ORIGINAL RESEARCH

Mortality Study of Patients with Omicron Infection Before and After the Implementation of the New Crown Standard

Wei Liu, MD; Chun Liu, MD; Aimin Wang, MD; Xinhua Ma, MD; Yang Sun, BM; Chunhui Li, MD; Lina Zhang, MD; Yong Lu, MD

ABSTRACT

Objective • To investigate the mortality rate of patients with Omicron infection before and after the implementation of the new crown standard, and to evaluate the impact of new treatment protocols on the mortality rate of patients with Omicron infection.

Methods • Clinical data of 1419 Omicron-infected patients treated in our hospital from April 10, 2022 to June 3, 2022 were collected(Patients diagnosed with Omicron infection who met the diagnostic criteria in the "Diagnosis and treatment protocol for novel coronavirus pneumonia (trial version 9)"15 and whose nasal/pharyngeal swab samples were typed as Omicron variants by laboratory viral genotyping). They were divided into the observation group (April 25 2022 - June 3 2022) and the control group (April 10 2022 - April 24 2022) before and after the implementation criteria. Clinical data of 1419 patients were collected and compared between the two groups on whether to use anticoagulant drugs, whether to use antiplatelet drugs, gender, whether to use new drugs of thymosin/thymus method, age, whether to use herbal medicine, whether to use Fuzheng prescription, blood routine, liver function, kidney function indicators, mortality of patients.

Results • A total of 1419 patients were initially selected; 501 patients with incomplete information were excluded, and finally, 918 patients were included. According to the time period before and after the application criteria, they were divided into an observation group (586 cases) and a control group (332 cases). There were no statistically significant differences in gender, age, antiplatelet drug use, and herbal medicine use between the two groups ($P < .05$). However, there were significant differences in the use of anticoagulant drugs, thymidine/thymidine drugs, and Fu Zhengfang between the two groups. It was statistically significant that the mortality rate in the observation group (2.39)% was significantly lower than that in the control group (5.12)%. $P < .05$ White blood cell count, red blood cell ratio, lymphocyte count, hemoglobin, neutrophil count, and neutrophil ratio were not significantly different between the two groups ($P < .05$) .In comparison to the control group (4.92±8.00)10^9/L, the platelet count in the observation group (4.77±3.41)10^9/L was considerably lower. The difference was statistically significant ($P < .05$). The comparison of total bilirubin, total protein values and alkaline phosphatase values between the two groups was not significant ($P < .05$). In the observation group, albumin (38.71±6.39) g/L, glutamate transaminase (23.93±26.03) U/L, glutathione transaminase (26.12±25.53) U/L, gamma-glutamyltransferase (34.28±52.3) U/L, globulin values (28.13±5.55) g/L were significantly lower than those of the control group (36.66±7.08) g/L, (30.36±65.77) U/L, (33.29±49.72) U/L, (43.76±80.23) U/L, (29.85±5.67) g/L, the difference was statistically significant ($P < .05$). Between the two groups, there were no significant differences in the values of uric acid or creatinine ($P > .05$). Levels and uric acid readings did not differ significantly, $P > .05$. The difference between the urea values of the observation group (7.44±6.34 mmol/L) and the control group (8.75±7.51 mmol/L) was statistically significant ($P < .05$).

Conclusion • After the implementation of the treatment protocol for COVID-19 (Trial Version 9), the number of death cases among patients with Omicron variant infection has significantly decreased. The treatment protocol is safe and feasible and can be widely applied in clinical settings..And it will further promote the development and administration of vaccines to prevent and control the spread of the novel coronavirus, reducing the occurrence of patients and death cases. (*Altern Ther Health Med.* 2024;30(10):238-243).

Wei Liu, MD, Attending doctor; **Xinhua Ma, MD**, Chief physician; **Yang Sun, BM**, Supervisor nurse; **Lina Zhang, MD**, Chief physician; Department of critical care medicine, Xiangya Hospital of Central South University, Changsha, Hunan, China; Hunan Provincial Clinical Research Center for Critical Care Medicine, Xiangya Hospital of Central South University, Changsha, Hunan, China; National Clinical Research Center for Geriatric Disorders, Xiangya Hospital of Central South University, Changsha, Hunan, China. **Chun Liu, MD**, Chief physician; Department of Respiratory and Critical Care Medicine, the third Xiangya Hospital, Central South University, Changsha, Hunan, China. **Aimin Wang, MD**, Associate chief physician; Department of emergency, Xiangya Hospital, Central South University, Changsha, Hunan, China. **Chunhui Li, MD,** Chief physician; Infection Control Center, Xiangya Hospital of Central South University, Changsha, Hunan, China. **Yong Lu, MD,** Chief physician; Luwan Branch of Ruijin Hospital Affiliated to Shanghai Jiaotong University School of Medicine, Shanghai, China.

Corresponding author: Lina Zhang, MD
E-mail: Zln7095@163.com
Corresponding author: Yong Lu, MD
E-mail: 18917762053@163.com

INTRODUCTION

The virus has now spread to 222 nations and territories since the global pandemic of new coronavirus disease2019 (COVID-19), with a cumulative total of more than 596.87 million confirmed cases and 6.46 million deaths worldwide.[1] COVID-19 poses a serious risk to people's health and safety. The threat posed by COVID-19 to people's health and safety is significant. As the COVID-19 epidemic continues, the

virus continues to evolve and mutate, with multiple mutations having emerged.[2] B.1.1529, a 2019-nCoV mutant strain, was initially discovered in a case sample from South Africa on November 9, 2021. On November 26 of the same year, the World Health Organization (World Health Organization (WHO) The World Health Organization (WHO) designated it as the Omicron variant on November 26 and listed it as a major current prevalence variant of concern (VOC).In the WHO, classification is based on factors such as the transmissibility of the Omicron variant, the severity of the disease, and immune evasion.

On December 9, 2021, the Tianjin Center for Disease Control and Prevention conducted whole genome sequencing and sequence analysis on respiratory specimens of asymptomatic COVID-19-infected persons imported from outside Tianjin. After reexamination by the Chinese Center for Disease Control and Prevention, the Omicron variant of COVID-19 was confirmed and detected. The infected person is a closed-loop immigration control worker and is being treated in isolation in a designated hospital. It is reported that this is the first time that the Omicron variant of the novel coronavirus has been found in the Chinese mainland. Omicron belongs to B.1.1.529 of the Pangolin typing, 21K and 21L of the Nextstrain typing and GR/484A of the GISAID typing, and is further divided into BA.1, BA.2 and BA.3 branches according to the mutation sites specific to B.1.1.529, with BA.1 being the main branch. The BA.2 branch does not show an amino acid deletion at positions 69-70 of the stinger protein. The gene sequence analysis of the Omicron variant showed that there were about 50 nucleotide variants in the Omicron variant, and more than 30 of them were on the stinger protein of the virus,these mutations are concentrated in the virus's receptor-binding domain (RBD), a crucial area for the virus to bind with the ACE2 receptors on the surface of host cells.The abnormalities could make the virus more capable of attaching to human cells and spreading more widely; they could also cause more immune escapes, resulting in secondary infections and reduced vaccine efficacy.[3] The incubation time for omicron ranges from 1 to 14 days, with the majority of cases lasting 3 to 7 days. Malaise, a dry cough, and fever are the major symptoms. Some individuals may experience congestion, a runny nose, a sore throat, diminished or absent taste and smell, conjunctivitis, myalgia, and diarrhea.[4] In extreme cases, hypoxia or respiratory distress may appear a week after the initial symptoms and may proceed quickly to acute respiratory distress syndrome, septic shock, irreversible metabolic acidosis and coagulopathy, and multi-organ failure.[5] Only a very small percentage of individuals may additionally exhibit ischemic necrosis of the extremities and involvement of the central nervous system. It is crucial to highlight that during the course of the illness, people with severe and critical forms of the disease may experience low, moderate, or even no significant fever. Low fever, a slight malaise, or no overt symptoms may be present in mild cases.[6]

In comparison to the original SARS-CoV-2 strain and the Alpha variant, the Omicron variant has a shorter incubation period and is more contagious, being 60% more contagious.[7] The Omicron variant is one of the most infectious strains of the novel coronavirus. The basic number of regeneration of this strain is 18.6, and an average of one infected person can infect 18 people during the infection period.[8] Asymptomatic infected persons account for a relatively high proportion, and a small number of infected persons have developed fever, cough, sore throat and other symptoms, but the nucleic acid test results are still negative, which increases the difficulty of early detection and control of cases, and easily leads to the spread and spread of cases. The incubation period of Omicron ranges from 1 to 14 days, mostly 3 to 7 days. The average time from infection to infection is 2-3 days, and the shortest time is only about 24 hours. When some infected people are found to be positive for nucleic acid tests, latent transmission is caused in families, communities and other groups.[9,10] The increase in the survival time of the virus in vitro has further increased the transmission capacity of the epidemic and increased the possibility of "transmission from object to person". The main manifestations of Omicron are fever, dry cough and fatigue. Nasal congestion, runny nose, sore throat, loss or loss of smell and taste, conjunctivitis, myalgia and diarrhea are the main manifestations in some patients.[11,12] The most concerning characteristic of the Omikron variant is its significantly increased transmissibility. Its rate of transmission is much faster than that of the previous Delta variant and the original strain of the virus.This increased transmissibility is partly attributed to multiple mutations in its spike protein, which enhance the virus's binding affinity to the ACE2 receptors on host cells, thereby improving the efficiency of viral invasion. As the Omicron mutant strain continues to spread, the situation abroad remains critical, and China continues to face a serious risk of importation from abroad, with several regions now experiencing local transmission of cases linked to importation from abroad.[13]

The R0 value of the Omicron variant is higher than that of the traditional strains of the novel coronavirus. The R0 of the traditional strains is approximately 2-3, while the R0 of the Omicron variant may exceed 3. The spike protein of the Omicron variant may bind more tightly to the receptors of host cells, thereby increasing the virus's ability to enter host cells and leading to more people getting infected in a shorter period of time.

Detecting the Omicron variant poses certain challenges due to factors such as asymptomatic cases and false-negative test results. These challenges contribute to the spread of the variant in the following ways:

Omicron has been associated with a higher rate of asymptomatic infections compared to previous variants. This means that individuals infected with the Omicron variant may not exhibit any symptoms, making it difficult to identify and isolate them. And The Omicron variant has shown some ability to evade detection by certain diagnostic tests. This can lead to false-negative results, where individuals infected with the variant may receive negative test results, despite being infected. To address these challenges, it is crucial to implement

comprehensive testing strategies that include both PCR-based tests and rapid antigen tests to increase the chances of detecting infections.

Omicrons are widely present in all countries, and each country has conducted research on this variant to manage and treat Omicron-infected patients properly. The Chinese Health Commission has also established new diagnostic and treatment criteria for the Omicron variant, for example, adjust the testing methods and standards based on the characteristics of the Omicron variant. This may include using PCR tests targeting Omicron-specific genetic markers to rapidly and accurately identify Omicron infections. Update guidelines on the clinical manifestations of the Omicron variant, considering that it may cause symptoms different from previous variants. Adjust treatment plans based on the characteristics of the Omicron variant. This may include using specific antiviral drugs, immunomodulators, or other treatment methods, especially for high-risk groups.[14]But its impact on the mortality rate of Omicron-infected patients is still unclear. Therefore, this study provides a retrospective analysis of patient deaths before and after the implementation of the new Omicron variant criteria for the novel coronavirus, aiming to determine the clinical value of the Omicron variant criteria for the novel coronavirus.

METHODS

General information

Clinical data of 1419 Omicron-infected patients treated in our hospital from April 10, 2022 to June 3, 2022 were collected. They were divided into observation group (April 25 2022 - June 3 2022) and control group (April 10 2022 - April 24 2022) before and after the implementation criteria.

This study has passed the review, follow-up review and review by the Ethics Committee members of our hospital.

Inclusion criteria: (1) Patients diagnosed with Omicron infection who met the diagnostic criteria in the "Diagnosis and treatment protocol for novel coronavirus pneumonia (trial version 9)"[15] and whose nasal/pharyngeal swab samples were typed as Omicron variants by laboratory viral genotyping; (2) Patients voluntarily participate in the treatment protocol trial and patients are able to understand and comply with the requirements of the treatment protocol; (3) patients do not have severe liver or kidney function impairment; (4) Chest CT showed patch shadows and interstitial changes, and severe patients may present multiple ground glass shadows and infiltrating shadows in both lungs.

The reason for selecting these four as inclusion criteria is to ensure that the study subjects are voluntary participants who are infected with Omicron and can undergo treatment according to the requirements of the treatment protocol, reducing potential confounding factors. This is achieved by excluding patients who may die due to liver or kidney dysfunction and patients with pulmonary lesions, in order to ensure the accuracy of the research results and evaluate their clinical impact.

Exclusion criteria: (1) suspected patients and patients with other lung infections. (2) incomplete information. (3) Patients with allergies or intolerance to the medications in the treatment protocol; (4) patients participating in other clinical trials; (5) patients who cannot provide complete medical records and relevant test results.

The reason for selecting these five as exclusion criteria is to ensure the integrity and accuracy of the research data, as well as the effectiveness and safety of the treatment protocol. Additionally, it aims to ensure that the study subjects are confirmed cases of Omicron infection in order to minimize the interference of other lung infections on the research results.

METHODOLOGY

Collection of information

Patients' age, gender, use of anticoagulant drugs, use of antiplatelet drugs, use of thymidine/thymidine drugs, use of herbal drugs, use of Fuzheng formula, blood count, liver function, kidney function indicators, and patient mortality are collected through the hospital electronic case system.

Observation indicators

Compare the general information, blood count, liver function, kidney function and mortality between the two groups.

Routine blood, liver and kidney function tests. Blood was collected from the elbow in the early morning, and 4 mL of blood was collected from a common vacuum blood collection tube. The instruments selected for testing were a Roche ROCHEECL (411) electrochemiluminescence analyzer and a Hitachi 7600D automatic biochemical analyzer. The liver and kidney function and blood tests were performed according to the reagents used and in strict compliance with the instructions. Liver function indicators include serum glutamate transaminase, glutamic oxalacetic transaminase, gamma-glutamyl transpeptidase, total bilirubin, albumin and total protein. Renal function tests include serum creatinine, alkaline phosphatase, urea, uric acid and globulin. Routine blood tests include white blood cell count, red blood cell ratio, lymphocyte count, hemoglobin, platelet count, neutrophil count, and neutrophil ratio.

Statistical analysis

The statistical software package for social sciences (SPSS) version 26 (IBM, Armonk, NY, USA) was used to perform normality tests on the collected data, including age, white blood cell count, red blood cell ratio, lymphocyte count, hemoglobin, neutrophil count, neutrophil ratio, platelet count, total bilirubin, total protein, alkaline phosphatase, albumin, alanine aminotransferase, aspartate aminotransferase, gamma-glutamyl transferase, globulin, creatinine, uric acid, and urea measurements. The data were found to follow a normal distribution. For data that followed a normal distribution, independent samples *t* tests were used to compare the observation group and the control group, while for measurements that did not follow a normal distribution as described by the median (quartiles), the Mann-Whitney U test was used. The classification and enumeration data of whether anticoagulant drugs were used, whether antiplatelet drugs were used, sex,

Table 1. Gender, age and drug use of Omicron infected patients in observation group and control group ($\bar{x} \pm s$)/[cases (%)

Indicators		Control group (n = 332 cases)	Observation group (n = 586 cases)	t/χ^2	*P* value
Gender (example)	Male	137	273	2.429	.119
	Female	195	313		
Age (years)		75.42±17.24	76.14±15.97	0.638	.524
Use of anticoagulants (cases)	Yes	118	251	4.686	.030
	No	214	335		
Use of antiplatelet drugs (cases)	Yes	28	50	0.003	.959
	No	304	536		
Use of thymidine/thymifaxine drugs (examples)	Yes	77	258	39.695	.000
	No	255	328		
Use of herbs (examples)	Yes	267	472	0.002	.963
	No	65	114		
Use of corrective formula (example)	Yes	55	216	41.950	.000
	No	277	370		

Table 2. Comparison of mortality rates [cases (%)]

	Number of examples	Deaths (cases)	Mortality rate (%)
Observation group	332	17	5.12
Control group	586	14	2.39
χ^2	-	-	4.497
P value	-	-	.034

Table 3. Routine blood indicators ($\bar{x} \pm s$)

	White blood cell count (10^9/L)	Erythrocyte Specific Volume (%)	Lymphocyte count (10^9/L)	hemoglobin (g/L)	Platelet count (10^9/L)	Neutrophil count (10^9/L)	Proportion of neutrophils (%)
Control group (n = 332 cases)	6.95±8.08	36.73±6.04	1.38±0.61	120.58±21.03	223.51±97.23	4.92±3.88	65.27±13.58
Observation group (n = 586 cases)	6.85±3.65	36.22±5.72	1.77±5.85	122.25±21.72	206.46±77.61	4.77±3.41	65.87±13.67
t	0.257	1.272	1.211	1.132	2.913	0.395	0.641
P value	.797	.204	.226	.258	.004	.693	.522

Table 4. Liver function indicators ($\bar{x} \pm s$)

	Control group (n = 332 cases)	Observation group (n = 586 cases)	*t*	*P* value
Albumin (g/L)	36.66±7.08	38.71±6.39	4.489	.000
Glutathione transaminase (U/L)	30.36±65.77	23.93±26.03	2.095	.036
glutamic oxaloacetic transaminase, (U/L)	33.29±49.72	26.12±25.53	2.884	.040
Total bilirubin (mmol/L)	12.71±16.48	12.76±12.05	0.053	.958
Total protein value (g/L)	66.33±7.82	66.84±7.40	0.983	.326
Gamma-glutamyl transphthalase (U/L)	43.76±80.23	34.28±52.30	2.163	.031
Alkaline phosphatase value (U/L)	93.58±54.39	87.53±43.35	1.849	.065
Globulin value (g/L)	29.85±5.67	28.13±5.55	4.476	.000

whether new drugs of thymosin/thymus method were used, whether herbs were used, whether Fuzheng prescription was used, and mortality of patients were all described by (%). The enumeration data were disordered and Chi-square or Fisher exact test was used. The Mann-Whitney U test was used to order counting data. $P < .05$ was used to evaluate whether the difference between the two groups was statistically significant. If there is a significant statistical difference, it can indicate that the implementation of the COVID-19 treatment protocol (9th edition) significantly reduces the mortality rate of patients with Omicron variant infection.

RESULTS

Comparison of the general data of the two groups of Omicron-infected patients

A total of 1419 patients were selected, 501 patients with incomplete information were deleted, and 918 patients were finally included. According to the period before and after the application of the criteria, they were split into an observation group (586 cases) and a control group (332 instances).

In COVID-19, patients may face an increased risk of blood clot formation, and the use of anticoagulants is intended to reduce this risk. Moreover, effective anticoagulation treatment can not only reduce the occurrence of thrombotic events but also potentially be associated with reduced hospitalization time, decreased need for intensive care, and improved overall survival rates.

Gender, age, antiplatelet drug use, and herb use between the two groups did not differ significantly ($P > .05$). The differences in the use of anticoagulant drugs, use of thymidine/thymidine drugs, and use of the Fuzheng formula were significant between the two groups, $P < .05$ (Table 1).

Comparison of mortality rates between the two groups of Omicron-infected patients

It was statistically significant ($P < .05$) that the mortality rate in the observation group (2.39)% was significantly lower than that in the control group (5.12)% (Table 2).

Comparison of routine blood indicators (white blood cell count, red blood cell ratio, lymphocyte count, hemoglobin, neutrophil count, neutrophil ratio, platelet count)

Leukocyte, erythrocyte, lymphocyte, hemoglobin, neutrophil, and neutrophil ratio differences between the two groups were not statistically significant, $P > .05$. The observation group's platelet count $(4.77 \pm 3.41) 10^9$/L was statistically different from the control group's $(4.92 \pm 8.00) 10^9$/L, $P < .05$ (Table 3).

Comparison of liver function indicators (total bilirubin, total protein values, alkaline phosphatase values, albumin, glutamate transaminase, glutamic oxaloacetic transaminase, gamma-glutamyltransferase, globulin values)

Total bilirubin, total protein, and alkaline phosphatase readings between the two groups did not differ in a way that was statistically significant, $P > .05$. The albumin (38.71±6.39) g/L, glutamate transaminase (23.93±26.03) U/L, glutamic oxaloacetic transaminase, (26.12±25.53) U/L, gamma-glutamyltransferase (34.28±52.3) U/L and globulin values in the observation group (28.13±5.55) g/L were significantly lower than those of the control group (36.66±7.08) g/L, (30.36±65.77) U/L, (33.29±49.72) U/L, (43.76±80.23) U/L, (29.85±5.67) g/L, with statistically significant differences, $P < .05$ (Table 4).

Comparison of renal function indicators (creatinine value, uric acid value, urea value)

The difference between the creatinine and uric acid values of the two groups was not significant, $P > .05$. The difference between the urea values of the observation group (7.44±6.34 mmol/L) and the control group (8.75±7.51 mmol/L) was statistically significant, $P < .05$ (Table 5).

The reason for choosing total bilirubin, total protein, alkaline phosphatase, albumin, ALT, AST, GGT, globulin,

Table 5. Renal function indicators ($\bar{x} \pm s$)

	Creatinine value (μmol/L)	Urea values (mmol/L)	Uric acid value (μmol/L)
Control group (n = 332 cases)	111.71±242.08	8.75±7.51	344.25±156.32
Observation group (n = 586 cases)	92.63±149.14	7.44±6.34	337.97±128.99
t	1.474	2.810	0.388
P value	.140	.005	.698

creatinine, uric acid, and urea as testing indicators is that these parameters play a crucial role in diagnosing and monitoring patients' liver function, kidney function, and metabolic activity.

DISCUSSION

The Omicron variety continues to spread quickly and infectiously throughout the planet. With the rapid increase in the number of infected people,[16] repeated infections and immune escapes are frequent, and the number of Omicron variant patients imported from outside China is increasing,[17] in order to diagnose and treat the Omicron variant, it is crucial to use the 9th edition of the new coronavirus criteria. This study compares the mortality of Omicron variant-infected patients before and after the new criteria were put in place.

The study revealed through the collection of clinical data from patients that there was no significant difference in gender, age, use of antiplatelet drugs, and use of herbal drugs between the two groups of patients infected with Omicron variant, $P > .05$. The difference in the use of anticoagulants, use of thymidine/thymidine drugs, and use of fulvestrant were significant between the two groups, $P < .05$. This is due to the new criteria showing that for severe high-risk factors, patients with patients with rapid disease progression in the general, heavy and critical categories, therapeutic doses of low molecular heparin or normal heparin may be given in the absence of contraindications. The use of anticoagulants is therefore increased. In this study, after the revised criteria were put in place, there was a noticeably lower mortality rate among individuals who had the Omnicron variant infection, according to a comparison of the two groups' mortality rates. This is due to the fact that the diagnosis and treatment of Omnicron variant infections are clearer in the new standard and that patients are treated accordingly in a timely manner, reducing their symptoms and facilitating their recovery, thus reducing mortality.

In the study by Janosek J et al.[18], early on in the course of the disease, patients infected with the Omicron variety showed a normal or decreased total peripheral blood leukocyte count and a decrease in lymphocyte count. In this study, routine blood tests revealed that the platelet count was significantly lower in patients with standard implementation, while leukocyte count, erythrocyte ratio, lymphocyte count, hemoglobin, neutrophil count, and neutrophil ratio did not differ significantly between the two groups ($P > .05$). In patients infected with the Omicron variant, viral invasion of the body resulted in abnormalities in blood white blood cell count, red blood cell ratio, lymphocyte count, hemoglobin, neutrophil count, neutrophil ratio, and platelet count. Neutrophils have a role in fighting infection, regulating the inflammatory response, phagocytosis, and resistance to invasion by foreign pathogens. An elevated neutrophil ratio may be a result of a bacterial infection or may occur under stressful conditions. A decreased neutrophil ratio, on the other hand, can lead to an increased risk of bacterial infections in the body. An abnormal increase in platelet count can occur after an infection has occurred.[19] This is due to the rational use of medication and increased use of anticoagulants to reduce platelet clumping and lower platelet counts to prevent thrombosis after the implementation of the new standards.

After the implementation of COVID-19 vaccines, there has been a significant decrease in the mortality rate among Omicron variant infections. This suggests that the immune response elicited by vaccination may be effective in reducing the severity and risk of death associated with the Omicron variant. This finding is consistent with the study conducted by Janosek et al., which demonstrated that post-infection immune response can effectively prevent severe cases.

However, our research also focuses on the impact of new treatment strategies on the mortality rate of Omicron infections, an area that was not addressed in the study by Janosek et al.[26,27] When the liver is diseased, the ability to synthesize various proteins is reduced, and the amount of proteins in the body is changed, which is mainly reflected in the decrease of albumin, such as the increase of globulin.[28] Clinically, serum proteins are Total protein generally refers to the total serum protein, including albumin and globulin, which is an important indicator of human liver function. It can maintain the colloid osmotic pressure of the human body and is an important substance in human metabolism.[20,21] Total serum protein also has various functions, such as transporting human nutrients and immune ability. Total protein is an important indicator for monitoring the nutritional status of the human body,[22] and it is crucial for the clinical diagnosis and differential diagnosis of a variety of disorders.[23] Total bilirubin is the total value of direct bilirubin and indirect bilirubin. Bilirubin is a substance formed after the aging and destruction of red blood cells in the body.[24] The bilirubin formed after the destruction of red blood cells is called indirect bilirubin. After entering the liver, it combines with the enzymes in the liver to form direct bilirubin, which is then discharged into the intestine.[25] Some of the bilirubin is absorbed, while some of the bilirubin is directly discharged from the body. Hepatocytes synthesize serum albumin, globulin, and other substances involved in coagulation.detected to understand the condition of the liver or kidney.[29] In patients infected with Mr Mick Dijon variants, the abnormal liver function index, after the introduction of new standards, comparing two groups of total bilirubin, total protein value difference was not significant, $P > .05$, this may be due to clinical data statistics of liver function index data is more, lead to the results have a certain error, after the introduction of new standards in patients with liver function improved, Albumin, alanine aminotransferase, aspartate aminotransferase and γ-glutamyltransferase in the observation group were significantly lower than those in the control group. This is because the new standard closely monitors the liver function indicators of patients and provides targeted treatment for their abnormal conditions so as to alleviate the liver injury of patients.

Direct virus infection and renal epithelial cell proliferation can result in sarcov-mediated acute kidney injury, as might indirect causes such cytokine-mediated harm.[30] The results of the renal function indices in this study indicated that there was no significant difference in the values of uric acid and creatinine between the two groups ($P > .05$). The observation group's urea value was substantially lower than the control group's ($P < .05$). After the close grams of Dijon mutant infection, creatinine, uric acid and urea values were showing abnormal changes, in the new standard, urea value obviously improved, this is because the new standard for renal detectors to give timely treatment, in addition, the new standard in the use of interleukin 6 inhibitors for new crown critically ill patients experiencing an overreaction of the immune system to produce inhibition, So as to reduce renal injury.

In conclusion, the implementationthe impletion of the treatment protocol for COVID-19 (version 9) has significantly reduced the mortality rate among patients infected with the Omicron variant. It is safe and feasible, it looked at the Omicron variant and real-world clinical data and can be widely applied in clinical practice. However, the data in this study is relatively incomplete, and the sample size is insufficient. Therefore, the comparison results of liver function, kidney function, and routine blood indicators in patients may not be accurate enough. Subsequent research may consider expanding the sample size for comparison.

The lower mortality rate in the observation group suggests that the treatment protocol implemented after the implementation of the COVID-19 standards has significantly improved patient outcomes, It is mainly manifested in the improvement of treatment regimens, such as the use of antiviral drugs in the early stage of the disease, the use of anticoagulant drugs such as low molecular weight heparin to prevent thrombosis, etc., and the adjustment of treatment regimens according to the specific situation of the patient (such as age, underlying disease, viral variants), which affects clinical practice of patients. This indicates that the treatment protocol may effectively control and manage COVID-19 infections, reducing the risk of severe illness and death. This finding further supports the safety and feasibility of the treatment protocol ,provides important guidance and evidence for clinical practice. However, further research is needed to validate these observational results and understand the specific measures used in the treatment plan that contribute to reducing mortality. It is also necessary to evaluate the long-term effects of the treatment plan and conduct a more detailed analysis of the drugs used.

ETHICAL COMPLIANCE

This study was approved by the ethics committee of Xiangya Hospital of Central South University.

CONFLICT OF INTEREST

The authors have no potential conflicts of interest to report relevant to this article.

AUTHOR CONTRIBUTIONS

WL, CLiu, LZ and YL designed the study and performed the experiments, AW and XM collected the data, YS and CLi analyzed the data, and WL, CLiu, LZ and YL prepared the manuscript. All authors read and approved the final manuscript. WL and CL contributed equally to this work

FUNDING

This work was supported by the National Key Research and Development Program of China (2022YFC2009800) (Lina Zhang). Clinical Research Project of Medical College of Shanghai Jiaotong University, Prospective Observation on the Changes of Immune Function and Trajectory Characteristics of Elderly Patients Infected with Novel Coronavirus Omicron Strain (LWEC2022017) (Yong Lu).

REFERENCES

1. Shete AM, Patil DY, Sahay RR, Sapkal GN, Deshpande GR, Yadav PD. Waning natural and vaccine-induced immunity leading to reinfection with SARS-CoV-2 Omicron variant. *Hum Vaccin Immunother*. 2022;18(6):2127289. doi:10.1080/21645515.2022.2127289
2. Pedersen RM, Bang LL, Tornby DS, et al; COVAC-TX Study Group. Neutralization of SARS-CoV-2 Omicron and Delta Variants in Relation to Vaccine-Induced Antibody Levels in Kidney Transplant Recipients and Healthy Controls. *Microbiol Spectr*. 2022;10(5):e0131422. doi:10.1128/spectrum.01314-22
3. Schrag SJ, Verani JR, Dixon BE, et al. Estimation of COVID-19 mRNA Vaccine Effectiveness Against Medically Attended COVID-19 in Pregnancy During Periods of Delta and Omicron Variant Predominance in the United States. *JAMA Netw Open*. 2022;5(9):e2233273. doi:10.1001/jamanetworkopen.2022.33273
4. Liu J, Wang J, Liu X, Shen H; The Role of Traditional Chinese Medicine in COVID-19: Theory, Initial Clinical Evidence, Potential Mechanisms, and Implications. *Altern Ther Health M*. 2021;27(210-227.
5. Lyngse FP, Kirkeby CT, Denwood M, et al. Household transmission of SARS-CoV-2 Omicron variant of concern subvariants BA.1 and BA.2 in Denmark. *Nat Commun*. 2022;13(1):5760. doi:10.1038/s41467-022-33498-0
6. Nazir SUR, Nazir T, Sultana M, et al; The Potentially Recommended Pharmacotherapy for COVID-19. *Altern Ther Health M*. 2021;27(24-28.
7. Le TTB, Vasanthakumaran T, Thi Hien HN, et al. SARS-CoV-2 Omicron and its current known unknowns: A narrative review. *Rev Med Virol*. 2023;33(1):e2398. doi:10.1002/rmv.2398
8. Rabiul IM, Nasreen W, Anjum R, et al; Characteristics of the SARS-CoV-2 Omicron (B.1.1.529) Variant and Emerging Impact on Global Public Health. *Clin Pathol*. 2022;15:2632010X221124908. doi:10.1177/2632010X221124908
9. Chung H, Austin PC, Brown KA, et al. Effectiveness of COVID-19 Vaccines Over Time Prior to Omicron Emergence in Ontario, Canada: Test-Negative Design Study. *Open Forum Infect Dis*. 2022;9(9):ofac449. doi:10.1093/ofid/ofac449
10. Tan KT, Benedict SLH, Chang CY, et al. Clinical severity of COVID-19 with omicron variant predominance in relation to vaccination status, age, comorbidities- a single center in Selangor, Malaysia. *Med J Malaysia*. 2022;77(5):558-563.
11. Ling Y, Lu G, Liu F, et al. The Omicron BA.2.2.1 subvariant drove the wave of SARS-CoV-2 outbreak in Shanghai during spring 2022. *Cell Discov*. 2022;8(1):97. doi:10.1038/s41421-022-00468-1
12. Mungmunpuntipantip R, Wiwanitkit V. Expected cost effectiveness of the fourth dose of COVID-19 vaccine against the omicron variant of COVID-19: a preliminary report. *Int J Physiol Pathophysiol Pharmacol*. 2022;14(4):272-275.
13. Parmar M, Thumar R, Sheth J, Patel D. Designing multi-epitope based peptide vaccine targeting spike protein SARS-CoV-2 B1.1.529 (Omicron) variant using computational approaches. *Struct Chem*. 2022;33(6):2243-2260. doi:10.1007/s11224-022-02027-6
14. Iyengar KP, Nune A, Botchu R. Is the current Omicron wave in the UK due to risk compensation? *J R Coll Physicians Edinb*. 2022;52(2):183. doi:10.1177/14782715221103725
15. Zhu X, Wu W, Ning J, et al; Clinical characteristics and clinical outcome of community clusters with SARS-CoV-2 infection. *Front Public Health*. 2022;10(1010099. doi:10.3389/fpubh.2022.1010099.
16. Buchan SA, Chung H, Brown KA, et al. Estimated Effectiveness of COVID-19 Vaccines Against Omicron or Delta Symptomatic Infection and Severe Outcomes. *JAMA Netw Open*. 2022;5(9):e2232760. doi:10.1001/jamanetworkopen.2022.32760
17. Motozono C, Toyoda M, Tan TS, et al. The SARS-CoV-2 Omicron BA.1 spike G446S mutation potentiates antiviral T-cell recognition. *Nat Commun*. 2022;13(1):5440. doi:10.1038/s41467-022-33068-4
18. Janošek J, Komárek A. Post-infection immunity provides excellent protection from COVID-19 ICU hospitalization during Delta and Omicron waves. *Infect Dis (Lond)*. 2023;55(1):74-77. doi:10.1080/23744235.2022.2125575
19. Muik A, Lui BG, Bacher M, et al. Omicron BA.2 breakthrough infection enhances cross-neutralization of BA.2.12.1 and BA.4/BA.5. *Sci Immunol*. 2022;7(77):eade2283. doi:10.1126/sciimmunol.ade2283
20. Ren SY, Wang WB, Gao RD, Zhou AM. Omicron variant (B.1.1.529) of SARS-CoV-2: Mutation, infectivity, transmission, and vaccine resistance. *World J Clin Cases*. 2022;10(1):1-11. doi:10.12998/wjcc.v10.i1.1
21. Kandeel M, Mohamed MEM, Abd El-Lateef HM, Venugopala KN, El-Beltagi HS. Omicron variant genome evolution and phylogenetics. *J Med Virol*. 2022;94(4):1627-1632. doi:10.1002/jmv.27515
22. Kannan S, Shaik Syed Ali P, Sheeza A. Omicron (B.1.1.529) - variant of concern - molecular profile and epidemiology: a mini review. *Eur Rev Med Pharmacol Sci*. 2021;25(24):8019-8022. doi:10.26355/eurrev_202112_27653
23. Cocherie T, Bastide M, Sakhi S, et al. Decreased Sensitivity of Rapid Antigen Test Is Associated with a Lower Viral Load of Omicron than Delta SARS-CoV-2 Variant. *Microbiol Spectr*. 2022;10(5):e0192222. doi:10.1128/spectrum.01922-22
24. Takashita E, Yamayoshi S, Fukushi S, et al. Efficacy of Antiviral Agents against the Omicron Subvariant BA.2.75. *N Engl J Med*. 2022;387(13):1236-1238. doi:10.1056/NEJMc2209952
25. Pustake M, Giri PA, Ganiyani MA, Deshmukh K. Omicron and other variants of SARS-CoV-2 roles of vaccines and herd immunity in protecting from the emerging strains. *J Family Med Prim Care*. 2022;11(6):3393-3394. doi:10.4103/jfmpc.jfmpc_2372_21
26. Hoffmann M, Krüger N, Schulz S, et al. The Omicron variant is highly resistant against antibody-mediated neutralization: implications for control of the COVID-19 pandemic. *Cell*. 2022;185(3):447-456.e11. doi:10.1016/j.cell.2021.12.032
27. Lu L, Mok BWY, Chen LL, et al. Neutralization of Severe Acute Respiratory Syndrome Coronavirus 2 Omicron Variant by Sera From BNT162b2 or CoronaVac Vaccine Recipients. *Clin Infect Dis*. 2022;75(1):e822-e826. doi:10.1093/cid/ciab1041
28. Murakami K, Iwasaki S, Oguri S, et al. SARS-CoV-2 Omicron detection by antigen tests using saliva. *J Clin Virol Plus*. 2022;2(4):100109. doi:10.1016/j.jcvp.2022.100109
29. Zhang GP, Su C, Yang J, et al. [Transmission characteristics and risk factors of household COVID-19 clusters caused by 2019-nCoV Omicron variant in Tianjin]. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2022;43(9):1370-1375. doi:10.3760/cma.j.cn112338-20220425-00340
30. Du J, Wang JM, Wang J, Gao YL, Pang XH, Li G. [Study of transmissibility of 2019-nCoV Omicron variant in Beijing]. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2022;43(9):1364-1369. doi:10.3760/cma.j.cn112338-20220410-00274