



Original

Effect of oral nutritional support on hospitalized patients with AIDS

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Abstract

Introduction: The emergence of more effective therapies for the treatment of Acquired Immunodeficiency Syndrome (AIDS) has reduced the rates of illness, mortality and malnutrition among infected patients. However, reduced food intake, nutrient malabsorption and metabolic alterations induced by fever and infection are seen in cases of hospital malnutrition.

Objectives: The aim of the present study was to assess the impact of oral nutritional support (ONS) on hospitalized patients with AIDS.

Methods: The following variables were analyzed: weight, body mass index (BMI), triceps skinfold (TSF), arm circumference (AC), arm muscle circumference (AMC), albumin, hemoglobin, hematocrit and total serum lymphocytes.

Results: Significant improvements were found in weight, BMI, TSF, AC, albumin and lymphocytes after 19.27 ± 7.45 days of ONS, whereas no significant improvements were found in AMC, hemoglobin or hematocrit.

Conclusion: Dietary intervention with nutritional counseling and the use of supplements led to an improvement in the nutritional status of malnourished individuals with AIDS, but with an increase in adipose tissue and no impact on lean muscle mass or anemia.

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Key words: AIDS. Nutritional status. Oral nutritional support. Malnutrition. Hospital malnutrition.

EFFECTOS DE APOYO NUTRICIONAL POR VÍA ORAL EN PACIENTES HOSPITALIZADOS CON SIDA

Resumen

Introducción: La aparición de terapias más eficaces para el tratamiento del Síndrome de la Inmunodeficiencia Adquirida (SIDA) redujo la morbi-mortalidad y la desnutrición entre los pacientes infectados. Sin embargo, en los casos de desnutrición hospitalaria, son observados reducciones de la ingestión alimentaria, mala absorción de nutrientes y alteraciones metabólicas inducidas por fiebre e infecciones.

Objetivos: Evaluar el impacto del Soporte Nutricional Oral (SNO) en pacientes hospitalizados portadores de SIDA.

Métodos: Se analizaron los siguientes parámetros: peso, índice de masa corporal (IMC), pliegue cutánea tripital (PCT), circunferencia del brazo (CB), circunferencia muscular del brazo (CMB), albumina, hemoglobina, hematocrito y linfocitos totales séricos.

Resultados: Mejora significativa en el peso, IMC, PCT, CB, albumina y linfocitos, tras $19,27 \pm 7,45$ días de SNO, sin mejora significativa en la CMB, hemoglobina y hematocrito.

Conclusión: La intervención dietética con recomendación nutricional y uso de suplementos promovió mejora del estado nutricional de individuos desnutridos con SIDA, pero con aumento del tejido adiposo, sin impacto en la masa magra o anemia.

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Palabras clave: Sida. Estado nutricional. Soporte nutricional oral. Desnutrición. Desnutrición hospitalaria.

Abbreviations

AIDS: Acquired Immunodeficiency Syndrome.
AC: Arm circumference.

AMC: Arm muscle circumference.

BMI: Body mass index.

TSF: Triceps skinfold.

HIV: Human Immunodeficiency Virus.

UFPE: Universidade Federal de Pernambuco.

W3: Omega 3 unsaturated fatty acid.

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Introduction

The emergence of more effective treatments for individuals infected with Human Immunodeficiency

Virus (HIV) has led to a reduction in morbidity and mortality rates related to Acquired Immunodeficiency Syndrome (AIDS).¹⁻⁴ The introduction of antiretroviral therapy has diminished the incidence of malnutrition in this group. However, this condition remains frequent among patients who have never been medicated, those with multi-resistance to the drugs employed and those who do not adhere to treatment.^{2,5} With regard to nutritional aspects, weight loss has a multifactor etiology, involving a reduction in food intake, nutrient malabsorption and an increase in energy expenditure induced by fever and infection.^{2,5-7}

Oral nutritional support (ONS) is a low-cost intervention often employed with such patients in clinical practice. The adequate tolerability and efficacy of oral nutritional support are well documented, with a positive impact on immunological function, a reduction in the number of infections, shorter internment duration and lower mortality rate.^{5,8-10} However, a number of studies have reported that individuals with severe weight loss exhibit limited tolerance to liquid supplements.¹¹⁻¹³ Therefore, the assessment of this nutritional intervention strategy is of utmost important, which justifies carrying out the present study in a hospital setting.

The aim of this study was to assess the effects of oral nutritional support in malnourished patients with AIDS.

Methods

Study design and population

A prospective case-series was carried out at the Infectious-Parasitic Disease Clinic of the hospital of the *Universidade Federal de Pernambuco* (UFPE, Brazil) between March and September 2007. The following were the inclusion criteria: Hospitalized male and female adults (20 to 65 years of age) with AIDS and opportunistic diseases, non-compliant with antiretroviral therapy or recently diagnosed with AIDS (on their first internment) and body mass index (BMI) ≤ 18.5 kg/m² and/or involuntary weight loss $\geq 10\%$ in the previous six months in relation to habitual weight. The following were the exclusion criteria: overweight/obesity (BMI ≥ 25 kg/m²); pregnancy; lactating mothers; kidney disease; liver disease; severe diarrhea (three or more liquid evacuation per day); dysphagia; having received oral supplements, appetite stimulants or enteral/parenteral nutritional support in the previous three months; and current use of palliative care. The study received approval from the UFPE Human Research Ethics Committee under process n^o. 064/07.

Anthropometric and biochemical evaluation

The following anthropometric measures (determined upon admission and discharge) were used:

weight, BMI, arm circumference (AC), triceps skinfold (TSF) and arm muscle circumference (AMC). The values of these measures were classified based on reference values for age and gender.^{14,15} Weight was determined using a platform scale (Filizola[®]) with a 150 kg capacity and precision of 0.1 kg, with the subjects barefoot and wearing light clothing. Height was measured with an aluminum stadiometer coupled to the scale, with the individual standing erect without moving his/her head. These data were used to calculate the BMI, which is the ratio between weight in kg divided by height in meters squared (kg/m²). The criteria established by the World Health Organization (1997)¹⁶ were used for the classification of nutritional status based on BMI. The biochemical analysis involved the determination of serum albumin, hemoglobin, hematocrit and total lymphocytes, which are routinely used at the UFPE hospital. For such, blood was collected through venous puncture and automatic equipment was used: COBAS Integra 400 plus (ROCHE) and ARCHITECT.

Oral nutritional support

Calorie and protein needs were respectively estimated at 35 to 40 kcal/kg and 1.5 to 2.0 g/kg of current weight/per day,¹⁷ with the following distribution of macronutrients: 50 to 60% total calories in carbohydrates, 10 to 15% in proteins and 25 to 30% in lipids. The diet offered met 100% of the macronutrient and micronutrient needs, based on the specific recommendations for individuals with AIDS.¹⁷ The diet was offered by the hospital and planned respecting individual eating habits, preferences and tolerance as well as the availability of foods at the institute. Six meals were offered per day: three main meals (breakfast, lunch and dinner) and three intermediate snacks.

In the presence of gastrointestinal symptoms, such as nausea, vomiting, abdominal distension or flatulence, the diet was changed in terms of consistency and digestibility in order to control the symptoms, while maintaining the proportion of macronutrients.

Along with the diet, a protein-rich (6 g/100 ml), calorie-rich (1.5 kcal/ml) polymeric dietary supplement was offered, composed of 49% carbohydrates, 16% proteins and 35% lipids, and was nutritionally complete in micronutrients and added fiber (15 g/l; 51% insoluble and 49% soluble). The patients received a total of 600 ml of the supplement divided into three 200 ml portions offered at snack times between main meals. An assessment of supplement acceptance was performed through a sensory analysis at the onset and every three days through to the end of the study, using the quantitative descriptive analysis formula described by Stone and Sidel (1985).¹⁸ A global acceptance test of the supplement was also performed, in which the patients reported their perceptions regarding the supplement in terms of sweetness, taste, aroma, texture

Table I
Anthropometric variables of malnourished patients with AIDS, HC/UFPE, 2007

Variable	Initial Mean ± SD ^a	Final Mean ± SD ^a	Difference Mean ± SD ^a	p-value
Weight (kg)	48.75 ± 6.46	50.62 ± 6.86	1.87	p ⁽¹⁾ = 0.005*
BMI (kg/m ²)	17.78 ± 2.44	18.34 ± 2.65	0.56	p ⁽¹⁾ = 0.013*
AC (cm)	22.17 ± 3.06	22.79 ± 3.24	0.62	p ⁽¹⁾ = 0.007*
AMC (cm)	19.75 ± 2.75	20.00 ± 3.01	0.25	p ⁽¹⁾ = 0.235
TSF (mm)	7.75 ± 4.32	9.09 ± 5.09	1.34	p ⁽¹⁾ = 0.003*

*Significant difference at 5.0%; SD^a = Standard deviation.

⁽¹⁾Student's t-test.

Table II
Biochemical variables of malnourished patients with AIDS, HC/UFPE, 2007

Variable	Initial Mean ± SD ^a	Final Mean ± SD ^a	Difference Mean ± SD ^a	p-value
Albumin (g/dl)	3.11 ± 0.46	3.25 ± 0.51	0.14	p ⁽¹⁾ = 0.017*
Hemoglobin (g/dl)	9.16 ± 2.61	9.76 ± 1.58	0.60	p ⁽¹⁾ = 0.140
Hematocrit (%)	27.46 ± 7.14	29.42 ± 4.53	1.95	p ⁽¹⁾ = 0.100
Lymphocytes (cells/mm ³)	800.95 ± 464.68	950.95 ± 410.87	150.00	p ⁽²⁾ = 0.034*

*Significant difference at 5.0%; SD^a = Standard deviation.

⁽¹⁾Student's t-test. ⁽²⁾Wilcoxon test.

and color, as recommended by Meilgard, Civille and Carr (1987).¹⁹

Statistical analysis

The Excel 2003 and SPSS version 13.0 (SPSS Inc., Chicago, IL, USA) programs were used, with the level of significance set to 5.0% ($p \leq 0.05$). The Kolmogorov-Smirnov test was used to determine the normality of the distribution of the quantitative variables. Data with normal distribution were expressed as mean and standard deviation and those without normal distribution were expressed as median and interquartile intervals. The paired Student's t-test and Student's t-test for independent samples with equal or unequal variances and Levene's F test were used for the verification of the hypothesis of equality of variance (inferential statistical techniques). The Wilcoxon test was used for variables with non-normal distribution.

Results

Age of the 22 patients (12 males) analyzed ranged from 22 to 49 years (mean: 32.59 ± 7.67 years). Weight loss was $20.90 \pm 7.13\%$. The adequacy of AC, AMC and TSF in relation to reference values for age and gender were 72.7%, 79.5% and 47.3%, respectively. Mean duration of ONS was 19.27 ± 7.45 days. The sensory assessment of the supplement indicated optimal acceptance (100% approval), with no complaints of

nausea, vomiting, premature satiety or diarrhea, but 17 individuals reported experiencing a small degree of flatulence during ONS, which did not impede continuation in the study. No statistically significant differences were detected between genders. The results of the nutritional intervention are displayed in tables I and II.

Discussion

Inadequate food intake is one of the possible causes of chronic malnutrition in patients with AIDS, especially in developing countries.²⁰ However, the impact of ONS remains unclear, especially in chronic health conditions such as HIV infection.

Regarding acceptance and tolerance to the supplement, the flatulence observed may have occurred due to the presence of fiber in the composition, which has a fermentation effect in the intestine.⁹ However, this condition may also be associated with the medications commonly used in this group.²¹

No statistically significant gender differences were found in the comparison of any of the variables studied. This finding may have been due to the small sample size.

The present study demonstrates that malnutrition is common among adults with AIDS, as confirmed by the > 60% occurrence in the sample of weight loss > 10%.¹ Assessing 29 HIV-positive patients, Monteiro et al. (2000)²² report similar findings, as 51.7% of the patients were severely malnourished based on anthropometrics. Likewise, assessing the nutritional status of

120 seropositive patients upon admission to hospital, Martin et al. (2003)²³ report that 61.6% had BMI \leq 18.5 kg/m² or weight loss greater than 10%.

With regard to weight gain, Stack et al. (1996)²⁴ found similar results to those of the present study, with weight gain of 1.1 ± 2.2 kg in six weeks of oral nutritional support using a calorie-rich, protein-rich formula in combination with nutritional counseling among patients with AIDS. Comparing the effects of oral supplementation using a peptide-based formula and standard polymeric diet, De Luis et al. (2001)⁸ report weight gain of 3.2% and 3.1%, respectively, in a three-month intervention.

The TSF, which expresses the amount of body fat, was severely depleted prior to the nutritional intervention, with values similar to those reported by Silveira et al. (1999).⁷ The data obtained throughout the intervention were similar to those reported by De Luis et al. (2001),⁸ who report an increase in TSF after 12 weeks of oral supplementation. In contrast, Rabeneck et al. (1999)²⁵ found no change in TSF after six weeks of oral support.

AC is considered a measure with a high degree of sensitivity and specificity in the detection of malnutrition.²¹ The positive findings achieved are in agreement with those described in a study by Wandall et al. (1992),²⁶ who report significant increases in weight, AC and TSF after four weeks of oral supplementation.

AMC provides a quantitative notion of the protein reserves of the organism and was relatively preserved in relation to fat depletion in the present sample, with values similar to those described by Silveira (1999),⁷ who reports marasmic malnutrition in patients with AIDS. The lack of a positive impact on AMC may be explained by the short supplementation duration as well as physical inactivity and fatigue, which are common findings among hospitalized patients.²⁷ Moreover, preferential replacement of body fat stocks occurs in the early phase of recovery from catabolic conditions, such as HIV infection, with no initial gain in muscle mass.^{28,29}

The hypoalbuminemia observed may be considered a marker of protein reserves and is often used as a biochemical indicator of nutritional status. However, alterations in vascular permeability, such as those that occur during an infectious process, result in the loss of albumin from the intravascular to the extravascular space, implying a rapid drop in serum levels.³⁰ The improvement in albumin may have been the result of the increase in calorie-protein intake, which may be better observed after 21 days (duration of half life) associated to the concomitant treatment of opportunistic co-morbidities, which inhibits the synthesis of acute phase proteins, enabling their hepatic synthesis.³¹

Hemoglobin and hematocrit levels, which were low in the majority of patients, were similar to those reported by Rabeneck et al. (2008),²⁵ who found no changes in hematological parameters in six weeks of supplementation. Anemia in individuals with AIDS may be associated with the direct and indirect

inhibitory effects of HIV on stem cells, an increase in the destruction of red blood cells, the inhibition of bone marrow by pathogens and medications.³² Moreover, the duration of nutritional support may have been insufficient in order to have an impact on hemoglobin levels, the half life of which is 120 days.

The total lymphocyte count is used for nutritional assessment, with values below 1500 cells/mm, indicative of malnutrition,³ also associated with higher morbidity and mortality rates in patients with AIDS.²¹ Favorable results were obtained in the intervention period, which may be explained by the rapid multiplication of lymphocytes, suggesting that the greater protein intake may have led to an increase in the substrate for the production of immunoglobulins and defense cells.

Conclusion

The results of the present study indicate that the use of oral supplements in combination with nutritional counseling was well tolerated and had a positive effect on nutritional status, with significant improvements in anthropometric parameters, weight gain, body fat gain, an increase in albumin and lymphocyte count, but with no impact on muscle reserves, hemoglobin or hematocrit. Further studies with a larger number of patients and other types of supplements should be carried out in order to confirm the impact of this intervention on clinical progress and survival.

Conflicts of interest

The authors declare they have no conflicts of interest.

Authors' contributions

RP: conception of study, data acquisition, drafting of manuscript; PS: drafting and revision of manuscript; MG: conception and coordination of study; participation in drafting of manuscript.

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