Libyan Med J. 2026;18(11):750-753
https://doi.org/10.69667/lmj.26111

Libyan Medical Journal
https://lmj.ly/index.php/ojs/index *eISSN: 3107-0426*

Original article

Association Between Serum C-Reactive Protein Levels and Influenza A Infection: A Cross-Sectional Study

Nahed Almeesawi [1], Siham Ali[1], Sara Hwisa[2]*, Ghadah Alneli[3]

[1]*Department of Medical Laboratories, Faculty of Medical Technology, Sabratha University, Sabratha, Libya*
[2]*Department of Medical Science, Faculty of Dentistry, Sabratha University, Zawia, Libya*
[3]*Department of Anaesthesia, Faculty of Medical Technology, Sabratha University, Sabratha, Libya*
Email. *sara.ab.mu.hw@gmail.com*

Keywords.
Influenza A, C-reactive protein, Respiratory Infection, Inflammatory Biomarker.

Abstract

C-reactive protein (CRP) is a nonspecific inflammatory biomarker that may be elevated during respiratory infections. However, its association with influenza A infection requires further investigation. This study aimed to assess the association between serum CRP levels and influenza A infection among patients presenting with acute respiratory symptoms. A cross-sectional study was conducted between November 2025 and February 2026 among 62 patients presenting with acute respiratory symptoms in Sabratha, Libya. Participants were classified as influenza-positive (n = 22) or influenza-negative (n = 40) according to their influenza test results. Serum CRP levels were measured using an immunoturbidimetric assay. Data were analysed using IBM SPSS Statistics, version 21.0, with statistical significance set at $p < 0.05$. Influenza positivity was significantly associated with cold symptoms ($p = 0.001$) and fatigue ($p = 0.002$). CRP levels were significantly higher among influenza-positive patients ($p = 0.001$), and a significant positive correlation was observed between CRP levels and influenza status ($r = 0.664$, $p < 0.001$). Age was not significantly associated with influenza status ($p = 0.149$). Elevated CRP levels were significantly associated with influenza A positivity among patients presenting with acute respiratory symptoms. CRP may serve as an adjunctive inflammatory biomarker; however, further studies are needed to establish its diagnostic accuracy and clinical utility.

Introduction

Influenza A is a major cause of acute respiratory illness and may lead to severe complications in vulnerable populations. Its clinical presentation often overlaps with that of other respiratory infections, making clinical assessment alone insufficient for reliable identification. Recent studies have investigated clinical and laboratory indicators that may help assess influenza A infection and predict disease severity [1,2].

C-reactive protein (CRP) is an acute-phase protein whose levels increase in response to systemic inflammation. As CRP concentrations may rise during respiratory viral infections, CRP has been investigated as a potential biomarker for assessing inflammatory responses and clinical outcomes. A 2024 comparative study involving patients with influenza A, respiratory syncytial virus, and COVID-19 reported elevated CRP concentrations across these infections, whereas interleukin-6 demonstrated greater diagnostic potential in the study population [3]. Recent reviews have also highlighted the potential role of inflammatory biomarkers in assessing influenza-associated pneumonia while emphasising that CRP lacks sufficient specificity to identify the causative pathogen [4] independently.

Despite existing evidence, relatively few studies have investigated the association between serum CRP levels and confirmed influenza A infection among patients presenting with influenza-like illness. Therefore, this study aimed to compare serum CRP levels between patients with and without influenza A infection, assess the correlation between CRP concentrations and influenza A infection status, and examine the associations between selected demographic and clinical characteristics and influenza A infection.

Methods

Study Design

A descriptive cross-sectional study was conducted to investigate the association between serum C-reactive protein (CRP) levels and influenza A infection status among patients presenting with acute respiratory symptoms.

Study Setting and Participants

The study was conducted from November 2025 to February 2026 at Sabratha Teaching Hospital and local medical centres in Libya. A total of 62 patients presenting with acute respiratory symptoms were enrolled. Eligible participants were classified into influenza A-positive and influenza A-negative groups according to their influenza test results.

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received: *27-08-2026 -* ***Accepted:*** *25-10-2026 -* ***Published:*** *03-11-2026*

Libyan Med J. 2026;18(11):750-753
https://doi.org/10.69667/lmj.26111
Libyan Medical Journal
https://lmj.ly/index.php/ojs/index eISSN: 3107-0426

Data Collection
Demographic and clinical data were collected, including age, gender, cough, fever, cold symptoms, fatigue, and influenza A infection status. Serum CRP measurements were also recorded for statistical analysis.

Laboratory Analysis
Serum CRP levels were measured using an immunoturbidimetric assay to assess systemic inflammation.

Ethical Considerations
Ethical approval was obtained from the relevant institutional ethics committee before the study commenced. Informed consent was obtained from all participants or their legal guardians, where applicable. Participant confidentiality and anonymity were maintained throughout the study.

Statistical Analysis
Data were analysed using IBM SPSS Statistics, version 21.0. Descriptive statistics were presented as frequencies, percentages, means, and standard deviations, as appropriate. Chi-square tests, Fisher's exact tests, independent-samples t-tests, and Pearson's correlation analysis were used, as appropriate. A p-value of less than 0.05 was considered statistically significant.

Results
A total of 62 participants were included in the study, comprising 32 females (51.6%) and 30 males (48.4%). Fever was reported by all participants (100%), followed by cough (93.5%) and fatigue (79.0%). Cold symptoms were present in 51.6% of participants. Regarding influenza A infection status, 22 participants (35.5%) tested positive, while 40 (64.5%) tested negative (Table 1).

Table 1. Distribution of Demographic Characteristics and Clinical Symptoms Among Study Participants.

Items		Frequency (N)	Percentage (%)
Gender	Male	30	48.4%
	Female	32	51.6%
Cough	No	4	6.5%
	Yes	58	93.5%
Fever	No	0	0.0%
	Yes	62	100.0%
Cold	No	30	48.4%
	Yes	32	51.6%
Fatigue	No	13	21.0%
	Yes	49	79.0%
Influenza	Negative	40	64.5%
	Positive	22	35.5%

The mean age of participants was 32.11 ± 24.26 years. The mean serum CRP level was 61.00 ± 70.34, with values ranging from 5 to 301, indicating considerable variability in CRP levels among participants (Table 2).

Table 2. Descriptive Statistics of Age and Serum CRP Levels Among Study Participants.

Items	Max	Min	Mean	SD
Age	91.00	4.00	32.11	24.26
CRB	301.00	5.00	61.00	70.34

Among influenza A-positive participants, 54.5% were female, and 45.5% were male. All influenza A-positive participants reported cough, fever, and fatigue, while cold symptoms were reported by 95.5% of influenza A-positive participants, compared with 27.5% of influenza A-negative participants. Cold symptoms ($p = 0.001$) and fatigue ($p = 0.002$) were significantly associated with influenza A positivity. However, neither gender ($p = 0.795$) nor cough ($p = 0.287$) showed a statistically significant association with influenza A positivity. Fever was reported by all participants, regardless of influenza A infection status (Table 3).

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received: *27-08-2026 -* ***Accepted:*** *25-10-2026 -* ***Published:*** *03-11-2026*

Libyan Med J. 2026;18(11):750-753
https://doi.org/10.69667/lmj.26111
Libyan Medical Journal
https://lmj.ly/index.php/ojs/index eISSN: 3107-0426

Table 3. Association Between Demographic and Clinical Characteristics and Influenza A Infection Status

Items		Influenza-Negative		Influenza-Positive		P–value
		N	%	N	%	
Gender	Male	20	50.0%	10	45.5%	0.795[a]
	Female	20	50.0%	12	54.5%	
Cough	No	4	10.0%	0	0.0%	0.287[b]
	Yes	36	90.0%	22	100.0%	
Fever	No	0	0.0%	0	0.0%	-
	Yes	40	100.0%	22	100.0%	
Cold	No	29	72.5%	1	4.5%	0.001**[b]
	Yes	11	27.5%	21	95.5%	
Fatigue	No	13	32.5%	0	0.0%	0.002**[b]
	Yes	27	67.5%	22	100.0%	

*P-values were determined using (a) the chi-square test and (b) Fisher's exact test. **: high significance at the 0.01 level.*

The mean age was higher among influenza A-positive participants than among influenza A-negative participants (38.14 ± 29.24 vs. 28.80 ± 20.70 years), although the difference was not statistically significant (p = 0.149). In contrast, mean serum CRP levels were significantly higher among influenza A-positive participants than among influenza A-negative participants (113.65 ± 77.11 vs. 20.50 ± 21.56, respectively; p = 0.001) (Table 4).

Table 4. Comparison of Age and Serum CRP Levels Between Influenza A-Negative and Influenza A-Positive Participants

Items	Influenza-Negative				Influenza-Positive				P–value
	Max	Min	Mean	SD	Max	Min	Mean	SD	
Age	80	4	28.8	20.7	91	5	38.14	29.24	0.149
CRB	87	5	20.5	21.56	301	9	113.65	77.11	0.001**

*P-values were determined using the independent-samples t-test. **: high significance at the 0.01 level.*

A significant positive correlation was observed between serum CRP levels and influenza A infection status (r = 0.664, p = 0.001), indicating that higher CRP levels were associated with influenza A positivity (Table 5).

Table 5. Correlation Between Serum CRP Levels and Influenza A Infection Status

Items	N	CRB (r)	P–value
Influenza	62	0.664**	0.001**

*Pearson's correlation. **: high significance at the 0.01 level.*

Discussion

Demographic variables, including age and gender, were not significantly associated with influenza A infection status in this cohort, suggesting that these characteristics alone had limited discriminatory value within the study population. Nevertheless, age may influence host inflammatory responses, as immunosenescence and age-related changes in baseline inflammatory activity can affect circulating CRP levels, particularly among older adults [5,6]. Although interindividual variability in immune responses has been documented in studies of influenza vaccination, immune responses to natural infection differ substantially from vaccine-induced responses [7].

Cold symptoms and fatigue were significantly associated with influenza A positivity, suggesting that respiratory and systemic manifestations may contribute to clinical assessment. Previous studies have shown that combinations of clinical signs and symptoms may help identify patients with influenza A, although individual symptoms alone are insufficient to establish the diagnosis [8,9]. In the present study, cough was not significantly associated with influenza A infection status, potentially reflecting its occurrence across various respiratory infections. Fever was reported by all participants, irrespective of infection status, limiting its discriminatory value in this cohort. These findings highlight the importance of combining clinical assessment with appropriate diagnostic testing [8–11].

Accurate identification of influenza A infection may also support clinical decision-making and appropriate antiviral prescribing [10,12]. The most notable finding was the significantly higher serum CRP levels among influenza A-positive participants, accompanied by a significant positive correlation between CRP levels and infection status. CRP is a major acute-phase reactant that increases in response to infection and inflammation, and influenza A infection can trigger this inflammatory response [9,13]. However, CRP is a nonspecific inflammatory marker that may also be elevated in bacterial infections and other inflammatory conditions. Therefore, CRP alone cannot confirm influenza A infection or reliably

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received*: 27-08-2026 -* ***Accepted****: 25-10-2026 -* ***Published****: 03-11-2026*

Libyan Med J. 2026;18(11):750-753
https://doi.org/10.69667/lmj.26111
Libyan Medical Journal
https://lmj.ly/index.php/ojs/index eISSN: 3107-0426

distinguish viral from bacterial infections [4,14,15]. The present findings are consistent with those reported by Haran et al., who observed a strong correlation between CRP levels and symptom severity among patients with acute influenza A infection [16]. Collectively, these findings suggest that CRP may have value as an adjunctive inflammatory biomarker in patients presenting with suspected influenza A infection, although further studies are required to establish its diagnostic accuracy and clinical utility.

Conclusion

This study identified a significant association between elevated serum CRP levels and influenza A positivity, as well as significant associations between influenza A infection and cold symptoms and fatigue. Although CRP is not a standalone diagnostic test, it may serve as an adjunctive inflammatory biomarker alongside clinical assessment and appropriate diagnostic testing. Further studies are needed to determine whether CRP can improve risk stratification and support clinical decision-making in patients presenting with influenza-like illness.

Acknowledgments
Nil.

Conflicts of Interest
Nil.

References

1. Pereira LA, Lapinscki BA, Santos JS, Debur MC, Petterle RR, Nogueira MB, et al. Influenza A infections: predictors of disease severity. Braz J Microbiol. 2024 Mar;55(1):75-86.
2. Liu HF, Hu XZ, Huang RW, Guo ZH, Gao JR, Xiang M, et al. Evaluation of disease severity and prediction of severe cases in children hospitalized with influenza A (H1N1) infection during the post-COVID-19 era: a multicenter retrospective study. BMC Pediatr. 2024;24:234.
3. Iftimie S, Gabaldó-Barrios X, Penadés-Nadal J, Canela-Capdevila M, Piñana R, Jiménez-Franco A, et al. Serum levels of arachidonic acid, interleukin-6, and C-reactive protein as potential indicators of pulmonary viral infections: comparative analysis of influenza A, respiratory syncytial virus infection, and COVID-19. Viruses. 2024;16(7):1065.
4. Carbonell R, Moreno G, Martin-Loeches I, Bodí M, Rodríguez A. The role of biomarkers in influenza and COVID-19 community-acquired pneumonia in adults. Antibiotics (Basel). 2023;12(1):161.
5. Franceschi C, Campisi J. Chronic inflammation (inflammaging) and its potential contribution to age-associated diseases. J Gerontol A Biol Sci Med Sci. 2014;69(Suppl 1):S4-9.
6. Falsey AR, Walsh EE, Francis CW, Looney RJ, Kolassa JE, Hall WJ, et al. Response of C-reactive protein and serum amyloid A to influenza A infection in older adults. J Infect Dis. 2001;183(7):995-9.
7. McDade TW, Borja JB, Kuzawa CW, Perez TL, Adair LS. C-reactive protein response to influenza vaccination predicts cardiovascular disease risk in the Philippines. Biodemogr Soc Biol. 2020;65(1):88-96.
8. Monto AS, Gravenstein S, Elliott M, Colopy M, Schweinle J. Clinical signs and symptoms predicting influenza infection. Arch Intern Med. 2000;160(21):3243-7.
9. Whicher JT, Chambers RE, Higginson J, Nashef L, Higgins PG. Acute phase response of serum amyloid A protein and C reactive protein to the common cold and influenza. J Clin Pathol. 1985;38(3):312-6.
10. Barenfanger J, Drake C, Leon N, Mueller T, Troutt T. Clinical and financial benefits of rapid detection of respiratory viruses: an outcomes study. J Clin Microbiol. 2000;38(8):2824-8.
11. Lehtomaki K, Leinonen M, Takala A, Hovi T, Herva E, Koskela M. Etiological diagnosis of pneumonia in military conscripts by combined use of bacterial culture and serological methods. Eur J Clin Microbiol Infect Dis. 1988;7(3):348-54.
12. Mueller MR, Smith PJ, Baumbach JP, Palumbo JP, Meek JI, Gershman K, et al. Influenza testing and antiviral prescribing practices among emergency department clinicians in 9 states during the 2006 to 2007 influenza season. Ann Emerg Med. 2010;55(1):32-9.
13. Pathak A, Agrawal A. Evolution of C-reactive protein. Front Immunol. 2019;10:943.
14. Summah H, Qu JM. Biomarkers: a definitive plus in pneumonia. Mediators Inflamm. 2009;2009:675753.
15. Flanders SA, Stein J, Shochat G, Sellers K, Holland M, Maselli J, et al. Performance of a bedside C-reactive protein test in the diagnosis of community-acquired pneumonia in adults with acute cough. Am J Med. 2004;116(8):529-35.
16. Haran JP, Suner S, Gardiner F. Correlation of C-reactive protein to severity of symptoms in acute influenza A infection. J Emerg Trauma Shock. 2012;5(2):149-52.

Copyright *Author (s) 2026. Distributed under Creative Commons CC BY 4.0*
Received: *27-08-2026 -* ***Accepted:*** *25-10-2026 -* ***Published:*** *03-11-2026*