

Maternal Use of Snus in Pregnancy and Early Childhood Blood Pressure: A Warning for e-Cigarettes?

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The health-related harms of tobacco smoking are largely uncontroversial. The consequences are amplified in women of reproductive age; tobacco smoking during pregnancy has health-related implications for both the mother and the fetus. These include an increased risk of ectopic pregnancy, placental abruption, and placenta previa¹ in addition to worse perinatal outcomes such as miscarriage, low birth weight, and sudden unexpected infant death.^{2–4} There is also growing evidence that tobacco smoking during pregnancy is associated with worse long-term health outcomes, including cardiovascular disease, for the offspring.^{5–7}

Although it is welcome news that the prevalence of tobacco smoking has decreased in the United States, this decrease has been accompanied by a surge in electronic cigarette (e-cig) use. The prevalence of active e-cig use in the United States is 4.5%, with rates as high as 10% among younger people.⁸ Pregnant women have significantly lower rates of tobacco smoking than nonpregnant women; however, pregnant and nonpregnant women have similar rates of e-cig use.⁹ This suggests that pregnant women may perceive e-cigs to be a safe alternative to tobacco smoking. Indeed, although attitudes are shifting,¹⁰ e-cigs have generally been perceived as a safe alternative to tobacco smoking.¹¹ Because widespread e-cig use is a recent phenomenon, our understanding of the sequelae of e-cig use is rapidly evolving. The recent multistate outbreak of severe respiratory disease is an example.¹²

The increased popularity of e-cigs demands rigorous safety research. In addition to e-cigs, noncombustible nicotine

products include snus (Swedish moist tobacco) and chewing tobacco. Because these products have a long history of use, we can learn valuable lessons from their safety data. In addition, studies of noncombustible nicotine products disambiguate the effects of nicotine from those of smoke inhalation.

Prior studies have shown that maternal smoking is associated with higher childhood blood pressure and altered autonomic parameters, but the precise role of in utero nicotine exposure is unclear.^{7,13,14} Children born to mothers who smoke tobacco are exposed to products of combustion in addition to nicotine, and they have additional second-hand exposure to tobacco smoke during childhood. These concerns are less salient when considering snus use because it is used by placing a tobacco pouch under the lip.

Nordenstam and colleagues asked whether maternal snus use during pregnancy is associated with higher childhood blood pressure and alterations in heart rate variability.¹⁵ As reported in this issue of the *Journal of the American Heart Association (JAHA)*, the authors analyzed data from a prospective cohort study of mother–child pairs recruited in Sweden during 2006–2011. Pregnant women were classified as *snus users*, *tobacco smokers*, or *tobacco-free controls*. For this study, only women who used high-dose snus during their entire pregnancy were categorized as snus users. From the original cohort, the authors selected snus-user and tobacco-free mother–child pairs in which the child was born with appropriate birth weight and reached an age of 5 to 6 years. Importantly, they excluded pairs in which children were exposed to parental tobacco smoking in utero or during childhood. The outcomes were systolic and diastolic blood pressure, averaged over 3 measurements. Age-, sex-, and height-adjusted percentiles were calculated to define elevated blood pressure and hypertension. In addition, they measured heart rate variability among a subsample of 32 children who tolerated a 24-hour ECG monitor. The authors selected low/high-frequency ratio as the primary heart rate variability parameter of interest based on their prior work.¹⁶ Multiple linear regression models were used to evaluate the association between maternal snus use and childhood blood pressure while adjusting for confounders.

Among 40 mother–child pairs, 21 mothers were snus users and 19 were controls. Children of snus users had higher

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systolic blood pressure than control children (98.7 versus 93.3 mm Hg; $P=0.013$). In multiple linear regression models, maternal snus use was associated with higher systolic blood pressure after adjusting for the child's age and height. However, when adjusting instead for age and weight, a similar direction of effect was observed, but the association was not statistically significant ($P=0.10$). Differences in diastolic blood pressure were not seen. Heart rate was similar in both groups, but a greater low/high-frequency ratio was observed in snus-exposed children than controls. In summary, their data support an association between maternal snus use and higher childhood systolic blood pressure and altered autonomic cardiac control.

The strengths of this study are the unique nature of the nicotine exposure and the study design; the study of the effect of maternal snus use on childhood cardiovascular parameters is a useful model for the study of in utero nicotine exposure. A caveat is that children were exposed to variable amounts of nicotine after birth when breastfeeding, so the exposure is not strictly in utero. Additional important limitations include the small sample size, the presence of selection bias, and multiple statistical comparisons. These limitations may explain the dramatic effect size of a 5-mm Hg difference. Their findings require rigorous replication.

The results, however, are noteworthy for 2 reasons. First, their findings are consistent with prior studies demonstrating a deleterious association between in utero nicotine exposure and childhood blood pressure and other cardiovascular parameters.^{7,16,17} This is worrisome given mounting evidence that pediatric hypertension is associated with hypertension in adulthood.¹⁸ In the population of pregnant women who smoke tobacco, fetal safety considerations should likely limit the use of nicotine-based alternatives such as snus and e-cigs. Second, the findings may inform our understanding of the overall public health impact of e-cigs. Specifically, e-cigs may have a role in tobacco smoking cessation.¹⁹ It will be important to elucidate the safety of long-term nicotine exposure to ensure that possible risks do not outweigh the lower carcinogen and toxin exposure compared with tobacco smoking.²⁰ Regardless, efforts to minimize the new use of such products, especially among young people and women of reproductive age, should be a public health priority.

Disclosures

None.

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