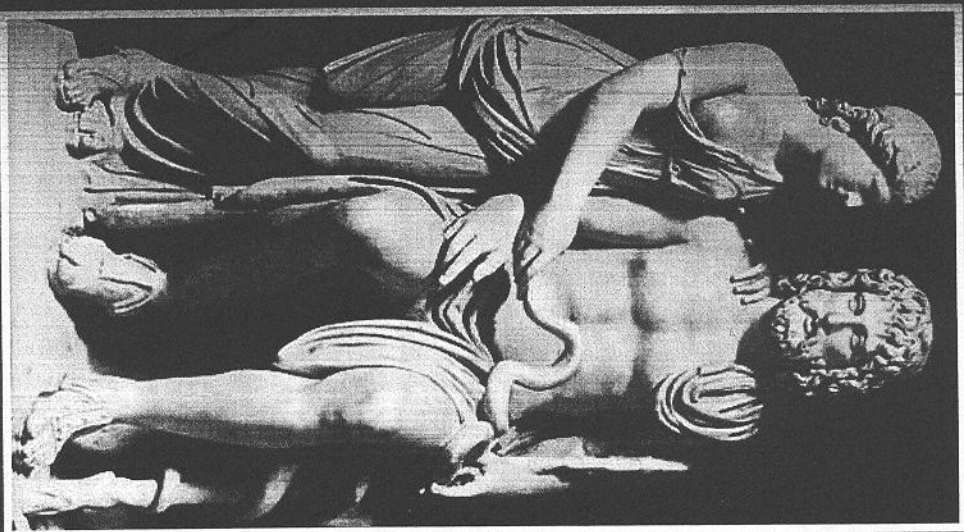


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**OCCUPATIONAL EXPOSURE
TO ENVIRONMENTAL POLLUTANTS:
EVALUATION OF LONG-TERM EFFECTS
ON A GROUP OF NEWSAGENTS
IN THE CITY OF PALERMO**

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Abstract

Environmental pollution constantly threatens the health of urban populations. This problem of environmental hygiene takes a particular interest in Occupational Medicine, whereas some tasks take place mostly outdoors, so the airborne pollutants and noise can be considered as occupational hazards. The subject of this study is to evaluate the health of a group of newsagents in the city of Palermo, in relation to the level of urban pollution and noise monitored in ten years (2000-2010). It was assessed lung function, hearing, kidney, liver and cardiovascular systems, with particular reference to endothelial structures.

Analysis of the results show the high prevalence of damage to the carotid district, for which we can not exclude a role simultaneously, contribute to various airborne pollutants.

INTRODUCTION

Environmental pollution, global emergency for several years, threatens the state of human health not only through the direct action of different pollutants, but also through changes in the ecosystem.

A lot of studies in scientific literature show, in fact, an increase of morbidity and mortality from respiratory and cardiovascular diseases in populations living in urban environments. In particular, exposure to airborne pollutants has been associated with increased mortality from acute myocardial infarction and cerebro-vascular diseases. The percentage of deaths attributed to air pollution, calculated after a compar-

ative analysis of three European states (France, Switzerland and Austria) is estimated to be 6% per annum. This assessment relates to the general population, whereas the average time spent outdoors is about 20% of the whole day long.

Air pollution caused by traffic, only in Italy, is related to the premature death of about 80,000 people, and it is important to clarify that, in urban areas, up to 50% of particulate matter (PM10) is emitted by traffic and that epidemiological studies have demonstrated a correlation between increased levels of particulate air pollution and alteration of the cardiovascular system (interference with the main cardiovascular function), resulting in increased hospital admissions.

This problem of environmental hygiene in the Occupational Medicine acquires additional importance: just think of how many workers job mainly outdoors in the performance of their duties.

In this case, exposure to airborne pollutants and noise are among the occupational hazards.

For years our Unit studies long-term effects of pollutants on various organ systems and especially on the cardiovascular system. The survey, which initially examined the category of newsagents, will be further extended to other tasks, especially of positive feedback we have already identified cardiovascular disease.

MATERIALS AND METHODS

The quantitative evaluation of the damaging agents was based on surveys provided by the environmental report by Municipal Enterprise for Environmental Health on noise and air pollution in the city of Palermo in the years 2000-2010. We considered, on the basis of current Italian legislation, three types of limits: attention limit, alarm for each offending agent limit and also the limit for the protection of human health.

The term "alertness" is defined in the previous phase of pollution "state of alarm" condition, the latter could lead to environmental and health risk. Instead, the term "limit for the protection of human health" are defined as atmospheric concentrations, determined in accordance with scientific knowledge, in order to avoid, prevent or reduce harmful effects on human health and the environment.

It is remarkable that, in the city of Palermo in the considered ten years, there has been several times the feedback effects of "poor qual-

ity" but were never exceeded the levels of attention and alarm of individual pollutants. It was, however, exceeded the limit for the protection of human health for suspended particulate matter (PM10), for ozone and nitrogen dioxide.

With regard to other harmful agents, environmental monitoring for benzene, carried out periodically during the years considered, showed the constant value is exceeded in the air the annual limit for the protection of human health, of 10 mg/m³, in many areas of the city, with a predominance of areas with heavy traffic vehicles.

The values of lead were found in the air, however, consistently fall below the limit value for the protection of human health (0.5 mg/m³). With regard to noise pollution, the city of Palermo is divided into 6 areas according to your activities to a greater or less noise: for each of these there is a variable limit for nighttime Leq of 40 dBA in protected areas, 70 dBA in industrial areas, and for those 50 to 70 dBA during the day. The monitoring showed equivalent sound level values in excess of the limits in all areas both during the day and night, but in areas of high density of traffic only has never exceeded the value of 74 dBA (1).

Having acquired these data, we proceeded to recruitment of members of the chosen field of work, i.e. the newsagents, in advance by contacting the trade association most representative of the class. Then the sample was selected with specified requirements, which included: the exercise of a kiosk with full seniority and job fair also the absence of disease borne by the existing equipment in question, namely the cardiovascular, respiratory, hearing, the marrow, as well as the excretory organs (liver and kidney). From an initial list, supplied by the trade unions, including 224 newsagents, only 89 had the features above, but 36 of these have joined the initiative, showing distrust and lack of sensitivity to the issue of health protection. Therefore, the final sample was reduced finally to 53 workers.

At the selected sample was administered a questionnaire designed to gather information about what types of work environment: location, size, conditioning aedicule any means, organization of work: working hours, any shift work and weekly rest periods, lunch, place of consumption of meals, holidays and sick leave, prevalent during the day posture (sitting or standing), manual handling of loads. The workers selected were subjected to medical examination and laboratory and

instrumental tests such as: CBC, peripheral smear with, transaminases AST and ALT, creatinine, blood glucose and lipid profile, carboxyhemoglobin and blood lead; ECG and Doppler ultrasound of carotid and arts districts smaller vessels (taking as reference the internal carotid and popliteal arteries); flow volumes as an indicator of early respiratory damage; audiometry.

RESULTS

The sample consisted of 53 subjects, 42 men and 11 women, mean age 43.2 years (SD = 11.5) and average seniority of 18.4 years. Among these, 16 subjects (30.2%) are smokers. Analysis of the questionnaires showed that the shrine has a square average of 9.9 square meters, is equipped with heating (heat pump, stove) in 31 cases (58.5%), and cooling systems (air conditioner, fan) in 36 (67.9%). With regard to work habits it is estimated that the average hourly activity of 11 hours per day, 8.2 of which he spent in orthostatic position, the average number of absences is 2.5 days per year and the holiday of 7.9 days; newsagents 36 (67.9%) are alternated to work with a partner and 49 (92.4%) manually lift newspaper bundles. During the anamnesis it was found in 13 cases positive for atopy. Among those who had carried out specific tests, 3 subjects with rhinitis were positive to dust mites, other two men with rhinoconjunctivitis and asthma, respectively, presenting instead a polysensibilization (mites, Parietaria and Gramineae). In two additional cases, hives had been reported with known hypersensitivity to drugs such as Non-steroidal anti-inflammatory drugs, penicillin and cephalosporins. Among those who had not practiced any specific test, 2 complained of rhinitis, 2 rhinoconjunctivitis and other 2 bronchial asthma.

During the interview was reported by 13 subjects lumbosciatica, supported in 6 cases from the radiologic diagnosis of osteoarthritis of the lumbosacral District and others 2 had CT diagnosis of herniated disc. In 9 subjects, there was a positive anamnesis for inguinal hernia, in 8 cases arose after several years of activity and treated surgically.

Almost all newsagents examined have also expressed their discomfort encountered in turn, linked mainly to the difficult aedicule microclimatic conditions, long working hours, failure to take a regular diet and a normal social life.

Table 1. Main findings on physical examination

Findings	Number of cases	% of total
Overweight	16	30.2
Varices of the lower limbs	11	20.7
Hypertension	10	18.9
Signs of bronchostenosis	8	15.1
Hyperkeratosis handfield	6	11.3
Positivity at Lasegue's sign	6	11.3

The biochemical tests revealed 7 cases of hypercholesterolemia (13.2%), hypertriglyceridemia in 11 workers (20.7%) and in 20 subjects HDL-cholesterol levels were below normal limits (37.8%). In 6 subjects (11.3%) was evident hyperglycemia. Activity data and renal impairment occurred in all subjects but were within normal limits. Measurement of blood lead levels showed values lower than the reference for the general population, with the exception of two men with 58.8 mg/dL (subject 41 years old, non-smoker) and 37.4 mg/dL (subject 42 years old, smoker), respectively. The percentage of carboxyhemoglobin has exceeded the biological limit for occupationally exposed, representing 3.5% of total hemoglobin at the end of turn, in 10 subjects, with an average of 5.4% (min. 3.8% - 7.8% max), among these only one was a smoker. The District of carotid Doppler ultrasound revealed intimal thickening in 13 subjects (24.5%), 6 of which are smoking, and the presence of atherosclerotic plaques in other three (5.7%). Among those who had intimal thickening, two 57 and 28 years old respectively, had no traditional cardiovascular risk factors.

Among those with significant atherosclerotic plaques, it is reported the case of a man 29 years old with no apparent cardiovascular risk factors. Nothing abnormal was found in the popliteal District. ECG examination were found just to the left electrical axis deviation and mild right intraventricular conduction disturbances superimposed on data referring to the prevalence in the general population; only one electrocardiogram detected a case of hypoxic distress in a patient with

extensive previous values tensile borderline arterial, non-smoker, not aware of the problem. No cases of arrhythmia.

Table 2. Pathological findings on spirometry

Diagnosis	Non smokers	Smokers
Reduction of flows	1 (1.9%)	4 (7.5%)
S. obstructive	0	1 (1.9%)
S. restrictive	2 (3.8%)	3 (5.7%)
S. Mixed	2 (3.8%)	2 (3.8%)
Total	5 (9.5%)	10 (18.9%)

The subjective audiometry, finally, showed a deficit in auditory sensory bilateral in 6 subjects (11.3%), however, a configurational presbycusis.

DISCUSSION AND CONCLUSIONS

Analysis of the results reveals some reflections. The first observation refers to the high prevalence of endothelial damage (over 30%) vessels in the district epiaortic found to the ecocolor Doppler. In many cases, these subjects had a high blood level of triglycerides and total cholesterol with HDL fraction decreased, and that some were not aware of hypertension ascertained at the time of medical examination (hypertension was a criterion for exclusion from enrollment) and others associated with these risk factors including cigarette smoking.

While not wishing to consider regardless of the elements normally involved in the realization of endothelial damage, remember that two subjects (1 with intimal thickening and the other with atherosclerotic plaques), under the age of 30 years, did not show any of traditional risk factors. We could here rely, *inter alia*, a sedentary lifestyle typical of the job, as well as the wrong food, given the small breaks that prevent the return home for lunch with the opportunity to pursue a healthy diet. Exposure to environmental toxicants may play a role, however, simultaneously, contribute to this effect, though as we noted, the values of carboxyhemoglobin stood on high or medium levels, which fall within the range allowed in smoking rooms, provide values in our sample up to 7.8% of total hemoglobin. To support this, just remember the occurrence of endothelial injury, and consequently

organ (heart, brain, kidneys), in smokers, not preserved by the damage range from easy to predict HbCO higher than non-smokers.

In the case of allergic symptoms, only 7 of 13 subjects who reported symptoms attributable to sensibilization of the skin tests were performed, but in any case, the percentage of hypersensitive individuals we found is similar to data collected for the general population. Numerous studies show, however, the increased incidence of allergic symptoms, especially respiratory tract, in areas with high air pollution. Also known irritating agents such as sulfur oxides, ozone, nitrous gases, when inhaled, can aggravate the symptoms of allergic and interact with conventional allergens, enhancing effects. As regards exposure to noise, as previously mentioned, were never exceeded 74 dB Leq and, as expected, the 6 patients who had to the audiometry hearing loss were not affected by deafness due to noise but presbycusis. The analysis of data collected at the flow-volume curve, as explained above, has revealed changes in varying degrees in 9 smokers and in 5 nonsmokers. Among these nonsmokers 3 were positive for allergies. In the group of smokers, almost all consumers of at least 20 cigarettes per day, only one was allergic to history, and one had reported a past history of TB, and 3 were overweight. Therefore, only 2 subjects, 1 with mild restrictive syndrome and 1 with a slight reduction in expiratory flow, did not appear to have any traditional risk factor for respiratory diseases (allergy, smoking or overweight).

In conclusion, as previously noted, at first we examined the professional category, show the occurrence of endothelial injury, certainly associated with traditional cardiovascular risk factors, but it is conceivable that the incidence of other significant environmental factors concomitant and not yet well identified. To support this there are several experimental studies that demonstrate the detrimental action of the discharge motor vehicle on human endothelial cells through a complex mechanism involving *inter alia* the enzyme NO-synthase and reactive oxygen species. It's also important to remember the frequent coexistence of other diseases, such as varicose veins in the legs, obesity and arthritis-degenerative disease of the lumbar spine, probably related to each other and mostly associated with features of the same job function, which provides significant physical inactivity, improper posture and the inability to make a healthy diet. We say, at

last, that the results are still partial, preliminary studies planned for the future, and therefore inconclusive. We intend to investigate further and extend it to other categories of workers similarly exposed to environmental pollution, in relation to the possible effects of different toxic agents.

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