were a mother and daughter. 2 patients lived in institutions but had no known contacts.

Significantly more of the women patients in their twenties were single compared with a similar age group in the community. Thus 11 (92%) of the 12 patients, compared with 36% of similarly aged women in the community were unmarried ($p<0.0005$). The proportion of single male patients (7/9) aged 20 to 29 years was also higher than in the community, but the difference was not significant.

DISCUSSION

In this survey of viral hepatitis in an urban community 13% (48/368) appeared to have non-A, non-B hepatitis. This is surprisingly similar to the figure of 14% (10/73) patients reported in a consecutive series of patients admitted to hospital in Denmark.[11] Our 368 patients were selected from 489 patients detected during the 3 years of the survey.[10] The selection was on the basis of availability of serum for further detailed testing. This selection may have introduced bias and so no conclusion could be drawn about the prevalence of this type of hepatitis. The ratio of non-A, non-B hepatitis to hepatitis B and hepatitis A in the 368 patients studied was 1:2:4 (table I).

There are few reports on sporadic non-A, non-B hepatitis. In a study of 103 patients with endemic viral hepatitis in Costa Rica, Villarejos et al.[7] found 11 who, by exclusion, were thought to have this form of hepatitis. None had received a blood transfusion. 4 of these cases occurred in one family, which strongly suggested person-to-person transmission. In the United States an estimated 25% of sporadic cases may be due to virus(es) of non-A, non-B hepatitis.[12] Investigation of 69 stored serum specimens from patients involved in two water-borne outbreaks and sera of endemic cases in three areas of India indicated that many cases of hepatitis in that country were due to viruses other than hepatitis A and B.[13] It has been suggested that non-A, non-B hepatitis is a milder illness than hepatitis B as judged by the proportion of icteric cases and the maximum bilirubin and transaminase levels.[11,14,15] Our findings are in keeping with these reports.

A significantly higher proportion of the women patients were single than in the local population of women of the same age. This may simply have reflected a greater chance of exposure to the infective agent as a consequence of more frequent and varied close social contacts than experienced by married women. It is of interest that non-A, non-B disease predominated in women of 35 years or more in Los Angeles.[12]

In contrast to the reports from the United States[12,16,17] and one British study,[18] neither drug addiction nor the administration of blood or its products appeared to be important factors in the transmission of non-A, non-B hepatitis in the present study. This may be because the patients investigated were drawn from a community survey. Although household contacts were significantly less common than in hepatitis A, the finding of 4 patients with such a history indicated that close personal contact may be important.[7]

Members of the original Hepatitis Survey Team and the late Dr R A Dale, of the West Middlesex Hospital, provided the biochemical data. This work was supported by a generous grant from the Department of Health and Social Security.

Requests for reprints should be addressed to A.J.Z., London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT.

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Public Health

MALIGNANT MESOTHELIOMA AND RADIOLOGICAL CHEST ABNORMALITIES IN TWO VILLAGES IN CENTRAL TURKEY

An Epidemiological and Environmental Investigation

Y. I. BARIS, R. SARACCI, L. SIMONATO, J. W. SKIDMORE, M. ARTVINLI

Department of Chest Diseases, Hacettepe University, Ankara, Turkey; International Agency for Research on Cancer, Lyon, France; and MRC Pneumoconiosis Unit, Llandough Hospital, Penarth, Wales

Summary A comparative epidemiological and environmental study in two neighbouring villages, Karain and Karlik, in Central Turkey showed an excess adult mortality, shortening of life expectancy, and an excess of pleural radiological abnormalities in Karain. This supports an earlier report of an endemic of pleural mesothelioma in the village. Concentrations of airborne respirable fibres were uniformly very low in Karlik and higher in some of the air samples from Karain, the fibres being similar in composition to those of erionite—a mineral of the zeolite family and the major contributor to the Karain clouds. This is compatible with the hypothesis of a causal association between endemic mesothelioma and inhalation of erionite fibres, but the fibre concentrations in all samples are so low as to leave in question

DR FARRON AND OTHERS. REFERENCES

1. Havens WP. Viral hepatitis: multiple attacks in a narcotic addict. *Ann Intern Med* 1956; 44: 199–203.
2. Iwarson S, Lundin P, Holmgren J, Hermodsson S. Multiple attacks of hepatitis in drug addicts: biochemical, immunochemical and morphologic characteristics. *J Infect Dis* 1973; 127: 544–50.
3. Alter HJ, Holland PV, Purcell RH, Lander JJ, Feinstone SM, Morrow AG, Schmidt PJ. Post-transfusion hepatitis after exclusion of commercial and hepatitis B antigen-positive donors. *Ann J Intern Med* 1972; 77: 691–99.
4. Hollinger FB, Aach RD, Gitnick GL, Roch JK, Melnick JL. Limitation of solid-phase radioimmunoassay for HBsAg in reducing frequency of post-transfusion hepatitis. *N Engl J Med* 1973; 289: 385–91.
5. Prince AM, Brotman B, Grady GF, Kuhns WJ, Hazzi C, Levine RW, Millian SJ. Long incubation post-transfusion hepatitis without serological evidence of exposure to hepatitis B virus. *Lancet* 1974; ii: 241–46.
6. Dienstag JL, Feinstone SM, Purcell RH, Wong DC, Alter HJ, Holland PV. Non-A, non-B post-transfusion hepatitis. *Lancet* 1977, i: 560–62.
7. Villarejos VM, Visona KA, Eduarte CA, Provost PJ, Hilleman MR. Evidence for viral hepatitis other than type A or type B among persons in Costa Rica. *N Engl J Med* 1975, 293: 1350–52.
8. Farrow LJ, Stewart JS, Lamb SGS, Stern H, Smith H, Tuquaye KN, Zuckerman AJ. Sporadic non-A, non-B hepatitis in West London. *Lancet* 1979; ii: 300.
9. Farrow LJ, Lamb SG, Coghill NF, London RL, Preece J, Zuckerman AJ, Stewart JS. Hepatitis B antigen in viral hepatitis in West London. *Br Med J* 1974, iii: 83–86.
10. Stewart JS, Farrow LJ, Clifford RE, et al. A three year survey of viral hepatitis in West London. *Quart J Med* 1978; 47: 365–84.
11. Kryger P, Aldershvile J, Christoffersen P, Hardt F, Juhl E, Mathiesen LR, Nielsen JO, Poulsen H, and the Copenhagen Hepatitis Acuta Programme (CHAP). Acute non-A, non-B hepatitis—clinical, epidemiological and histological characteristics. *Scand J Infect Dis* 1980, 12: 165–69.
12. Dienstag JL, Alaama A, Mosley JW, Redeker AG, Purcell RH. Aetiology of sporadic hepatitis B surface antigen negative hepatitis. *Ann Intern Med* 1977, 87: 1–6.
13. Wong DC, Purcell RH, Sreenivasan MA, Prasad SR, Pavri KM. Epidemic and endemic hepatitis in India: evidence for a non-A, non-B hepatitis virus aetiology. *Lancet* 1980; ii: 876–78.
14. Purcell RH, Alter HJ, Dienstag JL. Non-A, non-B hepatitis. *Yale J Biol Med* 1976; 49: 243–50.
15. Norkrans G, Frosner G, Hermondsson S, Iwarson S. Multiple hepatitis attacks in drug addicts. *JAMA* 1980; 243: 1056–58.
16. Feinstone SM, Kapikian AZ, Purcell RH, Alter HJ, Holland PV. Transfusion-associated hepatitis not due to viral hepatitis type A or B. *N Engl J Med* 1975, 292: 767–70.
17. Meyers JD, Dienstag JL, Purcell RH, Thomas ED, Holmes KK. Parenterally transmitted non-A, non-B hepatitis. *Ann Intern Med* 1977, 87: 57–59.
18. Craske J, Spooner RJD, Vandervelde EM. Evidence for existence of at least two types of factor VIII associated non-B transfusion hepatitis. *Lancet* 1978, ii: 1051–52.

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the aetiological role of erionite. In addition to their local importance these results may have relevance for the wider scientific and public-health issue of long-term inhalation of mineral fibres at low concentrations.

INTRODUCTION

MALIGNANT mesothelioma, a rare tumour with an estimated incidence of 1–2 per million person-years in the general population of Western countries,[1] is receiving increasing attention as an asbestos-induced disease, no other cause having yet been identified for it in man. In some cases, however, no history of asbestos exposure can be elicited, and the question remains whether the determining role may be played by some other agent(s) or by exposure to asbestos so inconspicuous as to have escaped detection. The question is of import both scientifically and for public health, particularly in relation to exposure of the general population to very low levels of airborne mineral (asbestos) fibres.[2]

Very high rates of mesothelioma have been noted in some villages of Cappadocia, in Central Turkey.[3] No asbestos could be identified in the environment, but crystalline fibres of erionite (a mineral of the zeolite family) with dimensions within the respirable range have been found in rock samples[4,5] and in two lung-biopsy specimens from Cappadocia (P. Sebastien, personal communication). Also, there is some evidence that erionite fibres can produce mesotheliomas when injected intrapleurally in rats.[6] We present here the results of a comparative epidemiological and environmental survey carried out in two Cappadocian villages as a first step in investigating: (a) whether erionite has indeed an aetiological role in this mesothelioma endemic; and (b) at which ambient concentrations it may have such a role.

THE SURVEY

Two agricultural villages—Karain (population 554), with high mesothelioma rates, and the nearest village south of it, Karlik (population 479), with no case reported[3]—were selected for study. The two villages lie within the same valley, along a north-south road which first goes through Karain for about 400 m, then, some 3 km south, passes through Karlik for some 100 m. Karain is located 10 km south-east of Ürgüp, the main tourist centre of Cappadocia (Nevsehir province, some 300 km south-east of Ankara). A health centre in Karain, staffed by nurses, serves nine villages, including Karlik. The survey had three specific objectives: (a) to compare the two populations for a number of descriptive features; (b) to assess the prevalence of radiological chest abnormalities—in particular, pleural calcifications and pleural plaques (which, like mesothelioma, are more common in occupational groups exposed to asbestos); and (c) to estimate the concentrations of mineral fibres in air and water samples and determine the composition and size of the fibres.

The epidemiological survey was conducted during two weeks in summer, 1979, and the environmental sampling was done in June and November, 1978, and May and August, 1979. Demographic data were abstracted from the health-centre registries. All persons aged 20 and over were invited to the health centre for an interview, a chest X-ray, and a brief physical examination. High proportions of the subjects in the population registry attended (89·8% men and 90·8% women in Karain and 83·4% men and 77·1% women in Karlik), a substantial proportion of those not attending being absent from the villages as emigrants or serving in the army. The interviews, all conducted by one local interviewer and lasting on average about 4½ min, covered items on personal, family, residential, and occupational history. The interviews were scored by an observer for reliability, on the basis of whether problems of communication had been noted and recorded: less than 2% in each village were discarded as unreliable. A full-size postero-anterior chest film was taken, and the films were read blind by one of us (Y. I. B.). A further independent reading, the results of which will be reported separately, was done by three readers using the ILO 1980 classification of pneumoconioses. Respirable and total environmental dust was measured. The respirable-dust samples were obtained by operating Casella size selective gravimetric samplers for 8–10 h daily over a minimum of 3 days. Total-dust samples were obtained with the method recommended for sampling asbestos clouds.[7] Outdoor samples were collected in the main street, back streets, field, and recreational areas of the two villages. Indoor samples were also taken, particularly in a number of caves attached to the houses, and the walls and floors were swept to obtain a measure of peak concentrations. Samples were evaluated with optical and electron microscopy and the composition of the fibres was analysed with EDAX (energy-dispersion analysis of X-rays) in conjunction with transmission electron microscopy.[8] Three water samples from the main sources (two wells in Karain, one in Karlik) were analysed for fibre concentrations and identification (Dr J. Millette, U.S. Environmental Protection Agency). Standard statistical procedures for comparison of frequencies and standardisation of rates[9] were used in the analysis of the data.

RESULTS

The Two Villages

Table I shows the sex and age composition of the two village populations in 1978, which are closely similar. No statistically significant differences (at $p = 0{\cdot}01$) were found for a number of other variables recorded at the interview: educational status (91% of the men and 44% of women having some degree of literacy); occupation (more then 95% of people of both sexes working as farmers and employing both artificial and natural fertilisers); residence (71% of women and 77% of men having lived all their lives in the same village); proportion of consanguineous marriages (13%); origin of spouse (79% of husbands and 94% of wives being from the same village). Cigarette-smoking habits were also very similar: 56% of men were smokers, 83% of those being current and 17% ex-smokers, whereas only 2 women were smokers. Of the smokers 75% had started between the ages of 15 and 25, and about 70% smoked 20 cigarettes or more per day. There was a clear difference in the way people in the past, but not currently, plastered their houses; whereas in Karain 79% had used white stucco and whitewash (and further 3% white stucco and only), in Karlik the majority (87%) had used only plain whitewash (see also below: "Environmental data").

Birth and death rates were derived from data in the health-centre registers. Birth rates for the 1970–78 period were slightly, but not significantly, higher in Karain (19·7%) than in Karlik (18·0%). Infant-mortality rates over the same years were significantly higher ($p < 0{\cdot}01$) in Karlik (20·8%) than in Karain (8·8%). These compare with a combined rate of 14·5% for the nine villages served by the health centre and

TABLE I—1978 POPULATIONS BY SEX AND AGE

Age (yr)	Karain (%)		Karlik (%)	
	M (n = 273)	F (n = 281)	M (n = 221)	F (n = 258)
0–4	8·8	5·7	8·1	5·8
5–9	12·1	8·5	13·1	7·8
10–19	18·3	16·0	20·8	25·6
20–29	13·6	19·6	12·7	14·3
30–39	9·1	8·6	5·9	7·4
40–49	9·1	15·3	12·2	17·4
50–59	18·0	15·6	14·0	10·1
60–69	6·6	7·5	9·1	9·3
70–79	4·4	3·2	3·6	1·9
80–89	..	..	0·5	0·4
Total	100·0	100·0	100·0	100·0

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TABLE II—ADULT MORTALITY (ALL CAUSES) 1970–78

	Deaths/1000 person-years*			
	Karain		Karlik	
	M	F	M	F
	5·8 (4)	7·1 (6)	1·9 (1)	1·5 (1)
	21·9 (16)	13·4 (10)	3·8 (2)	3·4 (2)
	21·8 (8)	30·0 (8)	43·9 (12)	36·7 (9)
	888·9 (2)	111·1 (1)	..	..
dardised rate†	17·0	13·4	10·1	7·5
Median age at death (yr)	54·4	54·0	68·3	67·8

*No. of deaths in parenthesis.
†By the direct method, with the combined populations of the two villages as a standard.

12·3% for Turkey as a whole (1974).[10] In Karlik, with a higher infant-morality rate, living quarters are more crowded (median number of persons/room is 1·8, against 1·3 in Karain, as a result of both smaller houses and larger households in Karlik). Table II shows the adult (age 20 and over) mortality rates for all causes, no medically certified cause of death being recorded in most cases. In seven out of eight age-sex groups the rates are higher in Karain than in Karlik, this being reflected both in the standardised rates (some 70–80% higher in Karain) and in the median age at death of those surviving at least 20 years, which is 14 years earlier in Karain than in Karlik ($p<0·01$). This observation alone clearly indicates an excess adult mortality in Karain.

Radiological Data

There were no statistically significant differences in a number of radiological features between the two villages. In particular, the prevalence of radiological diagnoses based on parenchymal signs (essentially tuberculosis) was 2·8% in men and 1·6% in women (averages for the two villages). However, a pattern of consistent differences (none statistically significant if taken individually) showed up in pleural findings and diagnoses (table III). Every individual finding had a higher prevalence in Karain than in Karlik, and the same held for the prevalence of diagnoses of both benign and malignant conditions. Although the survey was designed as a cross-sectional one and subsequent follow-up of the subjects examined has not yet been completed, the one subject from Karlik diagnosed as mesothelioma was alive one year later and the radiological picture did not show a progressing malignancy.

TABLE III—PREVALENCE (%) OF PLEURAL RADIOLOGICAL FINDINGS AND DIAGNOSES

	Karain		Karlik	
	Males (149)	Females (176)	Males (107)	Females (116)
X-ray findings:				
Pleural thickening	22·8 (34)	9·7 (17)	21·5 (23)	6·9 (8)
Pleural effusion	1·3 (2)	..	..	..
Pleural calcification and thickening	2·7 (4)	0·6 (1)	0·9 (1)	..
Pleural plaques	0·7 (1)	..	..	..
Pleural effusion and thickening	2·7 (4)	0·6 (1)	0·9 (1)	..
Diagnosis:				
Malignant mesothelioma	5·4 (8)	1·7 (3)	0·9 (1)	..
Simple	3·4 (5)	1·1 (2)	0·9 (1)	..
With chronic fibrosing pleuritis	2·0 (3)	0·6 (1)	..	..
Benign lesions	8·7 (13)	4·0 (7)	2·8 (3)	..
Chronic fibrosing pleuritis	2·7 (4)	0·6 (1)	0·9 (1)	..
Chronic pleural plaques	2·7 (4)	2·8 (5)	1·9 (2)	..
Chronic pleural plaques and chronic fibrosing pleuritis	3·4 (5)	0·6 (1)	..	..

No. of subjects in parenthesis.

TABLE IV—CHEMICAL ANALYSIS OF KARAIN TUFF COMPARED TO ERIONITE

	Karain tuff		
	Fibre (%)	Non-fibre (%)	Erionite (%)
SiO_2	74·0	76·4	73·2
Al_2O_3	15·4	13·3	18·1
FeO	0·5	1·9	0·7
MnO	0·2	0·2	..
MgO	1·5	1·8	1·0
CaO	1·4	1·9	3·9
Na_2O	1·2	0·9	0·5
K_2O	5·8	3·5	2·2

Environmental Data

In the *street atmosphere* the concentration of respirable dust was 0·2–2·8 mg/m³ (n = 7 measurements) in the main street of Karain and between 0·2–0·8 mg/m³ in the back streets (n = 6). In Karlik the range was 0·3–1·5 mg/m³ (n = 3) in the main street, whereas 4 measurements in the back streets all gave a value of 0·1 mg/m³. The elemental analysis of the dusts showed a broad similarity between the two villages. The concentrations of fibres longer than 5 μm (20 samples) in both Karlik and Karain, main street and back streets, were all below 0·01 fibres/ml in both villages and the mean diameter was 1·3 μm. The mean length of the fibres was close to 10 μm. Approximately 80% of the respirable fibres in Karain, and only 20% in Karlik, showed a chemical composition similar to that of zeolite (erionite), the rest being mainly calcite.

In *work and recreational areas* fibres longer than 5 μm were found in concentrations below 0·01 fibres/ml in Karlik (n = 4), while in Karain 5 of 8 samples gave levels below 0·01 fibres/ml and 3 (school playground, field during work, stone-cutting area) gave values of 0·2–0·3 fibres/ml.

A similar picture emerged from *indoor samples* obtained during cleaning operations within family caves. 11 samples from Karlik all gave levels below 0·01 fibres/ml, whereas in Karain 4 were below 0·01 fibres/ml and 7 showed levels of 0·03–1·38 (0·03, 0·05, 0·06, 0·09, 0·83, 0·95, 1·38) fibres/ml. In 3 with the highest levels the walls were soft yellow volcanic rock (tuff) which was friable and was shown to contain fibres with a mean length of 20 μm and mean diameter 1·3 μm. This tuff, which was observed in several family caves, showed only a small crystalline content when examined by X-ray diffraction, whereas elemental analysis of both the fibrous and non-fibrous particles showed a composition similar to that of erionite (table IV).

The analysis of *white stucco*, which has been used in the past as plastering in Karain (but very little in Karlik), did not detect the presence of fibres.

Similarly no fibres, and in particular no erionite fibres, were detected in the three water samples.

DISCUSSION

The epidemiological survey in the two villages of Karain and Karlik has shown, first, a 70–80% excess in adult mortality and a sizeable reduction in life expectancy, similar for both sexes, for the population of Karain compared with that of Karlik which, on the other hand, shows poorer general hygiene indicators (infant mortality, house crowding). The two villages appear closely similar in virtually all other

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aspects. Secondly, the prevalence of pleural radiological abnormality was higher in Karain than in Karlik with, in particular, an overall (both sexes) prevalence of 3·4% (11/325) of mesothelioma diagnosis by X-ray in the Karain adult population.

This joint mortality and radiological evidence is partially independent from and consistent with the previously published findings from the same health-centre district:[3] in 1970–76 no cases of mesothelioma were reported from Karlik, whereas 35 cases (7 of which were histologically confirmed) were reported from Karain. This corresponds to a crude rate of 8·7 per 1000 person-years, or 1·7 per 1000 person-years for histologically confirmed cases. These rates are higher, although of the same order or magnitude, than the highest rates among workers exposed to asbestos, reported in one review[11] as ranging between 0·25 and 2·9 per 1000 person-years.

The environmental data are qualitatively compatible with the hypothesis that the mesothelioma is causally associated with the presence of airborne erionite fibres. All the Karlik air samples had fibre concentrations at or below 0·01 fibres/ml, with erionite representing some 20% of the fibrous material, whereas some samples from Karain had higher concentrations, with erionite representing 80% of the fibrous material. From a quantitative viewpoint, however, all measured concentrations, both in Karlik and in Karain, were low, most of them being near the detection limit and 2 to 3 orders or magnitude lower than those nowadays prevalent in most asbestos occupational settings (e.g., limits for environmental concentrations in some European countries have been set at 2 fibres/ml[2]). It is not clear how such low levels could be reconciled with mesothelioma rates at least as high as those observed among heavily exposed asbestos workers.[11] Possible explanations include: enhanced carcinogenic properties of the fibres; inhalation of fibres during infancy; presence of other (undected) carcinogenic agents; different genetic make-up of the people in the two villages (an unlikely factor, given the close contacts and resemblance of the two populations). However, no information so far collected points to a role for any of these factors.

The resolution of these questions, besides being of critical local importance, may be relevant to the wider issue of mesothelioma in relation to long-term inhalation of low levels of mineral fibre (typically asbestos) by the urban populations of industrialised countries.

Requests for reprints should be addressed to R. S.

REFERENCES

1. McDonald JC, McDonald AD. Epidemiology of mesothelioma from estimated incidence. *Prev Med* 1977; 6: 426–46.
2. Zielhuis RL. Public health risks of exposure to asbestos. Report of a working group of experts prepared for the Commission of the European Communities. Pergamon Press, Luxembourg, 1977.
3. Baris YI, Sahin AA, Ozesmi M, et al. An outbreak of pleural mesothelioma and chronic fibrosing pleurisy in the village of Karain/Urgup in Anatolia. *Thorax* 1978; 33: 181–92.
4. Mumpton FA. Report of reconnaissance study of the association of zeolites with mesothelioma cancer occurrences in central Turkey. Department of the Earth Sciences, State University College, Brockport, New York, 1979.
5. Pooley FD. Evaluation of fibre samples taken from the vicinity of two villages in Turkey. In: Lemen R, Dement JM, eds. Dust and disease. Park Forest South, Illinois. Pathotox Publishers, 1979: 41–44.
6. Suzuki Y, Rohl AN, Langer AM, Selikoff IJ. Mesothelioma following intraperitoneal administration of zeolites. *Fed Proc* 1980; 39: 640.
7. AIA Health and Safety Publication. Recommended technical method no. 1. London, 1979.
8. Pooley FD. The identification of asbestos dust with an electron macroscope microprobe analyser. *Ann Occup Hyg* 1975; 18: 181–86.
9. Armitage P. Statistical methods in medical research. Oxford. Blackwell, 1971.
10. Turkey Almanac 1980. Ankara: Turkish Daily News Publishers, 1980.
11. Selikoff IJ, Lee DHK. Asbestos and disease. New York: Academic Press, 1978: 290.

SMOKING AND RISK OF MYOCARDIAL INFARCTION IN COPENHAGEN MEN AGED 40–59 WITH SPECIAL REFERENCE TO CHEROOT SMOKING

FINN GYNTELBERG, LONE LAURIDSEN, PETER BECK PEDERSEN, KEN SCHUBELL

Departments of Internal Medicine C and Clinical Physiology, Bispebjerg Hospital; Department of Internal Medicine C and Division of Prospective Medicine, Glostrup Hospital; and Clinic for Occupational Diseases, Rigshospitalet, Copenhagen, Denmark

Summary A 5-year and 7-year follow-up study on 5249 Copenhagen men showed a relationship between smoking habits at the time of entry into the study and incidence of lethal and non-lethal myocardial infarction. With a relative risk of 4·2, heavy cheroot smokers had a higher risk of myocardial infarction than cigarette smokers (relative risk 2·1) and never-smokers. A multiple regression analysis indicates that cheroot smoking is an independent coronary risk factor.

INTRODUCTION

EPIDEMIOLOGICAL studies from several countries have demonstrated that cigarette smoking is associated with an increased risk of myocardial infarction in both men and women.[1] This risk has also been shown for pipe and cigar smoking.[2,3]

Cheroot smoking (cheroots are small cigars with open ends) is related to an increased total mortality rate in men aged 18–69 years,[4] and carbon-monoxide haemoglobin levels are no less after cigar smoking than after cigarette smoking.[5] Information on cheroot smoking as a possible coronary risk factor is very limited.[3] Since cheroot smoking is fairly common in Denmark in both men and women, and since it is considered less harmful than cigarette smoking both by the public and by many doctors, we decided to investigate the relationship between cheroot smoking and risk of myocardial infarction in a cohort of middle-aged Copenhagen men.

SUBJECTS AND METHODS

Between autumn, 1970, and autumn, 1971, a cross-sectional prevalence study was carried out on 5249 men aged 40–59 employed in public and private Copenhagen companies. The initial response rate was 87·3%. The investigation of each subject consisted of a short interview based on a previously completed questionnaire, blood-pressure measurement, mesurement of height and weight, and indirect measurement of maximal oxygen uptake (VO_2max_p) with the bicycle-ergometer test introduced by Astrand.[6] The questionnaire yielded information on family history of coronary heart disease, hypertension, and diabetes mellitus. Subjects' recall at interview was reasonably good. Standard questions recommended by the World Health Organisation were used to detect angina pectoris, intermittent claudication, and history of cough. Questions on smoking habits and use of drugs, coffee, and alcohol were included.

TABLE I–7-YEAR INCIDENCE OF FATAL AND NON-FATAL FIRST MYOCARDIAL INFARCTION IN 3772 SMOKERS AND 1440 NON-SMOKERS

—	Myocardial infarction	Myocardial infarction per 1000 men	Relative risk
Smokers	140	37	2·2
Non-smokers	30	20	1·2
Ex-smokers	22	22	1·3
Never-smokers	8	17	1·0

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