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POSTER ABSTRACTS

203.LYMPHOCYTES AND ACQUIRED OR CONGENITAL IMMUNODEFICIENCY DISORDERS

Risk Factors for Omicron Pneumonia in Patients with Hematological Malignancies: A Multicenter Study in China

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BACKGROUND

Although Omicron's hospitalization rate and mortality rate decreased significantly in the immunocompetent population (Wang B, et al. J Infect 2023; Maslo C, et al. JAMA 2022), it remains a fatal threat to patients with immunocompromised hematological malignancies (HM) (Zhu X, et al. BJH 2023). The overall mortality rate of Omicron infection was 16.5% among hospitalized HM patients according to the "EPICOVIDEHA survey report" (Blennow O, et al. AJH 2022), significantly higher than that observed in the general population. The main cause of Omicron-related death in HMs was respiratory failure caused by Omicron pneumonia and data showed that approximately 10% of HM patients develop Omicron pneumonia after infection (Zhu X, et al. BJH 2023). However, little is known about the risk factors for Omicron pneumonia in HM patients after Omicron infection.

METHODS

The data in this study comes from a registered multi-center, prospective, observational study during the latest Omicron wave in Chongqing, China (November 2022 to January 2023), of which the initial purpose was to investigate the neutralizing antibody levels in HM patients after Omicron infection. Detailed information can be found on international clinical trials registry platform (ICTRP) of world health organization (WHO) (https://trialsearch.who.int/) (No.ChiCTR2300071830) or the Chinese clinical trial registry website (http://www.chictr.org.cn). Patients were enrolled at the time of diagnosis of SARS-CoV-2 infection. Immune function stats, which was assessed by the counts of immune cells including neutrophils, total lymphocytes, CD4 (+) T cells, B cells, NK cells, were measured at the time of enrollment. All patients were followed up once a week for a total of 6 weeks after enrollment. During the period, chest CT scans were performed to determine Omicron pneumonia on patients with any of the following characteristics: 1) Sustained high fever > 3 days; 2) Respiratory rate $\geq$ 30 beats/minute; 3) Oxygen saturation at rest < 93%; 4) $PaO_2/FiO_2 \leq 300mmHg$. The sequencing results were download from the Global Initiative on Sharing Avian Influenza Data (GISAID) database (https://db.cngb.org/gisaid) to identify the potential SARS-CoV-2 strains present in our patients. Risk factors were analysed by logistic univariate / multivariate regression methods.

RESULTS

Omicron subvariant BA.5.2.48 was speculated to be the dominant SARS-CoV-2 strain in our patients. A total of 475 HM patients enrolled in this study. Omicron pneumonia was observed in 15.8% (75/475) of patients. In the Omicron pneumonia group, patients had a median age of 58 years [IQR 48-69] and males accounting for 61.3%, 56 (74.7%) patients with a baseline disease of lymphoma, 41 (54.7%) with disease status of active disease, 33 (44.0%) patients had no COVID-19 vaccination history, and 65 (86.7%) patients had received targeted chemotherapy; B/ CD4 (+) T/ NK-cell reduction rate were 49 (65.3%), 66 (88.0%) and 47 (62.7%), respectively. Risk factors associated with Omicron pneumonia included active disease status of HM at infection (OR=3.42, 95% CI: 1.59-7.37, P=0.002), (1-2) dose of COVID-19 vaccination (OR=2.55, 95% CI: 1.28-5.10, P=0.008), no COVID-19 vaccination history (OR=4.81, 95% CI: 2.45-9.43, P<0.001), chemotherapy prior to infection <6 months (OR=2.58, 95% CI:

1.12-5.96, *P*=0.027), chemotherapy prior to infection $\geq$ 6 months (OR=2.93, 95% CI: 1.31-6.53, *P*=0.009) and NK-cell reduction (< 150/μL) (OR=2.19, 95% CI: 1.27-3.79, *P*=0.005).

CONCLUSIONS

Our study investigated risk factors for Omicron pneumonia in HM patients after Omicron (BA.5.2.48) infection. Highlights that HM patients with these risk factors, may be susceptible to lung involvement after Omicron infection and need to be taken seriously in clinical practice.

Disclosures No relevant conflicts of interest to declare.

Table 1 Characteristics of pneumonia and non-pneumonia group

Variables	Total	Non-pneumonia	Pneumonia	P value
	(N=475)	(N=400)	(N=75)	
Age (years), n (%)				0.996
< 40	58 (12.2)	49 (12.3)	9 (12.0)	
40-60	229 (48.2)	193 (48.3)	36 (48.0)	
> 60	188 (39.6)	158 (39.5)	30 (40.0)	
Male sex, n (%)	279 (58.7)	233 (58.3)	46 (61.3)	0.619
Baseline disease, n (%)				0.950
HL	43 (9.1)	34 (8.5)	9 (12.0)	
Aggressive B-cell NHL	183 (38.5)	157 (39.3)	26 (34.7)	
Indolent B-cell NHL	79 (16.6)	67 (16.8)	12 (16.0)	
HIV-related lymphoma	19 (4.0)	16 (4.0)	3 (4.0)	
T or NK/T-cell lymphoma	30 (6.3)	24 (6.0)	6 (8.0)	
Multiple myeloma	72 (15.2)	62 (15.5)	10 (13.3)	
Myeloid cancer	42 (8.8)	34 (8.5)	8 (10.7)	
CLL	7 (1.5)	6 (1.5)	1 (1.3)	
Disease status at infection, n (%)				0.130
Complete remission	110 (23.2)	99 (24.8)	11 (14.7)	
Partial remission	146 (30.7)	123 (30.8)	23 (30.7)	
Active disease	219 (46.1)	178 (44.5)	41 (54.7)	
Prior dose of vaccination, n (%)				<0.001
3	234 (49.3)	214 (53.5)	20 (26.7)	
1-2	127 (26.7)	105 (26.3)	22 (29.3)	
0	114 (24.0)	81 (20.3)	33 (44.0)	
Chemotherapy prior to infection, n (%)				0.014
Untreated	122 (25.7)	112 (28.0)	10 (13.3)	
<6 month	150 (31.6)	127 (31.8)	23 (30.7)	
≥ 6 month	203 (42.7)	161 (40.3)	42 (56.0)	
Anti-CD-20 moAb, n (%)	220 (46.3)	190 (47.5)	30 (40.0)	0.233
BTK inhibitor therapy, n (%)	46 (9.7)	41 (10.3)	5 (6.7)	0.340
Lenalidomide maintenance, n (%)	23 (4.8)	22 (5.5)	1 (1.3)	0.156
PD-1/PD-L1 inhibitor, n (%)	21 (4.4)	18 (4.5)	3 (4.0)	0.847
Proteasome inhibitor, n (%)	59 (12.4)	52 (13.0)	7 (9.3)	0.379
Auto-HSCT, n (%)	41 (8.6)	35 (8.8)	6 (8.0)	0.832
Neutropenia [a], n (%)	98 (20.6)	79 (19.8)	19 (25.3)	0.274
Lymphopenia [b], n (%)	232 (48.8)	193 (48.3)	39 (52.0)	0.551
B-cell reduction [c], n (%)	281 (59.2)	232 (58.0)	49 (65.3)	0.237
CD4 (+) T-cell reduction [d], n (%)	378 (79.6)	312 (78.0)	66 (88.0)	0.053
NK-cell reduction [e], n (%)	219 (46.1)	172 (43.0)	47 (62.7)	0.002

[a] Absolute neutrophil count < 1.8×10^9/L; [b] Absolute lymphocyte count < 1.1×10^9/L; [c] Absolute B-cell count < 90/μL; [d] Absolute CD4(+) T-cell count < 680/μL; [e] Absolute NK-cell count < 150/μL.
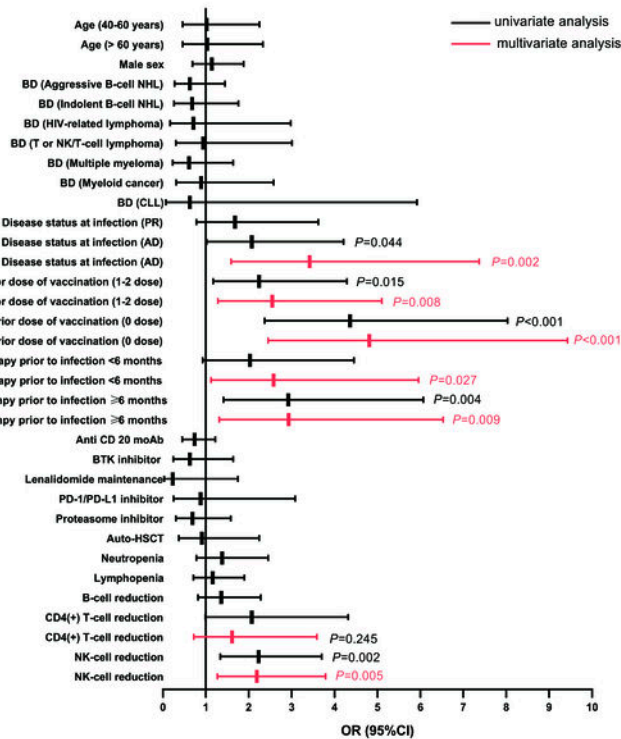
Table 2 Logistic regression univariate and multivariate analyses of risk factors for Omicron pneumonia in HM patients

Variables	Univariable		Multivariable	
	OR (95% CI)	P value	OR (95% CI)	P value
Age, years				
< 40	1			
40-60	1.02 (0.46-2.25)	0.970		
> 60	1.03 (0.46-2.33)	0.936		
Male sex	1.14 (0.69-1.88)	0.619		
Baseline disease				
HL	1			
Aggressive B-cell NHL	0.63 (0.27-1.45)	0.276		
Indolent B-cell NHL	0.68 (0.26-1.76)	0.424		
HIV-related lymphoma	0.71 (0.17-2.98)	0.638		
T or NK/T-cell lymphoma	0.94 (0.30-3.01)	0.923		
Multiple myeloma	0.61 (0.23-1.64)	0.328		
Myeloid cancer	0.89 (0.31-2.58)	0.828		
CLL	0.63 (0.07-5.92)	0.686		
Disease status at infection				
Complete remission	1			
Partial remission	1.68 (0.78-3.62)	0.183		
Active disease	2.07 (1.02-4.21)	0.044	3.42 (1.59-7.37)	0.002
Prior dose of vaccination				
3	1			
1-2	2.24 (1.17-4.29)	0.015	2.55 (1.28-5.10)	0.008
0	4.36 (2.37-8.03)	<0.001	4.81 (2.45-9.43)	<0.001
Chemotherapy prior to infection				
Untreated	1			
<6 months	2.03 (0.93-4.45)	0.077	2.58 (1.12-5.96)	0.027
≥ 6 months	2.92 (1.41-6.07)	0.004	2.93 (1.31-6.53)	0.009
Anti-CD-20 moAb	0.74 (0.45-1.22)	0.233		
BTK inhibitor therapy	0.63 (0.24-1.64)	0.340		
Lenalidomide maintenance	0.23 (0.03-1.75)	0.156		
PD-1/PD-L1 inhibitor	0.88 (0.25-3.08)	0.847		
Proteasome inhibitor	0.69 (0.30-1.58)	0.379		
Auto-HSCT	0.91 (0.37-2.24)	0.832		
Neutropenia [a]	1.38 (0.78-2.45)	0.274		
Lymphopenia [b]	1.16 (0.71-1.90)	0.551		
B-cell reduction [c]	1.36 (0.82-2.28)	0.237		
CD4(+) T-cell reduction [d]	2.07 (0.99-4.32)	0.053	1.61 (0.72-3.59)	0.245
NK-cell reduction [e]	2.23 (1.34-3.70)	0.002	2.19 (1.27-3.79)	0.005

[a] Absolute neutrophil count < 1.8×10^9/L; [b] Absolute lymphocyte count < 1.1×10^9/L; [c] Absolute B-cell count < 90/μL; [d] Absolute CD4(+) T-cell count < 680/μL; [e] Absolute NK-cell count < 150/μL.

Fig.1 Sequencing results of 278 cases from GISAID database.

- BA.5.2.48 (n=258, 92.8%)
- BA.5.2.49 (n=9, 3.2%)
- BF.7.14 (n=9, 3.2%)
- BA.2.76 (n=1, 0.4%)
- BA.5.2 (n=1, 0.4%)

N=278

Fig.2 Forest plot of variables in univariate and multivariate analyses of risk factors for Omicron pneumonia (n=75) in HMs

Figure 1