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Nutritional profile and outcomes of noncritical hospitalized patients with COVID-19 in a large tertiary hospital in southern Brazil

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SUMMARY

INTRODUCTION: Patients with chronic diseases, such as diabetes and cardiovascular diseases, and old age, which are associated with a high risk of malnutrition and worse outcomes, are at a higher risk for developing the severe presentation of COVID-19.

METHODS: This is an observational and cross-sectional study with a sample defined by convenience. Data were collected in adult inpatient units through information obtained via telephone contact with the patient/companion, records collected by the nursing staff, and medical records, tabulating demographics, body composition, previous illnesses, nutritional diagnoses, diet acceptance, and hospitalization outcomes. The following symptoms were observed: inappetence, smell, dysgeusia, odynophagia, nausea, vomiting, and diarrhea.

RESULTS: Most deaths occurred after transfer to the intensive care unit (79.6%). Patients with the worst outcome had lower food intake with a cutoff point of 60% for diet acceptance, which seems to be an adequate discriminator between those who survived and those who did not. Gastrointestinal symptoms were significantly associated with food consumption below 60% of the planned goal. The symptoms most associated with lower energy intake were inappetence, dysgeusia, and nausea/vomiting.

CONCLUSIONS: Reduced caloric intake and the presence of nutritional risk or its appearance during hospitalization seemed to be associated with mortality in patients with COVID-19 admitted outside the intensive care unit.

KEYWORDS: Coronavirus infections. COVID-19. Nutritional status. Nutritional support.

INTRODUCTION

Infections of the new coronavirus (called COVID-19, i.e., coronavirus disease 2019) are caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2). They are flu-like infections similar to the severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) in 2002 and 2012, respectively. Most conditions (80%) are mild. However, approximately 20% of cases will require hospitalization, of which 6–10% will require transfer to the intensive care unit (ICU)[1]. Among noncritical hospitalized patients, nutritional therapy appears to be associated with reduced complications[2].

Patients with chronic diseases, such as diabetes and cardiovascular diseases, and old age, associated with a high risk of malnutrition and worse outcomes, are at a higher risk of developing the severe presentation of COVID-19. Thus, assessing nutritional risk and body composition takes on additional importance since combining these morbidities increases the chance of malnutrition, immunosuppression, and unfavorable outcomes[2-4]. Recent data suggest that nutritional risk, accessed by the NRS-2002, is associated with higher mortality[5]. A series of cases indicated that these patients are hypercatabolic[6], which determines a more significant concern on the part of the care team in avoiding the establishment of a negative energy balance. In this context, COVID-19 is associated with malnutrition. Diarrhea, abdominal pain, nausea, vomiting, lack of appetite, and other symptoms are commonly reported and related to COVID-19. Cachexia can be related to feeding difficulties and malnutrition in this population[7].

Our objective was to recognize whether a given level of caloric intake, body mass index (BMI), or the presence of nutritional risk is associated with outcomes in this population (noncritical patients with COVID-19) and to identify factors related to this level of intake.

METHODS

Study, patients, and data: This is a cross-sectional observational study with a convenience sample. Patients were selected in the emergency room and adult inpatient units of the Moinhos de

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Vento Hospital, a tertiary clinical-surgical hospital reference for COVID-19 treatment. Inclusion criteria included age equal to or above 18 years, and presenting COVID-19 and needing hospitalization outside the ICU. The only exclusion criterion was to remain hospitalized for less than 24 h. Data collection took place over 5 months (from March 25, 2020 to August 31, 2020). Data were obtained through the information obtained during nutritional screening, nutritional assessment, and care via telephone contact with the patient or family/caregiver. The following data were collected by the nursing team and medical record data and tabulated in an electronic spreadsheet: age, arterial hypertension, diabetes, heart disease, lung diseases, neoplasms, date of patient assessment, the result of nutritional screening (Nutritional Risk Score, 2002), BMI, nutritional diagnosis, the results of Subjective Global Assessment and patient-generated Subjective Global Assessment if pertinent, nutritional therapy route, percentage of oral diet acceptance, use of nutritional supplementation, length of stay in the inpatient unit before being transferred to the ICU, length of stay in ICU, and the total length of stay and outcome (hospital discharge or death). The following symptoms were also observed: loss of appetite, smell, dysgeusia, odynophagia, nausea, vomiting, and diarrhea.

Protocol: The first nutritional screening was carried out in the first 24 h of hospitalization and was repeated every 24 (patients at risk) or 48–72 h (no-risk patients). Patients with oral feeding were monitored for the number of calories consumed and received either high protein supplements or enteral nutrition when their intake was less than 60% of the predicted. Once submitted to enteral nutrition, the target for calories was 25–30 kcal/kg/day and protein was 1.5–2 g/kg/day, both to be achieved over 3 days.

Statistical analysis: The variables were expressed as percentile, mean (and standard deviation), or median (and interquartile range) and compared with Student's t-test, Mann-Whitney U test, or χ^2. A multivariate binary logistic regression model was used to assess the determinants of the outcomes. The number of independent variables followed the rule of one variable for every 10 outcomes. The data were analyzed using the IMB SPSS-23.0 statistical software package. A p-value of less than 0.05 was adopted for the significance level in all analyses.

RESULTS

The sample comprised 526 patients. The characteristics of the population enrolled, stratified by mortality, are described in Table 1. Most deaths happened after ICU transference (79.6%). Patients who did not survive significantly received less energy intake, and the 60% cutoff seemed to be an adequate discriminator between those who survived and those who did not.

Considering the specificity and sensitivity of BMI related to mortality, values between 26.5 and 33 kg/m² seem to be

Table 1. Characteristics of the patients who survived and died during hospitalization

Characteristics	All patients (n=526)	Survivors (n=485)	Nonsurvivors (n=31)	p-value
Age	59.5 (46–72)	58.5 (44–77)	85 (82–90)	<0.001
BMI	28.2 (24.7–30.8)	27.4 (24.8–30.9)	25.3 (22.9–28.7)	0.004
Obesity (BMI>29.9 kg/m²) (%)	31.1	97.5	2.5	0.019
Female gender (%)	42.4	92.9	7.1	0.069
Nutritional risk (NRS-2002≥3) (%)	20.4	83.1	16.9	<0.001
Change in risk (NRS-2002) (%)	13.3	83.7	17.3	0.027
Diet acceptance (in %)	75 (57–92)	76.5 (59.2–94)	52.5 (39.5–62.7)	<0.001
Reduced intake (<60%)	30.2	36.8	76.3	<0.001
Previous comorbidity (%)	65.1	91.8	8.2	0.003
Hypertension (%)	48.3	92.7	7.3	0.177
Diabetes (%)	18.7	89.1	10.9	0.025
Heart disease (%)	15	81.3	18.7	<0.001
COPD (%)	12.7	96.9	3.1	0.316
Cancer (%)	8.9	81.8	18.2	<0.001
GIT symptoms (%)	53.6	95.2	4.8	0.152
Nausea/vomiting (%)	15.8	94.7	5.3	0.767
Anosmia (%)	16.7	99	1	0.022
Dysgeusia (%)	18.9	98.2	1.8	0.035
Inappetence (%)	36.4	95.4	4.6	0.275
Diarrhea (%)	11.1	95	5	0.728

BMI: body mass index; NRS: nutritional risk score; COPD: chronic obstructive pulmonary disease; GIT: gastrointestinal tract.

associated with a population with a greater chance of survival. The associations between digestive tract symptoms and calorie consumption are shown in Figure 1. Digestive tract symptoms were significantly associated with energy consumption below 60% of the planned goal (35.2% of the sample, p<0.001). Symptoms related to lower energy intake were inappetence, dysgeusia, and nausea/vomiting.

The most significant parameters in the univariate analysis were analyzed in multivariate logistic regression and are shown in Table 2.

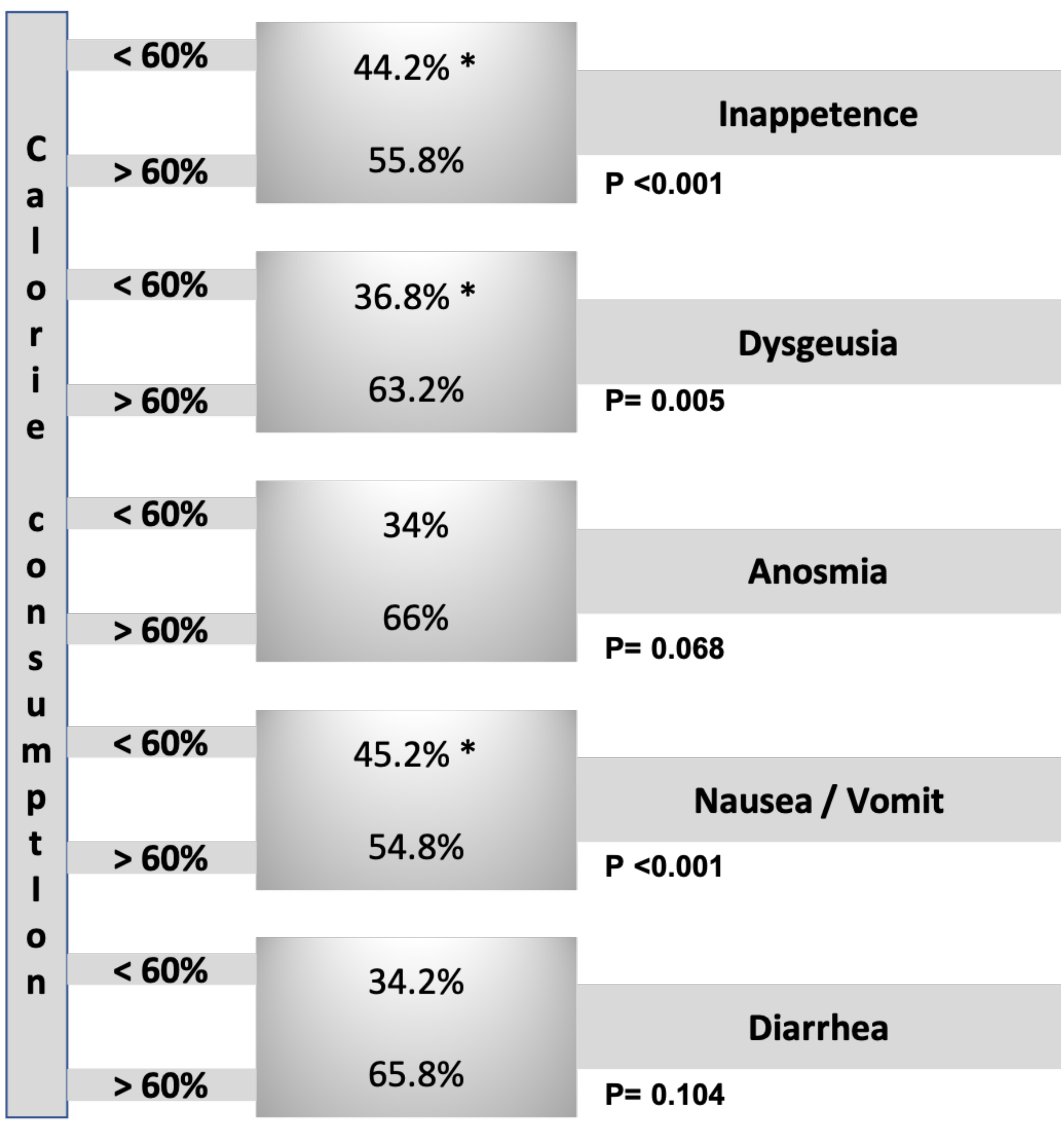
DISCUSSION

This study demonstrates an association between mortality and elderly patients and those who consume less than 60% of the

Table 2. Multivariate analysis of parameters associated with mortality

	RR (95%CI)	p-value
Age	1.133 (1.084–1.184)	<0.001
Nutritional risk (NRS-2002)	0.705 (0.293–1.697)	0.436
Diet acceptance percentage	0.978 (0.959–0.998)	0.032

RR: relative risk; NRS: nutritional risk score.



*Shows the parameter significantly elevated.

Figure 1. Associations between caloric intake and the presence of digestive symptoms.

planned energy supply in COVID-19 hospitalized patients outside the ICU. The mortality of critically ill patients with COVID-19 is high (up to 61.5%)[8], determining that all treatment strategies should be adequately combined to reduce it. Among these strategies, nutritional therapy plays a prominent role. The prevalence of the elderly in intensive care is increasing[9], constituting a fragile population with even higher mortality[10,11]. Thus, it is not surprising that older patients had a worse outcome. Regarding calorie intake, our study echoes others who have linked negative energy balance to worse outcomes[12,13].

The presence of nutritional risk or its appearance during hospitalization seems to mark more severe patients (Table 1), reinforcing the need for nutritional therapy teams to adopt some risk and nutritional assessment tool and use it early on in admission.

Although BMI did not remain an independent variable in the multivariate analysis of survival, patients with higher BMI demonstrated a tendency to survive in the univariate analysis. We cannot argue here about the possibility of parallelism about the debated paradox of obesity in the ICU, but if we consider negative energy balance as a parameter associated with mortality, those with body composition potentially associated with malnutrition (lower BMI) could present a worse outcome. A fact that should be noted is related to the average BMI of the population studied (28.2 kg/m^2 [24.7–30.8]), suggesting that the malnutrition rate in this sample is low, deviating from the pattern most often observed in most Brazilian hospitals. Our hospital is private, which may at least partially explain this finding. Finally, BMI does not appear in the logistic regression (Table 2), because in no regression model, it was proved to be an independently significant variable (due to the total number of deaths, we could not include more than four parameters in the model).

The presence of symptoms that potentially interfere with ingestion (e.g., lack of appetite, nausea, vomiting, changes in taste or smell, and diarrhea) was associated with lower consumption of calories, especially inappetence, dysgeusia, and nausea/vomiting. These complications reinforce the importance of monitoring negative energy balance and implementing strategies to minimize it, such as supplements or inserting a feeding tube. These strategies become more important if, in the background, there is a patient with hypoxemia using some form of ventilatory support (noninvasive ventilation or high-flow cannula) that can compromise ingestion.

This study has limitations. No comorbidity score, such as the Charlson score, was recorded (it would probably improve the comparisons among patients). We do not have indirect calorimetry, which would contribute to an accurate measurement of energy expenditure. Patients were not submitted to computed tomography or dual x-ray absorptiometry to determine their muscle mass.

In summary, reduced caloric intake appears to be associated with mortality in patients with COVID-19 admitted outside the ICU. Nutritional therapy strategies should be implemented in this population. Our findings need to be confirmed by a prospective, randomized, and controlled study.

CONCLUSIONS

Reduced caloric intake appears to be associated with mortality in patients with COVID-19 admitted outside the ICU. Nutritional therapy strategies should be implemented in this population. Our findings need to be confirmed by a prospective, randomized, and controlled study.

AUTHORS' CONTRIBUTIONS

ECN: Conceptualization, Data curation, Formal Analysis, Writing – original draft, Writing – review & editing. **SM:** Conceptualization, Data curation, Formal Analysis, Writing – original draft, Writing – review & editing. **PEO:** Data curation, Formal Analysis, Writing – original draft, Writing – review & editing. **SHL:** Conceptualization, Data curation, Formal Analysis, Writing – review & editing.

REFERENCES

1. Loss SH, Nunes DL, Franzosi OS, Teixeira C. Loss SH, Nunes DL, Franzosi OS, Teixeira C. A pragmatic approach and treatment of coronavirus disease 2019 (COVID-19) in intensive care unit. Rev Assoc Med Bras (1992). 2020;66(8):1157-63. https://doi.org/10.1590/1806-9282.66.8.1157
2. Barazzoni R, Bischoff SC, Breda J, Wickramasinghe K, Krznaric Z, Nitzan D, et al. ESPEN expert statements and practical guidance for nutritional management of individuals with SARS-CoV-2 infection. Clin Nutr. 2020;39(6):1631-8. https://doi.org/10.1016/j.clnu.2020.03.022
3. Gasmi A, Noor S, Tippairote T, Dadar M, Menzel A, Bjørklund G. Individual risk management strategy and potential therapeutic options for the COVID-19 pandemic. Clin Immunol. 2020;215:108409. https://doi.org/10.1016/j.clim.2020.108409
4. Caccialanza R, Laviano A, Lobascio F, Montagna E, Bruno R, Ludovisi S, et al. Early nutritional supplementation in non-critically ill patients hospitalized for the 2019 novel coronavirus disease (COVID-19): Rationale and feasibility of a shared pragmatic protocol. Nutrition. 2020;74:110835. https://doi.org/10.1016/j.nut.2020.110835

5. Zhao X, Li Y, Ge Y, Shi Y, Lv P, Zhang J, et al. Evaluation of Nutrition Risk and Its Association With Mortality Risk in Severely and Critically Ill COVID-19 Patients. JPEN J Parenter Enteral Nutr. 2021;45(1):32-42. https://doi.org/10.1002/jpen.1953
6. Yu PJ, Cassiere H, DeRosa S, Bocchieri K, Yar S, Hartman A. Hypermetabolism and Coronavirus Disease 2019. JPEN J Parenter Enteral Nutr. 2020;44(7):1234-6. https://doi.org/10.1002/jpen.1948
7. Virgens IPA, Santana NM, Lima SCVC, Fayh APT. Can COVID-19 be a risk for cachexia for patients during intensive care? Narrative review and nutritional recommendations. Br J Nutr. 2021;126(4):552-60. https://doi.org/10.1017/S0007114520004420
8. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Lancet Respir Med. 2020;8(5):475-81. https://doi.org/10.1016/S2213-2600(20)30079-5
9. Fuchs L, Chronaki CE, Park S, Novack V, Baumfeld Y, Scott D, et al. ICU admission characteristics and mortality rates among elderly and very elderly patients. Intensive Care Med. 2012;38(10):1654-61. https://doi.org/10.1007/s00134-012-2629-6
10. Silva DJN, Casimiro LGG, Oliveira MIS, Ferreira LBDC, Abelha FJPA. A população cirúrgica muito idosa em cuidados intensivos: características clínicas e desfechos [The very elderly surgical population in a critically ill scenario: clinical characteristics and outcomes]. Braz J Anesthesiol. 2020;70(1):3-8. https://doi.org/10.1016/j.bjan.2019.10.001
11. Guidet B, Vallet H, Boddaert J, Lange DW, Morandi A, Leblanc G, et al. Caring for the critically ill patients over 80: a narrative review. Ann Intensive Care. 2018;8(1):114. https://doi.org/10.1186/s13613-018-0458-7
12. Waitzberg DL, Caiaffa WT, Correia MI. Hospital malnutrition: the Brazilian national survey (IBRANUTRI): a study of 4000 patients. Nutrition. 2001;17(7-8):573-80. https://doi.org/10.1016/s0899-9007(01)00573-1
13. Klipstein-Grobusch K, Reilly JJ, Potter J, Edwards CA, Roberts MA. Energy intake and expenditure in elderly patients admitted to hospital with acute illness. Br J Nutr. 1995;73(2):323-34. https://doi.org/10.1079/bjn19950033