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MORTALITY STUDY OF ITALIAN WORKERS COMPENSATED FOR ASBESTOSIS (1980-1990)

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OBJECTIVES

The purpose of the present investigation is to study cause-specific mortality in a cohort of subjects compensated for asbestosis . The rationale for this study can be summarized as follows.

Even if the carcinogenic action of asbestos has been ascertained with regard to lung cancer and mesothelioma of pleura, peritoneum, pericardium and tunica vaginalis of testis, conflicting opinions exist about other cancer sites (Edelman 1992, Garabrant et al 1992, Homa et al 1994).

The present cohort , which deals with subjects certainely exposed to elevated concentrations of asbestos, can provide information in this respect. Furthermore, it may be of interest to compare the mortality pattern of asbestosic subjects from different industrial sectors, corresponding to different modes of exposure to asbestos.

Finally, this study may contribute to the very issue of the mortality experience of asbestosic patients, which has been the object of some previous studies in various countries and is currently being debated (Berry1981, Cookson et al 1985, Browne 1986, Hughes & Weill 1991).

METHODS

The cohort included all subjects compensated for asbestosis who were alive at 31.12.1979, altogether 3417 subjects (2776 men and 641 women).

The source of data was constituted by the files of the Statistical Actuarial Service of INAIL. Information available for every cohort member included among else anagraphic data and branch of activity, which were abstracted.

Vital status was ascertained at 30.6.1990 ; for deceased subjects, causes of death were obtained from the Registry office of the municipality where death had occurred. The subjects whose vital status was unknown at the end of the study period were assumed to be alive.

Cause-specific mortality ratios, standardized for age (five-year bands), sex and five-years calendar periods, were calculated using the PC-OCMAP package (Marsh et al 1986). The mortality rates of the Italian population were used as standard; two-sided 95% confidence intervals (95% CI) of standardized mortality ratios (SMR's) were computed assuming a Poisson distribution; the exact method was used when observed death were fewer than 200; the chi-square approssimation was considered in the remaining cases.

Table 1
Distribution of cohort members b sex and branch of activity

	Men No. (%)	Women No. (%)
Asbestos-cement industry	1298 (46.8)	261 (40
Textile industry	159 (5.7)	209 (32
Naval industry	369 (13.3)	1
Insulators	57 (2.0)	0
Others	893 (32.2)	170 (26
Total	2776	641

Table 2
Mortality among asbestosic subjec
(men)

CAUSE OF DEATH	OBS	SMR
All causes	980	153 (*
Infectious diseases	7	201
Cardiovascular diseases	223	84 (*
All malignancies	380	188 (*
Benign and unspecified tumours	0	---
Blood disorders	0	---
Respiratory diseases	184	361 (*
Digestive diseases	46	99
Cirrhosis of the liver	33	107
Diseases of the genito-urinary tract	4	44
Psychological disorders	0	---
Diseases of the nervous system	3	34 (*
Diabetes	5	31 (*
Violence	32	125
Ill defined and unknown	7	111

CANCER SITES		
Buccal cavity	8	126
Digestive tract	88	125 (*)
Esophagus	2	41
Stomach	24	108
Small intestine	2	697
Big intestine	14	140
Rectum	10	162
Liver	14	114
Pancreas	8	107
Peritoneum	11	1344 (*)
Respiratory tract	217	297 (*)
Nasal sinuses	0	---
Larinx	4	59
Bronchus and lungs	180	281 (*)
Pleura	27	2408 (*)
Connective tissue	1	362
Melanoma	2	185
Skin	1	150
Prostate	11	88
Bladder	13	128
Kidney	4	98
Nervous system	6	150
Thyroid	0	---
Lymphohaematopoietic tissue	10	88

= lower limit of 95% CI > 100 or upper limit of 95% CI < 100

Table 3
Mortality among asbestosic subjects (women)

CAUSE OF DEATH	OBS	SMR
All causes	154	151 (*)
Infectious diseases	0	---
Cardiovascular diseases	43	86
All malignancies	58	228 (*)
Benign and unspecified tumours	0	---
Blood disorders	0	---
Respiratory diseases	34	653 (*)
Digestive diseases	3	55
Cirrhosis of the liver	2	69
Diseases of the genito-urinary tract	3	224
Psychological disorders	0	---
Diseases of the nervous system	0	---
Diabetes	3	55
Violence	2	59
Ill defined and unknown	1	49

CANCER SITES

Buccal cavity	0	---
Digestive tract	17	163
Esophagus	0	---
Stomach	1	36
Small intestine	2	4652 (*)
Big intestine	7	371 (*)
Rectum	1	104
Liver	0	---
Pancreas	2	166
Peritoneum	3	1481 (*)
Respiratory tract	34	653 (*)
Nasal sinuses	1	5486 (*)
Larynx	0	---
Bronchus and lungs	10	538 (*)
Pleura	7	5967 (*)
Connective tissue	1	1910
Melanoma	0	---
Skin	0	---
Breast	4	89
Ovary	6	545 (*)
Bladder	0	---
Kidney	0	---
Nervous system	0	---
Thyroid	0	---
Lymphohaematopoietic tissue	1	55

(*) = lower limit of 95% CI > 100 or upper limit of 95% CI < 100

Table 4
Mortality among asbestosic subjects in asbestos-cement industry (Casale Monferrato plant)

CAUSE OF DEATH	OBS	SMR
All causes	248	154 (*)
Respiratory diseases	49	409 (*)
All malignancies	124	258 (*)
MN of lung	50	381 (*)
pleura	19	7348 (*)
peritoneum	5	2192 (*)
intestine and rectum	8	189
ovary	3	844 (*)

Table 5
Mortality among asbestosic subject in asbestos-cement industry (other plants)

CAUSE OF DEATH	OBS	SMR
All causes	199	122 (*
Respiratory diseases	28	245 (*
All malignancies	61	113
MN of lung	26	153 (*
pleura	2	665 (*
peritoneum	2	849 (*

Table 6
Mortality among asbestosic subjects in textile industry

CAUSE OF DEATH	OBS	SMR
All causes	141	178 (*)
Respiratory diseases	33	583 (*)
All malignancies	46	221 (*)
MN of lung	19	428 (*)
pleura	2	1878 (*)
peritoneum	2	1765 (*)
intestine and rectum	3	148
ovary	3	910 (*)

Table 7
Mortality among asbestosic subjects in naval industry

CAUSE OF DEATH	OBS	SMR
All causes	115	126 (*)
Respiratory diseases	19	259 (*)
All malignancies	53	185 (*)
MN of lung	26	290 (*)
pleura	5	3153 (*)
peritoneum	1	871

Table 8
Mortality among asbestosic insulators

CAUSE OF DEATH	OBS	SMR
All causes	21	227 (*)
Respiratory diseases	1	161
All malignancies	12	367 (*)
MN of lung	8	722 (*)
pleura	0	---
peritoneum	0	---
intestine and rectum	1	407

RESULTS

At the end of the study period, 2235 subjects were alive and 1134 deaths occurred; 48 subjects were lost, corresponding to 1.4 % of the initial cohort. The cause of death was not ascertained for 78 subjects, corresponding to 6.9 % of the deceased.

Observed and expected mortality for men and women are shown in tables 2 and 3, respectively.

Mortality from all causes, all malignant neoplasms and diseases of the respiratory tract were significantly increased in both sexes. The increase in neoplasms was essentially due to tumors of the respiratory tract (lung and pleura) and peritoneum and, among women, ovary and intestine.

Analysis by branch of activity provided some further information of interest.

Asbestos cement workers constituted the largest subcohort; about half of them came from a single facility located in Casale Monferrato (Piedmont), and they were the object of a separate analysis (table 4). As it can be seen asbestos cement workers from Casale showed significant increases for most SMR's in both sexes. Asbestos cement workers from other facilities (table 5) showed significant increases for most of the causes of death at study, even if SMR's were lower than in the Casale subcohort, among men; among women, because of limited size, no final conclusion could be reached.

Significantly increased SMR's for most of the causes of death at study were seen among textile workers in both sexes (table 6).

Naval industry workers, all men , showed significantly increased mortality for lung and pleural neoplasms, all neoplasms, respiratory diseases and all causes of death (table 7).

Among insulators, 57 male subjects, a striking increase of lung cancer was detected (8 observed versus 1.1 expected).

CONCLUSIONS

The present study revealed significant increases in mortality from respiratory disease and from cancer among asbestosic subjects; the excesses in neoplastic causes of death concerned pleural and peritoneal mesotheliomas lung, intestinal and ovarian cancer. This study is consistent with other cohort studies of asbestosic subjects performed in Finland (Huuskonen 1978), Great Britain (Berry 1981), Australia (Cookson et al 1985) and US (Hughes and Weill 1991), and with previous findings from Italy (Rubino et al 1981).

Besides confirming the causal association between exposure to asbestos and occurrence of lung cancer and pleural and peritoneal mesothelioma, this study detected a significant increase of ovarian and intestinal cancer.

Ovarian cancer has previously been associated with occupational exposure to asbestos with special reference to the manufacture of gas masks (Wignall & Fox 1982 , Acheson et al 1982), of asbestos textiles (Newhouse et al 1985) and the extraction of rock salt (Tarchi et al 1994).The issue of intestinal cancer in asbestos workers has been studied with conflicting results. Ehrlich et al (1991) detected asbestos fibres in the colon of cancer patients previously exposed to asbestos but not in colon carcinoma patients without previous occupational exposure and Vineis et al (1993) described an excess risk of colon cancer among pipefitters and boilermakers; on the other hand, no association between colon cancer and asbestos exposure was found by Garabrant et al (1992) in a large case-control study. Recently, Homa et al (1994) suggested that exposure to relatively high concentrations of amphiboles in required in order to induce colon cancer.

The present study detected significant increases in risk associated with different occupations, in agreement with previous results from various countries (IARC 1987). The extremely severe disease pattern of asbestos cement workers from the Eternit facility in Casale Monferrato is coherent with the findings of the Casale occupational cohort (Magnani et al 1987), the workers wives cohort (Magnani et al 1993), and the figures on mesotheliomas in Casale's general population (Magnani et al 1991).

The major limitation of the present study is due to potential misclassification of causes of death. In Italy, death certification of lung cancer has a good agreement with clinical diagnosis (over 80%), but it underestimates the occurrence of the disease if a comparison is made with necropsy data (Delendi et al 1991). A national survey showed that about 75% of pleural mesothelioma cases are correctly classified on death certificates, while a necropsy based study in Trieste provided a much higher estimate of false negatives (80%), and a 20% estimate of false positives (Delendi et al 1991). Misclassification of abdominal neoplasms,including peritoneal mesothelioma and ovarian cancer, is commonly thought to be relatively high (Bruno et al 1990). 'Best pathologic evidence' procedures, such as those applied by Selikoff to US and Canadian insulators, may be implemented with respect to the cohort at study in order to achieve a deeper insight in the emerging pattern of disease. With respect to misclassification, it should finally be noted that three more subjects had a mention of mesothelioma in the death certificate (in one case it was not the underlying cause of death; in two cases the localization was not specified), while for 8 subjects the cause of death was peritoneal carcinosis or peritoneal neoplasm of unspecified nature; 14 deaths were ascribed to unspecified neoplasms.

Permanent epidemiologic surveillance of the cohort of Italian asbestosic subjects is required in order to follow in time the evolution of their cause-specific mortality; in the meanwhile, a limited number of actions aimed at decreasing individual risk of these subjects, suc has ad hoc antismoke campaigns, should be seriously considered.

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