Nutritional parameters of ALS patients were analyzed in the main compartments (D1, D2 and D3). Forced vital capacity and anthropometric measurements were most used to assess nutritional status. A possible mitochondrial involvement and an increased respiratory muscle activity to maintain adequate gas exchange were observed in ALS patients. The changes in nutritional status during disease evolution were studied. The nutritional assessment was performed with the Escorial diagnostic criteria for probable or definite ALS. Informed consent was obtained from all patients. The causes of hypermetabolism in ALS are not well understood. The accepted hypothesis is the increased respiratory muscle activity and energy consumption. The disease severity worsened during disease evolution, and worsened body weight was associated with a higher mortality rate. The nutritional status was associated with a higher mortality rate. It is likely that identifying malnutrition in ALS may help in the early diagnosis and management of the disease. Future studies are needed to clarify the role of nutritional assessment in the management of ALS patients.
The Functional Rating Scale of Amyotrophic Lateral Sclerosis (ALSFRS) is a 20-point rating scale. The PCSM, which is based on the protein-calorie malnutrition score (PCMS), is calculated in an isolated manner and later in conjunction with clinical characteristics and respiratory function.

The BMI was calculated to confirm the diagnosis, and the time between the onset of symptoms and nutritional assessment was recorded. The time between diagnostic confirmation and nutritional assessment was also noted. The nutritional assessment was performed consecutively to evaluating the nutritional counseling from the beginning.

For all studied moments, we found more malnutrition in Group B (GB). The MAC and %MAC had higher values in GB. For T2, no significant association was found with BMI, MAMC, %MAMC, %TSF, and negative with AMA. For T3, a significant positive association was found with BMI, MAMC, %MAMC, %TSF, and negative with AMA. For T1, no significant association was found with BMI, MAMC, %MAMC, %TSF, and negative with AMA.

The correlation coefficients of nutritional parameters were high for ALSFRS and GS patients. The MAC and %MAC had higher values in GB. The T1 showed no significant association with BMI, MAMC, %MAMC, %TSF, and negative with AMA. The T2 showed a statistically significant difference (P<0.012) among non-categorical variables and the value of the ratio tables was conducted by the Mann-Whitney test.

The semi-continuous and continuous data presented in Table 4. The MAC and %MAC had higher values in GB. The correlation coefficients of nutritional parameters were high for ALSFRS and GS patients. The MAC and %MAC had higher values in GB. The T1 showed no significant association with BMI, MAMC, %MAMC, %TSF, and negative with AMA. The T2 showed a statistically significant difference (P<0.012) among non-categorical variables and the value of the ratio tables was conducted by the Mann-Whitney test.
Table 4. Correlation between nutritional parameters and Amyotrophic Lateral Sclerosis Functional Rating Scale for spinal group.

| Parameter          | Domains 1 | Domains 2 | Domains 3 | Total       |
|--------------------|-----------|-----------|-----------|-------------|
|                    | r         | P         | r         | P           |
| Weight             | 0.22      | 0.151     | 0.27      | 0.0001*     |
| %Weight            | 0.21      | 0.040*    | 0.28      | 0.0001*     |
| BMI                | 0.21      | 0.002*    | 0.19      | 0.0001*     |
| %BMI               | 0.16      | 0.592     | 0.27      | 0.876       |
| Total score        | 0.51      | 0.011*    | 0.37      | 0.004*      |
| %TSF               | 0.23      | 0.309     | 0.50      | 0.398       |
| %AMA               | 0.25      | 0.776     | 0.31      | 0.938       |
| %MAMC              | 0.11      | 0.292     | 0.26      | 0.833       |
| AMA                | 0.17      | 0.254     | 0.26      | 0.179       |
| AFA                | 0.09      | 0.755     | 0.31      | 0.015*      |
| AFA%               | 0.18      | 0.245     | 0.29      | 0.989       |
| %AFA               | 0.28      | 0.042*    | 0.37      | 0.391       |
| %AFA%              | 0.43      | 0.063     | 0.115     | 0.370       |

Table 2. Comparison of the evaluated times of patients with amyotrophic lateral sclerosis

| Variable       | Spinal group, median | Bulbar group, median | P  |
|----------------|----------------------|----------------------|----|
| T1             | 12.1 (6.1-33.1)      | 9.5 (3.9-17.2)       | 0.137 |
| T2             | 43.8 (22.6-57.7)     | 24.9 (14.4-36.1)     | 0.012* |
| T3             | 1286.5 (907.2-1793.0)| 1206.5 (817.7-1397.0)| 0.203 |
| T4             | 23.0 (17.9-31.8)     | 24.1 (17.2-31.7)     | 0.681 |
| T5             | 91.5 (68.5-126.3)    | 59.6 (46.6-78.7)     | 0.001* |
| T6             | 15.0 (10.0-22.5)     | 14.0 (9.0-18.0)      | 0.138 |
| T7             | 10.7 (7.7-13.7)      | 9.5 (7.2-11.8)       | 0.121 |
| T8             | 12.7 (10.2-15.2)     | 11.1 (9.6-12.6)      | 0.073 |
| T9             | 23.0 (17.9-31.8)     | 24.1 (17.2-31.7)     | 0.681 |
| T10            | 91.5 (68.5-126.3)    | 59.6 (46.6-78.7)     | 0.001* |
| T11            | 15.0 (10.0-22.5)     | 14.0 (9.0-18.0)      | 0.138 |
| T12            | 10.7 (7.7-13.7)      | 9.5 (7.2-11.8)       | 0.121 |
| T13            | 12.7 (10.2-15.2)     | 11.1 (9.6-12.6)      | 0.073 |
| T14            | 23.0 (17.9-31.8)     | 24.1 (17.2-31.7)     | 0.681 |
| T15            | 91.5 (68.5-126.3)    | 59.6 (46.6-78.7)     | 0.001* |
| T16            | 15.0 (10.0-22.5)     | 14.0 (9.0-18.0)      | 0.138 |

PCRS, protein-caloric malnutrition score; TSF, triceps-skinfold thickness; MAMC, midarm muscle circumference; AMA, arm muscle area; AFA, arm fat área; BMI, body mass index; MAC, midarm circumference; TSF, triceps-skinfold thickness; MAMC, midarm muscle circumference; AMA, arm muscle area; AFA, arm fat área; BS, body surface; PES, protein-energy score; MAC, midarm circumference; TSF, triceps-skinfold thickness; MAMC, midarm muscle circumference; AMA, arm muscle area; AFA, arm fat área; BMI, body mass index; PCMS, protein-caloric malnutrition score.
| Parameter | r        | P       |
|-----------|----------|---------|
| PCMS      | 0.01     | 0.524   |
| AFA       | -0.23    | 0.416   |
| MAMC      | 0.12     | 0.670   |
| AMA       | 0.18     | 0.764   |
| %AFA      | 0.18     | 0.559   |
| Weight    | 0.16     | 0.943   |
| TSF       | -0.29    | 0.559   |

*P values: 0.016*, 0.022*, 0.015*, 0.027*, 0.003*, 0.001*, 0.027*, 0.008*, 0.008*, 0.032*, 0.003*.
Aspects (D1) we found only positive correlations recognized by the association with objective nutritional aspects. Higher scores suggest better estimates of body fat was limited to restrictive diets should not be recommended even with the findings of motor worsening, lower limbs indicating negative influence to fat, showed a negative correlation with TSF%, estimation measurement of body mass and fat-free mass.26 In ALS patients, AMA classification of nutritional status by BMI according to the pattern of disease onset.12,24 The classification of nutritional status by BMI analogy provide information respectively from fat and muscle circumference and their derivations: MAC and MAMC, as both are estimated in the same location as the AMA. Such results suggest that the loss of respiratory quality may be a sign of nutritional decline and the opposite gest that the positive influence of body fat would be limited only to bulbar aspects concerned. Such results indicate that the positive influence of body fat might be limited only to bulbar aspects concerned.23,25

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