

Respiratory Symptoms and Pulmonary Functions of Cleaners Working in a Hospital

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Abstract

Objectives: To evaluate respiratory symptoms among cleaners working in a hospital and compare the results of pulmonary function tests (PFTs) of cleaners with a control group who were not exposed to cleaning products at work. **Design and Setting:** Data were collected from 66 cleaners who work at the same university hospital. A questionnaire about respiratory complaints was administered in a person to person interview. PFTs were conducted to all cleaners. Control subjects were office workers at the same hospital and had similar age, sex, smoking habit, social and economic status. The same questionnaire and PFTs were also performed to the control group. **Measurements and Results:** The mean age of 66 cleaners was 31.3 ± 6.7 yr. Control group comprised 44 office workers with a mean age of 31.1 ± 7.1 yr. Among cleaners 32% defined wheezing and 24% defined chest tightness. These symptoms were significantly higher in the study group when compared with the control group ($p=0.030$ and $p=0.018$ respectively). The mean % predicted of FEV_1/FVC and FEF_{25-75} of the cleaners were found to be significantly lower than the control group ($p=0.0001$, and $p=0.004$ respectively). **Conclusions:** Employment in hospital cleaning was found to be associated with increased respiratory symptoms and decline in some of the PFT results. To the best of our knowledge, this is the first study from our country which evaluates respiratory symptoms and PFTs of cleaners who work in hospital. Further research is needed to identify the specific exposures responsible for increased respiratory symptoms in cleaners working in hospitals.

Keywords: Respiratory symptoms, Pulmonary function tests, cleaners, hospital

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INTRODUCTION

Cleaning products are widely used both at work and in the home. Cleaners are exposed to a large number of gaseous and particulate compounds. Professional cleaners work in diverse job tasks, ranging from domestic cleaning to cleaning offices, industrial plants, kitchens and hospitals [1].

There are a limited number of reports of new-onset work-related asthma occurring after a documented exposure to cleaning products [2-5], or exposure to common components of cleaning products [6, 7].

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Short-term respiratory effects of cleaning exposures in female domestic cleaners [8] and work related respiratory symptoms in female cleaners [9] were studied. These studies showed an increased risk of respiratory symptoms among cleaners. Recently, Roseman et al. [10] have reviewed the reports of work related asthma associated with cleaning products. From 1993 to 1997, 236 (16%) of the 1915 confirmed cases of work related asthma were associated with exposure to cleaning products. They suggested that epidemiological studies of exposed cohorts, such as the housekeeping staff in hospitals or hotels that repeatedly use cleaning products, were needed.

We planned this study to evaluate respiratory symptoms among cleaners working in a hospital and compare the respiratory symptoms and results of pulmonary function tests (PFTs) of cleaners with a control group who were not exposed to cleaning products at work. To the best of our knowledge, this is the first study from our country which evaluates respiratory symptoms and PFTs of cleaners who work in hospital.

MATERIAL AND METHODS

This study was conducted at a university hospital in Turkey. All subjects were volunteers who gave informed written consent to their participation in the study. The study was approved by the institutional review board.

Data were collected from 66 cleaners who work at the same university hospital. In terms of avoiding collection bias, all data, including questionnaires, were collected by two experienced pulmonologists. Data on demographics, episodes of wheezing or chest tightness, symptoms of dyspnea, cough, phlegm, any other allergic and/or respiratory symptoms, duration of symptoms, relation of symptoms to work, past medical history including smoking habits, history of treatment for the symptom was collected by a questionnaire modified from American Thoracic Society Questionnaire [11]. The questionnaire was administered in a person to person interview.

Table 1. The descriptive statistics (Mean±SD, Frequency and Percentage) of cleaners and control group

	Cleaners (n=66)	Control group (n=44)	P value
Mean age (± SD)	31.3 ± 6.7	31.1 ± 7.1	NS
Number of females	30 (46%)	20 (46%)	NS
Number of males	36 (54%)	24 (54%)	NS
Smoker	25 (38%)	18 (41%)	NS
Ex-smoker	4 (6%)	2 (5%)	NS
Non-smoker	37 (56%)	24 (54%)	NS
Mean pac-yrs (± SD)	11.1 ± 7.5	10.7 ± 8.7	NS

NS: p>0.05

Pulmonary function tests were performed according to American Thoracic Society criteria [12] while the patients were at rest and seated in the upright position with a portable spirometer (MIR Spirobank). All pulmonary function tests were done in the end of the work shift at week days. The forced vital capacity (FVC), forced expiratory volume in 1 second (FEV₁), and forced expiratory flow at 25% to 75% of the FVC (FEF₂₅₋₇₅) and peak expiratory flow (PEF) were determined.

A detailed smoking history was obtained from each cleaner. Smoking status was defined as never-smoker, former-smoker, and current-smoker. A never-smoker was defined as one who had never smoked before or smoked less than 100 cigarettes in his/her lifetime and was not a current-smoker [13]. A former-smoker was defined as one who had previously smoked more than 100 cigarettes in his/her lifetime and had quit smoking more than 1 year before diagnosis. Smokers who claimed to have quit within the year before diagnosis were classified as current-smokers because their ability to sustain prolonged abstinence from smoking was in question.

Control subjects (n=44) were office workers at our hospital and had similar age, sex, smoking habit, social and economic status. The same questionnaire and PFTs were performed to the control group.

Statistical Analysis

Descriptive statistics, (including mean±SD, frequency and percentage) were calculated for two groups separately. The difference between the means of variables in two groups was compared using Independent Samples t Test and Mann Whitney U test. The Chi-Square test was used to compare categorical variables. Logistic Regression analysis was used to determine the risk factors on the dependent variable. Significance was set at 5% level (p<0.05). The statistical analyses were performed with the statistical package program SPSS, version 11.5.

Table 2. Respiratory findings among cleaners and the control group

Symptoms	Cleaners		Control group		P
	n=66	%	n=44	%	
Wheezing	21	32	6	14	0.030
Chest tightness	16	24	3	7	0.018
Phlegm	18	27	6	14	NS
Wake-up at nights because of dyspnea	4	6	1	2	NS
Ever any asthma attack	1	2	1	2	NS
Chest tightness in a dusty place	7	11	3	7	NS
Dyspnea in a dusty place	5	7	4	9	NS
Cough in a dusty place	16	24	6	14	NS

NS: p>0.05

RESULTS

Our study population comprised 66 cleaners (30 female and 36 male) with a mean age of 31.3±6.7 (range: 19-49) yr. Employment duration of the cleaners was 2.45±2.46 (range: 1-14) yr. Control group comprised 44 office workers (20 female and 24 male) with a mean age of 31.1±7.1 (range: 20-48) yr. The demographic and smoking data of the two groups are presented in Table I.

Among cleaners 32% defined wheezing and 24% defined chest tightness. These symptoms were significantly higher in the study group when compared with the control group (p=0.030 and p=0.018 respectively) (Table II). All cleaners defined worsening at these symptoms during the cleaning job.

Among cleaners 27% and among control group 14% defined phlegm. This symptom was not found significantly higher in the study group when compared with the control group (Table II).

In the questionnaire we specifically asked if they had cough with phlegm. Sixteen people (24%) among cleaners and 7 (16%) people among control group answered yes to this question. Six people (9%) in the study group and two people (5%) in the control group defined cough and phlegm three months each year and having these symptoms more than two years. According to these data we defined the prevalence of chronic bronchitis as 9% among cleaners employed in our hospital.

Both groups defined similar prevalence of cough, dyspnea and chest tightness in dusty places (Table II). None of the risk factors (age, smoking habit, gender, respiratory symptoms) were significant by using logistic regression analysis.

Table 3. The results of the mean % predicted of PFTs of the cleaners and the control group.

PFTs	Cleaners		Control group		P
	Actual value	% predicted	Actual value	% predicted	
FEV ₁	3.37±0.67	98.4±12.0	4.13±0.83	97.0±9.8	NS*
FVC	3.95±0.83	98.6±11.4	3.72±0.68	91.5±11.3	0.011*
FEV ₁ /FVC	83.7±4.7		89.8±7.1		0.0001
PEF	7.04±1.77	76.6±14.4	8.38±1.99	92.2±18.1	0.0001*
FEF ₂₅₋₇₅	4.12±1.00	89.2±20.3	4.68±0.97	103.7±23.3	0.004*

*describes the p values of % predicted
NS: p>0.05

The results of the PFTs of the cleaners and control group are presented in table III. The mean % predicted of FEV₁/FVC and FEF₂₅₋₇₅ of the cleaners were found to be significantly lower than the control group (p=0.0001, and p=0.004 respectively).

DISCUSSION

Cleaners defined significantly higher prevalence of wheezing and chest tightness when compared with the control group. The prevalence of chronic bronchitis was 9% among cleaners employed in our hospital. The mean % predicted FEF₂₅₋₇₅ and FEV₁/FVC ratio of the cleaners were found to be significantly lower than the control group.

A prospective study was conducted by Nielson and et al. [9] in order to describe the incidence of nose or throat symptoms, asthma and bronchitis among cleaners. In that questionnaire based cohort including 1011 females, the cleaners tended to have higher risk of developing respiratory symptoms compared to former cleaners. In another study more than half of the cleaners reported work-related respiratory symptoms [14]. Our findings are in agreement with the result of these studies. Cleaners defined significantly higher prevalence of wheezing and chest tightness when compared with the control group in our study.

Occupational exposures to vapors, gas, dust, or fumes have been shown to be a risk factor of airway obstruction [15]. In a cross-sectional study among young subjects, chronic bronchitis symptoms were associated with occupational exposures assessed by using a job exposure matrix [16]. In another study which evaluates the relationship between specific occupations and occupational exposures during a 9 year follow-up period showed that occupational exposures to dusts, gases and fumes are associated with incidence of chronic bronchitis [15]. The prevalence of chronic bronchitis among women employed in domestic cleaning was reported as 15% [17]. In our study the chronic bron-

chitis prevalence was found as 9%. In addition to these questionnaire based studies we also conducted the PFTs of the cleaners, and compared them with the control group who has the similar age, gender and smoking habits.

Some earlier population based epidemiological studies [18-20], and analyses of occupational disease registry based data [21,22] have suggested that cleaners have a increased risk of asthma. Asthma prevalence amongst women employed in domestic cleaning was reported as 12.6% [17]. In our study population no one was diagnosed with asthma. This might be due to our small numbers of study population. Another explanation might be healthy worker effect. The cleaners who had asthma or asthma like symptoms would already quit the job. Among cleaners we could not find any PFT result that would cause a diagnosis as asthma. The mean % predicted FVC levels was higher in cleaners but both in control group and in cleaners, all the values were in normal limits. We do not think there might be an importance of higher FVC levels. But interestingly, the mean % predicted FEF₂₅₋₇₅ and FEV₁/FVC ratio of the cleaners was found to be significantly lower than the control group. FEF₂₅₋₇₅ might be considered as a measure of the caliber concerning distal airways, particularly in subjects with normal FEV₁ [23]. Thus FEF₂₅₋₇₅ may be envisaged as a marker of initial bronchial impairment [24]. To the best of our knowledge, the decline in FEF₂₅₋₇₅ is presented here for the first time in the literature amongst cleaners.

A cleaning product was defined as any material used for cleaning and/or disinfecting surfaces [10]. These products are widely used in hospitals. Exposure may occur during prescribed use as well as inappropriate mixing. Since cleaners are exposed to a large number of these gaseous and particulate compounds, the damage in the airways might be the reason of the increase in respiratory symptoms and decline in PFTs.

CONCLUSION

Employment in hospital cleaning was found to be associated with increased respiratory symptoms and decline in some of the PFT results. To the best of our knowledge, this is the first study from our country which evaluates respiratory symptoms and PFTs of cleaners who work in hospital. Further research is needed to identify the specific exposures responsible for increased respiratory symptoms in cleaners working in the hospitals.

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