Tobacco Smoke Exposure in Coffeehouse can be a Potential Threat for Public Health

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Abstract

Background: Carbon monoxide (CO) is one of the main pollutants in the air. Cigarette and stove smoke are the main sources. Exhaled carboxyhemoglobin (COHb) and CO measurements can be used to determine the degree of exposure to active and/or passive cigarette smoke. Coffeehouses are workplaces where heavily cigarette smoking is observed. We aimed to study the degree of air pollution caused by cigarette smoking in coffeehouses. **Methods:** Exhaled CO and COHb were measured in three groups: Coffeehouse customers (n=23, group I); smokers who don't go to the coffeehouses (n=25, group II); and nonsmokers who don't go to the coffeehouses (n=18, grup III). **Results:** Mean age and usage of coal stove were not statistically different among the groups. The length of cigarette smoking and the number of cigarettes smoked daily weren't statistically different between group I and II. Among the groups of I, II, III exhaled CO measurements were 21.4±9.3 ppm, 13.0±4.1 ppm, 2.4±0.8 ppm and COHb measurements were 3.5±1.5, 2.1±0.6, 0.4±0.1, respectively. Exhaled CO (p=0.000) and COHb levels (p=0.000) were statistically different among the groups. **Conclusion:** Exhaled CO levels of coffeehouse customers are significantly high. Being present in a coffeehouse is important for both active and passive tobacco smoke exposure. Improving the aeration can be considered as a first step, but improving people's consciousness and prohibiting tobacco use in the coffeehouses should be the main goal.

Key words: Coffeehouse customers, exhaled carbonmonoxide, passive smoking

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INTRODUCTION

Carbon monoxide is a tasteless, odorless, colorless and non-irritant gase. It is normally present as carboxyhemoglobin, 0.5-3% in blood. Additionally, CO is endogenously found in the body as result of the catabolism of carbon atom in the protoporfirin ring and hemoglobin (Hb). CO in the blood can only be eliminated from the lungs. It's half life is 2-4 h with regard to ventilation when breathing atmospheric air.

Carbon monoxide is one of main indoor and outdoor pollutants. The main sources of carbon monoxide indoor are cigarette and stoves without chimneys. The reason of the clinical scene in carbon monoxide intoxication is hypoxia. A long duration exposure to lower levels of CO causes chronic CO intoxication. This situation develops with active tobacco smoking and passive tobacco smoke exposure. The mainstream of cigarette includes 4% and the sidestream includes 16% CO (1).

A COHb level of 5-10% is the danger limit for chronic CO intoxication. The symptoms of chronic CO intoxication are headache, vertigo, nausea, impairment of awareness and shapness of vision, nocturia, diarrhea, impotance, sleeplessness and chronic fatigue (2-4).

In our country, coffeehouses are similar to public places called "cafe". But in contrast to "cafes", the aeration is much worse and tobacco use is free. The employees and the customers can actively use tobacco and are exposed to passive cigarette smoke in the duration they are there. Especially in winter, the closed area of these coffeehouses are more crowded (5). Considering that the percentage of smoking among adults in Turkey is about 50-60% (6), the significance of being in coffeehouses with regard to active and passive tobacco smoke exposure is better understood. We have previously demonstrated that coffeehouse employees are exposed to intense environmental tobacco smoke (7).

In the subjects without a known CO exposure, measurements of exhaled CO and COHb levels can give and idea about active and/or passive tobacco smoke exposure (8-10). It can be used as an indicator of level of air pollution in coffeehouse environment. In this study, we aimed to evaluate the extent of tobacco smoke exposure with being in coffeehouses in smoker and nonsmoker coffehouse customers, measuring exhaled CO and COHb levels.

MATERIALS AND METHODS

The study was performed between January-February 2000. Customers of the coffeehouses in the center of Izmir city were randomly selected for the study. As a control group, people working in small workplaces such as grocery or butcher who do not go to coffeehouses and who are either smokers or nonsmokers were selected, due to the

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Table 1. Mean ages and smoking habits of the groups

	Group I (n=23) Mean± SD (Median)	Group II (n=25) Mean± SD (Median)	Group III (n=18) Mean± SD (Median)	p value
Mean age	40.2 ± 17.1 (35.0)	44.3 ± 15.8 (44.0)	46.4 ± 15.5 (49.0)	0.480
Cigarette				
Smoking duration	23.0 ± 16.0 (18.0)	23.1± 13.8 (23.0)	-	0.844
Amount/day	25.7±11.9 (20.0)	24.4 ± 9.7 (20.0)		0.661
Package-year	32.7 ± 30.5(23.0)	30.3 ± 22.4 (23.5)		0.907

fact that they have socio-economical features similar to the study group.

Demographic features, smoking status, presence and use of coal stove in their house were recorded with a standart questionnaire that was performed with face-to-face interview. Exhaled CO and COHb levels were measured with a portable CO and COHb measurement device (Micro Carbon Monoxide Monitor (MCO2), Micro Medical Ltd, Rochester, Kent, UK). Measurements were performed within working hours in daytime. The parameters were measured during a single exhalation through the mouthpiece of the device.

Smokers who also go to coffeehouses were classified as group I, smokers who do not go to coffeehouses were classified as group II and nonsmokers who do not go to coffeehouses were classified as group III.

Statistical Analysis

Statistical analyses were performed with SPSS 10.0 package programme. Chi-square, One Way ANOVA test and Pearson correlation analysis were performed. Results with a p value <0.05 were considered as significant.

RESULTS

In the study period, 5 coffeehouses and 20 small workplaces other than coffeehouses were visited. There were 23 subjects in group I, 25 subjects in group II and 18 subjects in group III. There were no significant differences for the mean ages among the three groups and for smoking duration, daily number of cigarettes smoked and package-year duration of smoking among the smokers (Table 1). The coffeehouse customers were found to go to the coffeehouses for 14.6 ± 9.6 (3-40) years, 6.0 ± 1.6 (1-7) days in a week and 4.4 ± 1.8 (1-7) hours daily.

Exhaled CO and COHb leves were highest in group I and lowest in group III. The difference between the groups was statistically significant (Table 2).

In Turkey, another source of CO exposure is coal stoves without chimneys. Subjects were also questioned for this. Use of coal stove in the house was 43.5% (10) in group I, 48% (12) in group II and 33.3% (6) in group III. There was no significant difference for use of coal stoves in the houses among the groups (p=0.626). Using a coal stove at home was considered to influence exhaled CO and COHb levels, so subjects who do not use coal stove at home were evaluated. Levels of exhaled CO in subjects who do not use coal stove at home were 20.5±10.0 in group 1 (n=13), 14.0±5.1 in group 2 (n=13) and 2.3±0.9 in group 3 (n=12). There was a significant difference among the groups (p=0.000). According to the exhaled COHb levels in subjects who do not use coal stoves at home, there was also a significant difference among the groups (3.3±1.6, 2.2±0.8 and 0.4±0.1, respectively) (p=0.000).

Exhaled CO and COHb levels were higher in subjects who smoke more than 20 cigarettes a day than those who

Table 2. Exhaled CO and COHb levels of the groups.

	Group I (n=23)	Group II (n=25)	Group III (n=18)	p value
CO level (ppm)				
Mean± SD	21.4 ± 9.3	13.0 ± 4.2*	2.4 ± 0.8#	0.000
Median (Min-Max)	20.0 (6.0-42.0)	12.0 (5.0-21.0)	2.0 (1.0-4.0)	
COHb level				
Mean± SD	3.5 ± 1.5	2.1 ± 0.6*	0.4 ± 0.1#	0.000
Median (Min-Max)	3.2 (1.0-6.8)	2.0 (0.8-3.2)	0.4 (0.2-0.6)	

SD: Standard deviation; **Min-Max:** minimum-maximum values
* In the comparison of groups I and II p=0.000
# In the comparison of groups I and III p=0.000

Table 3. Exhaled CO and COHb levels according to the daily amount of cigarette consumption and packages per year

Cigarette smoking	n	CO level (ppm) Mean± SD (Median)	COHb level Mean± SD (Median)
≤20 cigarettes a day	32	15.2 ± 6.6 (14.0)	2.5 ± 1.1 (2.3)
>20 cigarettes a day	16	20.7±10.0 (17.5)	3.3 ± 1.6 (2.7)
p value		p=0.089	p=0.112
≤15 Package-year	15	13.9±3.3 (14.0)	2.3±0.5 (2.3)
>15 Package-year	33	18.7±9.1 (15.0)	3.0±1.5 (2.4)
p value		0.012	0.012

SD: standard deviation

smoke equal to and less than 20 cigarettes daily. There were no significant differences between exhaled CO and COHb levels of groups according to the daily amount of cigarettes smoked. Exhaled CO and COHb levels were significantly higher in subjects with a cigarette consumption above 15 packs/year than those with a cigarette consumption below 15 packs/year. (Table 3). There were significant correlations between daily number of cigarettes smoked and exhaled CO levels (r^2=0.128, p=0.013) and COHb levels (r^2=0.124, p=0.014). But, as the correlation coefficient was low, we considered that the relation between them is weak.

DISCUSSION

In our previous study, we have evaluated the hair nicotine levels of coffeehouse employees working in similar environments and found that hair nicotine levels were significantly higher in both smoker and nonsmoker employees than the control group (7). This data brought up the fact that coffeehouses are public places of heavy tobacco smoke exposure.

In this study, we found that exhaled CO and COHb levels of coffeehouse customers were significantly higher than smokers who do not go to coffeehouses. This finding means that coffeehouses not only constitutes a risk for health of employees but also are important risk areas for the public health.

As shown in other studies (11,12), the correlation we found between the daily amount of cigarettes smoked and exhaled CO levels exhibits the sensitivity of the method we used to demonstrate the level of tobacco smoke exposure and can give an idea about the level of tobacco smoke exposure of the individuals in the coffeehouses.

Laranjeira et al (13) measured the levels of exhaled carbon monoxide in nonsmoker waiters after one day work in restaurants without tobacco smoking restrictions and found that mean exhaled CO levels were 2.5 folds higher than the levels before the exposure. Tutt et al (14) measured the exhaled CO levels of employees of 6 clubs where smoking is free and employees of hospitals where smoking is prohibited. Mean exhaled CO concentration was 8.7 ppm in club employees and 5.3 ppm in hospital employees and the difference between the groups was found to be significant.

Gourgoulianis et al (8) measured CO levels of adolescents and found that the level was 2.37 ± 0.56 ppm for nonsmokers, 6 ± 2.5 ppm for nonsmokers whose mothers were smokers, and 35.67 ± 14.62 ppm for smokers. Cunnington et al (11) found that exhaled CO levels were 1.26 ppm in nonsmoker group and 16.4 ppm in smoker group.

With regard to these findings, we see that exhaled CO levels of coffeehouse customers are much higher than exhaled CO levels club employees and regular smoker subjects.

The major limitation of our study was that we did not have a group of nonsmokers who go to coffeehouses. But in our country, almost all of the people who go to coffeehouses are active smokers and it is hard to form such a group. And to constitute an experimental group would be an ethical problem.

As a conclusion, being in coffeehouses is important for both individual active tobacco smoke exposure and also for passive exposure. Moreover, the long duration subjects pass in the coffeehouses can worsen the cumulative hazardous effects of passive tobacco smoke. For this reason, improving the aeration can be considered as a first step, but improving people's and coffeehouse employees' consciousness about the health effects of environmental tobacco smoke and prohibiting tobacco use in the coffeehouses should be the main goal.

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