Received: 2 November 2020 | Revised: 8 April 2021 | Accepted: 13 July 2021

DOI: 10.1002/hsr2.560

ORIGINAL RESEARCH

Health Science Reports Open Access WILEY

Geriatric Nutritional Risk Index assessment in elderly patients during the COVID-19 outbreak

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Abstract

Background and Aims: Globally, coronavirus disease-2019 (COVID-19) is persistent in many countries and presents a major threat to public health. Critically, elderly individuals, especially those with underlying disease, poor nutritional and immune functions, are highly susceptible. Therefore, we analyzed the epidemiological features in elderly COVID-19 patients.

Methods: In total, 126 patients were recruited in the Fifth Affiliated Hospital of Sun Yat-sen University, China from January 2020 to March 2020 (including 103 confirmed COVID-19 patients and 23 elderly suspected cases). Epidemiological, demographic, clinical, laboratory, radiological, and treatment data were collected and analyzed. We assessed nutritional risks in elderly patients by calculating the Geriatric Nutritional Risk Index (GNRI).

Results: When compared with young patients, elderly patients were more likely to have underlying comorbidities and received nutritional support and intensive care unit treatment. Elderly patients had significantly lower levels of the following: lymphocyte percentages, red blood cell counts, hemoglobin levels, and serum albumin values. When compared with suspected COVID-19 elderly cases, elderly patients had significantly lower red blood cell counts and hemoglobin levels. The average GNRI of suspected cases and confirmed patients indicated no nutritional risk. There were no marked differences in GNRI values between groups.

Conclusion: Nutritional risk assessments may provide valuable information for predicting a COVID-19 prognosis, especially in elderly patients. Anemia prevention and management should be actively and timely provided. GNRI is a potentially prognostic factor for hospitalized elderly patients. Moreover, it is also important to follow up discharged patients for continuous nutritional observations.

KEYWORDS

aging, anemia, COVID-19, Geriatric Nutritional Risk Index, SARS-CoV-2

1 | INTRODUCTION

Globally, COVID-19 is persistent in many countries and presents a major threat to public health.[1] Worldwide, more than 50 million cases have been confirmed. Most patients are elderly, with severe disease.[2–4] The elderly are more vulnerable patients because of immunosenescence and increased malnutrition rates. Nevertheless, data concerning the patient nutritional status and COVID-19 are scarce. The Geriatric Nutritional Risk Index (GNRI) is a general indicator that evaluates the nutritional status of patients, that is, it is a valid and precise risk indicator reflecting the nutritional risk of patients, and has been proven as a prognosis predictor in elderly hospitalized patients.[5] Malnutrition is such reason why these high-risk elderly patients must be monitored. Many of these patients require nourishment, and experience delays in illness recovery, higher mortality, and morbidity.[6] Our previous study reported that clinicians should consider GNRI as a potential predictive factor for COVID-19 prognosis.[7] Moreover, Recinella et al. highlighted that GNRI is an independent predictor of in-hospital mortality in elderly patients with COVID-19. The association between GNRI and partial pressure of oxygen/fraction of inspired oxygen ratio (PaO_2/FiO_2) is a good prognostic model in these patients.[8] In addition, the most basic element of patient blood management is improving anemia during COVID-19 infection.[9–11] Owing to general health, changes in lifestyle and diet, elderly individuals may be primarily impacted. Although the exact impact of anemia on COVID-19 patients is not absolutely understood, it is clear the process has a negative effect on COVID-19 patients. Therefore, strategic anemia prevention and management can enhance a patient's tolerance to the virus. Also, GNRI may be invaluable in identifying high-risk patients, for instance, elderly patients with COVID-19. In this study, we analyzed the epidemiological features in patients admitted to our hospital during the outbreak and evaluated whether GNRI could be used as a potential indicator for the prognosis of COVID-19 in elderly patients.

2 | METHODS

2.1 | Study design and participants

Participants for this cross-sectional study were recruited from in-patients in the Fifth Affiliated Hospital of Sun Yat-sen University from January 2020 to March 2020. All participants were selected based on results from an epidemiological questionnaire and a clinical biochemical examination. Inclusion criteria for the confirmed COVID-19 patient group were: (1) age ≥ 15 and (2) a COVID-19 diagnosis based on a positive result from high-throughput sequencing or RT-PCR of throat swab specimens. Exclusion criteria were the presence of terminal neoplasia, the exclusive clinical and radiological diagnosis of COVID-19 without laboratory confirmation, or patients with incomplete data. Elderly patients with suspected cases of COVID-19 were also included in our study. Inclusion criteria were (1) age ≥ 60 and (2) fever or respiratory symptoms, a history of exposure to wildlife in the Wuhan seafood market, a travel history, and/or contact with people from Wuhan in the previous 2 weeks. The incubation period was defined as the time between the source of transmission and symptom onset.

This study was approved by the institutional ethics board of the Fifth Hospital of Sun Yat-sen University. This hospital is located in Zhuhai, Guangdong Province, and is a major tertiary teaching hospital responsible for COVID-19 treatment, as assigned by the government. Oral consent was obtained from patients.

2.2 | General clinical data and blood tests

Epidemiological, laboratory, imaging, treatment, and outcome data were retrieved from electronic medical records. Gathered information contained medical history, symptoms, comorbidities, laboratory indicators, chest computed tomographic scans, and treatment methods.

Basic data including age, sex, height, and weight were noted. Blood pressure was measured after the subjects had rested for 10 min. Venous blood was collected 12 h after fasting, and some blood samples were used for routine biochemical tests to determine routine, C-reactive protein (CRP), alanine aminotransferase, aspartate aminotransferase, total serum protein, serum albumin, lactic dehydrogenase, creatine kinase, fasting blood glucose (FBG), creatinine and uric acid (UA) levels.

2.3 | COVID-19 laboratory confirmation

Throat swab samples were collected from patients. After collection, swabs were placed in a collection tube with 150 µl virus preservation solution, and total RNA was extracted within 2 h using a respiratory sample RNA isolation kit (Shanghai ZJ Bio-Tech Co. Ltd.). In brief, 40 µl cell lysate was transferred to a collection tube, followed by vortexing for 10 s. After incubation at room temperature for 10 min, the tube was centrifuged at 1000 rpm for 5 min. The suspension was used for RT-PCR assay of SARS-CoV-2 RNA. Three target viral genes, RdRP, E, and N, were detected and amplified, indicating positivity for SARS-CoV-2. The RT-PCR assay was conducted according to the manufacturer's instructions.

2.4 | GNRI nutritional assessment

Upon admission, baseline nutritional assessments were conducted for all patients. Basic data including age, sex, height and weight, body mass index (BMI), and laboratory indicators (albumin, etc.) were documented in a standardized database. Patient nutritional condition was evaluated according to the GNRI formula[12]: GNRI = 1.489 × albumin (g/L) + 41.7 × (body mass/ideal body mass), where ideal weight was calculated from the Lorentz equation for males; height (cm) − 100 − [(height (cm) − 150)/4]; for females: height (cm) − 100 − [(height (cm) − 150)/2.5]. From these GNRI data, four nutrition-related risk grades were established according to previous research[12]: high risk (GNRI: <82), moderate risk (GNRI: 82 to <92), low risk (GNRI: 92 to ≤98), and no risk (GNRI: >98).

2.5 | Statistical analysis

All data were analyzed using SPSS 19.0 statistical software (IBM SPSS Statistics for Windows). The Kolmogorov–Smirnov method was used for normality testing. Measured data are expressed as the mean ± standard deviation, with differences examined using independent-sample *t* tests. Data not normally distributed are expressed as the median and interquartile range (IQR). Differences in variables among groups were analyzed by the Mann–Whitney *U* Test. The *p* values were derived from independent-sample *t* tests or Mann–Whitney *U* tests. Categorical data were shown as numbers and differences in variables among groups, and were analyzed using the χ^2 test or Fisher probabilities.

3 | RESULTS

3.1 | Subject characteristics based on age groups

The study population included 103 hospitalized patients with confirmed COVID-19. Basic clinical characteristics are shown in Table 1. When compared with younger patients (<60 years, $n = 80$), elderly patients ($n = 23$) were significantly older (median age, 65 years [IQR, 60–80] vs. 36.5 years [IQR, 0.83–59]; $p < 0.001$), and were more likely to have underlying comorbidities, including diabetes ($p < 0.05$) and hypertension ($p < 0.001$), with higher systolic blood pressure (SBP) and diastolic blood pressure (DBP) ($p < 0.01$). When compared with younger patients, elderly patients were more likely to report fatigue and dyspnea. There were, however, no marked differences in exposure history between the two groups (all $p > 0.05$).

3.2 | Radiographic and laboratory findings based on age groups

We observed several differences in laboratory findings between groups (Table 2). Elderly patients had significantly lower lymphocyte percentages, absolute lymphocyte counts, red blood cell counts, hemoglobin levels, and serum albumin values, but they had higher CRP, lactic dehydrogenase, and FBG levels. When compared with younger patients, elderly patients were more likely to present abnormalities on chest computed tomography scans.

3.3 | Organ dysfunctions and main interventions based on age groups

Organ dysfunctions and treatment of the 103 patients are shown (Table 3). When compared with younger patients, elderly patients were more likely to have ARDS, have received nutritional support treatment, oxygen inhalation, and intensive care unit (ICU) treatment ($p < 0.01$). Similarly, elderly patient hospital stay times were significantly longer than younger patients ($p < 0.05$).

3.4 | Physical and laboratory findings between suspected and confirmed COVID-19 patients

When compared with suspected cases, confirmed COVID-19 patients had significantly lower red blood cell counts and hemoglobin levels ($p < 0.01$). The average GNRI of suspected cases and confirmed patients indicated no nutritional risk. There were, however, no marked differences in GNRI values between groups (Table 4).

3.5 | Physical and laboratory variables of elderly patients at admission and discharge

During hospitalization, SBP, DBP, CRP, aspartate aminotransferase, serum albumin, lactic dehydrogenase, creatinine kinase, and FBG had been marked developed over time (all $p < 0.05$). However, the average GNRI of patients at discharge was not significantly higher than at admission (Table 5).

4 | DISCUSSION

Our single-center study of 126 hospitalized patients in Zhuhai, China, included 103 confirmed COVID-19 patients and 23 suspected cases. Our study revealed that elderly patients were more likely to have underlying comorbidities, including diabetes and hypertension, and were more likely to report fatigue and dyspnea. However, there were no significant differences in exposure history between groups. When compared with younger patients, elderly patients were more likely to have ARDS, have received nutritional support, oxygen inhalation, and ICU treatment. Equally, the hospital stay time of elderly patients was longer than younger patients. These data suggested that age and comorbidity may be risk factors for poor outcomes.

We observed several differences in laboratory findings between groups (Table 2). Elderly patients had significantly lower lymphocyte counts, red blood cell counts, hemoglobin levels, and serum albumin values. They also had higher CRP, lactic dehydrogenase, and FBG levels. When compared with COVID-19 suspected cases, confirmed cases had significantly lower red blood cell counts and hemoglobin levels. For COVID-19 patients, the most basic element of blood management is the improvement of anemia.[9–11] Because of changes in lifestyle and diet, these findings may increase during the COVID-19 pandemic, and decline purchasing power and income to exacerbate this phenomenon. Possible reasons for this include reduced intake of fresh food such as fruit and vegetables (e.g., reduced vitamin C and folic acid), fish and meat, indoor living, and social distancing.[13,14] Therefore, there may be effects on the proliferation of red blood progenitor cells, hemoglobin synthesis, and overall physical and mental state.[15,16] By relying on their basic health status and the length of the COVID-19 epidemic, elderly people may be primarily affected. Although the exact impact of anemia on COVID-19 patients is not absolutely understood, it is certain that anemia will also have negative effects on COVID-19

TABLE 1 Clinical characteristics of subjects based on age group

	≤60 years (*n* = 80)	>60 years (*n* = 23)	*p*
Age, median (IQR), years	36.5 (29.0–50.75)	65.0 (60–80)	0.000
Sex			
Male	40 (39.2)	12 (12.8)	
Female	40 (40.8)	14 (13.2)	0.733
BMI (kg/m^2)	23.33 ± 3.46	24.88 ± 3.34	0.060
SBP (mmHg)	122.93 ± 17.34	141.50 ± 21.69	0.000
DBP (mmHg)	79.96 ± 11.29	85.23 ± 12.49	0.044
Exposure to the source of transmission within 14 days—No. (%)			
Local residents of Wuhan			
Yes	57 (59.6)	22 (19.4)	
No	23 (20.4)	4 (6.6)	0.174
Nonlocal residents: Recently been to Wuhan			
Yes	67 (67.2)	22 (21.8)	
No	13 (12.8)	4 (4.2)	0.917
Nonlocal residents: Contacted with people from Wuhan			
Yes	73 (74.0)	25 (24.0)	
No	7 (6.0)	1 (2.0)	0.411
Incubation period—days, Median (range)	8 (6–13)	10 (7.5–13)	0.515
Comorbidities			
Hypertension			
Yes	4 (10.6)	10 (3.4)	
No	76 (69.4)	16 (22.6)	0.000
Cardiovascular disease			
Yes	0 (1.5)	2 (0.5)	
No	80 (78.5)	24 (25.5)	0.058
Diabetes			
Yes	2 (4.5)	4 (1.5)	
No	78 (75.5)	22 (24.5)	0.048
Cerebrovascular disease			
Yes	0 (0.8)	1 (0.2)	
No	80 (79.2)	25 (25.8)	0.245
COPD			
Yes	0 (1.5)	2 (0.5)	
No	80 (78.5)	24 (25.5)	0.058
Chronic kidney disease			
Yes	0 (1.5)	2 (0.5)	
No	80 (78.5)	24 (25.5)	0.058

	≤60 years (*n* = 80)	>60 years (*n* = 23)	*p*
HIV infection			
Yes	1 (0.8)	0 (0.2)	
No	79 (79.2)	26 (25.8)	0.755
Signs and symptoms			
Fever			
Yes	36 (38.5)	15 (12.5)	
No	44 (41.5)	11 (13.5)	0.260
Fatigue			
Yes	8 (13.6)	10 (4.4)	
No	72 (66.4)	16 (21.6)	0.002
Dry cough			
Yes	11 (11.3)	4 (3.7)	
On	69 (68.7)	22 (22.3)	1.000
Anorexia			
Yes	1 (1.5)	1 (0.5)	
No	79 (78.5)	25 (25.5)	0.432
Myalgia			
Yes	3 (3.8)	2 (1.2)	
No	77 (76.2)	24 (24.8)	0.771
Dyspnea			
Yes	3 (6.8)	6 (2.2)	
No	77 (73.2)	20 (23.8)	0.008
Expectoration			
Yes	22 (24.9)	11 (8.1)	
No	58 (55.1)	15 (17.9)	0.157
Pharyngalgia			
Yes	11 (9.1)	1 (2.9)	
No	69 (70.9)	25 (23.1)	0.304
Diarrhea			
Yes	5 (6.8)	4 (2.2)	
No	75 (73.2)	22 (23.8)	0.295
Nausea			
Yes	2 (2.3)	1 (0.7)	
No	78 (77.7)	25 (25.3)	0.574
Dizziness			
Yes	3 (3.0)	1 (1.0)	
No	77 (77.0)	25 (25.0)	1.000
Headache			
Yes	1 (1.5)	1 (0.5)	
No	79 (78.5)	25 (25.5)	0.432

(Continues)

TABLE 1 (Continued)

	≤60 years (*n* = 80)	>60 years (*n* = 23)	*p*
Abdominal pain			
Yes	0 (0.8)	1 (0.2)	
No	80 (79.2)	25 (25.8)	0.245

Note: *p* values indicate differences between young and elderly patients. $p < 0.05$ was considered statistically significant.

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; DBP, diastolic blood pressure; IQR, interquartile range; SBP, systolic blood pressure.

TABLE 2 Radiographic and laboratory findings of subjects based on age group

	≤60 years (*n* = 80)	>60 years (*n* = 23)	*p*
Abnormalities on chest X-ray			
Yes	33 (37.7)	17 (12.3)	
No	47 (42.3)	9 (13.7)	0.032
White blood cell count (10^9/L)	5.26 (4.38–6.74)	5.06 (3.80–7.91)	0.977
Absolute neutrophil (10^9/L)	2.94 (2.28–3.59)	2.95 (2.09–5.32)	0.479
Lymphocyte (%)	33.25 (25.85–43.50)	28.50 (12.78–32.53)	0.011
Absolute lymphocyte (10^9/L)	1.74 (1.36–2.41)	1.35 (0.86–1.84)	0.003
Red blood cell count (10^9/L)	4.65 (4.29–5.09)	4.02 (3.59–4.55)	0.000
Hemoglobin concentration	140 (127–154.25)	123.50 (108.75–135.50)	0.000
CRP	1.19 (0.46–8.52)	14.42 (3.72–36.45)	0.000
Alanine aminotransferase (U/L)	15.85 (10.68–27.83)	18.75 (12.28–29.13)	0.434
Aspartate aminotransferase (U/L)	20.55 (14.60–26.98)	21.90 (17.05–29.78)	0.057
Total serum protein	70.72 (68.10–73.39)	69.97 (66.91–74.96)	0.918
Serum albumin	40.90 (38.60–43.18)	36.70 (35.48–39.05)	0.000
Lactic dehydrogenase (U/L)	157.00 (134–192.25)	195.50 (161.50–260.00)	0.004
Creatine kinase (U/L)	68.00 (48.25–95.00)	63.00 (38.75–102.00)	0.394
FBG (mmol/L)	5.11 (4.12–14.00)	6.24 (5.35–8.96)	0.000
Creatinine	58.6 (48.0–74.78)	60.50 (54.45–71.53)	0.417
Uric acid	289.5 (238.5–345.0)	274.0 (213.25–316.50)	0.131

Note: *p* values indicate differences between young and elderly patients. $p < 0.05$ was considered statistically significant.

Abbreviations: CRP, C-reactive protein; FBG, fasting blood glucose.

patients. Therefore, strategic anemia prevention and management plans could provide more protection for severe COVID-19 cases.

When compared with younger patients, elderly patients were more likely to report chest CT abnormalities, lower lymphocyte percentages, and absolute lymphocyte counts. Pneumonia is a relatively long-lasting disease, often requiring 2–3 months to recover.[17] Elderly people or those with poor health may take longer to produce antibodies, thus experiencing a slower recovery from pneumonia.[18]

When compared with younger patients, elderly patients had significantly lower serum albumin levels. The average GNRI of elderly patients indicated no nutritional risk. There were no marked differences in GNRI values between elderly suspected cases and confirmed patients. GNRI is a general indicator that evaluates the nutritional status of patients, that is, it is an effective and simple risk indicator reflecting the nutritional risk of patients, and has been proven as a predictor of hospitalized elderly patient prognosis.[12] GNRI is based on serum albumin and weight loss measurements,

TABLE 3 Organ dysfunctions and main interventions based on age groups

	≤60 years (*n* = 80)	>60 years (*n* = 23)	*p*
Complications			
Shock			
Yes	0 (1.5)	2 (0.5)	
No	80 (78.5)	24 (25.5)	0.058
Acute cardiac injury			
Yes	0 (0.8)	1 (0.2)	
No	80 (79.2)	25 (25.8)	0.245
Arrhythmia			
Yes	0 (0.8)	1 (0.2)	
No	80 (79.2)	25 (25.8)	0.245
ARDS			
Yes	0 (3.0)	4 (1.0)	
No	80 (77.0)	22 (25.0)	0.003
Treatment			
Antiviral therapy			
Yes	59 (61.9)	23 (20.1)	
No	21 (18.1)	3 (5.9)	0.119
Nutritional support treatment			
Yes	14 (25.7)	20 (8.3)	
No	66 (54.3)	6 (17.7)	0.000
Oxygen inhalation			
Yes	13 (23.4)	18 (7.6)	
No	67 (56.6)	8 (18.4)	0.000
NIV			
Yes	0 (1.5)	2 (0.5)	
No	80 (78.5)	24 (25.5)	0.058
IMV			
Yes	0 (0.8)	1 (0.2)	
No	80 (79.2)	25 (25.8)	0.245
ECMO			
Yes	0 (0.8)	1 (0.2)	
No	80 (79.2)	25 (25.8)	0.245
ICU treatment			
Yes	0 (3.8)	5 (1.2)	
No	80 (76.2)	21 (24.8)	0.000
Hospital stay	17.0 (14.0–23.75)	20.5 (17.75–30.50)	0.043

Note: *p* values indicate differences between young and elderly patients. $p < 0.05$ was considered statistically significant.

Abbreviations: ARDS, acute respiratory distress syndrome; ECMO, extracorporeal membrane oxygenation; ICU, intensive care unit; IMV, invasive mechanical ventilation; NIV, noninvasive ventilation.

TABLE 4 Basic physical and laboratory findings between suspected cases and confirmed patients

	Suspected cases ($n = 23$)	Confirmed patients ($n = 23$)	p
Age, median (IQR), years	65 (62–73)	65.0 (63–69.25)	0.952
Sex			
Male	11 (10.8)	12 (12.2)	
Female	12 (12.2)	14 (13.8)	0.907
BMI (kg/m^2)	23.12 ± 2.10	24.88 ± 3.34	0.051
SBP (mmHg)	142.70 ± 23.85	141.50 ± 21.69	0.681
DBP (mmHg)	82.91 ± 15.07	85.23 ± 12.49	0.554
White blood cell count ($10^9/L$)	6.0 (4.50–9.35)	5.06 (3.80–7.91)	0.331
Absolute neutrophil ($10^9/L$)	4.02 (2.46–5.98)	2.95 (2.09–5.32)	0.483
Lymphocyte (%)	27.00 (18.3–33.2)	28.50 (12.78–32.53)	0.881
Absolute lymphocyte ($10^9/L$)	1.35 (0.98–1.99)	1.35 (0.86–1.84)	0.528
Red blood cell count ($10^9/L$)	4.60 (4.00–5.01)	4.02 (3.59–4.55)	0.009
Hemoglobin concentration	144.00 (121–149)	123.50 (108.75–135.50)	0.009
CRP	10.68 (2.15–39.99)	14.42 (3.72–36.45)	0.951
Alanine aminotransferase (U/L)	14.00 (12–17.9)	18.75 (12.28–29.13)	0.229
Aspartate aminotransferase (U/L)	19.3 (14.3–26.0)	21.90 (17.05–29.78)	0.130
Total serum protein	67.19 (65.36–73.21)	69.97 (66.91–74.96)	0.233
Serum albumin	37.60 (34.0–40.4)	36.70 (35.48–39.05)	0.779
Lactic dehydrogenase (U/L)	177.00 (143–257)	195.50 (161.50–260.00)	0.502
Creatine kinase (U/L)	62.00 (41.00–100.00)	63.00 (38.75–102.00)	0.912
FBG (mmol/L)	7.02 (5.42–7.41)	6.24 (5.35–8.96)	0.888
Creatinine	68.6 (60.0–76.6)	60.50 (54.45–71.53)	0.229
Uric acid	289.00 (247.00–326.00)	274.0 (213.25–316.50)	0.229
GNRI	102.65 ± 10.04	105.46 ± 7.72	0.345

Note: p values indicate differences between suspected and confirmed patients. $p < 0.05$ was considered statistically significant.

Abbreviations: BMI, body mass index; CRP, C-reactive protein; DBP, diastolic blood pressure; FBG, fasting blood glucose; GNRI, Geriatric Nutritional Risk Index; IQR, interquartile range; SBP, systolic blood pressure.

which are strong independent risk factors for mortality in elderly persons.[19] GNRI can also classify elderly patients according to morbidity and mortality risks in relation to pathologies often associated with malnutrition.[20] Malnutrition is one such reason for the high risk of elderly patients. Therefore, nutritional support can enhance the patient's tolerance to disease. Similarly, GNRI may be useful in identifying high-risk patients, such as elderly patients with COVID-19. This study found that most elderly patients admitted to our hospital were at low or no nutritional risk. After comprehensive treatment, including nutritional support, patient nutritional indices were increased when their condition improved. Importantly, all patients recovered. In this study, we confirmed that GNRI was a prognostic indicator for hospitalized elderly patients.

Our research had several limitations. First, this study was cross-sectional in nature, and participants were only recruited from our hospital. Therefore, the general applicability of the data was limited. A longitudinally designed study, including participants from different regions of China, is required to confirm our findings. Second, the number of participants was relatively small, especially in the elderly group. Third, our research was limited in terms of research metrics and variable selection. In addition, due to measurement limitations, some variables were not analyzed. Therefore, further research is required to confirm these findings.

In conclusion, nutritional assessment methods, like GNRI, may offer a quick and low-cost prognostic tool for older adults with greater nutritional risk. Nutritional support, including anemia prevention and management, should be actively given in a timely manner to improve COVID-19 prognosis. Moreover, it is also important to follow up discharged patients for nutritional maintenance.

TABLE 5 Basic physical and laboratory variables of elderly patients between admission and discharge

	Admission (n = 23)	Discharge (n = 23)	p
BMI (kg/m^2)	24.88 ± 3.34	24.06 ± 3.77	0.413
SBP (mmHg)	141.50 ± 21.69	126.12 ± 15.24	0.005
DBP (mmHg)	85.23 ± 12.49	73.12 ± 8.39	0.000
White blood cell count (10^9/L)	5.06 (3.80–7.91)	4.91 (4.00–6.04)	0.510
Absolute neutrophil (10^9/L)	2.95 (2.09–5.32)	2.92 (2.38–3.84)	0.699
Lymphocyte (%)	28.50 (12.78–32.53)	26.90 (23.00–34.40)	0.503
Absolute lymphocyte (10^9/L)	1.35 (0.86–1.84)	1.45 (1.08–1.86)	0.638
Red blood cell count (10^9/L)	4.02 (3.59–4.55)	3.70 (3.33–4.03)	0.095
Hemoglobin concentration	123.50 (108.75–135.50)	115.00 (102.00–123.50)	0.149
CRP	14.42 (3.72–36.45)	2.22 (0.61–9.33)	0.002
Alanine aminotransferase (U/L)	18.75 (12.28–29.13)	17.20 (11.00–27.90)	0.510
Aspartate aminotransferase (U/L)	21.90 (17.05–29.78)	17.90 (13.50–24.60)	0.014
Total serum protein	69.97 (66.91–74.96)	72.84 (69.49–76.96)	0.094
Serum albumin	36.70 (35.48–39.05)	41.30 (39.45–42.20)	0.000
Lactic dehydrogenase (U/L)	195.50 (161.50–260.00)	153.00 (133.50–181.00)	0.002
Creatine kinase (U/L)	63.00 (38.75–102.00)	41.00 (27.00–64.50)	0.029
FBG (mmol/L)	6.24 (5.35–8.96)	5.16 (4.91–6.43)	0.004
Creatinine	60.50 (54.45–71.53)	62.7 (52.95–70.80)	0.932
Uric acid	274.0 (213.25–316.50)	251.0 (191.0–298.0)	0.451
GNRI	105.46 ± 7.72	106.15 ± 7.57	0.759

Note: p values indicate differences between admission and discharge of confirmed patients. $p < 0.05$ was considered statistically significant.

Abbreviations: BMI, body mass index; CRP, C-reactive protein; DBP, diastolic blood pressure; FBG, fasting blood glucose; GNRI, Geriatric Nutritional Risk Index; SBP, systolic blood pressure.

ACKNOWLEDGMENTS

We thank the hospital staff for their efforts in recruiting patients, and we also thank the patients' support.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

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How to cite this article: Yuan Y, Mao J, Ou X, Huang L, Tu Q, Wang N. Geriatric Nutritional Risk Index assessment in elderly patients during the COVID-19 outbreak. *Health Sci Rep*. 2022;5: e560. doi:10.1002/hsr2.560