Environmental Tobacco Smoke and Child Development: A Case-control Study on Hong Kong Chinese Toddlers

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Abstract

Objective: To investigate the relationship between environmental tobacco smoke (ETS) exposure during prenatal and early childhood period and developmental delay among Hong Kong Chinese toddlers. Methods: A case-control study was carried out on 392 children with newly diagnosed developmental delay and 393 controls with normal development. A self-administered questionnaire was used to collect household smoking history. The main outcome measures were the adjusted odds ratios for developmental delay in different ETS exposures during prenatal and postnatal period. Results: Before adjustment, household ETS appeared to be associated with elevated rates of developmental delay among toddlers, before and after birth (crude ORs = 1.53 [95%CI 1.13-2.07] & 1.44 [95%CI 1.06-1.96] respectively). The main contribution was from paternal smoking (crude ORs = 1.73 [95%CI 1.24-2.42] & 1.90 [95%CI 1.34-2.68] respectively). However, these associations became non-significant statistically when the child’s gender and socioeconomic factors of the family were adjusted (adjusted ORs = 1.18 [95%CI 0.86-1.63] & 1.23 [95%CI 0.88-1.73] respectively). Conclusion: There is some evidence of an association between environmental tobacco smoke in both prenatal and early childhood period and developmental delay among Hong Kong Chinese toddlers. However, this association appears to be confounded by gender of the child and socioeconomic factors. However, since home is the most significant ETS exposure location for toddlers, educational efforts for family members about reducing their children’s ETS exposure are essential.

Key words Developmental delay; Environmental tobacco smoke (ETS)

Introduction

Human brain develops rapidly during pregnancy and the first two and a half years of life. Exposure to toxicants during this period is believed to have the greatest impact on neurodevelopmental functioning. The biological mechanism through which tobacco may exert adverse effects on neurodevelopment are potentially complex, given that tobacco smoke has over 2000 chemical constituents, most at trace levels. The two most well-examined constituents are carbon monoxide and nicotine, both of which are neurotoxic in a variety of species.

The negative effects of maternal smoking during pregnancy on children’s general intellectual ability, language tasks and academic achievement have been demonstrated by some overseas studies. At least three studies have shown an effect on mental development, including an association with a reduced cognitive functioning by age three and a reduction in vigilance in the young child. These studies often reported dose-related effects. The commonly accepted mechanism for these effects is altered brain development resulting from fetal hypoxia due to either nicotine in cigarette smoke that acts to reduce blood flow to the fetus or possibly carbon monoxide, which produces higher levels of carboxhemoglobin. Nicotine may also target specific neurotransmitter receptors in the fetal brain, causing abnormalities in cell proliferation and differentiation.

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