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Nutritional status and functional capacity of hospitalized patients with acquired immunodeficiency syndrome

Estado nutricional e capacidade funcional de pacientes com o vírus da imunodeficiência adquirida hospitalizados

Abstract

Objective: This work had as objective to evaluate the nutritional state and functional capacity of hospitalized patients with Acquired Immune Deficiency Syndrome. *Methods:* Cross-sectional and descriptive study conducted in the Infectious Disease infirmaries with HIV (human immunodeficiency virus) patients (n = 87), of age equal or higher than 19 years. The analyzed variables were: sex, age, clinical outcome, length of hospital stay, secondary diagnosis, presence of comorbidity, weight, stature, Body Mass Index, Arm Circumference, Arm Muscular Circumference, Arm Muscle Area, Triceps Skinfold, Handgrip Strength, Adductor Pollicis Muscle Thickness. *Results:* In this study, 64.4% of the patients were males, with average age of 39.24 ±10.45 years. The nutritional risk was observed in 64.4% of the cases. There was a prevalence of malnutrition, measured by the Body Mass Index, in 25.3% of the patients. However, this prevalence reached 78.2% when measured by Triceps Skinfold and 62.2% when me-

asured by the Arm Muscle Circumference. The length of stay was higher for the patients with nutritional risk (77.1%), who stayed hospitalized for over 21 days (p=0.041). The Handgrip Strength and the Adductor Pollicis Muscle Thickness were lower compared to patients with lower Body Mass Index. ***Conclusion:*** There was a high prevalence of nutritional risk and low performance for the functional methods in the patients hospitalized with HIV. The Adductor Pollicis Muscle Thickness and the FHandgrip Strength had a significant statistical association with the BMI, appearing as very useful factors in the evaluation of the functional capacity of patients with Acquired Immune Deficiency Syndrome.

Keywords: Nutritional Assessment. Functional Capacity. Acquired Immunodeficiency Syndrome.

Resumo

Objetivo: este trabalho avaliou o estado nutricional e a capacidade funcional de pacientes com síndrome da imunodeficiência adquirida hospitalizados. ***Metodologia:*** Estudo transversal e descritivo realizado nas enfermarias de Infectologia, com pacientes HIV (Vírus da Imunodeficiência Humana), com idade igual ou superior a19 anos (n = 87). As variáveis analisadas foram: sexo, idade, desfecho, tempo de internamento, diagnóstico secundário, presença de comorbidade, peso, estatura, índice de massa corpórea (IMC), circunferência do braço, circunferência muscular do braço, área muscular do braço, dobra cutânea tricipital, força de preensão manual e espessura do músculo adutor do polegar. ***Resultados:*** No estudo, 64,4% dos pacientes eram do sexo masculino, com idade média de 39,24±10,45 anos. O risco nutricional foi observado em 64,4% dos casos. Houve prevalência de desnutrição, segundo o IMC, em 25,3% dos pacientes, mas essa prevalência alcançou 78,2%, pela dobra cutânea tricipital, e 62,2% pela circunferência muscular do braço. O tempo de internamento foi maior nos pacientes com risco nutricional (77,1%), que permaneceram internados por mais de 21 dias (p=0,041). A força de preensão manual e a espessura do músculo adutor do polegar foram menores nos pacientes com menor IMC. ***Conclusão:*** Houve alta prevalência de risco nutricional, desnutrição e baixo desempenho dos métodos funcionais nos pacientes hospitalizados com HIV. A espessura do músculo adutor do polegar e a força de preensão manual tiveram associação estatisticamente significativa como IMC, demonstrando ser bastante úteis na avaliação da capacidade funcional de pacientes com síndrome da imunodeficiência adquirida.

Palavras-chave: Avaliação Nutricional. Capacidade Funcional. Síndrome da Imunodeficiência Adquirida.

INTRODUCTION

Human immunodeficiency virus (HIV) infection is considered a global public health problem. Approximately 36.9 million people are living with HIV, and tens of millions of people die every year from causes related to the acquired immunodeficiency syndrome (AIDS).[1] In Brazil, 982,129 cases were recorded between 1980 and June 2018.[2]

The nutritional approach plays a vital role in the treatment of people living with HIV/AIDS.[3] The nutritional status of these patients has gained importance in clinical practice due to malnutrition and side effects of antiretroviral therapy (ART).

Low body weight is a common manifestation in individuals with AIDS, that is, in the most advanced stage of the HIV infection. On the other hand, such underweight index is reduced in HIV-infected individuals receiving treatment with antiretrovirals, because ART is associated with a greater fat accumulation in some regions of the body, a side effect called lipodystrophy syndrome. This increases the risk of overweight, insulin resistance and cardiovascular diseases.[4] However, even with ART, the number of patients with weight loss and major alterations in the body composition is still great.[5]

Weight loss and depletion of body cell mass are characteristics of HIV infection and persist as a clinical problem in adults and children. In addition, malnutrition appears to be a strong risk factor in these patients, independent of death.[6] Data also suggest that the incidence of weight loss decreases proportionally according to the type of opportunistic infections.[5] In the case of hospitalized patients, low weight incidence is more frequent since it is associated with manifestation of the symptoms of the disease itself.[6]

In this context, anthropometric measures are used as a nutritional assessment tool and allow, in a practical and cost-effective manner, to identify nutritional disorders and the risk for malnutrition.[7] However, anthropometry has some limitations, and for this reason it cannot be used alone as a tool for assessment of nutritional status.[7]

Another simple method that can be used to monitor the nutritional status is hand-held dynamometry, also known as handgrip strength test (HST),[8] used to indicate health risks re-

lated to muscle strength. The handgrip strength (HS) has been correlated with the muscular strength of other body muscles and, consequently, with the overall muscular strength and physical performance.[8] In some clinical conditions, thickness of the adductor pollicis muscle (TAPM) has also been suggested as a promising indicator of muscle mass.[9]

Some studies describe a positive correlation between TAPM values and anthropometric variables, providing reliability for use in nutritional assessment. TAPM appears to be an appropriate parameter for early diagnosis of malnutrition in some specific populations, a risk marker of mortality and a prognostic indicator in critically ill patients.[10] In conjunction with other methods such as HST, TAPM can be an alternative indicator in nutritional assessment.[11]

However, there are few studies that associate TAPM with anthropometry of HIV/AIDS patients, indicating that more studies are needed in this area.

Studies also indicate that there is an association between TAPM and HS in unhealthy populations (oncological and post-surgical patients),[9,10,12] but there are few works with people living with HIV/AIDS. Thus, this work aimed to assess the nutritional status and handgrip strength of HIV/AIDS inpatients, seeking to associate the nutritional status with functional capacity.

MATERIALS AND METHODS

Ethical aspects

All experimental procedures were approved by the Human Research Ethics Committee, according to Regulation nº 466/12 of the ***Conselho Nacional de Saúde/Ministério da Saúde*** (Health National Council/Ministry of Health), process no 1.226.835 and CAAE 4433215.1.0000.5207.

Study characterization

It is a cross-sectional, descriptive and analytical study carried out at the Infectious Diseases unit of a university hospital, with adult patients of both sexes.

Eligible patients were 19 years old or over, with positive HIV diagnosis, and who agreed to participate in the study by signing the Free Informed Consent Form. Also, they were in good physical and mental conditions to perform the established procedures. Ineligible patients were those with amputated lower and/or upper limbs, edema, ascites, and chronic renal disease under hemodialysis.

The variables studied were sex, age, outcome, length of stay in hospital, secondary diagnosis, presence of comorbidities, anthropometric measures, and functional capacity. The following variables were examined on the medical records: outcome, length of hospital stay

secondary diagnosis and presence of comorbidities such as high blood pressure and diabetes mellitus. With respect to secondary diagnosis, the patients were subdivided into these groups: respiratory infections, neurological infections, gastrointestinal infections and others. The latter group included neoplasia, hepatopathies, cardiopathies, sexually-transmitted diseases, infections of the urinary tract, fungal infections and skin infections.

Anthropometry and nutritional risk screening

Nutritional Risk Screening 2002 was performed by a single individual within a maximum period of 48 hours after the patient admission to the infectious diseases ward.

In the nutritional assessment, the following anthropometric measures were taken: weight (kg), height (cm), body mass index (BMI), arm circumference (AC), arm muscle circumference (AMC), arm muscle area (AMA) and triceps skinfold (TSF).

Weight was measured using a platform scale (Filizola), with capacity of 150kg and 100g sensitivity, and the patient was barefoot and wearing light clothes. Height was measured using an anthropometer attached to the scale, 2.00m long, graduated in centimeters and millimeters. Both weight and height were measured according to the techniques recommended by the Ministry of Health, and served as the basis for calculation of the BMI, which was determined by dividing the body weight (kg) by the height (square meter). The cutoff points adopted for adults were those recommended by the World Health Organization (WHO), and for the elderly, according to the Pan American Health Organization (PAHO).[7]

AC was measured using a non-extensible measuring tape, precision of 1 mm and a capacity of 1.5m.[2] TSF was also obtained with the aid of a scientific (Cescorf-type) skinfold caliper (1 mm measuring unit and 0.05mm resolution). Based on the AC and TSF measures, the AMC was calculated by mathematical formulas. To check for adequacy, the 50th percentile was used.[7]

Assessment of functional capacity

For functional capacity, the handgrip strength (HS) and thickness of the adductor pollicis muscle (TAPM) were considered. The HS was measured using a Saeham hydraulic hand dynamometer (Saehan Corporation- SH5001), and the measuring unit was kilogram (kg). For this measurement, the patient remained sitting with the arm adducted and in neutral rotation, with elbow flexed at 90°, with forearm and wrist also in neutral rotation. The grip was self-adjusted, according to the best comfort reported by the patient and after observing the correct position of the tool, whose rod was positioned between the second finger phalanges (index, middle and ring fingers). The patient was then asked to employ maximum effort to bring closer both rods of the device. Three measures of the dominant hand were collected, with

a rest interval of one minute between them, using the highest score obtained. The patients who achieved test scores lower than the reference values, according to Mendes et al.,[12] were considered of low performance.

TAPM was performed using a Cescorf skinfold caliper, 10g/mm2 of pressure. The patient remained sitting with the hand placed on the homolateral knee, with the elbow at an angle of approximately 90° on the lower limb. The skinfold caliper was then used to pinch the adductor muscle at the vertex of the imaginary triangle formed by the extension between the thumb and the index finger, repeating this process three times. The mean value of the three measures taken was used as the TAPM value. The patients were considered as malnourished when they had values lower than the reference ones, according to Lameu et al.[13]

Statistical analysis

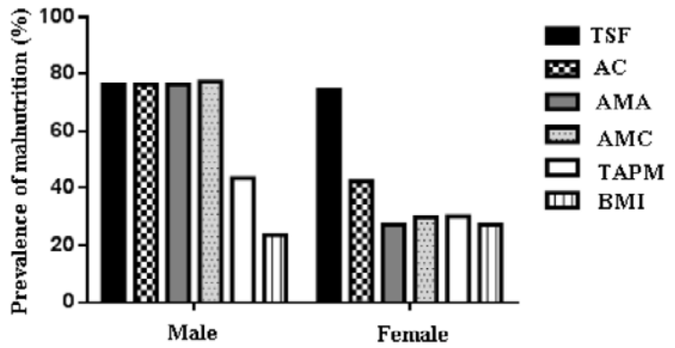
The statistical analysis was carried out using the software program Graph Pad Prism, version 5.0 for Windows (San Diego, CA, USA). Continuous variables were tested for distribution normality by the ***Kolgomorov-Smirnov*** test. The variables that were distributed normally were described as means and their respective standard deviations. When they did not have normal distribution, they were presented as median and their respective interquartile intervals. The means were compared by the student T-test by ANOVA. The chi-square test was employed to compare frequencies, and a $p<0.05$ value was considered to reject the null hypothesis.

RESULTS

A total of 128 patients were recruited, of whom 41 individuals were excluded because ten of them were isolated from contact, six refused to participate, 14 did not have physical and mental conditions to perform the procedures established, one patient had edema and ten individuals were re-admitted during the sample collection. Of 87 patients who participated in the study, the majority were male (64.4%), with average age of 39.24±10.45 years. With regard to distribution of the secondary diagnosis, 35% of the patients were hospitalized with respiratory infections, 17.2% with neurological infections, 20.7% with gastrointestinal infections, and 42.5% with other secondary diagnoses. With respect to comorbidities, 12.6% of the patients had high blood pressure, 2.3% had diabetes and 3.4% had both comorbidities.

Nutritional risk was observed in 64.4% of the patients. Total malnutrition prevalence was 78.2%, 66.7%, 62.2%, 59.8% and 25.3%, according to TSF, AC, AMA, AMC and BMI measures, respectively. There was a higher malnutrition prevalence in male patients (Fig. 1).

Figure 1. Prevalence of malnutrition in both sexes, according to anthropometric variables and functional capacity in HIV patients.



TSF (Triceps Skinfold), AC (Arm Circumference), AMA (Arm Muscle Area), AMC (Arm Muscle Circumference, TAPM (Thickness of Adductor Pollicis Muscle), BMI (Body Mass Index).

The average length of hospital stay was 18 (9-28) days. Length of stay was longer for patients at nutritional risk. In this case, 77.1% of the patients at risk stayed in the hospital for more than 21 days (p=0.041). With respect to the outcome, 6.9% of the patients died, but there was no statistical association with nutritional risk (Table 1).

Table 1. Association of nutritional risk with length of hospital stay and outcome of HIV inpatients. Recife-PE, 2015.

	At Risk	No Risk	p
Length of stay	%	%	
Up to 21 days	55.8	44.2	0.041*
>21 days	77.1	22.9	
Outcome			
Discharge	63.0	37.0	0.415**
Death	83.3	16.7	

*Pearson's chi-square test. ** Fisher's exact chi-square test

Most of the patients exhibited a low performance for HS (69.0%). The average HS was lower for patients with lower BMI (p=value 0.038), according to Table 2 and with lower TAPM (p=value 0.005), according to Fig. 2.

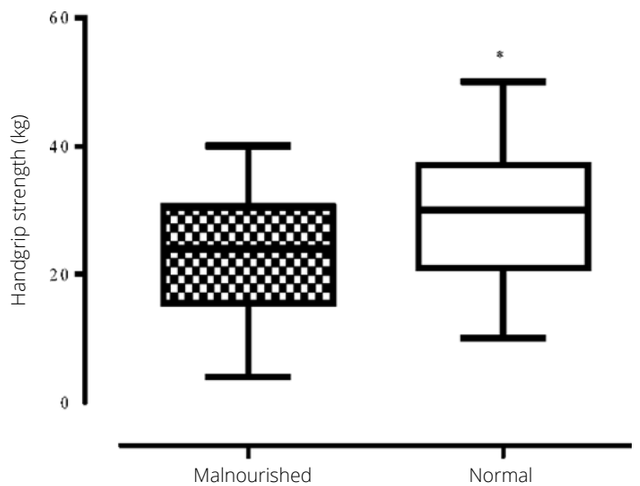
Table 2. Handgrip strength of HIV inpatients according to anthropometric variables. Recife-PE, 2015.

Nutritional Status	n	Mean± SD
	BMI	
Malnutrition	22	20.86 ±10.40
Normal	51	28.12 ±11.20*
Overweight	14	24.14 ±12.10
	AC	
Malnutrition	58	25.43 ± 9.02
Normal	24	25.79 ±12.56
Overweight	5	27.40±9.26
	TSF	
Malnutrition	68	25.02 ± 9.72
Normal	8	30.71 ±12.12
Overweight	11	31.81 ±11.47
	AMC	
Malnutrition	52	25.93 ±10.04
Normal	24	27.78 ± 11.64
Overweight	11	20.81 ± 7.16
	AMA	
Malnutrition	51	26.59 ±11.72
Normal	31	23.87 ±10.76

Statistically different from the other groups ($p < 0.05$)

BMI: body mass index; AC: arm circumference; TSF: triceps skinfold; AMC: arm muscle circumference; AMA: arm muscle area

Figure 2. Handgrip strength in HIV inpatients, according to the nutritional status rated by TAPM. T-test ($p < 0.01$).



DISCUSSION

In this study, there was a prevalence of male patients (64.4%). In fact, 68.6% of individuals living with HIV/AIDS in Brazil are men. The sex ratio in 2018 was 26 men for every ten women.[2]

Nutritional risk and malnutrition were the most prevalent conditions found in the nutritional screening and anthropometry of the population studied, probably due to the profile of the studied population – inpatients with clinical manifestation of symptoms. Differently, outpatients undergoing ART monitoring usually exhibit the other extreme of nutritional status, i.e., overweight and obesity. Such overweight can be justified by lipodystrophy syndromes, one of ART side effects.[14,15] In this regard, studies with outpatients living with HIV have found a lower prevalence of low weight.[14,15]

It was also found that positive HIV patients at nutritional risk have a longer length of hospital stay when compared with patients at no nutritional risk. Similarly, Texeira et al.[16] found that malnutrition is a determining factor for prolonged hospitalization and clinical complications. Inpatients may develop malnutrition after being admitted to hospital as well as up to 70% of previously malnourished patients have their nutritional status worsened during the hospital stay, increasing the risk of infections and mortality. The response to the stress generated by the disease and other malnutrition causes such as reduced daily food intake in

the long term, makes that the body uses the energy stored in the muscle and adipose tissues, causing changes in the body composition, reduced functionality, blood alterations and a fragile metabolic condition.[17] As a result, hospital bed turnover decreases, causing a reduction in the number of beds available.[17-19]

Reduced muscle mass is considered as the most valuable criterion to detect malnutrition. On the other hand, assessment of the muscular function has placed great importance in nutritional assessment, not only for being one of the major consequences of malnutrition but especially for preceding changes in body composition.[20, 21] In this regard, methods that assess muscular functions are necessary in clinical routine and contribute to a more precise assessment of nutritional status.

In this regard, TAPM has increasingly been studied as a nutritional parameter either in healthy or ill individuals.[19, 20] In the present study, lower TAPM values were found in patients considered as malnourished according to the BMI ($p = 0.024$) and TSF ($p < 0.001$), which corroborates findings of Martin et al.[20] and Crawford et al.[21] These authors also found a good correlation of TAPM with AC and AMC,[18,19] but in this study we did not find associations of TAPM with the other anthropometric variables, only with BMI and TSF. BMI, in epidemiological studies, has still being considered a valuable tool for assessment of nutritional status,[21] and for the present study it was useful to compose the nutritional assessment of HIV/AIDS inpatients. This is because it was found that the patients rated as malnourished according to BMI were the ones who exhibited the worst performance for the functional capacity indicators studied.

On the other hand, the HST performed with a dynamometer is a well-established method used to assess muscular function,[19,20,22] although there are few studies with HIV/AIDS patients. Some advantages attributed to HST are its practicality, objectivity and low cost, besides the fact that it is a non-invasive method. In this study, it was found that patients with lower BMI scores had lower HST values when compared with higher BMI scores. When assessing the importance of BMI on muscle strength, it can be seen that this strength is affected by the nutritional status; therefore, it is expected that individuals with poor nutritional diagnosis do not have better muscle strength than well-nourished individuals.[22] In addition, Crawford et al.[21] found a relationship between inflammatory markers and reduced handgrip strength in adults living with HIV/AIDS, findings that point out to the importance of a clinical evaluation of muscular strength.

In general, the factors with great influence on HS are age and sex. But there are other important factors such as acute and chronic diseases, severity of the disease, associated comorbidities, treatment and immobilizations that contribute to muscle weakness.[23-30] In adults living with HIV/AIDS, loss of muscle mass is associated with a reduction of the functional capacity and muscle strength.[22-30]

Considering that the evaluation of functional capacity proved to be useful for monitoring the clinical evolution of patients living with HIV/AIDS, we believe that these methods should complement other anthropometric measures in clinical practice, helping in the nutrition diagnosis of these patients.

CONCLUSIONS

The concern with the functional capacity and quality of life of patients with HIV/AIDS is a matter that has received great attention, considering that the life expectancy of this population has increased considerably in the last years with the use of ART. The prevalence of nutritional risk and malnutrition found in this study was significant, as well as the low performance indicated by the methods used to assess functional capacity. Considering that TAPM and HS had a statistically significant association with BMI, it is suggested to include these parameters in the clinical routine or nutrition assessment of hospitalized patients with HIV/AIDS.

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Colaboradores

Alves DVS and da Silva CP participated in the conception, design, data analysis and interpretation, and in writing the manuscript. Pereira CGS participated in data collection and analysis. Arcoverde MPF and Melo CO participated in data collection and interpretation. Sousa MSB participated in data analysis and interpretation, in writing the manuscript and final version.

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