Second-Hand Smoking in Children: How Extensive Is It?

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Introduction

Sources of carbon monoxide include wood/gas-burning stoves, oil/gas heaters, motor vehicles and tobacco smoking, likely the most relevant source. Second-hand smoking can contribute to adverse outcomes in pediatric anesthesia. The prevalence of increased preoperative carboxyhemoglobin (COHb) in children is unknown. This prospective study with a noninvasive COHb monitor seeks to determine preoperative COHb levels in children and to assess a possible link between elevated COHb values and parental smoking as well as additional environmental factors. Interim results are presented.

Methods

Following IRB approval and with parental written informed consent, parents and children presenting for elective pediatric surgery were enrolled. Parents completed an anonymous survey including questions about their tobacco use. Children between the ages of 1 - 12 years underwent preoperative COHb testing using a noninvasive dual oxygen saturation and COHb monitor (Radical-7 Rainbow SET Pulse CO-Oximeter, Masimo, Irvine, CA). The Mann- Whitney and Kruskal-Wallis tests were used for statistical analyses, a $p < 0.05$ was significant. Results reported in means + standard deviation.

Results

166 parents and children have been enrolled. 48 children (29%) were exposed to parental smoking. The COHb level of the 69 girls and 97 boys was 4.2 + 4.4 %, no gender differences. Children of smokers had higher COHb than control (4.96 + 5.5% vs 3.86 + 3.86% p=0.3). Data were then analyzed in 3 distinct age groups: 1-2 n=30, 3 - 6 n=63, and 7-12 n=73, indicating higher values in younger children of smoking parents (Fig 1). Among children without tobacco smoke exposure COHb was elevated when their school was close to a highway (4.8 + 3.6% vs 3.7 + 3.9%). None of these results were statistically significant. In children of smoking parents, boys' mean COHb was significantly higher than girls' (6.03 + 6.2% n = 30 vs 3.17 + 3.58 n= 18%, p=0.04).

Discussion

Our interim analysis demonstrates that children with parental tobacco smoking exposure have consistently elevated COHb levels compared to their peers, pronounced at a younger age. Considering a similar study in adults, COHb levels of our second-hand smoking children are close to those of adult smokers and even exceed them at a younger age, while adult second-hand smokers had much lower COHb. This suggests that younger children in particular are highly affected by tobacco smoke exposure. It is unclear why secondhand smoking boys had

significantly higher COHb values compared to girls. Highway proximity of a school may be a potential factor for elevated COHb levels. Limitations of this study include the small sample size, specifically second-hand smokers, possible parental smoking habit reporting bias and the device's COHb error margin of up to 3 %. With improved accuracy, noninvasive COHb monitoring may be useful for preoperative risk stratification of individual pediatric patients.

Figure 1