Comparing salivary cotinine concentration in non-smokers from the general population and hospitality workers in Spain

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Background: The objective was to compare the pattern of exposure to second-hand smoke (SHS) among non-smokers in the general population and in hospitality workers. Methods: We used the adult (16–64 years) non-smokers of two independent studies (general population and hospitality workers) in Spain. We assessed the exposure to SHS by means of questionnaire and salivary cotinine concentration. Results: The salivary cotinine concentration by sex, age, educational level, day of week of saliva collection, and exposure to SHS were always higher in hospitality workers than in the general population. Conclusion: Our results indicated that non-smoker hospitality workers have higher levels of exposure to SHS than general population.

Keywords: cotinine, environmental tobacco smoke, general population, hospitality worker, second-hand smoke.

Introduction

Second-hand smoke (SHS) has been associated with a variety of health effects among non-smokers.1 Exposure to SHS mainly depends on exposure at home and work, and, among workers in the absence of a smoking ban in workplaces, it may vary for different occupations.2 We have recently conducted two independent studies in Spain to assess SHS exposure in non-smokers in different population groups. One study describes salivary cotinine concentration among non-smokers from the general population.3 The other study evaluates the impact of the Spanish smoking law in hospitality non-smoker workers.4 With these data, we aimed to compare the pattern of exposure to SHS among non-smokers in the general population and in hospitality workers assessed by means of salivary cotinine concentration.

Methods

We used non-smoker population within labour age (16–65 years) of these two independent studies. The first study was a cross-sectional survey conducted between March 2004 and December 2005 on a representative random sample (1245 people, 694 women and 551 men) of the non-institutionalized population of Barcelona, Spain.5 The second study was a prospective study in five regions of Spain, including 431 hospitality workers (180 women and 251 men) employed at pubs, bars, restaurants, hotels and discoteques. The follow-up period was from 2005 (before to the enactment of the Tobacco Control Law in Spain) until 2008 (2 years after the law). We used data from the baseline survey (October–December 2005).4 Both surveys were conducted before the Spanish smoking law came into effect in January 2006.5

In both studies, we obtained a saliva sample for cotinine analysis using the same protocol. Participants were asked to rinse their mouths and then suck a lemon candy (Smint®) to stimulate saliva production. Saliva samples were frozen and sent to the Bioanalysis Research Group of the Municipal Institute for Medical Research (IMIM-Hospital del Mar) in Barcelona. Salivary cotinine was measured by gas chromatography with detection by mass spectrometry (GC/MS). The limit of quantification was 1 ng/ml and the limit of detection was 0.3 ng/ml (quantification error <15%). For cotinine concentration between the limits of quantification and detection, we assigned half the level of quantification (0.5 ng/ml).

The same definition of smoking status was used in both studies. We considered as non-smoker the person who declared to have never smoked or to have formerly smoked, and had a salivary cotinine concentration compatible with non-smoking (<20 ng/ml).6,7 The final sample for this analysis consisted of 509 non-smokers from the general population and 209 non-smokers from the baseline cohort from the hospitality workers. Given the skewed distribution of cotinine concentration, we calculated geometric means and 95% confidence intervals (CIs) to describe the data. We also computed the ratios of the geometric mean of salivary cotinine concentration (hospitality workers vs. general population) to describe differences according to selected socio-demographic characteristics (i.e. sex, age, and educational level), day of the week of the saliva sample collection, and exposure to SHS at home and work.
The geometric mean of cotinine concentration was 1.45 ng/ml (95% CI: 1.33–1.60 ng/ml) in the general population, and 1.95 ng/ml (95% CI: 1.78–2.14 ng/ml) in hospitality workers. Salivary cotinine concentration was higher in men as compared to women, but always higher in both men and women who were hospitality workers (ratio of geometric means = 1.30) (Table 1). Salivary cotinine concentration by sex, age, educational level, exposure to SHS at home and work and day of week were always higher in hospitality workers than in the general population (Table 1). When we restricted the general population sample to those employed men and women, we found a similar salivary cotinine concentration (overall geometric mean: 1.43 ng/ml, 95% CI: 1.29–1.59 ng/ml).

In the general population, the prevalence rate of exposure to SHS was 26.1% (95% CI: 18.7–33.6%) at home and 40.5% (95% CI: 32.7–48.3%) at work. In hospitality workers, the prevalence rate of exposure to SHS was 31.2% (95% CI: 19.9–42.6%) at home and 70.6% (95% CI: 63.0–78.1%) at work. The geometric mean of salivary cotinine concentration was 1.57 ng/ml (95% CI: 1.32–1.86 ng/ml) in the general population who reported exposure to SHS at home, and 2.01 ng/ml (95% CI: 1.90–2.14 ng/ml) in hospitality workers who reported exposure to SHS at home (ratio = 1.41). The geometric mean of cotinine concentration in subjects who reported exposure to SHS at work was 1.44 ng/ml (95% CI: 1.23–1.69 ng/ml) in general population, and 2.01 ng/ml (95% CI: 1.80–2.24 ng/ml) in hospitality workers (ratio = 1.40). The highest differences in the geometric means between hospitality workers and the general population were present among less-educated individuals and those aged over 45 years. In hospitality venues, the owners had higher salivary cotinine concentration than other hospitality workers (data not shown). The salivary cotinine concentration in hospitality workers was higher when the saliva sample was obtained during the weekend compared with the weekdays.

Discussion

The results of this study show that non-smoker hospitality workers are more exposed to SHS than the general population before the Spanish Tobacco Control Law. Hospitality workers have the highest levels of cotinine concentration on weekends. This could be explained because the frequency of smokers on weekends in bars, restaurants and pubs is higher than during the rest of the week. It may also be explained by the cumulative exposure during the week and is hence detected during the weekend. Interestingly, the salivary cotinine concentration among persons from the general population employed and not employed was similar. The prevalence of exposure to SHS at home was similar in the general population and in hospitality workers; however, the prevalence of exposure to SHS at work was almost 2-fold in the hospitality workers.

One limitation of this study is derived of the use of an opportunistic and non-randomized sample of hospitality workers. The use of salivary cotinine as a specific biomarker of exposure to SHS in the previous 2–5 days in both studies is one of the strengths of this report. Moreover, the analytical method to evaluate salivary cotinine is highly sensitive; assessment of cotinine concentration was blind to the participants’ smoking status, and the same protocol was used for all saliva samples in the two studies.

In conclusion, this study shows that exposure to SHS was higher in non-smoker hospitality workers than in non-smokers from the general population, in terms of sex, age, educational level, exposure to SHS at home and work and day of week of saliva collection, before a national ban on smoking came into
effect in Spain. Therefore, these employees are subject to a higher health risk in terms of lung cancer, ischaemic heart disease and respiratory symptoms due to their occupational exposure to SHS.

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Conflicts of interest: None declared.

Key points

- Exposure to SHS was higher in non-smoker hospitality workers than in non-smokers from the general population before a national ban on smoking came into effect in Spain.
- Smoking control law must protect all workers without exceptions from exposure to SHS including hospitality workers.

References


Appendix 1: Determinants of COTinine (DCOT) Study investigators

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