

ORIGINAL ARTICLE

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Respiratory system symptoms in marble quarry and marble factory workers

Suphi Aydin, Ahmet Dumanli

Afyonkarahisar Health Sciences University, Faculty of Medicine, Department of Thoracic Surgery, Afyonkarahisar, Turkey

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Abstract

In this study, respiratory system symptoms developed in workers working in 35 marble factories, 20 marble quarries in Afyonkarahisar İscehisar region were examined and compared. 35 marble factories and 20 marble quarries belonging to these factories in the İscehisar region of Afyonkarahisar were scanned. A total of 553 workers, 58 women and 495 men, were included in the study. Demographic information, respiratory system symptoms and respiratory system diseases were investigated. Statistically, convenience sampling method was used in the selection of marble quarries, factories, and individuals. A total of 553 people were included in the study. Of the people screened, 58 (10.5%) were female, 495 (89.5%) were male. The age range was 18-65, the mean was 37.42 ± 9.4 . The working time of the workers was 1-31 years, the average was 10.25 ± 7.4 . Of the 553 people, 115 (20.8%) were working in a marble quarry and 438 (79.2%) were working in the factory. Nonspecific respiratory symptoms were present in 121 (21.9%) workers, including 22 (19.1%) of the marble quarry workers and 99 (22.6%) of the factory workers. In the last year, among 553 workers, 46 (40%) of the marble quarry workers, 160 (36.5%) of the factory workers had a history of respiratory system disease. It was determined that the workers working in the marble factory were exposed to more marble dust than the workers working in the marble quarry. Except for hemoptysis, it was determined that respiratory system symptoms were more common in marble factory workers, smoking was more common in marble factory workers and increased respiratory system symptoms in both groups.

Keywords: Marble, dust, respiratory system, symptom

Introduction

As a result of exposure to marble dust, symptoms of various lung diseases may occur in workers working in marble quarries and factories. Exposure to these dusts can lead to lung diseases such as pulmonary fibrosis, pleural mesothelioma, and silicosis. Marble is a metamorphic limestone used in the construction of statues, buildings and monuments.

People who work in sculpting marble rocks are exposed to dust containing particles of calcium carbonate and silica. Complaints involving respiratory symptoms such as cough, shortness of breath, chest pain, chest tightness, abnormal breathing pattern are common in these workers. Occupational lung diseases, like other lung diseases, require chest X-ray or computed tomography (CT)

scan for clinical diagnosis [1,2]. There are many marble quarries in Turkey, especially in the Afyonkarahisar-Eskisehir region. It is estimated that 8-10 thousand people work in the marble quarries in the İscehisar region of Afyonkarahisar. However, it is not known how many workers have lung disease due to dust exposure. In a study conducted in Afyonkarahisar marble quarries on this subject, it was shown that marble workers were exposed to high levels of dust in their working environment and respiratory symptoms were observed at a high rate. It is known that workers working in the marble factory and workshop are exposed to more dust than those working in the quarry [3], however, the incidence of lung diseases and symptoms between these two groups is not well known. There are very few studies on this subject. The aim of this study is to investigate the respiratory system symptoms seen in marble workers and to compare the symptoms among the workers in the marble quarry and factory.

Materials and Methods

This study was conducted by Afyonkarahisar Health Sciences University, Faculty of Medicine, Department of Thoracic Surgery,

*Corresponding Author: Suphi Aydin, Afyonkarahisar Health Sciences University, Faculty of Medicine, Department of Thoracic Surgery, Afyonkarahisar, Turkey, E-mail: dr_suphi@hotmail.com

between 10 July and 15 August 2019.

Demographic information of workers (sex, age, place of employment, education level), symptoms of respiratory system diseases (shortness of breath, chest pain, cough, hemoptysis, sputum production, weight loss, smoking) and respiratory system disease in the last year (asthma), bronchitis, influenza, pneumonia) and their number were investigated.

Features of the scanned area; Afyonkarahisar is geographically located in the Aegean region and has borders to the Central Anatolia and Mediterranean regions. Its height above sea level is 1021 meters. İscehisar district with a population of approximately 25 thousand is the place where the most marble quarries are found. İscehisar marble fields start from 1 km southeast of the district center and are concentrated in two separate points. The first point is 500 meters wide, 1300 meters long and 100 meters thick in the Dangictepe marble field. In the Bacakale area, which is the second point, there are marble beds of 1000 meters wide, 4500 meters long and 260 meters thick. It is understood from the old historical marble works that the operation of marble quarries in İscehisar district dates back to 2000 years. While the workers working in the marble quarry are cutting as blocks, the workers in the factory transform the marble into layers of the desired thickness. Workers in the workshop shape marble and make ornaments.

Selection and method of the scanned area; 35 marble factories located in İscehisar region of Afyonkarahisar and selected by convenience sampling method and 20 marble quarries connected to them were scanned. A total of 553 workers, 58 women and 495 men, were included in the study.

Inclusion criteria: Being over the age of 18, working in the marble business for more than 1 year.

Exclusion criteria: Being physically or mentally unable to answer the questions and not wanting to participate in the study.

Statistical Analysis

The marble quarry, factory and individuals were selected using the convenience sampling method.

Sample size: Using the G*Power package program for chi-square, (effect size ($w=0,2$); α -prob=0,05; power= 0,99; df (degree of freedom)= 1 the minimum sample size was shown to be 460.

The data collected in this study was evaluated using the SPSS 20.0 package program. It was selected at a significance level of $p=0.05$ and % and frequency significance values were given as descriptive statistics. The Pearson Chi-square test was used to determine whether or not there was a correlation between place of employment and other symptoms.

Logistic regression analysis was used to determine whether or not place of employment and smoking were risk factors in the development of respiratory symptoms.

Ethical approval: The ethics committee approval of the study was obtained from the health directorate (2018/39) and the ethics committee of our faculty (2019/6).

Results

A total of 553 people were included in this study. 58 (10.5%) of the people screened were female and 495 (89.5%) were male. The age range was 18-65 and the mean was 37.42 ± 9.4 . The working time of the workers was 1-31 years and the average was 10.25 ± 7.4 .

Of the 553 people, 115 (20.8%) were working in the marble quarry and 438 (79.2%) were working in the factory. 5 (4.34%) of the workers in the marble quarry were female, 110 (95.66%) were male, 53 (12.1%) of the factory workers were female and 385 (87.9%) were male.

When the education levels of the workers were evaluated, it was determined that 253 (45.8%) were primary school graduates, 154 (27.8%) were secondary school graduates, 105 (19%) were high school graduates and 41 (7.4%) were university graduates. While 38 (33.05%) of the marble quarry workers are primary school graduates, 4 (35.65%) secondary school graduates, 26 (22.6%) high school graduates and 10 (8.7%) university graduates, 215 (49.09%) of the employees were primary school graduates, 113 (25.8%) secondary school graduates, 79 (18.04%) high school graduates and 31 (7.07%) university graduates. 121 (21.9%) of all workers, 22 (19.1%) of quarry workers and 99 (22.6%) of factory workers had nonspecific respiratory symptoms (Table 1). There was no statistically significant difference between workplace and respiratory system symptoms ($p=0.423$).

Table 1. The distribution of nonspecific respiratory symptoms according to place of employment

Nonspecific Respiratory Symptoms	Quarry	Factory	Total	P Value
Present	22 (19.1%)	99 (22.6%)	121 (21.9%)	>0.05
Absent	93 (80.9%)	339 (77.4%)	432 (78.1%)	>0.05
Total	115 (20.80%)	438 (79.2%)	553 (100%)	0.423

Chest pain was detected in a total of 22 (3.98%) of the 553 workers included in the study, including 5 (4.35%) working in the marble quarry and 17 (3.88%) working in the factory. There was no statistically significant difference between workplace and chest pain ($p=0.82$).

Cough symptoms were detected in 13 (11.30%) of the workers in the marble quarry, 67 (15.3%) of the workers in the factory, and in 80 (14.46%) of the workers. There was no statistically significant difference between workplace and cough symptom ($p=0.279$).

Sputum complaints were detected in 55 (9.94%) of the workers, 12 (10.43%) of the workers in the marble quarry and 43 (9.81%) of the workers in the factory. no significant difference was detected ($p=0.884$).

Complaints of hemoptysis were observed in 4 (3.48%) workers in the marble quarry and in 3 (0.68%) workers in the factory, a total of 7 (1.26%) workers. A statistically significant difference was found between the workplace and hemoptysis ($p=0.017$).

A total of 54 workers (9.76%) were found to have shortness of

breath, in 15 (13.04%) of the marble quarry workers and 39 (8.9%) of the factory workers. No statistically significant difference was found between the workplace and dyspnea ($p=0.183$) (Table 2).

Table 2. Evaluation of respiratory symptoms

	Quarry	Factory	Total	P value
Chest pain	5 (4.35%)	17 (3.88%)	22 (3.98%)	0.820
Side pain	6 (5.21%)	11 (2.51%)	17 (3.07%)	0.531
Coughing	13 (11.3%)	67 (15.3%)	80 (14.46%)	0.279
Phlegm	12 (10.43%)	43 (9.81%)	55 (9.95%)	0.884
Hemoptysis	4 (3.48%)	3 (0.68%)	7 (1.26%)	0.017
Breathing difficulties	15 (13.04%)	39 (8.9%)	54 (9.76%)	0.183

The number of respiratory system diseases among the workers in the last year was between 0- 12 and average was 1.07 ± 1.5 . 206 (37.34%) of 553 working people had respiratory system disease in the last year. 46 (40%) of the workers in the marble quarry and 160 (36.5%) of the workers in the factory had a respiratory system disease in the last year. A total of 2 (0.36%) workers had asthma attacks and 2 (0.45%) were working in a marble factory. There was a history of bronchitis (acute or chronic) in a total of 27 (4.88%) workers, 5 (4.35%) of the workers at the quarry and 22 (5.02%) of the workers at the factory. A total of 176 (31.82%) workers, including 40 (34.78%) workers and 136 (31.05%) workers at the factory, had a flu infection. 1 (0.87%) worker working in the marble quarry had pneumonia. No statistically significant difference was found between the respiratory system infections observed in the last one year between those working in the marble quarry and those working in the factory ($p=0.114$). However, it was determined that the employees in the factory had a higher rate of respiratory system disease.

Of the employees, 232 (41.95%) smoked, 321 (58.05%) did not. The amount of smoking was 0-40 pack/year and the mean was 8.63 ± 9.5 . 42 (36.52%) of the marble quarry workers and 190 (43.38%) of the factory workers were smokers. Respiratory symptoms were observed in 11 (26.2%) of the marble quarry workers who were smokers and 61 (32.1%) of the factory workers. There was no statistical difference between smokers in terms of respiratory system symptoms and working place ($p=0.453$). Respiratory symptoms were present in 72 (31%) of 232 smokers and 49 (15.3%) of 321 non-smokers. There was a statistically significant difference between smoking and the occurrence of respiratory system symptoms ($p=0.000$). Chest pain was present in 13 (5.6%) smokers and 9 (2.8%) non-smokers. Although there was no statistically significant difference between smoking and chest pain, the rate was high ($p=0.096$). Cough was present in 53 (22.84%) smokers and 27 (8.41%) non-smokers. There was a statistically significant difference between smoking and cough complaints ($p=0.000$). 37 (15.9%) smokers and 18 (5.29%) non-smokers had sputum complaints. There was a statistically significant relationship between smoking and sputum complaints ($p=0.000$).

37 (15.9%) smokers and 18 (5.29%) non-smokers had sputum complaints. There was a statistically significant relationship between smoking and sputum complaints ($p=0.000$). 37 (15.9%) smokers and 17 (5.3%) non-smokers had complaints of dyspnea. There was a statistically significant relationship between smoking and dyspnea ($p=0.000$). Hemoptysis was present in 3 (1.29%) smokers and 4 (1.24%) non-smokers. There was no statistically significant difference between smoking and complaints of hemoptysis ($p=0.961$). In 52 (22.41%) smokers and 54 (16.82%) non-smokers, there was a system of raising a son.

Cigarette smoking was significant as a difference in health conditions of a final rearing system ($p=0.021$) (Table 3).

Table 3. Evaluation of smoking habits and symptoms

	Smoking (+)	Smoking (-)	p value
Chest pain	13 (5.6%)	9 (2.8%)	0.096
Coughing	53 (22.84%)	27 (8.41%)	0.000
Phlegm	37 (15.95%)	18 (5.29%)	0.000
Breathing difficulties	37 (15.95%)	17 (5.29%)	0.000
Hemoptysis	3 (1.29%)	4 (1.24%)	0.961
Side pain	9 (3.88%)	8 (2.49%)	0.351
Weight loss	12 (5.17%)	13 (4.05%)	0.531
Respiratory illness in the past year	52 (22.41%)	54 (16.82%)	0.021

As a result of the logistic regression analysis, the correct classification rate was found to be 78.1%. According to the Hosmer and Lemeshow test, our model is significant ($p=0.882$). Our model is $\text{symptom} = -1.83 \times \text{workplace} + 0.909 \times \text{smoking}$. According to the logistic regression analysis table, those working in a marble factory are 6.25 times more at risk of respiratory symptoms compared to those working in a marble quarry, and smokers are 2.48 times more at risk than non-smokers. Workplace risk values were calculated separately for smokers and non-smokers; Working in a marble factory for non-smokers is 5.65 times more risky than working in a marble quarry, and working in a marble factory for smokers is 333.3 times more risky than working in a marble quarry.

Discussion

The results of this study show us that respiratory system symptoms are seen at a higher rate in workers working in marble factories. This study shows that those who process marble (factory) have a higher rate of respiratory system symptoms (cough, sputum, shortness of breath, chest pain, flank pain) than those who cut marble (quarry), and the number of diseases in the last year is higher. Only hemoptysis was found at a higher rate in marble quarry workers. Respiratory system symptoms and respiratory system diseases in the last year were found to be higher in smokers.

Orman A. et al. In the study they conducted in the marble quarries in Afyonkarahisar, they determined that the dust exposure among the workers of the marble quarry, marble workshop, marble factory and office workers was seen mostly in the workers in the

workshop. It was found that cough and sputum symptoms were higher in all groups compared to the control group, and chronic bronchitis was more common in marble quarry and marble factory workers. They did not detect any difference in cigarette pack/year values between the groups. No difference was found between smokers and non-smokers in terms of PFT (pulmonary function test) and chronic bronchitis among workers working in the Marble Quarry. They found that sputum and chronic bronchitis in smokers working in the marble workshop were higher than in non-smokers and their PFT values were similar. They found that cough, sputum, and chronic bronchitis in workers working in a marble factory were higher in smokers than in non-smokers, and PFT values were similar [3]. The results of our study also show similarities with the results of this study.

Sezgi C. et al. In their study among marble workers, they examined 4 groups as block cutting, polishing, tile cutting and office workers according to marble dust exposure. They found that dust concentrations were similar for the first three groups, but lower in the office. They found that cough, phlegm and shortness of breath symptoms were higher in the first three groups.

They found no difference between the groups in terms of smoking [4]. In our study, cough, sputum and shortness of breath complaints were found to be higher in factory workers in accordance with the literature. Also, inconsistent with the literature, smoking was found to be significantly higher in factory workers. This makes us think that cigarette consumption is higher in our country.

In another study, it was reported that increasing dust concentrations, independent of smoking, caused an increase in respiratory symptoms in lime workers working in a marble factory [5]. No dust concentration comparison was made in our study.

Soysal N. et al. In a study they carried out, they compared spirometry and PFT values between the workers in the marble workshop and the control group who were not exposed to marble dust. While there was no significant difference in respiratory values between the smoking marble workers and the control group, a significant decrease was observed in the respiratory values of the smoking marble workers [6]. In our study, respiratory symptoms were higher in marble workers who smoked.

Shrivastava A. et al. In a study they carried out, they reported that the most common symptoms seen in marble workers were shortness of breath and cough, and chest pain, loss of appetite and weight loss were seen to a lesser extent. They found that symptoms were more common in those who were exposed to marble dust for a long time [7].

Nwibo AN. et al. In a study they conducted among marble stone cutting workers, they found that the most common respiratory system symptoms were chest pain, cough, shortness of breath, wheezing and hemoptysis, respectively. They reported that shortness of breath increased with the increase of dust exposure. In addition, they found that respiratory system symptoms were significantly higher in quarry workers and smokers [8].

Jesus AR. et al. in a study they conducted on 113 marble workers, those workers exposed to dust had chest tightness, cough, sputum and shortness of breath symptoms were found to be higher than the

control group. They found that the rate of symptoms was higher in smokers [9].

In many other studies, the workers working in marble works a high incidence of respiratory system symptoms has been shown [7,8,10].

Yadav SP. et al. In their study, it was reported that workers in a marble factory were exposed to more dust and showed more respiratory system symptoms than those working in a marble quarry [11].

In our study, it was observed that respiratory system symptoms were higher in factory workers.

Conclusion

In conclusion, this study is one of the few field studies conducted in Turkey. As a result of our study, it was determined that the workers working in the factory were exposed to more marble dust, and accordingly, respiratory system symptoms were seen more in these workers, but the complaint of hemoptysis was more common in marble quarry workers.

We think that trainings on the effect of marble dust on lung health and the importance of using protective equipment should be given to workers working in these jobs more frequently, and increasing protective measures will reduce respiratory system diseases.

In this study, there was no control group, and the dust concentration in the working environment of the people could not be measured and compared with the symptoms.

Conflict of interests

The authors have no conflicts of interest to declare.

Financial Disclosure

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Ethical approval

The ethics committee approval of the study was obtained from the health directorate (2018/39) and the ethics committee of our faculty (2019/6).

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