



Does the Hospital Admission of Patients with Respiratory Disease Increase in Izmir When the PM10 Level is High?

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Abstract

OBJECTIVES: Air pollution is caused by exhaust emissions from motor vehicles, fuel consumption for heating of residences, and especially emissions from industrial facilities around the world. The exposure to outdoor air pollution has been associated with acute and chronic health problems, from irritation to death. In this study, we aimed to determine whether air pollution increases the frequency of hospital admission and whether there is a difference between disease subgroups, age, and gender, in the 2-year period in Izmir province where air pollution is increasing.

MATERIALS AND METHODS: Collection of health data for the project compiled by the Ministry of Health, in cooperation with the Izmir Provincial Health Directory Information Processing Department, and information obtained on the age groups, gender, admission time, and diagnosis of illness [International Classification of Diseases (ICD)10 code] on the residents of Izmir in 2016/2017.

RESULTS: The daily numbers of patients with respiratory complaints and air pollution were found to be related. Both air pollution and the admission rate increase in the January–March period. In male patients, the risk of hospitalization increases for 1.14%. Males had a higher increase in the rate of diagnosis of chronic rhinitis (increase of 6.22%) than females who had an increase of 0.97%. It was observed that there was a 2.62% increase in the incidence of bronchiectasis, 2.53% in that of asthma, and 2.49% in that of dyspnea.

CONCLUSION: There was a significant increase in respiratory diseases during the days when the air pollution was high, and this was observed as the upper respiratory tract infection and acute bronchitis in the young group and chronic respiratory diseases in the elderly group upon hospital admissions. The reduction of air pollutants and inhalation of clean air are the most important aspects in providing a healthier and longer life.

KEYWORDS: Air pollution, morbidity, respiratory disease

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INTRODUCTION

Exhaust emissions of motor vehicles, heating fuel consumption in residences, and especially industrial facilities waste and extracts cause air pollution. Worldwide, a fivefold increase in the air pollutant emission is expected by 2030 [1].

Air pollution is a significant health risk factor. A global survey of diseases showed that air pollution is one of the top 10 health risk factors worldwide [2]. Approximately 7 million people in the world and 400,000 people in the European Union (EU) face premature death due to air pollution [3].

The effects of air pollutants on health can be acute or chronic. Acute effects cause an increase in hospital admissions and treatment needs to be started within the hours/days following the exposure, whereas chronic effects occur in the form of worsening of chronic diseases and premature deaths. Exposure to outdoor air pollution has been associated with a wide range of acute and chronic health problems, from irritation to death [4].

Gas particles and particulate matter (PM) 10 exposure are associated with the incidence of upper airway symptoms, such as rhinorrhea, nasal obstruction, cough, laryngospasm, and vocal cord dysfunction, and they may cause lower respiratory symptoms, especially coughing, shortness of breath, and wheezing in children [5]. This exposure also causes an increase in cough and wheezing in adults with chronic pulmonary disease, as well as healthy adults [6].

In this study, we aimed to determine the effect of a high PM10 level over the frequency of admission to the hospital and examine if there was a difference between the disease subgroups, age, and gender in the 2-year period in the Izmir province where the air pollution is increased.

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MATERIALS AND METHODS

The collection of data has been got from İzmir Provincial Health Directory Information Processing Department. The obtained information included the age groups, gender, admission time, and diagnosis of illness [International Classification of Diseases (ICD10 code)] about the residents of İzmir in 2016/2017.

The reliability of data was determined by comparing respiratory diseases evaluated in outpatient clinics. Risk analyzes were performed using the case-crossover method and the conditional logistic regression technique with the obtained epidemiological data, air pollutant (PM10) level, meteorological conditions, age, gender, and location-independent variables. Risk periods were determined by examining the temporal changes of the disease prevalence. A symmetric bidirectional case-crossover approach is used in this study. The level of PM10 at the time of hospital admission for each case was compared with the level of PM10 at a particular time point whereas there was no application. The cases were chosen from the respiratory tract disease applications during the study period, and the control days were set as 2 weeks before and 2 weeks after each case day. The meteorological variables such as the wind speed, wind direction, air temperature, air pressure, and relative humidity were kept constant in each analysis. The acute effect of air pollution can be seen immediately or even after a few days. In this study, the previous 4-day PM10 concentrations were also included in the analysis to determine the effect of PM10 (lag1, lag2, lag3, and lag4) levels on hospital admission 4 days before.

All the procedures performed in this study were in compliance with ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration

and its later amendments or comparable ethical standards. The study was conducted according to good clinical practice and the Declaration of Helsinki. It was approved by the local ethics committee of the Dr. Suat Seren Chest Diseases and Surgery Training and Research Hospital (NO:E.2234, 23.02.2018).

Statistical Analysis

The odds ratio (OR) values of the respiratory system diseases PM10, which give risk-level possibilities, were calculated using the Statistical Package for the Social Sciences software version 14.0 (SPSS Inc, Chicago, IL., USA) computer software.

The relationship between the air pollution level and hospital applications was calculated using OR at a 95% confidence interval. OR was evaluated with the predicted hospital applications against every 10 $\mu\text{g}/\text{m}^3$ increase of the air pollutant's (PM10) concentration. The obtained risk ratios are multiplied by the number of patients participating, and the number and percentage of the risk group patients are calculated. We calculated the risk rates by comparing 2 weeks before and 2 weeks after exposure with the Stan statistical program (Analyse-it Software Ltd., Leeds, UK). A p-value <0.05 was considered to be statistically significant.

RESULTS

In this study, a total of 3,072,029 of patients were male (49.6%), and 3,119,299 were female (50.4%). A total of 6,191,328 patients were assigned the codes of a respiratory system disease (ICD10 J00-J06, J10-J18, J30-J34, J40-J44, J45-J46, J47, R05, and R06) in the İzmir province between 1/1/2016 and 12/31/2017.

A total of 2,408,525 (38.9%) of the patients included in the study were in the 0-14 age group; 1,238,808 (20%) were 15-34; 616,494 (10%) were 35-44; 1,155,939 (18.7%) were 45-64; and 771,562 (12.5%) were aged ≥ 65 years. It was observed that the number of male applicants was only higher in the 0-14 age group, and the number of female applicants was higher in the 35-64 age group (Figure 1). No significant difference was found regarding gender in the 15-34 age group and ≥ 65 age group.

It was observed that over half of the patients (53.6%) who applied to the health institutions in İzmir due to respiratory system disorders received the diagnosis of an upper respira-

MAIN POINTS

- The exposure to outdoor air pollution has been associated with acute and chronic health problems. In this study, we aimed to determine the relation between air pollution and the frequency of hospital admissions. We evaluated air pollution with the PM10. PM pollutants have been shown to have a greater effect on mortality and morbidity when their diameters are smaller. We found when the air pollution increases hospital admission rates also increase. The cases presented with the diagnosis of upper respiratory tract infection and acute bronchitis in the young group whereas chronic respiratory diseases in the elderly group.
- The increase in hospital admissions occurred during January–March. It was due to the fact that fossil fuels were more used in İzmir due to the cold weather during these months, and therefore PM10 concentrations in the air were measured higher. PM10 can be considered as a measure of air pollution, and an increase of every 10 $\mu\text{g}/\text{m}^3$ in İzmir leads to a 3% increase in the number of hospital admissions.
- The reduction of air pollutants and inhalation of clean air are the most important aspects in providing a healthier and longer life, what is important is to keep the air always clean.

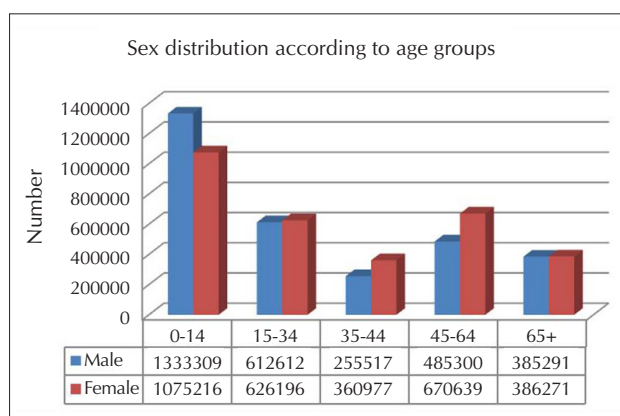


Figure 1. Gender distribution according to age groups of outpatient polyclinics

tory tract infection (URTI) between 2016 and 2017 (Table 1). As expected, asthma was more common in women (9.6% versus 5.2%), while COPD was more common in men

(10.3% versus 4.2%). The rate of diagnosis of chronic rhinitis was also higher in females than in males (11.8% versus 8.5%). Gender differences in other diagnoses were not significant (Table 1).

Table 1. Male and female numbers and ratios according to diagnosis in hospital applications in 2016/2017

| Outpatient clinic | Male (%) | Female (%) | Total (%) |
|----------------------------|------------------|------------------|------------------|
| URTI (J00–J11) | 1,672,946 (54.5) | 1,644,680 (52.7) | 3,317,626 (53.6) |
| Pneumonia (J15–J18) | 25,290 (0.8) | 23,949 (0.77) | 49,239 (0.8) |
| Acute bronchitis (J20–J22) | 403,518 (13.1) | 383,054 (12.9) | 786,572 (12.7) |
| Chronic rhinitis (J30–J34) | 259,506 (8.5) | 367,893 (11.8) | 627,399 (10.1) |
| COPD (J41–J44) | 316,577 (10.3) | 131,739 (4.2) | 448,316 (7.2) |
| Asthma (J45,J46) | 159,250 (5.2) | 299,112 (9.6) | 458,362 (7.4) |
| Bronchiectasis (J47) | 6,338 (0.2) | 7,144 (0.2) | 13,482 (0.2) |
| Cough (R05) | 124,826 (4.1) | 141,616 (4.5) | 266,442 (4.3) |
| Dyspnea (R06) | 103,778 (3.4) | 120,112 (3.9) | 223,890 (3.6) |
| Total | 3,072,029 | 3,119,299 | 6,191,328 |

URTI: upper respiratory tract infection

When the age groups were compared, the number of URITs in the 0-64 age group and COPD in the >65 years age group was found to be higher. It was found that half of URITs and acute bronchitis cases were in the 0-14 age group, more than one-third of pneumonia cases were in the age group ≥65 years, all of the COPD cases were in the age group ≥45 years, and 30% of patients with asthma were in the 0-14 age group and 27% in the 45-64 age group, 40% of bronchiectasis cases were in the 45-64 age group, one-third of cough cases was in the 0-14 age group, and two-thirds of patients from the dyspneic group were aged ≥45 years (Table 2).

The PM10 level averages were calculated as 38.57±29.52 µg/m³ for 2 years, and there was no significant difference between the weekday and weekend PM10 averages. On the other hand, the weekday patient admission average (10.809±3.024) was significantly higher than the weekend admission average (3.341±1.115; p<0.001).

According to the World Health Organization clean air criteria for the EU region, PM10 per day should not exceed 50 µg/m³. The number of days when the air monitoring station data exceeded the PM10 averages of 20, 30, 40, 50, 100, and 150 µg/m³ was, respectively, 597, 393, 254, 155, 28, and 3 days in this period. It can be said that almost half of the year is above the PM10 average (Table 3).

Table 2. Diagnosis and rates according to age in hospital applications in 2016/2017

| Diagnosis | 0–14 | 15–34 | 35–44 | 45–64 | 65+ | TOTAL |
|------------------|-------------------|------------------|----------------|-------------------|-----------------|-----------|
| URTI | 1,646,447 (49.6%) | 817,156 (24.6%) | 317,918 (9.6%) | 393,791 (11.9%) | 142,314 (4.3%) | 3,317,626 |
| % | 68.4 | 66.0 | 51.6 | 34.1 | 18.4 | 53.6 |
| Pneumonia | 6,516 (13.2%) | 5,299 (10.8%) | 4,684 (9.5%) | 13,750 (27.9%) | 18,990 (38.6%) | 49,239 |
| % | 0.3 | 0.4 | 0.8 | 1.2 | 2.5 | 0.8 |
| A. Bronchitis | 383,072 (48.7%) | 98,688 (12.5%) | 66,205 (8.4%) | 143,319 (18.2%) | 95,288 (12.1%) | 786,572 |
| % | 15.9 | 8.0 | 10.7 | 12.4 | 12.4 | 12.7 |
| Chronic rhinitis | 161,820 (25.8%) | 167,394 (26.7%) | 92,901 (14.8%) | 149,203 (23.8%) | 56,081 (8.9%) | 627,399 |
| % | 6.7 | 13.5 | 15.1 | 12.9 | 7.3 | 10.1 |
| COPD | 2,322 (0.5%) | 8,883 (2.0%) | 20,809 (4.6%) | 172,006 (38.4%) | 244,296 (54.5%) | 448,316 |
| % | 0.1 | 0.7 | 3.4 | 14.9 | 31.7 | 7.2 |
| Asthma | 111,439 (24.3%) | 66,827 (14.6%) | 61,458 (13.4%) | 143,330 (31.3%) | 75,308 (16.4%) | 458,362 |
| % | 4.6 | 5.4 | 10.0 | 12.4 | 9.8 | 7.4 |
| Bronchiectasis | 181 (1.3%) | 2,035 (15.1%) | 2,111 (15.7%) | 5,342 (39.6%) | 3,813 (28.3%) | 13,482 |
| % | 0.0 | 0.2 | 0.3 | 0.5 | 0.5 | 0.2 |
| Cough | 86,868 (32.6%) | 41,540 (15.6%) | 27,502 (10.3%) | 66,060 (24.8%) | 44,472 (16.7%) | 266,442 |
| % | 3.6 | 3.4 | 4.5 | 5.7 | 5.8 | 4.3 |
| Dyspnea | 9,860 (4.4%) | 30,986 (13.8%) | 22,906 (10.2%) | 69,138 (30.9%) | 91,000 (40.6%) | 223,890 |
| % | 0.4 | 2.5 | 3.7 | 6.0 | 11.8 | 3.6 |
| Total | 2,408,525 (38.9%) | 1,238,808 (20.%) | 616,494 (10%) | 1,155,939 (18.7%) | 771,562 (12.5%) | 6,191,328 |

URTI: upper respiratory tract infection

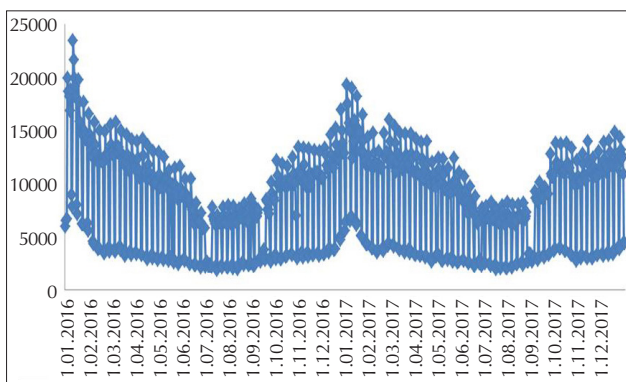


Figure 2. Temporal change of the total number of applications per day in Izmir between 2016 and 2017

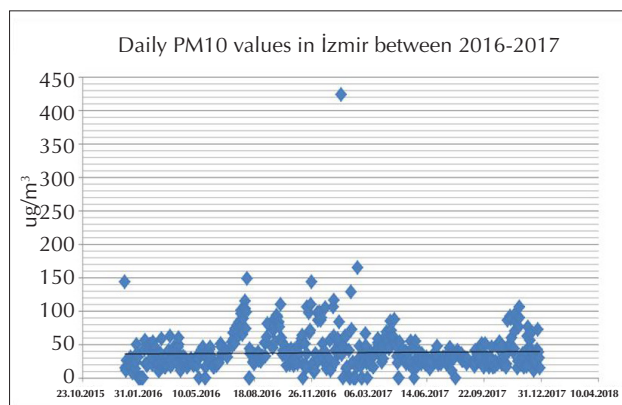


Figure 3. Daily PM10 values between 2016 and 2017 in Izmir ($\mu\text{g}/\text{m}^3$)

Table 3. Number of days when the air measuring station data exceeds the PM10 average of 20, 30, 40, 50, 100, and 150 $\mu\text{g}/\text{m}^3$ between 1/1/2016 and 12/31/2017

| PM10 level | Number of days L |
|-------------------------------|------------------|
| >20 $\mu\text{g}/\text{m}^3$ | 597 (85.4%) |
| >30 $\mu\text{g}/\text{m}^3$ | 393 (56.2%) |
| >40 $\mu\text{g}/\text{m}^3$ | 254 (36.3%) |
| >50 $\mu\text{g}/\text{m}^3$ | 155 (22.1%) |
| >100 $\mu\text{g}/\text{m}^3$ | 28 (4%) |
| >150 $\mu\text{g}/\text{m}^3$ | 3 (0.4%) |

URTI: upper respiratory tract infection

Table 4. Distribution of patients according to age groups and gender

| Age group | Male | Female | Total |
|-------------|--------|--------|--------|
| 0–14 | 6,048 | 4,301 | 10,349 |
| 15–34 | 4,020 | 3,148 | 7,168 |
| 35–44 | 14,179 | 4,199 | 18,378 |
| 45–64 | 4,723 | 11,214 | 15,937 |
| 65 and over | 5,921 | 7,292 | 13,213 |
| Total | 34,891 | 30,154 | 65,045 |

Table 5. Percentage increase in the number of hospital admissions associated with each 10 $\mu\text{g}/\text{m}^3$ increase in the PM10 level by gender and age groups

| Age | Male | Female | Total |
|-------|------|--------|-------|
| 0–14 | 0.45 | 0.40 | 0.43 |
| 15–34 | 0.66 | 0.50 | 0.58 |
| 35–44 | 5.55 | 1.16 | 2.98 |
| 45–64 | 0.97 | 1.67 | 1.38 |
| ≥65 | 1.54 | 1.89 | 1.71 |
| Total | 1.14 | 0.97 | 1.05 |

When the daily numbers of patients who applied with respiratory system complaints is high, the PM10 level was also high, as seen in Figure 2. In addition, both the PM10 level and the admission rate increase in the January-March period (Figure 2).

Table 6. Distribution of the rate of hospital referral rates associated with a 10 $\mu\text{g}/\text{m}^3$ increase at each PM10 level by diagnosis and gender

| Group at risk | Male | Female | Total |
|------------------|------|--------|-------|
| URTI | 0.45 | 0.44 | 0.45 |
| Pneumonia | 2.85 | 0.20 | 1.56 |
| Acute bronchitis | 0.28 | 0.26 | 0.27 |
| Chronic rhinitis | 6.22 | 1.69 | 3.56 |
| COPD | 1.70 | 1.99 | 1.78 |
| Asthma | 1.53 | 2.53 | 2.18 |
| Bronchiectasis | 2.62 | 2.69 | 2.66 |
| Cough | 0.84 | 1.58 | 1.23 |
| Dyspnea | 0.31 | 2.49 | 1.48 |
| Total | 1.14 | 0.97 | 1.05 |

URTI: upper respiratory tract infection

In Figure 3, daily mean PM10 concentrations in Izmir between 2016 and 2017 were presented. The PM10 levels peaked in January and in March.

In the 2-year period, the average concentration of PM10 in Izmir was calculated as $38.57 \pm 29.52 \mu\text{g}/\text{m}^3$, and the PM10 concentration was measured above this average 40% (266 days) of the year. Rather, both the PM10 level and the admission rate increase in the January-March period. It was found that there were significant increases in disease rates after 1, 2, 3, and 4 days of exposure to air pollution, which was expressed as lag1, lag2, lag3, and lag4 with risk rates.

A total of 65,045 (1.05%) of the 6,191,328 patients who applied suffered from respiratory system disorders during the 2-year period related to increased air pollution (34,891 men [53.6%]; 30,154 women (46.4%)).

In terms of age, a total of 18,378 (28.3%) patients were in the age group 35-44 years; 15,937 (24.5%) were in the age group 45-64 years; 13,213 (20.3%) were in the age group ≥65 years; 10,349 (15.9%) were in the age group 0-14 years; and 7,168 (11%) were in the age group 15-34 years. Regarding impact, males from the 35-44 age group were found to be more affected and the 45-64 age group had a higher proportion of females (Table 4).

In male patients, an increase in the risk of hospital admission (for every 10 $\mu\text{g}/\text{m}^3$ increase in PM10) was 1.14% (between 0.45% and 5.55%), while the highest increase was 5.55% in the 35-44 age group (Table 5).

The rate of increase of this ratio calculated using the ratio of the number of patients according to the gender and diagnosis in Table 1 is presented in Table 6.

Thus, in males, it was seen that there was the highest increase rate with the diagnosis of chronic rhinitis with an increase of 6.22%.

The risk of the increase in hospital admissions in female patients was found to be 0.97% (between 0.40% and 1.89%) for every 10 $\mu\text{g}/\text{m}^3$ increase in PM10, with a maximum increase of 1.89% in the age group ≥ 65 (Table 5). In females, it was seen that there was a 2.69% increase in bronchiectasis, 2.53% in asthma, and 2.49% in dyspnea (Table 6).

DISCUSSION

Air pollutants [PM10, PM2.5, sulfur dioxide (SO_2), nitrous oxide (NOx), ozone, and diesel particulates] have been shown to have adverse health effects, even at low levels. When classified according to their size, PM pollutants have been shown to have a greater effect on mortality and morbidity when their diameters are smaller. Also, they have severe effects on health, with many different organic and inorganic pollutants that can be found in a PM [7].

In morbidity studies, evaluating short-term health effects of air pollution, an examination of the effects of daily mean concentrations of pollutants on both the hospital admission numbers and daily deaths often involves examining daily data containing at least 2 years of exposure in the context of meteorological data, which are confounding factors of air pollution effects. From the 1990s onward, in such studies, the daily and 0-4 daily mean concentrations of pollutant concentrations were investigated using the time series analysis method to determine the effects on daily mortality or hospital applications. In a comprehensive US study, 115 million COPD, heart failure, cerebrovascular disease, and chest disease cases were associated with daily PM2.5 concentrations in 204 residential areas and with the increase in PM2.5 concentrations, hospital admissions for cardiac insufficiency were found to increase by 1.23% in increments of 10 $\mu\text{g}/\text{m}^3$ [8]. In Italy, the results of a study of hospital applications in 2013, in which the emergency department referrals due to chest diseases increased by 0.75% and 1.23%, respectively, in 10 $\mu\text{g}/\text{m}^3$ increments of PM10 and fine particulate matter concentrations in 25 cities [9]. In another study conducted using this method, Stieb et al. [10] reported that cardiovascular and respiratory diseases were associated with gas and particulate matter concentrations for emergency department visits in seven cities in Canada. For PM10 and PM2.5 increases, hospital applications for asthma increased three to four times a year. In Turkey, studies conducted in Erzincan between 2015 and 2016 and in Istanbul between 2013 and 2014 showed that an increase in the PM10 level of 10 $\mu\text{g}/\text{m}^3$ cause an increase in respiratory disease by 2.57% and 1.17%, respectively [11,12].

females in Erzincan and 1.17% for males and 1.16% for females in Istanbul. In our study, a 2-year time series analysis in 2016/2017 found that the increase in PM10 every 10 $\mu\text{g}/\text{m}^3$ also increased the frequency of respiratory complaints by 1.05% in total, which was 1.14% for males and 0.97% for females.

People with cardiac or pulmonary diseases, such as asthma, COPD, and heart disease, are at an increased risk of premature death or emergency room visits when exposed to PM. The elderly are susceptible to PM exposure. This group is more vulnerable to risks such as admission to hospitals or emergency services and premature death from heart and lung disease [13]. In studies in Turkey, the risk of hospital admissions increased in patients aged ≥ 65 and 15-34 years in Erzincan, whereas the age group 0-14 was found in Istanbul [11,12]. In our study, it was determined that the highest increase in the hospital admission in men was in the 35-44 age group, the highest increase in women in the group ≥ 65 years, and the highest increase in total was in the 35-44 years age group.

The fact that we could not differentiate whether the application came from an outpatient clinic or emergency department according to the health ministry data was a limitation of our study. However, there is a significant correlation between the outpatient clinics and emergency department, so it is possible to say that emergency applications have a significant increase within 10 days after the day of air pollution.

It is understood that the increase in hospital admissions during January-March was due to the fact that fossil fuels were more used in Izmir due to the cold weather during these months, and therefore PM10 concentrations in the air were measured higher (Figure 3).

As we know, an exposure to air pollution can trigger new asthma events, exacerbate a preexisting respiratory illness, and provoke lung cancer, COPD development, or progression of COPD. Air pollutants also affect the lung development negatively early in life, creating an additional risk factor for the development of lung diseases later in adulthood. In our study, we have seen increase in the frequency of chronic diseases like chronic rhinitis and bronchiectasis in males.

Studies investigating the effects of air pollution on hospital admissions found an increase in the hospital admissions for asthma and COPD in individuals aged ≥ 65 years due to an increase in PM10 levels [14,15]. In a study conducted in Düzce in 2009, it was determined that the PM10 concentration above 100 $\mu\text{g}/\text{m}^3$ was not associated with the rates of COPD and asthma and the rates of emergency service admission. In the same study, it was found that emergency admissions increased in elderly male patients with COPD in winter (≥ 65 years), and elderly female patients with asthma (≥ 65 years) in autumn [16]. In the study in Erzincan, the riskiest group was found to have acute bronchitis in both genders [11]. In our study, the riskiest group was found to have chronic rhinitis in men, bronchiectasis, and asthma in women.

Coal fumes contribute to air pollution with NOx, SO_2 , PM, and ozone. An exposure to fine particulates (PM2.5) at specific levels for a long time can lead to COPD. According to a recent systematic screening and meta-analysis, with an exposure to a concentration of total suspended solids greater than 200 $\mu\text{g}/\text{m}^3$,

there is a 1.33 fold increase in COPD cases, and an exposure to high levels of PM causes an 11% increase in the incidence [17]. PM is also known to exacerbate asthma symptoms and is also suspected of having a role in the development of asthma [18]. In the same way in our country, studies are supporting these data [11,12,19,20]. In our study, an increase in each 10 $\mu\text{g}/\text{m}^3$ in the PM10 level was found to increase the hospital admission for 2.23% in men aged ≥ 65 and 2.19% in women with COPD; and 2.56% in men aged ≥ 65 and 2.53% in women with asthma, respectively. In particular, diagnoses, other than those of URTI (chronic rhinitis, asthma, COPD), increase with an increase in PM10 levels between 1 and 4 days. The acute effects of air pollution, as well as the chronic effects, negatively affect the health of the lungs.

Studies showing a causal relationship between current levels of air pollution and morbidity/mortality have proved that the problem is vital for public health. Based on the results of the assessment from Austria, France, and Switzerland, mortality, chronic bronchitis incidence, hospital admissions, acute bronchitis among children, days of limited activity, and asthma attacks are all attributable to air pollution. The effect of smoking, environmental tobacco smoke, and air pollution on chronic cough/sputum prevalence has been determined. Despite all methodological differences, studies of the impact assessment demonstrate that the public health benefits greatly from a better air quality [21]. Our study is also an impact assessment study, and because of the lack of data, mortality has not been studied, but the increase in the number of both acute and chronic respiratory disease cases by 1% (as expected during the 2-year hospital admission period, suggests that air pollution will cause an increase in hospital admissions in the future as well.

As a result, there was a significant increase in the incidence of respiratory diseases during the days when the PM10 level was high in the 2-year period in the Izmir province, and these cases presented as the URTI and acute bronchitis in the young group and chronic respiratory diseases in the elderly group in the hospital emergency and outpatient clinics. The number of days when air monitoring station data exceeded the PM10 averages of 50 $\mu\text{g}/\text{m}^3$ was 155 in this period. Nearly one-fifth of the year, PM10 can be said to be $>50 \mu\text{g}/\text{m}^3$. This means that people living in Izmir have to inhale dirty air once every 5 days. It is obvious that Izmir, where migration increases in recent years, will become more polluted if the measures are not taken.

PM10 can be considered as a measure of air pollution, and an increase of every 10 $\mu\text{g}/\text{m}^3$ in Izmir leads to a 3% increase in the number of hospital admissions in the active working group.

The reduction of air pollutant concentration and inhalation of clean air are the most important factors in providing a healthier and longer life. Although it is recommended that patients with respiratory diseases do not go out on days when the air is dirty, especially in the winter months, what is important is to keep the air always clean.

Ethics Committee Approval: Local ethics committee approval was received for this study from the ethics committee of Dr. Suat Seren Chest Diseases and Surgery Research and Training Hospital (date: 23.02.2018; number: E.2234).

Informed Consent: Patient approval was not required. Information obtained from the registration data.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - E.Y., Ö.U., S.A., G.P., E.B.; Design - E.Y., Ö.U., S.A., G.P., E.B.; Supervision - E.Y., Ö.U., S.A., G.P., E.B.; Resources - E.Y., Ö.U., S.A. Data Collection and/or Processing - E.Y., Ö.U., S.A.; Analysis and/or Interpretation - E.B.; Literature Search - E.Y., Ö.U., S.A., G.P., E.B.; Writing Manuscript - S.A., E.Y., G.P.; Critical Review - E.Y., G.P., S.A.

Conflict of Interest: The authors have no conflicts of interest to declare.

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