

# DIGESTIVE NEOPLASIA, LOW BODY MASS INDEX AND WEIGHT LOSS AS INDICATORS OF THE LENGTH OF HOSPITAL STAY IN PATIENTS WITH NEOPLASIA

*Neoplasia digestiva, baixo índice de massa corporal e perda de peso como indicadores do tempo de internação em pacientes portadores de neoplasias*

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**HEADINGS** - Neoplasms. Hospital stay. Nutritional status. Weight loss. Body mass index.

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**DESCRITORES** - Neoplasias. Tempo de internação. Estado nutricional. Perda de peso. IMC.

**ABSTRACT – Background:** The nutritional status (NS) of patients with neoplasms can affect length of hospital stay. **Aim** - To investigate nutritional changes and risk factors associated with length of hospital stay in patients with neoplasms. **Methods:** A cross-sectional study was done to investigate nutritional status by classic anthropometry, energy intake, gastrointestinal changes, indicators of nutritional risk and length of hospital stay in 93 patients with neoplasms. The risk factors associated with long hospital stays were then determined. **Results:** Patients with digestive neoplasms presented significantly longer hospital stays. These patients were 26 times more likely to stay at the hospital seven or more days than patients with gynecological neoplasms. Additionally, patients with recent weight loss were 4.5 times more likely to stay seven or more days at the hospital than those without recent weight loss. **Conclusion:** Digestive neoplasms, low body mass index and recent weight loss are risk factors for longer hospital stays.

**RESUMO – Racional** - O estado de pacientes portadores de neoplasias pode influenciar o tempo de internação. **Objetivo:** Investigar as alterações nutricionais e estudar os fatores de risco associados ao tempo de internação em pacientes portadores de neoplasias. **Métodos:** Foi investigado em um estudo transversal o estado nutricional por antropometria clássica, consumo energético, alterações gastrointestinais, indicadores de risco nutricional e tempo de internação em 93 pacientes portadores de neoplasias. Posteriormente foram estimados os fatores de risco associados ao tempo de internação prolongado. **Resultados:** Verificou-se diferença significativa quanto ao tempo de internação, para os pacientes com neoplasias digestivas que apresentaram 26 vezes mais chance de ficar internado sete dias ou mais do que pacientes com neoplasia ginecológica. Aqueles com IMC < 18,5 apresentaram oito vezes mais chance de ficar internado sete dias ou mais. Os pacientes que apresentaram perda de peso recente, apresentaram 4,5 vezes mais chance de ficar internado sete dias ou mais do que aqueles que não apresentaram perda de peso. **Conclusão:** Pacientes portadores de neoplasias digestivas, com baixo IMC e perda de peso são considerados fatores de risco para maior tempo de internação.

## INTRODUCTION

Malnutrition has been described as an important problem in hospitalized patients and is associated with longer hospital stays. Many studies in the literature have reported that malnourished patients have longer hospital stays<sup>1,2</sup> including a recent study that used nutritional risk screening to determine nutritional status<sup>3</sup>. Another recent study showed that one in three patients with cancer is

malnourished, and they also presented longer stays<sup>4</sup>. Laboratory and body weight changes are important indicators of nutritional depletion and can increase the length of stay of patients with neoplasms<sup>5</sup>.

Weight loss deteriorates wellbeing and renders the patient vulnerable to a number of depletions that increase the likelihood of morbidity and mortality<sup>6,7</sup>. Some of its causes are tumor location, emotional factors, length of hospital stay, low acceptance of hospital food and type of treatment used<sup>7,8</sup>.

Treatment also causes many side effects<sup>9</sup> that have a direct impact on nutritional status, namely loss of appetite, nausea, vomiting, among others, by impairing energy intake and causing weight loss<sup>10</sup>.

The objective of this study was to investigate the nutritional changes and risk factors associated with length of hospital stay in patients with neoplasms.

## METHODS

A cross-sectional study was done with 93 cancer patients staying at a university hospital in the city of Campinas, SP, Brazil, in 2010. The study was approved by the local research ethics committee under protocol number 743/09. The initial screening included patients with many different neoplasms staying at the surgery ward. The exclusion criteria were age  $\leq 20$  years and medical records without nutritional status information and dietary data. The studied patients were divided into four groups: head and neck neoplasms, digestive, gynecological and other neoplasms.

Nutritional status was assessed by classical anthropometry by the following indicators: body mass index (BMI), arm circumference (AC), triceps skinfold thickness (TST), mid-upper arm muscle circumference (MUAMC), mid-upper arm muscle area (MUAMA), mid-upper arm fat area (MUAFA), calf circumference (CC), waist circumference (WC) and waist-to-hip ratio (WHR). BMI was calculated and classified according to the criteria established by the World Health Organization (WHO) in 1998<sup>11</sup> for adults under 60 years of age and by Lipschitz (1994)<sup>12</sup> for those aged  $\geq 60$  years. Body composition indicators (AC, MUAMC, MUAMA, TST, MUAFA) were classified according to percentiles<sup>13,14</sup>. Depletion was considered positive when these indicators were below the tenth percentile ( $< P10$ )<sup>13,14</sup>. CC was classified as determined by the WHO<sup>15</sup>, that is, the cut-off point was 31 cm. WC and WHR were measured and calculated according to the standard methods<sup>11,16</sup>.

Interviews were used to collect dietary information and the individual habitual energy intake (HEI) in kilocalories (Kcal) was then calculated by the software NutWin® (2002)<sup>17</sup>. Once HEI was determined, the adequacy of energy intake was

calculated according to individual requirement (%HEI/ER) by the Harris & Benedict equation<sup>18</sup>. HEI was expressed as percentage of energy requirement (%CEH/NE)<sup>19</sup>.

Other variables such as gastrointestinal changes (lack of appetite, nausea, vomiting, anorexia), dental changes (which may affect food intake), weight changes (gain or loss) and type of diet prescribed during hospital stay (general, bland, liquid, enteral or fasting) were also investigated. The following criteria were used as nutritional risk indicators: BMI  $< 18.5$ ; BMI  $< 20$ ; AC, TST and MUAMC  $< P10$ ; CC  $< 31$  cm and recent weight loss.

The chi-square test and Fisher's exact test were used for verifying associations or comparing proportions and the Kruskal-Wallis test or ANOVA on ranks followed by the Tukey test were used for locating differences and comparing continuous or ordinal measures among the four groups of cancer patients. Multiple logistic regression was used for identifying the risk factors associated with length of hospital stay (gender, disease, age, BMI, nutritional risk indicators). Univariate analysis of each factor of interest was done followed by multivariate analysis for selecting the variables in a stepwise manner. The significance level was set at 5%<sup>20,21,22</sup>.

## RESULTS

The patients with longest hospital stays were those with digestive neoplasms ( $p < 0.0001$ ). The mean age of patients with head and neck neoplasms was  $53.0 \pm 17.4$  years; for those with digestive neoplasms,  $59.8 \pm 12.6$  years; for those with gynecological neoplasms,  $57.4 \pm 11.8$  years; and for those with other neoplasms,  $60.9 \pm 13.0$  years. The mean ages of the groups did not differ significantly.

Table 1 shows nutritional status according to anthropometry and energy intake of the patients according to group. Except for TST ( $p = 0.0258$ ), the variables do not differ statistically among the groups. The mean BMI of the four groups were within the normal range; there was no evidence of malnutrition. The group with digestive neoplasms was the only group whose percentage of energy intake adequacy was below 80%, namely  $77.9 \pm 23.7\%$ .

Table 2 shows the comparison of dental changes, recent weight gain or loss, lack of appetite, nausea, vomiting, anorexia and type of diet prescribed during hospitalization for the four groups of patients. The groups did not differ significantly with respect to these variables. Patients with digestive neoplasms were more likely to present recent weight changes (57.6%) but the difference was not significant.

Table 2 shows the prescribed diets for each group in percentages: 63.6% of the gynecological patients consumed a general diet; 30.3% of the

digestive patients consumed a bland diet; 26.7% of other patients consumed a liquid diet; 14.8% of the

**TABLE 1** - Comparison of the anthropometric variables and energy intake among the groups of cancer patients

Variables		Head and neck neoplasms	Digestive neoplasms	Gynecological neoplasms	Other neoplasms	P-value
BMI	Nº	34	33	11	15	0.1753*
	X±DP	23.4±7.0	23±5.5	25.5±3.8	23.6±3.3	
	Median	23.1	22.1	25.7	23.4	
AC	Nº	34	33	11	15	0.2624*
	X±DP	27.4±5.6	26.8±4.5	29.2±3.3	27.5±4.2	
	Median	26.7	26.0	30.0	28.0	
TST	Nº	34	33	11	15	0.0258**
	X±DP	16.0±10.9	18.0±10.9	23.3±6.9	14.2±7.3	
	Median	11.5	15.0	23.0	12.0	
MUAMC	Nº	34	33	11	15	0.3258*
	X±DP	223.9±35.3	211.7±34.7	219.6±16.6	231.0±33.2	
	Median	220.7	209.7	221.5	223.0	
MUAMA	Nº	34	33	11	15	0.3366*
	X±DP	32.3±12.9	28.2±11.5	32.1±5.8	34.0±12.7	
	Median	31.5	25.5	32.6	29.6	
MUAFA	Nº	34	33	11	15	0.1451*
	X±DP	30.0±17.7	30.7±14.6	36.9±11.0	27.8±11.0	
	Median	23.9	25.9	38.0	26.2	
CC	Nº	34	32	11	15	0.4689*
	X±DP	30.6±4.5	31.7±4.3	32.0±3.9	32.2±3.0	
	Median	30.5	31.0	32.0	32.0	
WC	Nº	34	33	11	15	0.1325*
	X±DP	84.9±15.1	87.2±11.1	90.6±9.4	90.8±11.5	
	Median	84.0	86.0	92.0	93.0	
WHR	Nº	34	33	11	14	0.0615*
	X±DP	0.89±0.08	0.93±0.07	0.91±0.07	0.96±0.11	
	Median	0.89	0.94	0.89	0.95	
HEI/kcal	Nº	34	33	11	15	0.4200*
	X±DP	1742±614	1622±539	1507±302	1707±611	
	Median	1843	1653	1442	1656	
%HEI/ER	Nº	33	33	11	15	0.8892*
	X±DP	81.8±30.6	77.9±23.7	88.2±31.7	82.0±29.3	
	Median	79.3	75.4	81.2	83.3	

\* Kruskal-Wallis test; \*\* ANOVA. BMI: body mass index; AC: arm circumference; TST: triceps skinfold thickness; MUAMC: mid-upper arm muscle circumference; MUAMA: mid-upper arm muscle area; MUAFA: mid-upper arm fat area; CC: calf circumference; WC: waist circumference; WHR: waist-to-hip ratio; HEI: habitual energy intake / kcalorias; %HEI/ER: % of adequacy of the HEI in relation to the energy requirements.

head and neck patients consumed an enteral diet; and 27.3% of the gynecological patients had to fast.

Table 3 shows that the only nutritional status indicator that differs significantly among the groups is MUAMC (p=0.0193), that is, patients with head and neck and digestive neoplasms were most likely to have a MUAMC < P10.

Multiple logistic regression showed that patients with digestive neoplasms were 26 times more likely to present lengths of hospital stays ≥ 7 days than patients with gynecological neoplasms (p= 0.0047; RR= 26.058; 95%CI= 2.724; 249.223). Patients with IMC < 18.5 were eight times more likely to stay at the hospital for seven or more days (p=

**TABLE 2** - Comparison of the studied variables among the groups of cancer patients

Variables	Head and neck neoplasms	Neoplasia digestiva N/%	Neoplasia ginecológica N/%	Outras neoplasias N/%	P-valor
Dental changes	N/%	Digestive neoplasms	7/63.6	5/33.3	0.3705*
Weight changes a	N/%	Gynecological neoplasms	4/36.3	7/46.7	0.5686*
No appetite	N/%	Other neoplasms	1/9.0	2/13.3	0.1691**
Nausea	N/%	P-value	-	2/13.3	0.6167**
Vomiting	2/5.9	2/60	-	1/6.7	1.000**
Anorexia	2/5.9	3/90	-	2/13.3	0.6558**
Type of diet					0.1220**
General	12/35.3	8/242	7/63.6	4/26.7	
Bland	8/23.5	10/303	1/9.0	3/20.0	
Liquid	1/2.9	7/212	-	4/26.7	
Enteral	5/14.8	3/90	-	-	
Fasting	8/23.5	5/151	3/27.3	4/26.7	

<sup>a</sup> weight gain or loss, \* chi-square test; \*\* Fisher's test.

**TABLE 3** - Comparison of the nutritional risk indicators among the groups of cancer patients

Indicators of nutritional risk	Head and neck neoplasms N/%	Digestive neoplasms N/%	Gynecological neoplasms N/%	Other neoplasms N/%	P-value
BMI < 18.5	10/29.4	6/18.2	-	1/6.7	0.1008**
BMI < 20	11/32.3	12/36.3	1/9.0	3/20.0	0.3146**
AC < P10	15/44.1	13/39.4	2/18.2	5/33.3	0.4774*
TST < P10	5/14.7	4/12.1	1/9.0	1/6.7	0.9640**
MUAMC < P10	17/50.0	16/48.5	-	5/33.3	0.0193*
CC < 31 cm	17/50.0	13/39.4	4/36.4	5/33.3	0.6613*
RWL	25/73.5	24/72.7	9/81.8	12/80.0	0.9274**

\* Chi-square test; \*\* Fisher's test; BMI: body mass index; AC: arm circumference; TST: triceps skinfold thickness; MUAMC: mid-upper arm muscle circumference; CC: calf circumference; P10: tenth percentile; RWL: recent weight loss.

0.0070; RR= 8.173; 95% CI= 1.776; 37.622). Finally, patients with recent weight loss were 4.5 times more likely to stay at the hospital for seven or more days than those without recent weight loss (p= 0.0181; RR= 4.500; 95%CI= 1.293; 15.660) (Table 4).

**TABLE 4** - Risk factors associated with length of hospital stay (< 7 days or ≥ 7 days)

Variables	Reference	P	Odds Ratio	Confidence interval 95%
Disease	Head and neck neoplasms x gynecological neoplasms	0.3703	2.832	0.291; 27.599
Disease	Digestive neoplasms x gynecological neoplasms	0.0047	26.058	2.724; 249.223
Disease	Other neoplasms x gynecological neoplasms	0.5036	2.297	0.201, 26.280
BMI < 18.5	Yes x no	0.0070	8.173	1.776; 37.622
RWL	Yes x no	0.0181	4.500	1.293; 15.660

BMI: body mass index; RWL: recent weight loss. Studied factors: gender, disease, age, BMI and nutritional risk indicators

## DISCUSSION

The present study found that cancer patients with low BMI, recent weight loss and digestive neoplasms were more likely to present longer hospital stays than other cancer patients. Patients with digestive neoplasms were most likely to present recent weight changes. Malnourished patients<sup>3,4,5</sup> and patients with recent weight loss<sup>23</sup> presented longer hospital stays and the type of disease was found to have the greatest influence on length of hospital stay<sup>23</sup>. Logistic regression showed that cancer patients with AC<P10 were also more likely to present longer stays<sup>23</sup>.

In this study, the mean BMI of all groups were above 23.0 kg/m<sup>2</sup>, showing that the nutritional status of most patients were within the normal range and malnutrition was uncommon, contrary to another recent study that found that the average BMI of cancer patients is 20.8 kg/m<sup>2</sup><sup>24</sup>. However, when the criteria BMI<18.5 and BMI<20 were analyzed separately, higher percentages of malnourished patients were found in the head and neck and digestive neoplasms groups, but the difference was not significant. Patients with body composition indicators below the tenth percentile were also more common in these two groups. But recent weight loss was a very common finding, affecting more than 72% of the studied patients. Weight loss and loss of the reserves<sup>24,25</sup> help to increase morbidity and mortality in this population and recent weight loss is a prevalent characteristic of patients with poor nutritional status<sup>24</sup>. A recent multicentric, epidemiological and observational study<sup>4</sup> found that 30.9% of their sample of cancer patients was malnourished and according to multivariate analysis, pre-existing obesity was associated with increased risk of malnutrition and malnourished patients required significantly more antibiotics and presented longer hospital stays. The authors concluded that pre-existing obesity can be assigned as a new risk factor for malnutrition in cancer patients<sup>4</sup>.

Although the objective of the present study was not to assess or correlate the presence of certain symptoms with nutritional status but only to describe their prevalences, some symptoms seemed to affect nutritional status, but the difference was not significant among the groups: 17.6% of the head and neck cancer patients presented nausea and 6.7% were anorexic; 13.3% of the patients with other cancers were also anorexic; and 24.2% of the patients with digestive cancers presented lack of appetite. Some studies in the literature report that these symptoms do not affect nutritional status<sup>26</sup> while other studies report that they do, such as the study by Kwang & Kandiah, 2010<sup>24</sup> who showed that these symptoms are among the common side effects that

affect nutritional status. Energy intake, in particular, is the greatest predictive of gastrointestinal symptoms. The need of nutritional assessment and monitoring of gastrointestinal symptoms is critical in cancer patients<sup>26</sup>.

The present study found that digestive neoplasms are determinants of length of hospital stay among the studied neoplasms. Kim et al, 2011, recently investigated the nutritional status of hospitalized cancer patients and found that recent weight loss and length of hospital stay were significantly greater in malnourished patients ( $p < 0.0001$ ). The mean BMI of the patients in their study was  $23.0 \pm 3.4$ ; the mean BMI of the malnourished patients was  $21.7 \pm 3.5$  and that of well-nourished patients was  $23.5 \pm 3.2$ <sup>27</sup>. Another study with gynecological cancer patients found that malnutrition was also associated with longer hospital stays<sup>28</sup>.

The findings of another study<sup>29</sup> do not corroborate those of the present study, that is, the study reported that recent weight loss before surgery and low BMI do not affect complication and mortality rates, length of hospital stay or the prognosis of patients with esophageal cancer, and the authors concluded that recent weight loss could not have been used as an independent predictive factor.

A limitation of the present study was the relatively small sample size, which may not have allowed extrapolations, such as, for example, greater indices of malnutrition among patients with different neoplasms, and rates of recent weight loss. Another limitation is that other factors that determine nutritional status or risk were not used. Other factors may have resulted in associations between other variables, besides anthropometric variables, with length of hospital stay.

## CONCLUSION

Recent weight loss, low BMI and digestive neoplasms are determinants of longer hospital stays.

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