたPM2.5とその成分濃度から、Positive matrix factorization (PMF)解析を行い、6つのPM2.5発生源「二次硫酸塩及び石炭燃焼」、「二次硝酸塩」、「重油燃焼」、「海塩」、「土壌」、「交通」を同定し、学童の症状との関連について検討した。調査期間中の2317人の学童について、下気道、鼻、眼、及び皮膚の有症割合は、それぞれ28.9%、23.6%、11.2%、11.4%であった。PM2.5重量濃度の四分位範囲の増加は、鼻（オッズ比1.08、95%信頼区間[1.03, 1.13]）、眼（1.10, [1.04, 1.16]）、及び皮膚

症状 (1.13, [1.06, 1.20]) に関連していた。発生源別では、「重油燃焼」は鼻の症状 (1.11, [1.05, 1.18]) と有意に関連し、「海塩」は鼻 (1.06, [1.02, 1.11]) 及び皮膚 (1.073, [1.01, 1.14]) 症状と関連していた。黄砂の影響を受ける可能性のある「土壌」は、眼 (1.07, [1.03, 1.10]) 及び皮膚 (1.05, [1.01, 1.08]) の症状に関連していることが明らかとなった。