

Environmental Asbestos Exposure and Clustering of Malignant Mesothelioma in Community: a Spatial Analysis in a Population-Based Case-Control Study.

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BACKGROUND

Neighborhood exposure to asbestos increases the risk of developing malignant mesothelioma (MM) in residents who live near asbestos mines and asbestos product plants. The area of Casale Monferrato (Northwest Italy) was interested by several sources of asbestos environmental pollution, due to the presence of the largest Italian asbestos cement (AC) plant.

AIMS

In the present study, we examined the spatial variation of MM risk in an area with high levels of asbestos pollution and secondly, and we explored the pattern of clustering.

METHODS

A population-based case-control study conducted between 2001 and 2006 included 200 cases and 348 controls. Demographic and occupational data along with residential information were recorded. Bivariate Kernel density estimation was used to map spatial variation in disease risk while an adjusted* (age, sex, type of interview) logistic model was applied to estimate the impact of residential distance from the AC plant. Kulldorf test and Cuzick Edward test were then performed.

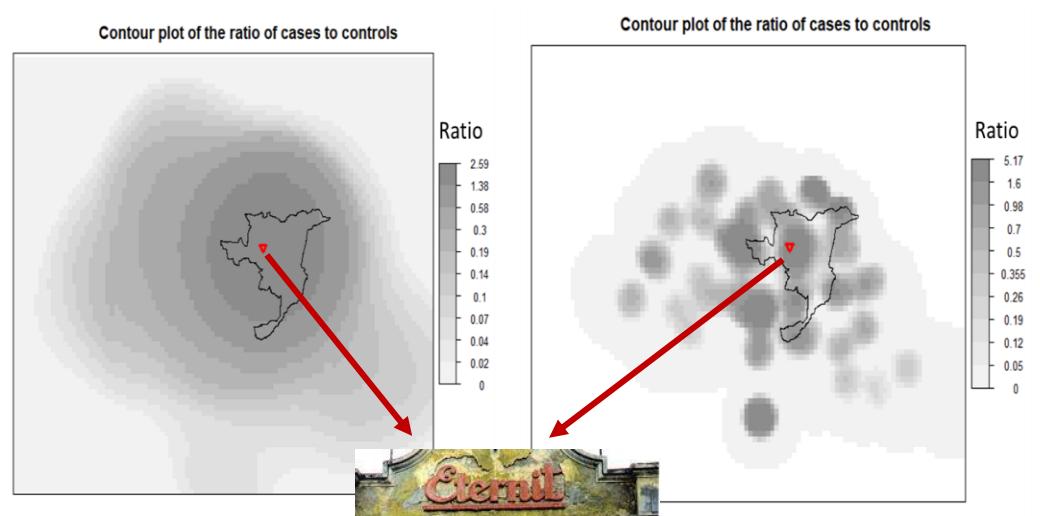
RESULTS

One hundred ninety-six cases and 322 controls were included in the analyses. The contour plot of the cases to controls ratio showed a well-defined peak of MM incidence near the AC factory, and the risk decreased monotonically in all directions when large bandwidths were used. However, considering narrower smoothing parameters, several peaks of increased risk were reported [Figure 1]. A constant trend of decreasing OR with increasing distance was observed, with estimates of 10.9 (95% CI 5.32-22.38) and 10.48 (95%CI 4.54-24.2) for 0-5 km and 5-10 km, respectively (reference >15 km) [Table 1]. Finally, a significant ($p < 0.0001$) excess of cases near the pollution source was identified and cases are spatially clustered relative to the controls until 13 nearest neighbours.

Table 1. Case control study on MM in Casale Monferrato area. Risk of MM of the pleura in relation to the distance of longest-held residence (after exclusion of 20 years before the date of diagnosis) from the AC plant. Odds ratios (OR), 95% confidence intervals (in brackets) and Akaike Information Criterion (AIC).

Figure 1. Case control study on MM in Casale Monferrato area. Contour plot of the kernel density surfaces of the case to control ratio, around Casale Monferrato (solid line). Bivariate Gaussian Kernels with smoothing parameters set to 10 and 20 km for cases and controls, respectively, in the left panel and 2 and 4 km in the right panel. The legend reports the value of ratio and the corresponding grey shades.

All subjects				
Distance from the AC plant (km)	All N=518	Cases N=196	Controls N=322	OR adjusted*
0-5	237 (45.75)	126 (64.29)	111 (34.47)	10.91 (5.32-22.38)
5-10	75 (14.48)	40 (20.41)	35 (10.87)	10.48 (4.54-24.2)
10-15	85 (16.41)	18 (9.18)	67 (20.81)	2.2 (0.9-5.33)
>15	121 (23.36)	12 (6.12)	109 (33.85)	Ref
AIC				513.71
Distance, Km	6.06 [12.25]	2.10 [5.9]	11.32 [15.77]	0.87 (0.84-0.91)
AIC				514.91



CONCLUSIONS

In this study, we found an increasing pattern of mesothelioma risk in the area around a big AC factory and we detected secondary clusters of cases due to local exposure points, possibly associated to the use of asbestos materials.