

EFFECTS OF SULPHUR DIOXIDE AND SMOKE ON THE INCIDENCE OF SECRETORY OTITIS MEDIA

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Received February 17, 1993

The study deals with the effects of sulphur dioxide and smoke as air pollutants on the incidence of secretory otitis media. Although various atmospheric irritants, such as sulphur dioxide and smoke, have been reported to increase proneness to infection and allergy stabilization, and to cause Eustachian tube obstruction and development of secretory otitis media by way of infection and allergy reaction, such statements appear to be challenged by the results obtained in this study. No correlation was found between the number of children hospitalized for secretory otitis media, and the mean and maximum monthly concentrations of sulphur dioxide and smoke in the air. Although there has been a steady decrease in sulphur dioxide and smoke concentrations over the past decade, the number of cases of secretory otitis media has not only failed to follow that decrease but has actually increased.

Key terms: air pollution, children, environmental effect

Numerous studies have shown that air pollution may decrease the resistance to viral infections, increase the risk of allergy sensitization and cause hyperreactivity of the respiratory tract mucosa (1-4). Secretory otitis media (SOM) occurs as a result of a disturbance in the Eustachian tube function which is frequently caused by infection and allergy of the upper respiratory tract (5, 6).

The aim of this study was to determine the possible effect of sulphur dioxide and smoke in the air as pollution indicators of SOM incidence.

SUBJECTS AND METHODS

Between January 1, 1981 and December 31, 1990, 297 children - 156 (52.5%) boys and 141 (47.5%) girls, aged 1-10 years, were hospitalized for SOM at the Ear, Nose and Throat Department of the Šalata Hospital Centre in Zagreb. In all patients audiologic examinations (audiometry and tympanometry) were performed. They were followed by myringotomy and insertion of a ventilation tube. So, in all of the 297 children the preoperatively suspected SOM was surgically confirmed.

During the ten-year period, the mean and maximum monthly values of sulphur dioxide and smoke in the air were monitored. Those data were compared with the number of children hospitalized for SOM by months. Data on air pollution were obtained from the Croatian Hydrometeorological Institute. Measurements were taken at the Grič Observatory in Zagreb.

RESULTS

The total number of children hospitalized for SOM during the ten-year period was 297, or ranged per month from 0 to 7, mean 2.48.

The mean and maximum monthly sulphur dioxide concentrations in the air ranged from 0 to 140 $\mu\text{g}/\text{m}^3$, mean 21.8 $\mu\text{g}/\text{m}^3$ and from 0 to 424 $\mu\text{g}/\text{m}^3$, mean 57.7 $\mu\text{g}/\text{m}^3$ respectively. The respective ranges for smoke were from 0 to 117 $\mu\text{g}/\text{m}^3$, mean 17.5 $\mu\text{g}/\text{m}^3$, and from 0 to 409 $\mu\text{g}/\text{m}^3$, mean 65.9 $\mu\text{g}/\text{m}^3$.

The coefficient of linear correlation between the mean monthly sulphur dioxide concentration in the air and the number of children hospitalized for SOM was $r=-0.131$ ($P>0.05$), and between the maximum monthly air concentration of sulphur dioxide and the number of hospitalized children $r=-0.076$ ($P>0.05$). These coefficients were not statistically significant. The coefficient of linear correlation between the number of children hospitalized for SOM and the mean monthly smoke in the air concentration was $r=-0.223$ ($P<0.05$), and between the number of hospitalized children and maximum monthly smoke in the air concentration $r=-0.080$ ($P>0.05$). Comparison of the number of hospitalized children, and the mean and maximum air concentrations of sulphur dioxide and smoke recorded in the two preceding months also failed to yield a statistically significant correlation ($P>0.05$).

The mean annual values of sulphur dioxide and smoke in the observation period decreased, but this decrease was not followed by a drop in the number of children hospitalized for SOM (Figures 1 and 2).

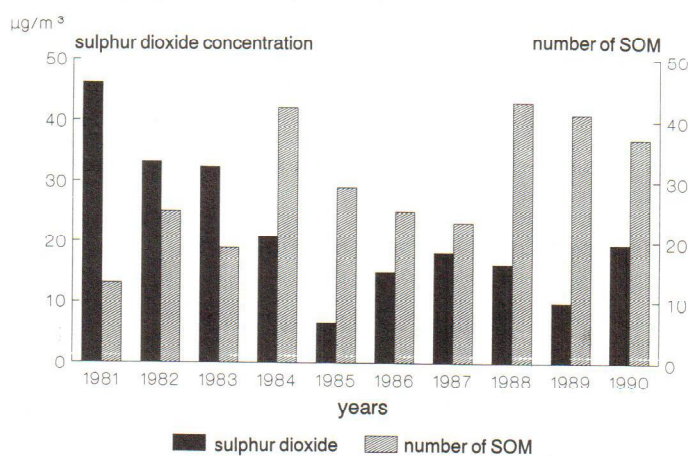


Figure 1. The relationship between mean air concentration of sulphur dioxide and the number of children hospitalized for secretory otitis media (SOM)

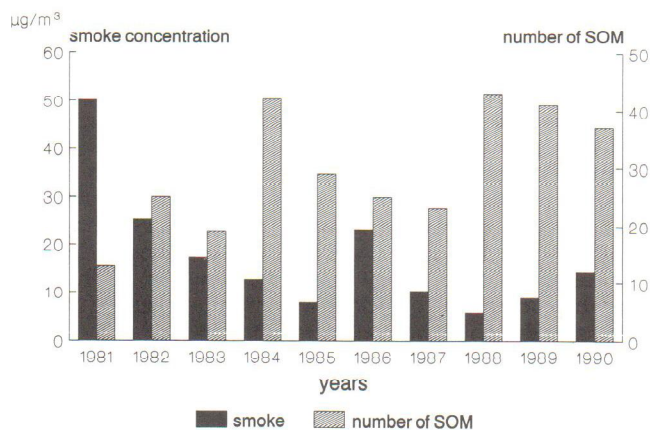


Figure 2. The relationship between mean air concentration of smoke and the number of children hospitalized for secretory otitis media (SOM)

DISCUSSION

Most of the children hospitalized for SOM were aged 5, 6 and 7 years. The diagnosis of SOM was rare in younger children, especially in those under three years of age, mainly because at that age children cannot indicate discomforts they experience. After the age of seven, the frequency of SOM showed a tendency towards a steady decrease (Figure 3).

Although various irritant air pollutants, such as sulphur dioxide and smoke, have been reported to increase proneness to infection and allergy stabilization, and to cause Eustachian tube obstruction and development of SOM by infection and allergy reaction,

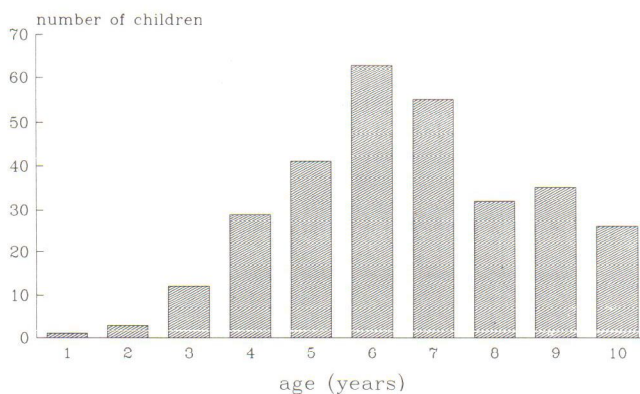


Figure 3. Children hospitalized for secretory otitis media (SOM) according to age

such statements appear to be challenged by the results of this study. Thus, no correlation was found between the number of children hospitalized for SOM, and the mean and maximum monthly air concentrations of sulphur dioxide and smoke.

As several weeks may elapse from the moment of action of air pollutants on the upper respiratory tract mucosa and the region of Eustachian tube ending in fully developed SOM and the child's hospitalization, the number of SOM cases was compared to the values of air pollution indicators over the preceding two months, in addition to the values in the respective month. Those comparisons failed to demonstrate any statistically significant correlations. On comparison between the number of hospitalized children and mean monthly air concentration of smoke, the correlation coefficient approached the level of statistical significance in one case only. However, in this, like in all other cases, the value of the correlation coefficient was negative, i.e. the SOM frequency decreased with increase in the pollutant concentration.

During the past decade there has been a steady decrease in sulphur dioxide and smoke concentrations. However, the number of cases of SOM not only failed to follow that decrease but has actually increased.

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Sažetak

UČINAK SUMPORNOG DIOKSIDA I DIMA NA UČESTALOST SEKRETORNOG OTITISA

U ovom radu istraživana je utjecaj sumpornog dioksida i dima, kao onečišćivača atmosfere, na nastanak sekretornog otitisa. Iako različiti iritansi iz atmosfere povećavaju vjerojatnost infekcije i alergijske senzibilizacije, djelujući na sluznicu respiratornog trakta i uzrokujući zatvaranje Eustachijeve cijevi i razvoj sekretornog otitisa, u ovom radu to nismo uspjeli dokazati za sumporni dioksid i dim. Nije dokazana povezanost koncentracije sumpornog dioksida i dima i broja djece hospitalizirane zbog sekretornog otitisa. U proteklom desetljeću vrijednosti sumpornog dioksida i dima u zraku snižavale su se, dok broj sekretornih otitisa ne samo da nije pratio taj pad, nego se povećao.

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Ključne riječi: onečišćivanje zraka, sekretorni otitis, utjecaj okoline.