

Is there a link between physical activity and Amyotrophic Lateral Sclerosis?

GIUSEPPE LA TORRE⁽¹⁾, DANIELE MASALA⁽²⁾

ABSTRACT

The Amyotrophic Lateral Sclerosis (ALS) is a chronic and progressive neuro-degenerative pathology that starts in adult age and usually leads patients to death for respiratory distress after 3 years from the onset of symptoms

In some studies, vigorous and continuous physical activity due to heavy working activity and sport is associated with ALS. On the other hand other studies are against this association. A study carried out in Europe found overall physical activity is associated with reduced odds of having ALS (OR=0.65, 95% CI=0.48-0.89), and the same protective factor is seen for work-related physical activity (OR=0.56, 95% CI=0.36-0.87) and organized sports (OR=0.49, 95% CI=0.32-0.75).

A recent literature review found that football/soccer may be considered as a possible risk factor for ALS (level C) and there is a strong need for further research that must take into account the numerous confounding factors that could be present in this field. However only well conducted observational studies, such as cohort and case-control studies, carried out with the same design in different countries could give a final answer to this suspected but still unconfirmed association

(1) Department of Public Health and Infectious Diseases, Sapienza University of Rome;

(2) University of Cassino and Southern Latium

CORRESPONDING AUTHOR: Giuseppe La Torre
Department of Public Health and Infectious Diseases,
Sapienza University of Rome - Piazzale Aldo Moro 5 - 00185
Roma - e-mail: Giuseppe.latorre@uniroma1.it

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BACKGROUND

The Amyotrophic Lateral Sclerosis (ALS) is a chronic and progressive neuro-degenerative pathology that starts in adult age and usually leads patients to death for respiratory distress after 3 years from the onset of symptoms (1). From the histological point of view this pathology is characterized by a damage of the motor neurons of the cerebral cortex, of the bulbar motor nucleus and/or anterior horn of spinal cord (1).

The incidence rate in Italy deeply varies between regions, with a minimum of 0.8 per 100.000 in Lombardy (2) and a maximum of 2.5 per 100.000 in Piedmont and Valle d'Aosta (3, 4). The prevalence of the diseases goes from a minimum in Sardinia (1.56 per 100.000) (5) to a maximum in Emilia Romagna (5.4 per 100.000) (6).

ALS is relatively rare before 40 years of age. As far as concerns gender differences, males have a higher risk (male:female ratio 1.3:1).

It was hypothesized that the pathogenesis of the disease is genetically based, or at least a genetic susceptibility, and a familiarity does exist for 10% of the cases (1). Genetic linkage studies showed that 20% of familiar cases are due to a genetic mutation of superoxide dismutase (Cuprum/Zinc) (7). An Italian study carried out at the University of Modena showed that low levels of activity of superoxide dismutase (SOD1) are associated with the sporadic type of ALS, but there is no agreement on the fact that this association represents a marker of causal relationship, or it is an expression of the onset of the diseases, or a confounding factor (8).

A Finnish study, that involved 1000 ALS patients between 1985 and 1995, underlined the existence of spatial cluster of this disease, both considering birth and death of the patients (9).

Some epidemiological studies found a link between ALS, and professional exposure to toxic agents, such as Lead (10), plastic materials (11) or chemicals used in agriculture (12); other authors did not support this evidence (13).

The association between trauma and ALS has not been confirmed in several case-control studies (11, 14) while for others antecedent trauma, repeated trauma, and severe trauma could be considered risk factors for ALS (15). A study carried out in the U.S. found a strong association between severe head and spine trauma and ALS (OR 5.3) (16).

A meta-analysis performed by Chen et al. in 2007 indicated a moderately elevated risk of ALS among persons with previous head injuries (OR = 1.7; 95%CI: 1.3 – 2.2) (17).

As far as concerns the possible association between nutrients intake and ALS, a case-control conducted in the U.S. indicated an increase of the risk with increasing uptake of fat through diet (OR = 2.7 for the highest vs lowest quartile; 95%CI: 0.9 – 8), and a decrease of the risk for those who take high quantity of fiber with diet (OR = 0.3 for the highest vs lowest quartile; 95%CI: 0.1 – 0.7). The uptake of glutamate is associated with an increased risk of ALS (OR = 3.2 for the highest vs lowest quartile; 95%CI: 1.2 – 8), while the assumption of anti-oxidant vitamins, with diet or as supplementation, is not associated with the risk of developing the disease (18).

ALS AND PHYSICAL ACTIVITY

In some studies, vigorous and continuous physical activity due to heavy working activity and sport is associated with ALS (19-22). On the other hand other studies are against this association. A study carried out in Europe found overall physical activity is associated with reduced odds of having ALS (OR=0.65, 95% CI=0.48-0.89), and the same protective factor is seen for work-related physical activity (OR=0.56, 95% CI=0.36-0.87) and organized sports (OR=0.49, 95% CI=0.32-0.75) (15). While in a case-control study Scarmeas et al (23) revealed that ALS were more frequent among slim (OR = 2.21; 95%CI: 1.40-3.47) and athletes (OR = 1.70; 95%CI: 1.04-2.76) (23), a literature review performed by Hamidou and coll. found there is evidence (level A) that physical activity is not a risk factor for ALS (24).

Other studies highlighted physical activity reduces the risk of developing ALS and this risk is evident only for those who practice organized sport activity during time spent at high school (OR = 1.52; 95%CI: 1.03-2.25) (25).

A revision of the classification of ALS susceptibility evidenced, considering that genetic mutations explain 10% of familial and sporadic forms, the majority of ALS should derive by the interaction between several genes and environmental factors, and this disease could be defined as multifactorial (26).

FOOTBALL AND ALS

In a paper published by Vanacore in 2005, possible specific risk factors for football players are trauma and micro-trauma typical of this sport, as well as dietetic supplementation, toxic substances, including the use of pesticide used for the field and the abuse of anti-inflammatory drugs (27).

A study conducted in Italy among professional athletes, found that no basketball players and no cyclists developed ALS, while soccer players have a highly significant risk of developing ALS. This study demonstrated that ALS is not related to physical activity per se (28).

Taioli in 2007 performed a study on mortality rates of professional football players in Italy between 1975 and 2003, considering more than 5000 players. She found a Standardized Mortality Ratio of 18.18 (95% CI 5.00-46.55)

based on four deaths for ALS, while 0.2 were expected (29).

A recent literature review found that football/soccer may be considered as a possible risk factor for ALS (level C) and there is a strong need for further research that must take into account the numerous confounding factors that could be present in this field (23). However, as outlined by Beghi, only well conducted observational studies, such as cohort and case-control studies, carried out with the same design in different countries could give a final answer to this suspected but still unconfirmed association (30).

CONCLUSION

There is evidence of a strong relationship between physical activity and health status, as investigated in several studies (31), even if usually there is a positive relationship between participation in physical activity and socio-economic status (32, 33). Some authors claimed a role for doping and dietetic supplements as an important factor to be considered for football players (34,35), and a possible connection between dietary supplementation or drugs used to enhance sporting performance and the development of ALS (36). However, there is the need of further epidemiological studies in order to confirm or deny the association between football playing, at least at professional level, and ALS pathogenesis.

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