Study on the Correlation between the Expression Level of Interleukin-17D in the Serum of Patients with Severe Pneumonia and Disease Severity

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Abstract: *Objective*: To investigate the expression level of interleukin-17D (IL-17D) in the serum of patients with severe pneumonia and its correlation with disease severity. *Methods*: This study included 50 patients with severe pneumonia who were diagnosed and treated in the hospital from May 2024 to May 2025. The expression level of IL-17D in the serum of all patients was recorded. Patients were divided into severe and mild groups based on their disease severity. Gender, age, disease duration, presence of fever, atelectasis, pneumothorax, interleukin-2 (IL-2), interleukin-4 (IL-4), interleukin-6 (IL-6), and interleukin-17D were selected as independent variables. Statistical software SPSS 22.00 was used for univariate analysis, and variables with statistical significance in the univariate analysis were included in a multivariate logistic regression analysis to determine the correlation between IL-17D and the severity of severe pneumonia. *Results*: The results of this study showed that the level of IL-17D in patients with severe pneumonia was significantly higher than the normal threshold. Univariate analysis indicated that atelectasis, IL-2, IL-6, and IL-17D were statistically significant ($P < 0.05$) and could be considered as influencing factors for the severity of severe pneumonia. Multivariate logistic regression analysis revealed that atelectasis (OR=2.141, 95% CI: 1.684–2.391), IL-2 (OR=2.884, 95% CI: 2.240–3.614), IL-6 (OR=2.571, 95% CI: 2.190–2.943), and IL-17D (OR=2.416, 95% CI: 2.093–2.735) were positively correlated with the severity of severe pneumonia. *Conclusion*: The expression level of IL-17D in the serum of patients with severe pneumonia is higher than the normal threshold and is positively correlated with disease severity.

Keywords: Interleukin-17D; Severe pneumonia; Expression level; Disease severity; Correlation

1. Introduction

Severe pneumonia, as a serious respiratory disease, is characterized by high morbidity and mortality, posing a significant threat to patients' lives and health [1]. Its pathogenesis is complex and involves multiple aspects such as

pathogen infection, abnormal host immune response, and multiple organ dysfunction. In the pathophysiological process of severe pneumonia, excessive activation of inflammatory response and imbalance of immune regulation are key factors leading to disease progression [2]. Therefore, exploring the pathogenesis of severe pneumonia and searching for effective biomarkers to evaluate disease severity and predict prognosis are crucial for improving patients' treatment efficacy and survival rate [3]. Cytokines, as important signaling molecules in the immune system, play a key role in inflammatory response and immune regulation. The interleukin-17 (IL-17) family is an important group of proinflammatory cytokines, including multiple members such as IL-17A to IL-17F [4]. Among them, IL-17D, as a member of the IL-17 family, has gradually attracted researchers' attention in recent years. Although the specific mechanism of IL-17D in severe pneumonia is not fully understood, studies have shown that IL-17D is upregulated in various inflammatory and infectious diseases and may be involved in regulating the activation of immune cells and the release of inflammatory factors [5]. In patients with severe pneumonia, changes in serum cytokine levels are often closely related to disease severity and prognosis [6]. For example, cytokines such as IL-6 and IL-17A have been proven to be potential biomarkers for severe pneumonia, and changes in their levels can reflect the degree of inflammatory response and immune status of patients. However, research on the expression level of IL-17D in the serum of patients with severe pneumonia and its correlation with disease severity is still insufficient. Based on this, this study included patients with severe pneumonia diagnosed and treated in the hospital from May 2024 to May 2025 as research subjects to explore the correlation between the expression level of interleukin-17D in the serum of patients with severe pneumonia and disease severity.

2. Materials and methods

2.1. General information

In this study, fifty patients with pneumonia admitted to Shapingba District People's Hospital in Chongqing from May 2024 to May 2025 are selected as the research subjects. They are divided into severe and mild groups based on the severity of their illness.

2.2. Inclusion criteria and exclusion criteria

2.2.1. Inclusion criteria

(1) Meet the diagnostic criteria for severe pneumonia and exhibit clinical symptoms of severe pneumonia.
(2) Age > 18 years old.
(3) Complete clinical data.
(4) Patients and their families signed informed consent and expressed voluntary participation in this study.

2.2.2. Exclusion criteria

(1) Combined cardiovascular disease.
(2) Combined liver and kidney dysfunction.
(3) Combined coagulation dysfunction.
(4) Pregnant or breastfeeding patients.
(5) Loss of clinical data.

2.3. Methods

In this study, 50 patients are divided into severe and mild groups based on disease severity, which is considered the dependent variable. The independent variables selected are gender, age, duration of illness, presence of fever, atelectasis, pneumothorax, interleukin-2, interleukin-4, interleukin-6, and interleukin-17D. Relevant indicators are compared between different groups.

2.4. Statistical methods

SPSS 25.0 statistical software is used for data processing. Count data are expressed as rates or proportions (%), and chi-square (X^2) tests are used for comparisons between groups. For measurement data, the t-test is used for data that follows a normal distribution, expressed as mean ± standard deviation. For data that did not follow a normal distribution, M(IQR) is used, and non-parametric rank sum tests are used for comparisons between groups. Correlation analysis is performed on variables with statistical significance in univariate analysis, and $P < 0.05$ is considered statistically significant.

3. Results

3.1. Expression level of serum Interleukin-17D

The study results showed that among the 50 patients, the expression level of serum interleukin-17D was 4.93 ± 0.85 ng/L. The expression level in the mild group was 3.75 ± 0.74 ng/L, while the expression level in the severe group was 5.83 ± 1.03 ng/L. The comparison of results was statistically significant, as shown in **Table 1**.

Table 1. Comparison of serum Interleukin-17D expression levels

Group	n	IL-17D level (ng/L)
Severe group	22	5.83 ± 1.03
Mild group	28	3.75 ± 0.74
t	-	8.308
P	-	< 0.001

3.2. Analysis of single-factor results

The research results indicate that 28 cases were included in the mild group and 22 cases in the severe group. Single-factor analysis revealed that atelectasis, interleukin-2, interleukin-6, and interleukin-17D were statistically significant in the single-factor analysis ($P < 0.05$), while other variables were not statistically significant ($P > 0.05$). Specific data are shown in **Table 2**.

3.3. Multi-factor logistics regression analysis results

Variables with statistical significance from the above single-factor analysis were included in the multi-factor logistics regression analysis. The research results showed that atelectasis (OR=2.141, 95% CI: 1.684–2.391), IL-2 (OR=2.884, 95% CI: 2.240–3.614), IL-6 (OR=2.571, 95% CI: 2.190–2.943), and IL-17D (OR=2.416, 95% CI: 2.093–2.735) were positively correlated with the severity of severe pneumonia. Specific data are presented in **Table 3**.

Table 2. Single-factor results analysis

Variable	Category	Mild group (n=28)	Severe group (n=22)	Statistic	P
Gender, n (%)	Male (n=26)	15 (53.57%)	11 (50.00%)	0.063	0.802
	Female (n=24)	13 (46.43%)	11 (50.00%)		
Age (years)	Mean ± SD	41.84 ± 6.91	40.99 ± 7.30	0.421	0.673
Disease course (months)	Mean ± SD	6.82 ± 1.04	7.29 ± 1.20	1.482	0.145
Fever, n (%)	Present (n=21)	12 (42.86%)	9 (40.91%)	0.019	0.890
	Absent (n=29)	16 (57.14%)	13 (59.09%)		
Pneumothorax, n (%)	Present (n=18)	11 (39.29%)	7 (31.82%)	0.298	0.585
	Absent (n=32)	17 (60.71%)	15 (68.18%)		
Atelectasis, n (%)	Present (n=20)	7 (25.00%)	13 (59.09%)	5.966	0.015
	Absent (n=30)	21 (75.00%)	9 (40.91%)		
IL-2 (ng/L)	Mean ± SD	6.08 ± 1.09	8.63 ± 1.31	7.513	< 0.001
IL-4 (pg/L)	Mean ± SD	6.80 ± 1.15	6.98 ± 1.16	0.547	0.587
IL-6 (ng/L)	Mean ± SD	1.59 ± 0.21	2.31 ± 0.29	10.182	<0.001
IL-17D (ng/L)	Mean ± SD	3.75 ± 0.74	5.83 ± 1.03	8.308	< 0.001

Table 3. Multi-factor logistics regression analysis results

Variable	β	S.E	P	OR	95% CI
Atelectasis	0.88	0.91	< 0.05	2.141	1.684–2.391
IL-2	0.74	0.86	< 0.05	2.884	2.240–3.614
IL-6	0.85	1.02	< 0.05	2.571	2.190–2.943
IL-17D	0.93	0.98	< 0.05	2.416	2.093–2.735

4. Discussion

As a member of the IL-17 family, IL-17D shows a significant upward trend in the serum of patients with severe pneumonia. This upregulation may originate from the immune response activated by pathogen infection [7]. Immune cells, such as monocytes and macrophages, regulate downstream inflammatory responses by secreting IL-17D after recognizing pathogens. Its expression level is positively correlated with disease severity, suggesting that IL-17D may be involved in the pathological process of severe pneumonia [8]. Relevant studies have directly pointed out that IL-17D is closely related to the APACHE II score [9]. As the level of IL-17D increases, the demand for mechanical ventilation also increases, and the mortality rate rises significantly. This may become a potential marker of disease progression. Other studies have conducted dynamic monitoring of IL-17D levels to reflect the treatment response of patients with severe pneumonia [10]. If the treatment is effective, the IL-17D level should gradually decrease. Conversely, persistently high levels may indicate a poor prognosis. This dynamic change provides a reference for clinical adjustment of treatment plans.

Based on this, the present study explored the correlation between interleukin-17D and the severity of severe pneumonia. A total of 50 patients were included as research samples. Through monitoring of expression levels,

it was found that the expression level of interleukin-17D in patients with severe pneumonia was significantly higher than the normal threshold. Single-factor analysis revealed that atelectasis, interleukin-2, interleukin-6, and interleukin-17D are influencing factors that affect the severity of severe pneumonia. After incorporating these factors into multi-factor logistics regression analysis, it was found that atelectasis, interleukin-2, interleukin-6, and interleukin-17D are all positively correlated with the severity of severe pneumonia, which may become important markers for the treatment of severe pneumonia.

5. Conclusion

In summary, interleukin-17D is positively correlated with the severity of severe pneumonia. However, the current study has a limited sample size, and there is heterogeneity in patient etiology and underlying diseases, which may affect the universality of the results. Future multi-center, large-sample studies are needed to validate the conclusions.

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Disclosure statement

The authors declare no conflict of interest.

References

[1] Li X, Ye L, Zhao L, et al., 2024, Etiology of Multidrug-Resistant Bacterial Infections in Patients with Severe Pneumonia and Diagnostic Value of NETs, IL-17, and TGF-β. Chinese Journal of Nosocomiology, 34(7): 973–977.

[2] Cai JY, Tao XF, Wang GW, et al., 2024, Expression Levels of Serum IL-17, IL-12P70, and CD64 in Patients with Severe Pneumonia and Their Relationship with Prognosis. Chinese Journal of Nosocomiology, 34(16): 2452–2456.

[3] Duan Y, Ou Y, Li J, et al., 2025, Serum Cytokine Levels in Children with Community-Acquired Pneumonia Caused by Different Respiratory Pathogens. Italian Journal of Pediatrics, 51(1): 147–147.

[4] Guo R, Wang W, Liu HF, 2024, The Effect of Serum Interleukin-17A and Interleukin-10 on the Prognosis of Patients with Emergency Severe Pneumonia. Chinese Journal of Emergency Medicine, 44(12): 1079–1084.

[5] Deng AB, Li XM, Song J, et al., 2024, Changes and Clinical Significance of Serum Procalcitonin, IL-17, and sTREM-1 Levels in Adult Patients with Severe Pneumonia. Journal of Clinical and Experimental Medicine, 23(14): 1498–1501.

[6] Yan L, Zeqin F, Yinfu H, et al., 2023, Interleukin-18-Primed Human Umbilical Cord-Mesenchymal Stem Cells Achieve Superior Therapeutic Efficacy for Severe Viral Pneumonia via Enhancing T-Cell Immunosuppression. Cell Death & Disease, 14(1): 66–66.

[7] Chen M, Xu H, Wang Q, et al., 2017, Changes and Significance of IL-6, IL-10, IL-17, and HMGB1 Levels in Bronchoalveolar Lavage Fluid of Children with Severe Pneumonia. Chinese Journal of Emergency Medicine, 37(z1): 171–172.

[8] Deng HT, Ran YP, Ma QH, et al., 2022, Efficacy of Immune-Enhancing Enteral Nutrition as Adjunctive Therapy for Elderly Patients with Severe Pneumonia and Changes in HMGB1/IL-17/IL-23. Chinese Journal of Nosocomiology,

32(9): 1299–1302.

[9]   Peng HL, Wang CG, Zhou TZ, et al., 2023, Expression of Serum IL-17A, S100A8, and S100A9 in Children with Severe Mycoplasma Pneumoniae Pneumonia and Their Significance in Prognosis. International Journal of Laboratory Medicine, 44(24): 3010–3015.

[10] Li MX, Liu Q, Peng HX, et al., 2024, Effects of Salidroside on Apoptosis of Lung Vascular Endothelial Cells and Expression of IL-23 and Th17 in Rats with Severe Pneumonia via the NF-κB/Bcl-2 Signaling Pathway. Shaanxi Journal of Traditional Chinese Medicine, 45(6): 745–750.