Associations between Maternal Periconceptional Exposure to Secondhand Smoke and Major Birth Defects

This study used data from the National Birth Defects Prevention Study (NBDPS), the largest case-control study to date of birth defects in the United States, to examine the association between maternal periconceptional exposure to secondhand smoke (SHS) and a spectrum of major birth defects for delivery years 1997 through 2009. The analysis was restricted to birth defects with ≥100 cases, singleton births, non-smokers, and mothers without pregestational type-1 or 2 diabetes (which has been associated with a range of birth defects). Following the inclusion/exclusion criteria, 44 birth defect “groups” were identified—leaving a total of 18,762 cases and 7,747 controls. Maternal exposure to SHS was examined for the period one month prior to conception through the first trimester for all birth defects; with the exception being craniosynostosis—where associations in the second and third trimesters were also examined. Additionally, source of SHS exposure (whether household or workplace/school – occurring concurrently or independently) were also examined. Multivariate logistic regression models were used to estimate both crude and adjusted odds ratios and 95% confidence intervals (cORs/aORs, 95% C.I.s). The odds ratios were adjusted for a variety of maternal and infant factors including: maternal age, education, race/ethnicity, BMI, periconceptional alcohol and folic acid intake, previous live births, maternal nativity, pregnancy intention, household income/number of people supported by the income, study center, and time to interview.

Main findings from this research

◊ The prevalence range of SHS was wider for cases (12.9-27.8%) than for controls (14.5-15.8%)

◊ Modest positive associations were noted between SHS and the following defect groups: neural tube defects (anecephaly: (aOR, 1.66; 95% C.I., 1.22-2.25); spina bifida: (aOR, 1.49; 95% C.I., 1.20-1.80)), orofacial clefts (left lip without cleft palate: (aOR, 1.41; 95% C.I., 1.10-1.81); cleft lip with or without cleft palate (aOR, 1.24; 95% C.I., 1.05-1.46); and cleft palate alone (aOR, 1.31; 95% C.I., 1.06-1.63)), bilateral renal agenesis (aOR, 1.99; 95% C.I., 1.05-3.75), amniotic band syndrome-limb body wall complex (aOR, 1.66; 95% C.I., 1.10-2.51), and atrial septal defects, secundum (aOR, 1.37; 95% C.I., 1.09-1.72)

◊ No significant inverse associations observed across any of the case groups

Conclusion and discussion

A modest positive association between exposure to any SHS and 8 birth defects, 1 CHD and 7 non-CHDs, was observed. The results are consistent with previous studies which have found SHS to be moderately associated with a few birth defects—particularly NTDs and orofacial clefts. Despite the moderate size of the risk estimates, the pervasiveness of SHS worldwide, particularly in lower-resource countries and segments of the population, may translate into many cases of potentially preventable birth defects.