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COVID-19 Nedeniyle İnterne Edilen Geriatrik Hastalarda Malnütrisyon Riski ile Prognoz Arasındaki İlişki

The Relationship between Malnutrition Risk and Prognosis in Geriatric Patients Hospitalized for COVID-19

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ÖZ

Amaç: Çalışmamızda COVID-19 hastalığı nedeniyle hastaneye yatırılan geriatrik hastalarda nutrisyon durumunun hastalığın prognozuna olan etkisini değerlendirdik.

Materyal ve Metot: Bu prospektif tek merkezli çalışmaya pandemi servisimize yatırılan 65 yaş üstü 110 COVID-19 tanılı hasta dâhil edildi. Malnutrisyon riski Nutrityonel Risk Taraması 2002 (NRS 2002) ile değerlendirildi. Hastalar NRS 2002 skoruna göre ≥3 puan (1. grup) ve <3 puan (2. grup) olacak şekilde iki gruba ayrıldı. Hastaların prognoz belirteçleri kaydedildi. Tüm bu parametreler bu iki grup arasında değerlendirildi. İstatistiksel anlamlılık düzeyi p<0,05 olarak belirlendi.

Bulgular: Çalışmaya toplam 110 hasta (Erkek/ Kadın:51/59) dahil edildi. 1.grupta yatış süresi, tomografi tutulumu, entübasyon ve yoğun bakıma sevk oranları, lökosit, C reaktif proteini (CRP), ferritin, d-dimer düzeyleri 2. gruba göre daha yüksekti (p<0,05). 1.gruptaki 35 olgu taburcu, 18 olgu 1. basamak yoğun bakıma sevk, 2 olgu 3. basamak yoğun bakıma sevk edildi. 2. Grupta ise 53 olgu taburcu, 2 olgu 1. basamak yoğun bakıma sevk edildi. NRS2002 skoru ile yaş, solunum sayısı, lökosit, üre, kreatinin, CRP, d-dimer ve yattığı gün sayısı arasında pozitif yönde anlamlı bir ilişki saptandı (p<0,05).

Sonuç: COVID-19 tanısı ile hastaneye yatırılan geriatrik hastalarda nutrisyonel durumun hastalığın prognozunu etkilediğini gösterdik. Malnütre hastaların prognostik belirteçleri daha kötü, hastanede yatış süresi daha uzundur ve yoğun bakım ihtiyacı belirgin olarak artmıştır.

Anahtar Kelimeler: COVID-19, geriatri, malnütrisyon, NRS 2002

ABSTRACT

Objective: We evaluated the effect of nutritional status on the prognosis of the disease in geriatric patients hospitalized due to COVID-19 disease.

Materials and Methods: 110 patients over 65 years old were included. Malnutrition risk was assessed by Nutritional Risk Screening 2002 (NRS 2002). The patients were divided into two groups according to the NRS 2002 score (≥3 as group-1, <3 as group-2). Prognosis markers of the patients were recorded. Statistical significance level was set at p<0.05.

Results: The study was conducted 110 patients (Man/ Woman:51/59). In group-1, duration of hospitalization, tomography involvement, intubation rate and referral to intensive care, respiratory rate, leukocyte count, C reactive protein (CRP), ferritin, d-dimer levels were higher than group-2 (p<0.05). In group 1; 35 cases were discharged, 18 cases were transferred to 1st level intensive care, and 2 cases were transferred to 3rd level intensive care. In the group 2, 53 cases were discharged, and 2 cases were transferred to 1st level intensive care unit. There was a significant positive correlation between NRS 2002 score and age, respiratory rate, leukocyte, CRP, d dimer and days of hospitalization score (p<0.05).

Conclusion: Malnourished patients have higher poor prognostic markers, longer hospital stay and more intensive care needs.

Keywords: COVID-19, geriatrics, malnutrition risk, NRS 2002

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INTRODUCTION

Six coronavirus strains, including Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) and Middle East Respiratory Syndrome Coronavirus (MERS-CoV), are known to cause respiratory diseases in humans.[1] SARS-CoV and MERS□CoV are corona viruses that can cause severe respiratory failure in humans.[2] COVID-19 disease occurred in Wuhan, China in December 2019, and then spread to many countries of the world, including Turkey was declared a pandemic.[3-5] In COVID-19 disease, the prognosis is worse and mortality rates are higher in older adults, those with low body resistance and polymorbid individuals.[6,7] Although more than 159 million people are infected worldwide due to COVID-19 disease, an effective antiviral treatment has still not been found.[5,8] Nutrition is one of the important elements of healthcare. Nutritional deficiency and imbalance play a direct or indirect role in the pathophysiology of many diseases. Malnutrition increases the risk of developing the disease in individuals, extends the duration of hospital stay, and increases post-discharge mortality and re-hospitalizations.[9] Although these bad effects of malnutrition are known in other diseases, there is not enough data on the effects of COVID-19. For this purpose, the present study was planned in the vulnerable group in epidemic diseases and individuals over 65 years of age who are at risk for malnutrition. We aimed to investigate the relationship between the risk of malnutrition and the prognosis of the disease in patients over 65 years infected by COVID-19.

MATERIALS AND METHODS

The study was designed as a cross-sectional study and has been approved by the Ethics Committee of Umraniye Education and Research Hospital (Date: 14.04.2020; decision no: B.10.1.TKH.4.34.H.GP.0.01/107). For the power analysis, the study titled 'Prognostic significance of malnutrition for long-term mortality in community-acquired pneumonia: a propensity scores matched analyses' was taken as reference. Considering the correlation coefficient between long-term clinical outcomes and nutritional status r: 0.86 $p<0.001$, the sample size per group was calculated as minimum 55, with a Type 1 error of 0.05 and the strength of the study being 80%. With a 20% loss, a total of 110 patients (55 patients for the first group and 55 patients for the second group) were incorporated in the study. Since the first detection of SARS-COV 2 infection on 03/10/2020 in Turkey, a total of 110 patients, 51 males and 59 females, who were over 65 years of age admitted to our hospital's pandemic services, were included in the study according to the order of hospitalization. Patients under 65 years of age and with a history of malignancy that could lead to malnutrition were not included in the study. A detailed history was taken from all patients and their physical examinations were performed. Biochemical blood tests (urea, creatine, C-reactive protein (CRP), procalcitonin, d-dimer, ferritin, calcium, lactate dehydrogenase, albumin, leukocyte, lymphocyte, hemoglobin, thrombocyte, neutrophil lymphocyte ratio, partial arterial oxygen pressure (PaO2), oxygen saturation (SaO2), computed tomography findings, duration of hospitalization, clinical discharge, intensive care transfer and intubation rates were recorded. The blood samples of the patients were taken between 08.00 and 10.00 on an empty stomach. Blood samples were collected into SST II, LH PST II and EDTA tubes and analyzed simultaneously.

Metabolic Parameters: Plasma glucose by the enzymatic test method, calcium, phosphorus, alanine transaminase, aspartate transaminase, gamma glutamyl transferase, alkaline phosphatase, amylase, albumin and triglyceride concentration by enzymatic colorimetric test, creatinine by Jaffe` method, CRP by immunoassay, blood urea nitrogen by spectrophotometer, potassium, sodium, and chlorine level with ion-selective electrode analysis was measured with Architect plus c4000 (Abbott, USA). D-dimer was measured by immunoturbidimetric method with STA-Liatest device (Asnières-sur-Seine, France). Hemogram parameters were measured with the Mindray MC6800 device (Shenzhen, P. R. China.) by the electrical impedance method. Procalcitonin was measured by the ELFA method with the Biomerieux screw device (Hennigsdorf, Germany). Blood gas measurements were measured with ABL800 FLEX device (Bronshoj, Denmark).

Nutrition assessment: Nutritional Risk Screening 2002 (NRS 2002) questionnaire was used in the nutritional evaluation of the patients. Patients with a NRS 2002 score ≥3 were defined as increased malnutrition risk. Those with a score below 3 points were considered as normal nutritional status.[10] The patients were divided into two groups according to the NRS 2002 score. Those with NRS 2002 ≥3 was included in group 1 and those with NRS 2002 <3 was included in group 2. All parameters were compared between these two groups.

Statistical Analysis: Statistical analyzes in the study were analyzed using the Statistical Package for the Social Sciences 25.0, IBM, Armonk, NY, United States (SPSS 25.0) program. Distribution of data was found to be normal with the Kolmogorov Smirnov test. While evaluating the study data, besides descriptive statistical methods (mean, standard deviation, frequency), t-test and One Way Anova test were used for parametric data. Pearson correlation analysis was performed to determine the relationship between quantitative data, and regression analysis was used to determine the associated parameters. Significance was evaluated at $p<0.05$ levels for all values.

RESULTS

The study was conducted between 01.04.2020 and 01.06.2020 with a total of 110 patients (51 males and 59 females) aged 75.1±7.6 years. The general characteristics of the patients are summarized in Table 1. When patients were compared according to NRS 2002 scores, mean age, respiratory rate per minute, white blood cell (WBC), urea, creatinine, CRP, ferritin, D-dimer, and the mean number of days of lying were higher in group 1than group 2. Arterial blood PaO2 value, Sp02, albumin levels were found to be lower in group 1 compared to group 2 (Table 2). In the correlation analysis, a positive significant correlation was found between NRS 2002 score and age, urea, crp, respiratory rate, WBC, creatine, d-dimer, and duration of hospitalization. There was also an inversely significant correlation between NRS 2002 score and arterial blood po2, Spo2, albumin and hemoglobin values. No statistically significant relationship was found between lymphocyte, thrombocyte, neutrophil lymphocyte ratio, procalcitonin, ferritin, calcium, LDH and CT findings (Table 3). According to the regression analysis results, the parameters affecting the NRS 2002 score were age, albumin, arterial blood p02 and spo2 values (Table 3).

Of the 110 patients participating in the study, 88 were discharged, 20 were transferred to the 1st level intensive care unit, and 2 were transferred to the 3rd level intensive care unit. No statistically significant relationship was found between gender and type of discharge (p: 0.394). In addition, no statistically significant correlation was found between CT findings and the type of discharge (p: 0.583). When the relationship between the comorbidity and the type of discharge was examined, it was found that 15 of the 17 patients without additional disease were discharged and 2 were transferred to intensive care. Diabetes and cardiovascular disease were present in one of the patients who was transferred to intensive care unit and intubated. The other patient had respiratory system, cardiovascular system, and neurological system diseases.

A statistically significant relationship was found between the respiratory rate, arterial blood p02 value, spo2, neutrophil lymphocyte ratio, albumin, urea, creatine, crp, ferritin, d-dimer and calcium

Table 1. Demographic data, and clinical parameters.

		N	%
Gender	Male	51	46.4
	Woman	59	53.6
Nutritional Risk Screening 2002	≥3	55	50
	<3	55	50
Involvement Severity on Tomography	Light	58	52.7
	Middle	30	27.3
	Heavy	22	20
Type of involvement on tomography	Unilateral	19	17.3
	Bilateral	91	82.7
Type of discharge	Discharge	88	80
	ICU / Extubate	20	18.2
	ICU / Intubate	2	1.8
Mortality	SARS COV-2	17	15.4
	Nrs2002≥3	16	29
	Nrs2002<3	1	1.8

ICU / Extubate: Extubated and transferred to the intensive care unit; ICU / Intubate: Intubated and transferred to the intensive care unit; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus-2; Nrs2002: Nutritional Risk Screening 2002.

Table 2. Comparison of all parameters according the NRS 2002 score.

	NRS 2002	Mean	Standard deviation	Mini-mum	Maxi-mum	P value*
Hospitalization Day	Group 1	9.35	5.948	1	27	0.006
	Group 2	6.47	4.826	1	25	
Age (years)	Group 1	77.33	7.732	65	93	0.002*
	Group 2	72.91	6.859	65	95	
Respiratory Rate (/min)	Group 1	23.13	3.991	16	40	0.011*
	Group 2	21.47	2.508	17	28	
Partial oxygen pressure (80-100 mmHg)	Group 1	80.25	18.02	45	129	0.042*
	Group 2	85.93	9.388	50	123	
Oxygen Saturation (% 95-100)	Group 1	93.62	4.403	77	100	0.016*
	Group 2	95.35	2.823	87	100	
Leukocyte (4.1-8.9 103 / ul)	Group 1	8.2693	3.60333	1.8	17	0.039*
	Group 2	6.9907	2.75769	2.8	17	
Lymphocyte (1.2-5.2 103 /ul)	Group 1	3.0647	12.3778	0.48	93	0.396
	Group 2	1.64	0.6985	0.23	3.3	
Hemoglobin (12.4-14.8 g/l)	Group 1	11.902	1.918	7.9	15.6	0.132
	Group 2	12.416	1.6287	7.6	17.1	
Neutrophil lymphocyte ratio	Group 1	6.112	5.66806	1.17	29	0.081
	Group 2	3.9647	7.03454	0.97	52	
Albumin (3.5-5.5 g/dl)	Group 1	32.89	9.739	18	44	0.000*
	Group 2	38.07	3.42	29	44	
Urea (5-11 mg/dl)	Group 1	69.95	44.325	23	254	0.003*
	Group 2	47.98	30.372	19	194	
Creatinin (<1 mg/dl)	Group 1	1.4744	1.30756	0.5	8.1	0.046*
	Group 2	1.0655	0.73541	0.5	5.6	
C-reactive protein (3mg/ l)	Group 1	12.33	8.901	0	37	0*
	Group 2	4.93	4.88	0	22	
Procalcitonine (< 0.50 ng/mL)	Group 1	2.9605	14.9474	0.05	109	0.825
	Group 2	3.8815	26.9569	0.05	200	
Ferritine (20-500 ml/ng)	Group 1	570.35	1093.32	16	7668	0.02*
	Group 2	212.96	260.08	7	1192	
D-Dimer (0-550 µg/mL)	Group 1	3544.78	4485.97	9	20000	0.004*
	Group 2	1447.65	2909.61	200	20000	
Calcium (8.5 ile 1.03 mg/ dL)	Group 1	8.684	0.7396	6.3	10.8	0.506
	Group 2	8.769	0.5947	7.9	7.9	
Lactate Dehydrogenase (90-250 U/L)	Group 1	398.8	173.064	113	1045	0.524
	Group 2	354.87	478.06	134	3686	

Nrs2002: Nutritional Risk Screening 2002; *: Mann Whitney U test.

Table 3. The correlation analysis between the NRS 2002 with other parameters.

	NRS 2002	P value
	Pearson Correlation	
Age (years)	0.408**	0
Respiratory Rate (min)	0.201*	0.035
Partial oxygen pressure (80-100 mmHg)	-0.247**	0.009
Oxygen Saturation (%95-100)	-0.239*	0.012
Leukocyte (4.1-8.9 103 /ul)	0.219*	0.021
Lymphocyte (1.2-5.2 103 /ul)	0.026	0.785
Hemoglobin (12.4-14.8 g/l)	-0.201*	0.035
Neutrophil Lymphocyte Ratio	0.176	0.065
Albumın (3.5-5.5 g/dl)	-0.385**	0
Urea (5-11 mg/dl)	0.358**	0
Creatinin (<1 mg/dl)	0.251**	0.008
C-reactive protein (<3mg/l)	0.405**	0
Procalcitonine (< 0.50 ng/mL)	-0.011	0.913
Ferritine (20-500 ml/ng)	0.179	0.061
D-Dimer (0-550 µg/mL)	0.255**	0.007
Calcium (8.5 ile 1.03 mg/dL)	-0.047	0.623
Lactate Dehydrogenase (90-250 U/L)	0.104	0.28
Hospitalization day	0.295**	0.002

Nrs2002: Nutritional Risk Screening 2002.

Table 4. Comparison of all parameters according to the type of discharge.

		Mean	Standard deviation	p value	Pearson correlation	p value
Age (years)	Discharge	74.32	14.7	0.019	0.156	0.103
	ICU / extubate	79.2	11.5			
	ICU / intubate	69.5	3.6			
	total	75.12	27.10			
Respiratory Rate (/min)	Discharge	21.94	7.3	0.023	0.157	0.101
	ICU / extubate	24.1	4.2			
	ICU / intubate	20.1	0.1			
	total	22.3	1.3			
Partial oxygen pressure (80-100 mmHg)	Discharge	84.81	1.11	0.04	-0.212*	0.026
	ICU / extubate	75.7	26.1			
	ICU / intubate	81.5	1.4			
	total	83.09	4.12			
Oxygen Saturation (%95-100)	Discharge	4.4	16.3	0.005	-0.226*	0.018
	ICU / extubate	92.05	1.10			
	ICU / intubate	5.4	14.11			
	total	94.48	9.5			
Lymphocyte (1.2-5.2 103 /ul)	Discharge	27.7	2.2	0.84	-0.043	0.657
	ICU / extubate	29.8	0.86011			
	ICU / intubate	1.2	23.2			
	total	27.5	17.2			
Neutrophil lymphocyte ratio	Discharge	9.3	2.10	0.016	0.205*	0.031
	ICU / extubate	26.11	14.6			
	ICU / intubate	1.6	11.8			
	total	10.12	28.7			
C-reactive protein (<3mg/l)	Discharge	1.7	29.5	0.003	0.261**	0.006
	ICU / extubate	14.14	26.11			
	ICU / intubate	7.3	13.3			
	total	1.8	17.1			
Procalcitonine (< 0.50 ng/ mL)	Discharge	2.4	27.5	0.252	0.123	0.2
	ICU / extubate	17.5	17.2			
	ICU / intubate	0.24	0.19799			
	total	13.5	17.2			
D-Dimer (0-550 µg/mL)	Discharge	1684.15	2090.51	0.1	0.362**	0.1
	ICU / extubate	6119.7	7103.6			
	ICU / intubate	1992.5	2164.45			
	total	2496.22	3908.11			
Hospitalization day	Discharge	1.8	5.6	0.022	-0.255**	0.007
	ICU / extubate	5.5	25.1			
	ICU / intubate	4.5	0.707			
	total	1.7	12.4			

ICU / Extubate: Extubated and transferred to the intensive care unit; ICU / Intubate: Intubated and transferred to the intensive care unit; Nrs2002: Nutritional Risk Screening 2002; *: One-way ANOVA p values; **: Spearman's rho.

value and the type of discharge of the patients ($p<0.05$). While this relationship was positive with NLR, urea, creatine, crp, ferritin, d-dimer, it was negative with arterial blood p02, sp02, albumin, calcium value (Table 4).

DISCUSSION AND CONCLUSION

We examined the relationship between malnutrition risk and prognosis of the patients in this study. At the end of the study, we found that poor nutritional status prolonged the length of stay in COVID-19 patients, and the rates of intubation, intensive care transfer rate referral and mortality were higher in these patients.

Malnutrition causes many adverse metabolic events that affect the immune system and hinder the body's ability to adapt, heal, and survive. The susceptibility of malnourished individuals to bacterial and parasitic infections and especially respiratory tract infections has been found. Saunders et al. clearly revealed

the relationship between malnutrition and airway functions in their study.[11] It has been reported that COVID-19 can infect human respiratory epithelial cells by interacting with the human ACE2 receptor.[12,13]

Malnutrition can delay recovery and prolong hospital stay, increase susceptibility to infection, reduce the quality of life, and even increase the mortality rate in most patients.[9] The present study has once again revealed the relationship between malnutrition and length of stay in hospital, in concordant to other studies. Since malnutrition disrupts the functions of the organs, it causes the prolongated hospitalization, development of complications, recurrent hospital admissions, and decreased life expectancy.[14]

When looking at the relationship between gender and NRS 2002 score, malnutrition risk was found in 47% of men and 52% of women. According to this result, there was no significant difference between gender and malnutrition risk.

It has been shown that malnutrition is associated with increased mortality in acute conditions.[15] Matthay et al. found that patients with diabetes, hypertension, coronary heart disease, chronic obstructive pulmonary disease, cerebro vascular disease and kidney disease exhibited worse clinical outcomes when infected with SARS-CoV-2 than those without additional disease.[16] In the present study, NRS 2002 score was found to be higher in patients with comorbid diseases. It was observed that 15 of 17 patients without any additional disease were discharged. These results were consistent with other publications in terms of the relationship between comorbidity and disease severity.

In a study conducted by Chen et al., they showed that 75% of the patients had bilateral pneumonia and the remaining 25% had unilateral pneumonia in chest X-ray and CT imaging.[17] In the present study, we found that 83% of 110 patients had bilateral pneumonia and 17% had unilateral pneumonia. Our results in terms of lung involvement were consistent with other studies in the world in this age group.

According to the results obtained from the case studies of the European Center for Disease Prevention and Control, it was found that 80% of COVID-19 patients had mild pneumonia, 14% more severe pneumonia and 6% were critically ill.[18] In the present study, 80% patient was discharged from the hospital. 18% patient was transferred to the 1st level intensive care unit without being intubated. 1.8% patient was intubated and transferred to the 3rd level intensive care unit. In present study, while the mortality rate of patients who were followed up for COVID-19 disease was 15.4%, this rate was quite high with 29% in the group with NRS 2002≥3. When the computed tomography findings were examined, moderate and severe involvement was found to be significantly higher in the NRS 2002≥3 group. These data are consistent with the data of other studies in terms of the severity of the disease. A retrospective study conducted during the corona virus epidemic found that only 6% of patients infected with SARS-CoV developed acute kidney damage, and approximately 92% of patients with SARS with acute kidney damage died.[19] A recent prospective study involving 701 patients with moderate or severe disease showed that 43.9% of patients had proteinuria and 26.7% hematuria, and approximately 13% had elevated levels of serum creatinine, blood urea nitrogen, or both. In the present study, we found a significant relationship between high creatine and blood urea nitrogen levels and NRS score and the type of discharge. Urea and creatinine levels were found to be higher in patients who transferred to intensive care.

In the study conducted by Qin et al., serum ferritin levels were found to be high in critically ill patients in the intensive care unit.[20] In the present study, it was concluded that the risk of malnutrition was higher in patients with high ferritin levels and the prognosis of these patients was worse. The CRP level was found to be high in COVID-19 patients and it was shown to be associated with the severity of the disease.[21] Luo et al. suggest that the CRP level may be important in grading the severity of the disease.[22] Consistent with these data, it was found in our study that patients with high CRP levels had higher NRS 2002 scores and were hospitalized for a longer time. Regarding procalcitonin, there was no significant relation neither in terms of malnutrition nor in terms of prognosis of the patients in our study. In the retrospective cohort study of Zhou F et al., it was found that increased d-dimer levels were associated with increased in-hospital mortality.[23] In our study, a statistically significant relationship was found between d-dimer and the prognosis and malnutrition status.

In the present study, we tried to evaluate the effect of malnutrition risk on the prognosis of the disease during the SARS COV-2 pandemic process in elderly patients.

Our study is valuable because it is one of the first studies evaluating the effect of malnutrition risk on COVID-19 in the elderly. Malnutrition is known to

increase susceptibility to other infections and especially respiratory infections in the elderly. However, there is not enough information about the effect of malnutrition in COVID-19 on the course of the disease.

As a result of our study, the duration of stay was longer in elderly patients at risk of malnutrition. Intensive care referral rates, intubation rates and mortality were higher in these patients. Among the laboratory findings that can be considered as prognostic, WBC, urea, creatine, CRP, ferritin, and d-dimer were found to be higher in this group. The limitation of our study is this was a cross-sectional study and did not obtain direct evidence of causal relationship. Secondly, the patients' NRS 2002, and laboratory measurements were evaluated at a single time point. Thirdly, our study was a single center study, so our results may not be representative of all patients with COVID-19.

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REFERENCES

1. Sohrab SS, Suhail M, Kamal MA, et al. The Emergence of Human Pathogenic Coronaviruses: Lectins as Antivirals for SARS-CoV-2. Curr Pharm Des. 2020;26(41):5286-5292. doi:10.2174/1381612826666200821120409
2. Fehr AR, Perlman S. Coronaviruses: an overview of their replication and pathogenesis. Methods Mol Biol. 2015;1282:1□23. doi:10.1007/978-1-4939-2438-7_1
3. Zhao S, Lin Q, Ran J, et al. Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: A data-driven analysis in the early phase of the outbreak. Int J Infect Dis. 2020;92:214-217. doi:10.1016/j.ijid.2020.01.050
4. World Health Organization. Novel Coronavirus – Japan (exChina); 2020. https://www.who.int/csr/don/16-january-2020-novel-coronavirus-japan-ex-china/en/. Accessed date 16 January 2020.
5. Worldometer. Coronavirus Cases; 2021. https://www.worldometers.info/coronavirus/. Accessed date May 2021.
6. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 Cases from the Chinese Center for Disease Control and Prevention. JAMA. 2020;323(13):1239-1242. doi:10.1001/jama.2020.2648
7. Ji Y, Ma Z, Peppelenbosch MP, Pan Q. Potential association between COVID-19 mortality and health-care resource availability. Lancet Glob Health. 2020;8(4):e480. doi:10.1016/S2214-109X(20)30068-1
8. Lazaridis II, Kraljević M, Schneider R, et al. The Impact of the COVID-19 pandemic on bariatric surgery: Results from a Worldwide Survey. Obes Surg. 2020;30(11):4428-4436. doi:10.1007/s11695-020-04830-8
9. Saunders J, Smith T. Malnutrition: causes and consequences. Clin Med. 2010;10(6):624. doi:10.7861/clinmedicine.10-6-624
10. Kondrup J, Rasmussen HH, Hamberg OLE, et al. ESPEN Working Group. Nutritional risk screening (NRS 2002): a new method based on an analysis of controlled clinical trials. Clin Nutr. 2003;22(3):321-336. doi:10.1016/s0261-5614(02)00214-5
11. Saunders J, Smith T, Stroud M. Malnutrition and undernutrition. Medicine. 2010;39(1):45-50. doi: https://doi.org/10.1016/j.mpmed.2010.10.007
12. Song W, Gui M, Wang X, Xiang Y. Cryo-EM structure of the SARS coronavirus spike glycoprotein in complex with its host cell receptor ACE2. PLoS Pathog. 2018;14(8):1-19. doi:10.1371/journal.ppat.1007236
13. Xu X, Chen P, Wang J, et al. Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission. Sci China Life Sci. 2020;63:1-4. doi:10.1007/s11427-020-1637-5
14. Martín-Palmero Á, Serrano-Pérez A, Chinchetru-Ranedo M, et al. Malnutrition in hospitalized patients: results from La Rioja. Nutr Hosp. 2017;34(2):402-406. doi:10.20960/nh.458
15. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. Clin Nutr. 2008;27(1):5-15. doi:10.1016/j.clnu.2007.10.007

16. Matthay MA, Aldrich JM, Gotts JE. Treatment for severe acute respiratory distress syndrome from COVID-19. Lancet Respir Med. 2020;8:433-434. doi:10.1016/S2213-2600(20)30127-2
17. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. 2020;395(10223):507-513. doi:10.1016/S0140-6736(20)30211-7
18. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med. 2020;382(18):1708-1720. doi:10.1056/NEJMoa2002032
19. Chu KH, Tsang WK, Tang CS, et al. Acute renal impairment in coronavirus-associated severe acute respiratory syndrome. Kidney Int. 2005;67(2):698-705. doi:10.1111/j.1523-1755.2005.67130.x
20. Qin C, Zhou L, Hu Z, et al. Dysregulation of immune response in patients with COVID-19 in Wuhan, China. Clin Infect Dis. 2020. doi:10.1093/cid/ciaa248
21. Lippi G, Plebani M. Procalcitonin in patients with severe coronavirus disease 2019 (COVID-19): A meta-analysis. Clin Chim Acta. 2020;505:190-191. doi:10.1016/j.cca.2020.03.004
22. Luo X, Zhou W, Yan X, et al. Prognostic value of C-reactive protein in patients with coronavirus 2019. Clin Infect Dis. 2020;71(16):2174-2179. doi:10.1093/cid/ciaa641
23. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. 2020;395(10229):1054. doi:10.1016/S0140-6736(20)30566-3