Active and passive smoking increase blood cadmium concentrations in Canadian newcomers and Canadian-born participants; a preliminary report.

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Introduction

High cadmium exposure is a population health hazard, which may cause a decrease in long-term bone mineral density and act as a risk factor for osteoporosis. Moreover, a high cadmium body burden is associated with increased excretion of beta 2-microglobulin from urine, which is a nonspecific biomarker of future kidney disease. Finally, zinc and iron absorption have shown to be negatively affected by cadmium, and conversely could affect the rate of cadmium absorption.

Smoking has been attributed to cadmium exposure. Moreover, recent reports suggest smoking is a greater contributor for Cadmium exposure in First Nations communities of Canada, versus consumption of cadmium-accumulating organ meats. Cadmium concentrations were positively associated with the number of cigarettes smoked daily.

In this study, we hypothesized that smoking would increase the bodily cadmium burden, and that Canadian newcomers may harbour different heavy metal concentrations, in comparison to the Canadian-born population, leading to health inequities across the nation.

Methods

Data from the Canadian Health Measures Survey was used to examine groupings of newcomers (Caucasian (CN) and non-Caucasian (NCN)) and Canadian-born (CB) participants. Smoking, as one of the sociodemographic variables, was assessed to examine the influence of exposure on heavy metal burden within the body. Smoker type (e.g., never, daily), and whether or not there were daily smokers within the home, categorically characterized participant smoking exposure. Finally, time since quitting daily smoking was additionally examined as a continuous variable. Canadian newcomers and Canadian-born were compared.

Results

Active smoking

- Cadmium
  Smoking significantly increased cadmium concentrations for both CN and NCN (p<0.0001), and CB (p<0.0001).

- Smoking elevated concentrations of cadmium for all subgroups.

Passive smoking

- Cadmium
  Having smokers inside of the home significantly increased cadmium, as well, for both CN (0.0002) and NCN (0.0002) newcomers, and CB (p<0.0001).

Living with members that smoke inside the home elevated cadmium for all subgroups.

Lastly, all significant associations of metal concentrations and time since quitting smoking daily were negatively directed (p<0.0001).

Quitting daily smoking reduced cadmium for all subgroups.

Discussion

This study found that both active and passive smoking is related to increased body burden of cadmium that could be a risk factor for osteoporosis and kidney diseases. These findings are consistent with similar studies.

We also found that newcomers have higher total blood cadmium levels, in comparison to CB participants, which NCN exhibiting the highest cadmium levels. The observation of elevated metal concentrations in newcomers, compared to native-born individuals, is consistent with prior research conducted on this topic. Moreover, and more specifically, differing exposure concentrations between CN and NCN is also consistent with prior studies conducted where the researchers found regional variations in the dioxin and the aflatoxin exposure burden, similar to our results on metals.

Although cadmium can be measured in blood, urinary cadmium levels better reflect total body burden. Normal urine levels should generally be less than 1 mcg/g of creatinine. If higher levels are observed, long-term exposure to cadmium is likely. The limited access to urinary cadmium is a limitation for this study.

Conclusion

The results of this investigation suggest that active and passive smoking are both a predictor of elevated blood cadmium, supporting the concept that smoking is detrimental to health.

The strength of the association between, both, active and passive smoking is a relationship that smokers should be aware of. Smokers, or those exposed to second-hand smoke frequently, may require lifestyle advice on preventing other risk factors of osteoporosis and kidney diseases, such as mobility. They may also require awareness towards diet modifications, and supplementation, to minimize risk of cadmium exposure.

Moreover, this study provides insight on the necessity to identify important distinctions amongst newcomer subgroups when examining health, allowing us to move past the Canadian-born/newcomer dichotomy. Because of the lengthy half-lives of particular metals such as cadmium, it is expected that mono tonic and non-montonic health burdens may persist for an extended period of time amongst heavily exposed newcomers.

The results of this investigation are unique and have provided a starting point for the development of forthcoming targeted interventions and risk management strategies for particular subgroups, disproportionately exposed to cadmium.

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References

14. The ToxGuide™ is developed to be used as a pocket guide. Tear off at perforation and fold along lines. ATSDR. https://www.atsdr.cdc.gov/toxguides/toxguide5-5.pdf (accessed Nov 05, 2018).
18. Cadmium. IBM Micromedex®.