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Aging and environmental factors: An estimation of the health state of the elderly population residing in industrialized vs. rural areas

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ABSTRACT

The possibilities have already been discussed that the environment of the living beings may influence the aging process, by causing alterations of the homeostatic capacities to such an extent that definitive pathologies will come into being. Therefore, the aim of the present study was at estimating the effective impact of the environmental pollution on the health state of the subjects residing in highly industrialized areas. For this purpose, we compared 2 populations over the age of 56 years, one from the industrialized areas and the other of agricultural character. The health indicator we utilized was the rate of hospitalization calculated for the main geriatric pathologies. It has been observed that among the residents of highly polluted areas, the hospitalizations were more frequent for the screened pathologies. This finding could be an indicator of an interference of the environmental pollution with the physiological process of aging. One can also suspect that for the cardiovascular pathologies also the factor of physical fatigue being more prevalent in the rural population might play an important role in the high occurrence of this type of diseases. On the basis of these findings we intend to emphasize that the sanitary programs of a given territory should consider in the development and application of a sanitary service the intrinsic characteristics of the given area, when designing the possibly most adequate health care service.

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1. Introduction

Elderly patients often develop chronic pathologies, the course of which is frequently crossing the aging process, i.e., may result in a serious worsening of the quality of life (QoL) (Sarvimäki and Stenbock-Hult, 2000). The physiological aging is characterized by a gradual and continuous loss of functional abilities, involving the whole body, however, without any serious disequilibria between various organs, and without the signs of any evident pathologies. However, the pathological aging process is accompanied by diseases bad disabilities (Rowe and Kahn, 1987).

Among the extremely numerous factors influencing the aging process, the vital environment definitively acts either positively or negatively (Weinert and Timiras, 2003; Semsei, 2007) on the homeostatic capacities of the organism, i.e., it may be responsible for the development of certain risk of disease development. In the early history of human being, the individuals became victims of many kinds of hostilities even before getting old. Nowadays, due to an adaptation of the human physiology as well as to an improved environment, we can see a constant increase of the human medium life-span, allowing to survive until the late expression of the genetic programs of the human body, up to the various levels of human aging (Marigliano, 2007). In these phenomena we observe also opposite and paradoxical processes. Namely, the human activity themself, causing environmental pollution through its various damaging procedures, will be damaging for the human health of the population residing in the same area (Abelsohn et al., 2002). The Italian Longitudinal Study on Aging (ILSA) has revealed that the elderly Italians suffer mainly from chronic cardiovascular, respiratory and metabolic pathologies, as well as from the diseases of the central nervous system, like dementia, depression, brain stroke, and neuropathies of the lower limb (Amaducci et al., 1996).

Considering that the effects of the environmental pollution in the development of these pathologies has widely been shown (Goldberg et al., 2000; Sergeev and Carpenter, 2005; Chen et al., 2008), our

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present study was intended to quantify the impact of environmental pollution on the health state of the geriatric population.

2. Subjects and methods

As an indicator of the sanitary situation we selected the rate of hospitalization. We evaluated the documents of the dimissions from the hospital (SDO, abbreviated from the Italian name) of the patients who had been recovered in 2 Sicilian communities (Augusta and Pachino) in 2004. Up to several decades ago both communities had an economy based on the agriculture and animal "allevamento". Even today the area of Pachino remained in the old style, and has not been influenced by the environmental pollution. On the contrary, the area of Augusta became a site of industrial enterprises during the last 50 years.

The geriatric population of Pachino was considered as the reference, while that of Augusta was taken as the experimental sample. It was supposed quite realistically that the geographic vicinity of the 2 sampling areas in the Province of Siracusa assures the cultural, ethnic, climatic and historical similarity of this sample populations. Both communities were under the same provincial sanitary service, called the "Azienda Sanitaria Locale" (ASL)-8 of the Region of Sicily.

The archives of the "Observatory Epidemiological Department of the Regional Sanitary Assessorate of the Region of Sicily" have been used. We have analyzed the SDO documents regarding all kinds of hospital recoveries of patients of 56 years of age and above. These data were subdivided according to the residence community, sex, and 5-year age-groups. For each group we calculated the number of recoveries per specific causes (taking into consideration only the primary diagnosis). In the successive phase of elaboration of the data in each group, we calculated the number of recoveries per specific causes for using an algorithm, allowing us the "l'incrocio" of the data present in each SDO, related to the principal diagnosis, using the codes of the ICD-9th revision, and the Clinical Modification of it (ICD9CM) (Ministero dellla Sanità, 1998), grouped according to the "Aggregati Clinici di Codici" (ACC) (Fortino, 2004). This procedure resulted in a database in which each ICD inserted in the 259 ACC was associated with a number of recoveries in which it was present as the primary diagnosis. This number was then grouped according to the residence, the age-group, and sex of the patients. The ACC categories were then grouped also according to the classical subdivision of the pathologies in the different medical specialities. At last, "accorpamenti" of the ISD codes have also been studied in order to evaluate the data regarding the pathologies of geriatric interest, based on the ILSA studies. Similar grouping procedure was carried out for the pathologies of the highest frequency.

For the final calculation of the rate of hospitalization, the rough number of recoveries was related to the total number of inhabitants (given by the ISTAT) in the specified territory. Particularly, we compared the calculated specific rates of hospitalization between the 2 territories, being an indicator for each specific age-group, and pathologies. In addition, we calculated the standardized rates of hospitalization in order to have a uniform basis for comparison when evaluating the composition of age-groups in the given sample.

3. Results and discussion

The standardized rates of hospitalization (Table 1) have been found higher in Augusta compared to Pachino for a number of disease groups. Tables 2–8 demonstrate specific rates of hospitalization calculated for 1000 inhabitants. These data give useful information on the distribution of the studied pathologies, and also, indirectly on the clinical history of them.

Our data demonstrate generally higher rates of hospitalization in Augusta, compared to Pachino. According to the ILSA results, as well as to the Atlas of Recoveries in Italia (Nicolosi et al., 2002), the most frequent diseases in the elderly are the cardiovascular pathologies. Our data confirm these observations, and we observed also a substantial overlapping of the data between the 2 communities (Table 1). The maximum peak appeared in Augusta displaying a standardized rate of hospitalization in the males of 467.7/1000 inhabitants, as against the value of 868/100.000 inhabitants, described in the Atlas of Recoveries in Italia (Nicolosi et al., 2002) for the elderly over 65 years. The distribution per age-groups

Table 1
The standardized rates of hospitalization.

Causes	Augusta		Pachino	
	Males	Females	Males	Females
Cardiovascular pathologies	467.7	417.2	463.7	383.1
Respiratory diseases	174.3	101.2	155.7	80.0
Ictus cerebralis	44.3	63.5	59.5	30.2
Infectious diseases	239.8	106.6	158.4	82.1
Endocrine disorders	47.1	46.9	23.2	44.3
Osteo-articular diseases	71.7	123.5	53.5	71.9
Hip fractures	8.0	36.0	16.0	36.4
Connective diseases	20.1	26.3	14.4	6.5
Diseases of the male genital organs	89.2		47.8	

Table 2
Specific rate of hospitalization for cardiovascular diseases.

Age-groups (years)	Augusta		Pachino	
	Males	Females	Males	Females
56–60	64.5	33.9	48.7	30.2
61–65	66.4	56.3	83.5	67.4
66–70	105.1	76.4	147.3	74.8
71–75	102.7	81.9	133.7	80.8
76–80	169.8	110.5	125.7	100.2
81–85	220.6	129.8	96.8	90.6
86–90	138.2	198.0	160.5	170.7
91–95	127.7	102.3	190.5	86.2
96–100	333.3	230.8	0.0	0.0

Table 3
Specific rate of hospitalization for respiratory diseases.

Age-groups (years)	Augusta		Pachino	
	Males	Females	Males	Females
56–60	16.6	16.9	19.9	12.7
61–65	20.7	8.0	8.4	17.3
66–70	34.2	17.3	49.1	13.1
71–75	55.3	16.9	33.4	18.5
76–80	67.4	29.4	44.9	12.5
81–85	69.9	13.4	59.1	29.1
86–90	105.7	54.5	111.1	8.1
91–95	21.3	45.5	95.2	0.0
96–100	0.0	230.8	500.0	0.0

Table 4
Specific rate of hospitalization for ictus cerebri.

Age-groups (years)	Augusta		Pachino	
	Males	Females	Males	Females
56–60	1.7	0.9	1.8	0.0
61–65	3.3	6.0	10.4	3.5
66–70	9.4	6.2	8.9	5.6
71–75	6.3	10.4	25.7	11.5
76–80	14.0	13.8	15.0	10.4
81–85	36.8	35.8	16.1	3.2
86–90	40.7	54.5	61.7	16.3
91–95	21.3	34.1	47.6	0.0
96–100	333.3	76.9	0.0	0.0