

## Development of Amyotrophic Lateral Sclerosis and military service: a case report

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### Abstract

*Amyotrophic lateral sclerosis is a neurovegetative disease, and some studies point out a major risk of ALS in people who have served in the armed forces. In this case report we present an Italian case of ALS in a senior officer of the Italian Army.*

**Keywords:** *Amyotrophic lateral sclerosis; Army*

### Introduction

Amyotrophic lateral sclerosis (ALS) is a neurovegetative disease, and its causes are still unknown. It has been supposed that its underlying genetic and environmental etiopathogenesis are work-related [1-5].

### Case report

An Italian, Indo-European, 57 years-old man affected with ALS was admitted to the Geriatric, Neurosciences and Orthopedic Department at the Agostino Gemelli University Hospital in February 2013.

He was troubled by right shoulder ache, right upper limb hyposthenia, backache, and upper limbs fasciculations, as well as difficulties to keep his balance and to ambulate until the April hospitalization when a genetic/hereditary etiopathogenesis was excluded.

The diagnosis of the disease was made in February 2013 by the ALS Center at the Agostino Gemelli

University Hospital. The subject is a senior officer of the Italian Army. He has been in duty since 1975 and was employed in Italy in several garrisons and in some foreign countries in the following theatres of operations: Albany, Kosovo, Lebanon.

Two years after diagnosis the subject was totally paralyzed, unable to feed, unable of spontaneous breathing and unable to sustain phonation. Therefore, he was tracheotomized and connected to an automatic ventilator and fed through enteral nutrition. His clinical conditions quickly deteriorated since the first manifestation of symptoms.

The patient gave his written consent for the therapy and for the elaboration of this study.

### Discussion

In literature, there are studies that point out a major risk of ALS in people who have served in the armed forces. In particular, it has been observed that men who worked

in the armed forces show higher mortality, RR (relative risk) of 1,53 with 95%CI 1,12-2,09, and  $p=0,007$ , compared to those who never served in the armed forces. Higher mortality rates were also observed in those that worked in the Army or in the National Guard (RR=1,54), in the Air Force (RR=1,87) and in the Coast Guard (RR=2,24), but it was not observed in those who worked in the Navy. Other studies have shown that there is a certain correlation with the exposure to pesticides, herbicides, and also to formaldehyde [1-4]. Bove et al.'s study performed in the Navy has shown how the presence of tetrachloroethylene (PCE) and trichloroethylene (TCE) in the base of Camp Lejeune in the period 1980-1985 has raised the RR only for this disease [6]. The Australian study in 2013 supposed the correlation between ALS and diesel, especially in some professional categories such as truck drivers [7], and Haley [8] and Horner's studies [9] in 2003 quoted some observations made on this military professional category. Finally, the possible etiopathogenetic role developed by aluminium hydroxide can't be forgotten. It's a stabilizer present in inactivated vaccines that were given to American soldiers in the first Gulf war (1990-1991) [10]. The first Gulf war's theatre has been studied through its effects on veterans by Haley [7], Miranda et al. [11] and Schimdt et al. [12]; the period of observation was 1991-1998 and the studies demonstrated higher incidence of ALS on soldiers that worked in that area. In the next eight years after the Gulf war, 20 cases of ALS upon 690,000 veterans were confirmed, 17 of them were diagnosed before the age of 45; the incidence changed from 0,93 cases per year in 1991 to 1,57 cases in 1998. The initial RR was 0,94 with 95%CI 0,26 – 2,41 (period 1991-1994), afterwards RR was 2,27 with 95%CI 1,27 – 3,88 and  $p=0,006$  (period 1995-1998). At the end of the period of observation, RR increased further to 3,19 with 95%CI 1,03-7,43 and  $p=0,02$ .

Horner et al.'s study in 2003 extended the sample and the period of observation (1990-2000) identifying 107 cases of ALS and an incidence of 0,43 cases out of 100,000 per year. A marked increased risk has been shown in all soldiers (RR = 1.92; 95%CI = 1.29, 2.84), soldiers on duty (RR = 2.15; 95%CI = 1.38, 3.36), Air forces' soldiers (RR = 2.68; 95%CI = 1.24, 5.78), and land forces'

soldiers (RR = 2.04; 95%CI = 1.10, 3.77). An irrelevant increased risk has been shown in reserves and in the National Guard (RR = 2.50; 95%CI = 0.88, 7.07), in the Navy (RR = 1.48, 95%CI = 0.62, 3.57) and in the sea crew (RR = 1.13; 95%CI = 0.27, 4.79). However, on the whole there was an increased risk of 18% (95%CI = 4.9%, 29.4%) [8].

These data have been confirmed also by Coffman et al. in their study aimed to reduce possible mistakes of sampling; their conclusions have shown that the risk of developing ALS according to age remained high among soldiers employed in the Middle East during the war of 1991, confirming the previous report [13]. Similar conclusions were found in other studies [14, 15].

Kasarkis et al.'s study in 2009 divided the sample in two cohorts, employed and not employed in the Gulf war, and inquired about an atypical form of work-related ALS. The two cohorts were almost similar in age (40,8 years old as medium age, 40,1 years old for soldiers on duty, 41,2 for soldiers off duty). The review of medical records doesn't substantiate the atypical specifications. Choosing the sample at bulbar onset, median survival from the first symptoms in patients aged 40 or more was 35,5 months (2,96 years) in comparison with 64,7 months (5,39 years) in the group aged 40 or less (hazard ratio (HR) = 0,47; 95%CI 0,30-0,73,  $p = 0,0006$ ). Alternatively, not considering the age, median survival was 45,4 months (3,78 years) and 54,8 months (4,57 years) in patients with ALS at bulbar onset versus the group at not bulbar onset (HR = 1.41; 95%CI 0,83-2,39,  $p = 0,20$ ) respectively. The veterans in formation however have shown significantly lower survival than those not in formation (40,2 vs. 57,0 months, HR = 0.62, 95%CI 0,40-0,96,  $p = 0,03$ ) [16].

Among the possible causes related to the ALS onset in soldiers on duty in the Gulf war (1990-1991), Cox in 2009 supposed the professional exposure to cyanobacteria that, inhaled with desert dust, causes an increased exposure to their own toxins, neurotoxic like beta-N-methylammonium-L-alanine (BMAA) and 2,4diaminobutyric acid (DAB) [17]. Finally, a study identified only employment as a soldier as the main cause of onset and not the specific employment in the Gulf area (Rose et al. 2006) [18].

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