ORIGINAL ARTICLE

Lymphocytes Count and its Correlation with Nutritional Status in Patients with Head-and-Neck Cancer Assisted in an Oncology Hospital in Rio Grande Do Norte

Danielle Bernardo da Silva[1], Yasmim Guerreiro Nagashima[2], Jeane Cristina Alves de Sousa Dantas[2], Lorena dos Santos Tinôco[1], Alexandre Coelho Serquiz[3]

[1]University Center of Rio Grande do Norte - University-RN, Natal, Brazil, [2]Hospital Dr. Luiz Antônio - League Against Cancer, Natal, Brazil, [3]Centro Universitário do Rio Grande do Norte(UNI RN), Natal, Brazil

ABSTRACT

Background: The main reasons that predispose head-and-neck cancer are strongly related to alcoholism and smoking. It manifests in the oral cavity, lips, oropharynx, nasopharynx, hypopharynx, nasal cavity, paranasal sinuses, and larynx. Objective: The objective of this study was to evaluate the correlation of lymphocyte counts with the nutritional status of patients with head-and-neck cancer in outpatient care in an oncology hospital in Rio Grande do Norte. **Methodology:** Seventy patients of both genders were studied, the majority were male and the age group was distributed among adults and the elderly. **Results:** There were no significant differences concerning age, weight, body mass index (BMI), arm circumference, waist circumference, albumin, patient-generated subjective global assessment (PG-SGA), and total lymphocyte count ($P > 0.05$). PG-SGA and lymphocytes ($r = -0.878$, $P \leq 0.0001$) show a strong and significant negative correlation. Compared to albumin, the BMI presented better values. **Conclusion and Recommendation:** It was observed that when the PG-SGA score increases, the BMI and albumin values decrease. Further researches on this subject are important, due to the need for new methods to complement nutritional assessment.

Key words: Head-and-neck neoplasms, lymphocyte count, nutritional status

INTRODUCTION

Cancer is a chronic non-communicable disease characterized by abnormal cell proliferation and is considered a public health problem worldwide. The emergence of the tumor modifies the bearers' metabolism, affecting their nutritional status and quality of life.[1]

The main reasons predisposing to head-and-neck cancer are strongly associated with tobacco and alcohol consumption. Other factors conducive to the tumor development process include poor oral hygiene, infectious agents, family history, exposure to UV light, formation of dental plaques, and preexisting pathologies.[2]

Head-and-neck cancer manifests in the oral cavity, lips, oropharynx, nasopharynx, nasopharynx, hypopharynx, nasal cavity, paranasal sinuses, and larynx[3] report that the location of the tumor interferes with the nutritional status and can be associated with difficulties in chewing and swallowing, thus reducing food intake.

Address for correspondence:
Alexandre Coelho Serquiz, Department of Heath Sciences, Federal University of Rio Grande do Norte - UFRN and Teacher of the Nutrition Course, Center University of Rio Grande do Norte, Natal-RN, Brazil.

It is of utmost importance to investigate the nutritional status, and nutritional assessment must be part of the treatment of oncological patients. It is vital to determine the extension of nutritional.[4]

A sharp decrease in total lymphocytes count increases the risk of various forms of infection. Recent studies reveal an association of low total lymphocyte count (TLC) in post-treatment as well as a decreased life expectancy of patients with solid tumors undergoing chemotherapy or radiotherapy.[5]

The present study is justified by the importance of new methods to assess the nutritional status of oncological patients, considering that a low TLC can be a bad prognosis associated with the severe treatments that patients with cancer must undergo. Thus, the aim of this study was to assess the correlation of lymphocyte counts with the nutritional status of patients with head-and-neck cancer in outpatient care at a hospital for cancer in the state of Rio Grande do Norte.

METHODOLOGY

Research type

This is a descriptive study with qualitative cross-sectional design.

Population and sample

The latest cases of head-and-neck cancer included in the annual report of the Liga Norte Riograndense Contra o Câncer (Rio Grande do Norte League Against Cancer) published in 2013, totalizing 558 new cases, were examined. From this population, a significance level of 95% and 5% confidence interval in the n value of 228 patients was considered. A total of 70 data from 70 patients were collected.

Eligibility criteria

All individuals who had head-and-neck cancer of both sexes, with diagnosis confirmed in a maximum of 1½ years before the date of assessment were included in the study. The patient must be aged 20 years and over and not have a recurrence in the disease. We did not differentiate nor excluded patients at different stages of treatment.

Criteria of exclusion

Patients who had thyroid or skin cancer were excluded as well as those who felt uncomfortable during data collection and decided not to participate in the survey, thus leaving both management and doctor exempt from any responsibility related to the exclusion of the patient from the study.

Tools and techniques for data collection

Data began to be collected after approval of the study by the Research Ethics Committee, authorization number 39006914.5.0000.5293. The nutritional assessment was carried out at the dates scheduled for consultation at the nutrition clinic and when the place was available. However, if there was no room available, the nutritional assessment was not done.

The patients were approached in the waiting room, and the nutritional assessment was only done after their agreement to participate in the study, and we only began the interview after the expressed authorization of the participant by signing and/or fingerprinting the free and informed consent form (Exhibit A). Data were collected and analyzed by the responsible researcher under the supervision of the dietitian in charge of the service.

Anthropometric assessment

To determine the current body weight, a zeroed (tare) calibrated electronic scale (Filizola) was used. The scale was placed on an even and steady surface, and the individual stood upright at the center of the base of the scale, bare feet, and wearing light clothes.[6] The percentage of weight loss was measured, considering that an involuntary weight loss is a significant indicator of the severity of a health problem as well as its high correlation with mortality.[7] Classification was done according to ASPEN.[8,9]

The height (m) was measured using a portable stadiometer (Sanny®). The individual stood erect, bare feet, heels together, and arms along the body.[6] The body mass index (BMI) is the simplest indicator of the nutritional status of an individual and is considered a global index because it does not specify the kind of reserve that is being assessed. It is calculated as follows: Current body weight (kg) divided by height (m^2). The following criteria for nutritional diagnosis recommended for adult individuals. The classification of the nutritional status of the adults based on the BMI was made according to the World Health Organization of 1995 and 1997; and the classification of the nutritional status of the elderlies was made according to the Pan American Health Organization (PAHO/WHO) of 2002.

The arm circumference (AC) is a measure that represents the sum of the areas comprising the arm's bone, muscle, and fat tissues. To determine it, the arm to be assessed must be flexed toward the thorax, with the elbow bent at an angle of 90o, and the mid-point between the acromion and the olecranon is marked with a pen. Then, the individual is asked to stay with the arm hanging at the side of the body with the palm of the hand facing the tight.[6] The AC is then measured with a Sanny® tape positioned at the marked point around the arm, not too tight nor loose. For the classification of the nutritional status, the parameter of Blackburn and Thorntin, 1979, was used. The waist circumference (WC) is a useful measure to quantify interindividual differences, allowing to identify individuals at higher risk of malnutrition and interindividual differences during nutritional monitoring.[10] To measure the

WC, an inelastic tape measure was placed around the waist and below the last rib of the individual standing upright. The classification measures for men are <94 (normal) and >94 (increased risk), and for women, they are <80 (normal) and >80 (increased risk).

Biochemical assessment

Regarding biochemical tests, the TLC parameter was used. The values were collected from the patient's medical records.

Patient-generated subjective global assessment (PG-SGA)

Patient-generated subjective global assessment (PG-SGA) The scored PG-SGA questionnaire, validated by Gonzalez (2010).[11] Was filled out by the patient himself, but when he/she did not know how to answer nor had doubts, the researcher offered help.

Treatment for data analysis

The data were analyzed for normality using the Kolmogorov–Smirnov's test. To assess current weight, BMI and AC, as well as the lymphocyte biochemical data in the control groups, were used according to the normality test. To test for the correlations, the Pearson's correlation coefficient (r) was used. Data were expressed as means ± SD and analyzed by the GraphPad Prism software, version 5.0 (GraphPad Software, San Diego, CA, USA). Significant differences were accepted with $P < 0.05$.

RESULTS

The population sample was comprised 70 individuals of both genders, the majority being male, and the age group consisted of adults and elderlies. The most affected location of the cancer was the oral cavity followed by laryngeal cancers. With respect to occupation and lifestyle, most of the participants were former smokers and heavy alcohol consumers, who quit these habits after being diagnosed with cancer. The majority is retired followed by farmers [Table 1].

Table 2 shows the mean values of the variables which are expressed according to the classification of lymphocyte groups (900, 900–1499, and ≥1500). There was no significant difference for age, weight, BMI, AC, WC, albumin, PG-SGA, and the TLC (P-value over 0.05).

The values between albumin and lymphocyte counts ($r = 0.723$ $P = 0.0011$), as shown in Table 3, generate a positive and significant correlation between the samples, since when lymphocyte counts increase, albumin values will also increase. The PG-SGA and the lymphocytes ($r = -0.878$k, $P \leq 0.0001$) indicate a strong and significant negative correlation, since when the PG-SGA values increase, the lymphocyte values diminish.

Table 1: Characterization of the sample of patients with head-and-neck cancer in outpatient care in an oncology hospital in the state of Rio Grande do Norte, 2016–2017

Variables	Answers	*n*	%
Gender	Male	46	65.7
	Female	24	34.3
Age	20–59	41	58.6
	>60	29	41.4
Location of cancer	Oral cavity	23	32.9
	Larynx	21	30
	Oropharynx	9	12.9
	Pharynx	1	1.4
	Parotid gland	5	7.1
	Others	11	15.7
Smoking	Ex-smoker	46	65.7
	Smoker	9	12.9
	Non-smoker	15	21.4
Drinking	Ex-alcohol consumer	32	45.7
	Alcohol consumer	11	15.7
	Not alcohol consumer	27	38.6
Occupation	Farmer	13	18.6
	Retired	41	58.6
	Others	16	22.8

Figure 1 illustrates the correlation between albumin and PG-SGA with the number of the lymphocytes in the patient.

The samples were divided into BMI, albumin, and PG-SGA groups, according to their classifications [Table 4]. We can assume, concerning age and the groups, that the most of them would be of more debilitated patients. BMI, when compared to albumin, exhibited better values, but when compared with the PG-SGA scores, it can be seen that the values (0–1) can indicate obesity, according to the WHO of 1995 and 1997.

We can see that the AC value increases or decreases, when correlated with BMI, with a significant difference between them. About the AC and PG-SGA, we can see that the lower the PG-SGA score, the higher will be the AC value. With respect to the comparison between WC and PG-SGA, we can see that the values are higher than those recommended by the World Health Organization (WHO, 2000). The PG-SGA was compared to the BMI and albumin, and it could be seen that the PG-SGA scores increase when the reference values of BMI and albumin decrease.

DISCUSSION

According to Almeida *et al*.,[12] cases of head-and-neck cancer have grown remarkably, being more frequent in men than

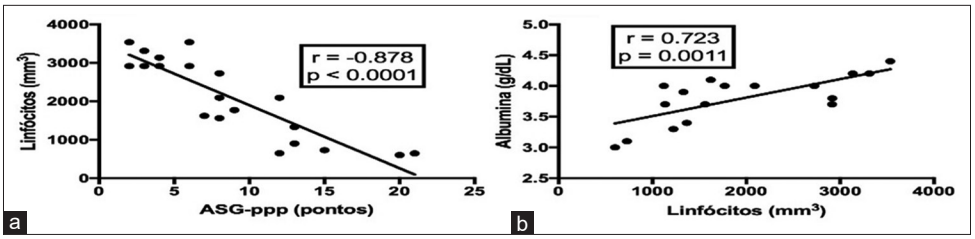

Figure 1: (a and b) Correlation between albumin and patient-generated subjective global assessment (PG-SGA) with lymphocytes in patients with head-and-neck cancer in outpatient care in an oncology hospital in Rio Grande do Norte, 2016–2017 (Na figura acima, substituir: Lymphocytes [mm³], PG-SGA [scores], albumin [g/dl], and lymphocytes [mm³])

Table 2: Lymphocyte counts and nutritional characteristics of patients with head-and-neck cancer in outpatient care in an oncology hospital in the state of Rio Grande do Norte, 2016–2017

Men/women	Lymphocytes (mm³)			
	<900	900–1499	≥1500	*P*-value
Age (years)	66.86 (±12.5)	64.57 (±16.5)	57.25 (±6.2)	0.181
Weight (kg)	50.6 (±13.3)	63.54 (±15.7)	65.65 (±15.5)	0.395
BMI (kg /m²)	20.98 (±4.2)	24.07 (±5.23)	25.95 (±6.4)	0.427
AC (cm)	24.29 (±6.7)	27.86 (±4.6)	28.13 (±5.6)	0.428
WC (cm)	73.71 (±14.9)	93 (±16.6)	84.83 (±21.9)	0.135
Albumin (g/dL)	3.97 (±0.3)	4.35 (±1.2)	2.55 (±0.3)	0.108
PG-SGA	13.8 (±5.49)	12.72 (±4.03)	7. 78 (±4.43)	0.255

BMI: Body mass index, AC: Arm circumference, WC: Waist circumference, PG-SGA: Patient-generated subjective global assessment

Table 3: Correlation between albumin and PG-SGA with lymphocyte counts of patients with head-and-neck cancer in outpatient care in an oncology hospital in the state of Rio Grande do Norte, 2016–2017

	Lymphocytes	
Albumin	*r* – Pearson	0.723
	P-value	0.0011
PG-SGA	*r* – Pearson	−0.878
	P-value	<0.0001

PG-SGA: Patient-generated subjective global assessment

women. The study showed a similar parameter, corroborating those already existing in literature, which report a higher incidence of head-and-neck cancer in men, although in recent years, there has been a considerable increase in women, which is likely to be due to smoking and drinking habits.

The most common factors for this kind of cancer are intrinsically connected with smoking habits, and the risks increase when the use of tobacco is combined with alcohol intake. In Brazil, it is estimated 11,200 new cases of cancer in the oral cavity in men and 3500 in women for each year of the 2018–2019 biennium.[13] In the study conducted by Campion *et al*. (2016), the authors mention that most of the patients with mouth cancer have low income, live in the countryside, and are smokers and drinkers, thus increasing the likelihood of developing the disease.

In the research conducted by Kuzuya *et al*.,[14] the authors did not find a correlation between the TLC and other parameters commonly used in nutritional assessments, showing a result similar to the present study, although there is not much evidence that TLC reflects the nutritional status.

According to the studies of Cereda,[15] there is a significant interrelation between a set of prognostic factors such as TLC, oral intake of albumin, and the percentage of weight loss, corroborating the present research. Malnutrition may mirror a stress-related inflammatory condition often leading to hypoxia, weight loss, and immunological dysfunction. Low levels of lymphocytes can be related to decreased immunity mediated by the tumor tissue cells.[16]

According to Rocha and Fortes,[5] in the patients assessed, the scored subjective global assessment, TLCs, and albumin were good nutrition predictors of post-operative complications, since as the SGA scores increased, the risks for complications also increased, and when the albumin and TLC scores increased, the risks for surgical complications diminished, similar to the data described in Table 3.

Rocha and Fortes assessed oncological outpatients and found similar results to the present study, probably because their

Table 4: Comparison between the markers of nutritional assessment of patients with head-and-neck cancer in outpatient care in an oncology hospital in the state of Rio Grande do Norte, 2016–2017

Men/women	BMI (kg/m²)			Albumin (g/dL)			PG-SGA			
	<18.5	≥18.5	*P*-value	<3.5	≥3.5	*P*-value	0–1	2–3	4–8	>9	*P*-value
Age (years)	62.8 (±10.3)	57.1 (±13.7)	0.2370	56.8 (±6.3)	66 (±14.0)	0.1819	60.3 (±6.8)	51.4 (±14.2)	61 (±11.1)	58.5 (±15.8)	0.2064
BMI (kg/m²)	17.2 (±1.8)	24.8 (±4.5)	0.0049	20.2 (±3.3)	25.5 (±4.2)	0.0260	30.8 (±5.4)	24.3 (±2.7)	28 (±1.4)	21.0[a] (±5.1)	0.0026
AC (cm)	20.8 (±2.6)	28.5 (±3.9)	<0.0001	23.9 (±4.4)	28.5 (±5.3)	0.1092	34.67 (±1.2)	28.6 (±2.1)	28.3 (±3.1)	25.2[a] (±2.9)	0.0006
WC (cm)	69.7 (±5.5)	88.9 (±14.2)	0.0002	83.7 (±12.5)	90.8 (±14.5)	0.3523	99 (±5.6)	87.9 (±8.3)	89.1 (±7.1)	85.1[a] (±5.45)	0.0151
Albumin (g/dL)	3.0 (±0.4)	3.8 (±0.5)	0.3432	3.23 (±0.17)	4 (±0.43)	0.0006	*	4.1 (±0.5)	3.8 (±0.7)	3.4 (±0.3)	0.1430
PG-SGA	14.6 (±4.2)	6.9 (±4.9)	<0.0001	11 (±5.70)	5.25 (±2.59)	0.0104	14.7 (±3.5)	12.8 (±4.1)	7.5[a] (±3.8)	5.45[a] (±2.8)	0.0001

BMI: Body mass index, AC: Arm circumference, WC: Waist circumference, PG-SGA: Patient-generated subjective global assessment

patients had a higher mean age (>60 years), as well as in the study of Guthrie *et al*.[17]

Patients with head-and-neck neoplasia were those who experienced more weight changes, and weight loss was more frequent in the majority of the population studied,[18] which differs from the present study, where such variation was not found.

In the work carried out by Ferreira[19] the mean values of BMI were 22.14 kg/m², a result that is within the normal range, differently from other study that found BMI mean values of 20.8 kg/m² in patients with malignant diseases.[18] Based on the study of Cagol,[20] of 73 patients with overweight or obesity according to the BMI, 20 (27.4%) were considered with some degree of malnutrition by the SGA, which disagrees with this study, as shown in Table 4.

Regarding normal weight range,[4] found higher values for BMI, AC, and MUAC. Based on the BMI, Gevaerd *et al*.[21] assessed 95 patients and also found a high percentage of individuals with normal weight, differently from this work, as can be shown in Table 4. On the other hand, Ulsenheimer *et al*.[22] found percentages of malnutrition based on the same indicators, of 66.67% for PCT, 38.89% for AC, and 16.67% for MUAC.

In a study conducted by Galbiatti *et al*.[2] with patients with head-and-neck cancer, their WC was measured to detect metabolic complications, and it was found that the majority of the patients (66.6%) were at no risk for cardiovascular diseases, a parameter that differs from our study, as shown in Table 2.

Cancer causes an impact on the nutritional status, showing that this disease is a frequent cause of malnutrition, and 80% of the patients already have cancer-related malnutrition at the time of diagnosis, thus contributing to the increased morbidity and mortality associated with the disease.[4] This corroborates with Dallascosta *et al*.,[23] where 81.4% of the patients are not undergoing nutritional follow-up, and it is known that this care by specialized professional improves the prognosis of the disease. BRASIL[24] indicates that a nutritional intervention improves homeostasis and the metabolic and oxidative stress.

FINAL REMARKS

There was no significant difference between the lymphocyte groups and nutritional characteristics. However, the correlation between albumin and PG-SGA with lymphocyte counts was significant. Nonetheless, it could be seen in this study that the values of lymphocytes and albumin (when compared to the PG-SGA scores) possibly indicate malnutrition in patients with cancer, thus showing that it is another practical tool that dietitians may use to assess nutritional status.

At present, there are few studies published on lymphocyte and albumin counts as a means of assessing nutritional status.

Thus, it is considered of great importance to carry out further research on the topic proposed here in view of the importance of developing new methods to complement the assessment.

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