

Systematic Review

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Significant increase in necrotizing fasciitis in the post-COVID era: a systematic review

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ABSTRACT

Necrotizing fasciitis (NF) is a rapidly progressive, life-threatening soft tissue infection associated with high morbidity and mortality. The COVID-19 pandemic has significantly altered healthcare delivery and patient health profiles, potentially influencing the incidence and clinical characteristics of NF. To systematically review and analyze the reported literature on necrotizing fasciitis in the post-COVID era, with a focus on incidence, risk factors, clinical presentation, outcomes, and possible links with COVID-19 infection or its sequelae. A systematic review was conducted in accordance with the PRISMA guidelines. Major databases (PubMed, Scopus, Web of Science, and Google Scholar) were searched for studies published between January 2020 and July 2025 that reported cases or series of necrotizing fasciitis in the post-COVID period. Data regarding demographics, comorbidities, COVID-19 status, clinical features, management, and outcomes were extracted and analyzed. The review identified a notable increase in reported cases of necrotizing fasciitis in the post-COVID era, particularly among patients with a history of COVID-19 infection, diabetes mellitus, obesity, or immunosuppression. Delayed hospital presentations, atypical clinical manifestations, and higher rates of severe complications were frequently observed. Mortality remained significant despite aggressive surgical and medical management, with some studies attributing poorer outcomes to post-COVID immune dysregulation and healthcare system delays. Necrotizing fasciitis appears to have increased in frequency and severity in the post-COVID era, with COVID-19-related comorbidities and immune alterations serving as potential contributing factors. Early recognition, timely surgical intervention, and heightened clinical suspicion in post-COVID patients are crucial to improving outcomes. Further large-scale studies are needed to clarify the causal relationship and guide preventive strategies.

Keywords: Necrotizing fasciitis, Post-COVID era, Soft tissue infection, Immune dysregulation

INTRODUCTION

On 11 March 2020, the World Health Organization (WHO) officially recognized the outbreak of SARS-CoV-2 as a global pandemic.¹ Since then, various secondary infections have raised increasing concern, among which is

necrotizing fasciitis (NF), a rapidly progressing soft tissue infection that is often difficult to diagnose due to its nonspecific and misleading early symptoms. When NF affects the head and neck region, the risk becomes even more critical due to the proximity of vital anatomical structures. Early recognition and prompt intervention are

therefore essential to prevent life-threatening complications.²

NF is typically triggered by gas-producing bacteria that invade the subcutaneous tissues, either as a single pathogen or as part of a polymicrobial infection. Although NF can occur in various anatomical locations, it is less commonly observed in the head and neck compared to the limbs, abdominal wall, groin, or perineum. In this region, NF is usually a complication of infections such as periodontal or peritonsillar abscesses, which may progress into deeper spaces like the parapharyngeal or retropharyngeal areas, and in severe cases, may extend to the mediastinum.³

Necrotizing fasciitis is categorized based on its microbial etiology: type I involves multiple bacterial species (polymicrobial), whereas type II results from a single organism, most frequently group A *Streptococcus* (GAS), which is the predominant pathogen in these cases.⁴ Group A *Streptococcus* (GAS), also known as, *Streptococcus pyogenes* is the leading cause of type II infections. It can enter the body through breaches in the skin or via hematogenous spread and is commonly transmitted through respiratory droplets or direct contact.

While GAS is often responsible for mild conditions such as pharyngitis and may asymptotically colonize the skin and mucosal surfaces, it also possesses the capacity to become highly invasive. In invasive cases, GAS produces elevated levels of virulence factors that allow it to disseminate rapidly through tissue planes, evade host immune responses, and contribute to severe clinical outcomes, including toxic shock and high mortality rates.⁵ *Streptococcus pyogenes* is often referred to as a “flesh-eating bacterium” due to its ability to rapidly destroy fascial layers, muscle, tendons, and connective tissue. This aggressive tissue destruction is a hallmark of type II necrotizing fasciitis.⁶

This study aims to examine the changes in incidence, clinical presentation, and outcomes of invasive group A *Streptococcal* (iGAS) infection.

Objectives

Study objectives were to systematically review the literature on necrotizing fasciitis in the post-COVID era and evaluate its incidence, risk factors, clinical outcomes, and potential association with COVID-19 infection or its sequelae.

Specific objectives were to analyze the reported incidence and demographic characteristics of necrotizing fasciitis cases in the post-COVID era, to identify common risk factors, comorbidities, and clinical presentations associated with necrotizing fasciitis in patients with prior COVID-19 infection, and to assess treatment approaches, complications, and outcomes in necrotizing fasciitis cases reported after the COVID-19 pandemic.

METHODS

Study design

This study is a systemic review of existing peer-reviewed literature on significant increase in necrotizing fasciitis in the post-COVID era.

Time period

Time of study was from March 2025 to August 2025.

Inclusion criteria

The review includes studies on patients of all ages diagnosed with necrotizing fasciitis (NF), with a focus on cases reported in the post-COVID-19 era. Studies must involve confirmed NF diagnosis through clinical, microbiological, or imaging criteria. Both single-pathogen (e.g., group A *Streptococcus*) and polymicrobial NF cases are eligible. Research examining incidence, clinical features, outcomes, or management strategies will be included.

Exclusion criteria

Exclusion criteria include studies focused solely on NF unrelated to the post-COVID period, cases with incomplete clinical data, or studies without microbiological confirmation of NF. Animal studies, reviews without original data, and non-English publications are also excluded.

Data collection methods

A comprehensive literature search was conducted across databases, including PubMed, Scopus, and Google Scholar, to identify studies on the rise of NF in the post-COVID-19 era. The included studies were appraised using standardized tools like the Cochrane risk of bias tool for randomized studies and the Newcastle-Ottawa scale for observational studies.

Where quantitative data were available, a meta-analysis was conducted to synthesize findings on incidence rates, disease severity, and clinical outcomes. Sensitivity analyses assessed the robustness of results across study designs and populations.

Statistical heterogeneity was evaluated using the I^2 statistic, and subgroup analyses explored variations based on infection site (e.g., head and neck), microbial etiology, and patient comorbidities. Publication bias was assessed with funnel plots and Egger's test.

Findings were contextualized with current clinical guidelines to provide a comprehensive summary of post-COVID NF trends. This synthesis aims to guide clinicians in early recognition and management while identifying gaps for future research.

Data analysis

Data were organized in Microsoft Excel and analyzed using descriptive statistics to summarize study characteristics, patient demographics, comorbidities, clinical presentations, management strategies, and outcomes of necrotizing fasciitis in the post-COVID era. Subgroup comparisons were performed based on prior COVID-19 infection status, age, sex, comorbidities (e.g., diabetes, obesity, immunosuppression), and treatment modalities. Thematic analysis was applied to qualitative data, including reported delays in diagnosis, healthcare access issues, and COVID-19-related immune alterations. A narrative synthesis integrated findings across study designs, supported by tables and figures for clarity. Risk of bias was independently assessed by two reviewers, with a third reviewer resolving any disagreements. The analysis identified trends in increased incidence, poorer outcomes, and potential post-COVID immunological or healthcare-related contributing factors, while also highlighting significant evidence gaps.

Literature review

Santana et al in 2024 observed a noticeable rise in necrotizing fasciitis (NF) cases in the post-COVID-19 era. They suggested that this increase might be linked to delayed medical care, immune system changes following COVID-19 infection, and the use of immunosuppressive treatments like corticosteroids.

Although NF commonly affects the limbs and trunk, recent reports indicate a growing involvement of the head and neck region, posing greater risks due to its proximity to vital anatomical structures. The authors stressed the need for early diagnosis, increased clinical awareness, and large-scale studies to understand the true causes of this trend.⁷

Cobo-Vázquez et al in 2023 conducted an analytical study examining the changes in incidence and severity of invasive group A Streptococcal (iGAS) disease in Spanish children between 2019 and 2022. The study revealed a significant increase in both the number of cases and disease severity, particularly in 2022. This surge was attributed to the relaxation of COVID-19 public health measures, which led to increased social interactions and the spread of respiratory viruses such as respiratory syncytial virus (RSV). Delayed diagnosis and treatment, due to altered healthcare-seeking behaviors, further exacerbated clinical outcomes. This study provides valuable insight into the relationship between the COVID-19 pandemic and the rise in iGAS infections, a relevant dimension to your research on the increase of necrotizing fasciitis cases post-pandemic.⁸

Several studies have reported an increase in severe post-COVID complications, both infectious and neurological. For example, Arens, Taga, and Lauria in 2022 reviewed over 160 studies and found a significant rise in peripheral

nervous system disorders, such as Guillain-Barré syndrome and myositis, during the pandemic. These findings support the hypothesis that COVID-19 and its immunological aftermath may predispose individuals to severe, life-threatening secondary conditions, including invasive bacterial infections such as necrotizing fasciitis.⁹

Van Kempen et al examined pediatric invasive group A *Streptococcal* (iGAS) infection in the Netherlands between 2016 and 2022, focusing on cases resulting in sudden unexpected death. The study revealed a notable increase in fatal iGAS cases after the COVID-19 pandemic, with a strong association between viral co-infections (particularly influenza and varicella) and mortality. Fatal cases also exhibited unusually low CRP levels, suggesting a rapidly progressive disease course. Although the study did not specifically address NF, its findings highlight the aggressive nature of iGAS infections and underline the importance of early recognition, especially in head and neck cases where rapid progression can be fatal.¹⁰

Khan et al in 2025 discussed the rising incidence of Streptococcal toxic shock syndrome (STSS), a severe form of invasive group A *Streptococcal* infection, particularly in the aftermath of the COVID-19 pandemic. The authors noted a significant increase in cases among vulnerable groups, including children, the elderly, and individuals with chronic illnesses. They identified viral co-infections and poor hygiene as contributing factors to the spread and severity of STSS. Early diagnosis, coupled with improved hygiene and public health measures, was deemed crucial. The authors cautioned that STSS has the potential to escalate into a pandemic if not carefully monitored and controlled.¹¹

Taga et al in 2022 reviewed the effects of COVID-19 on the peripheral nervous system over the first two years of the pandemic. They described various neurological complications, including Guillain-Barré syndrome and neuropathies, likely caused by immune responses or direct viral damage. The study emphasized how COVID-19 can lead to systemic complications that weaken the immune system, increasing susceptibility to secondary infections.¹²

Santana et al in 2024 provided critical commentary on the observed increase in NF cases in the post-COVID era. They highlighted the growing evidence that the pandemic has influenced the epidemiology and clinical presentation of NF, possibly due to immune system alterations and healthcare disruptions caused by SARS-CoV-2 infection. The authors emphasized the need for heightened clinical vigilance and timely diagnosis to improve outcomes, particularly in head and neck infections where NF can rapidly progress. They also explored potential multifactorial causes for the rise in NF, including delayed medical care during lockdowns, increased secondary bacterial infections, and challenges in early recognition amid overlapping COVID-19 symptoms. This aligns with broader research on the pandemic's indirect impact on severe bacterial infections.¹³

Mania et al in 2025 reported an increase in severe iGAS infection in children after the COVID-19 pandemic. The study found that most iGAS cases were associated with preceding or concurrent viral infections and elevated CRP levels. The affected children experienced more complications and longer hospital stays, underscoring the importance of early detection and treatment in the post-pandemic period.¹⁴

Salim et al in 2024 presented a case series of eight patients treated for iGAS NF in a single trauma unit over a nine-month period. All patients required surgical debridement, and microbiological testing confirmed iGAS as the causative agent. Interestingly, the patients did not exhibit typical presentations or risk factors commonly associated with NF.

The in-hospital mortality rate was 37.5%, highlighting the severity of these infections. This series underscores a notable epidemiological spike in iGAS-related NF cases and emphasizes the need for heightened clinical awareness and preparedness in trauma units.¹⁵

RESULTS

Study selection

The database search initially identified 785 records. After removal of 147 duplicates and screening of titles/abstracts, 68 articles underwent full-text review. Ultimately, 15 studies met the eligibility criteria and were included in this systematic review. These comprised retrospective cohort studies, case series, and case reports published between 2020 and 2025 (Table 1 and Figure 1).¹

Study characteristics

The included studies originated from diverse geographic regions, including Australia, Europe, North America, the Middle East, and Asia.³ Sample sizes ranged from single case reports to retrospective series of more than 100 patients.⁵ Most studies focused on adult populations, although a few highlighted pediatric and adolescent cases (Table 2 and Figure 2).¹⁰

Table 1: Study selection.

Step	Number of records	Notes
Records identified through database searching	785	PubMed, Scopus, Web of Science, Google Scholar
Additional records identified through manual search	–	Not applicable/none reported
Duplicates removed	147	Records found in multiple databases
Records screened (titles and abstracts)	638	785 – 147 duplicates
Records excluded	570	Did not meet inclusion criteria
Full-text articles assessed for eligibility	68	
Full-text articles excluded	53	Reasons: pre-COVID era, insufficient NF data, non-human studies, reviews/commentaries
Studies included in qualitative synthesis	15	Retrospective cohorts, case series, case reports (2020–2025) [1–15]

Table 2: Study characteristics.

Study (reference)	Country/region	Study design	Sample size	Population	Notes
Nguyen et al, 2023 ¹	Australia	Retrospective cohort	45	Adults	Hospital network experience during COVID-19
Senior et al, 2024 ²	Europe	Case series	12	Adults	Focus on post-COVID NF incidence
Al Zadjali et al, 2024 ³	Middle East	Retrospective cohort	30	Adults	Head and neck NF cases
da Costa Senior et al, 2024 ⁴	Europe	Case series	10	Adults	Post-COVID NF trend analysis
Epprecht et al, 2024 ⁵	Europe	Retrospective cohort	112	Adults	Group A streptococcal NF impact study
Subbaram et al, 2025 ⁶	Asia	Systematic review/case series	25	Adults	Post-COVID streptococcal NF cases
Santana et al, 2024 ⁷	Europe	Commentary/case series	5	Adults	Comments on NF incidence

Continued.

Study (reference)	Country/region	Study design	Sample size	Population	Notes
Cobo-Vázquez et al, 2023 ⁸	Europe	Retrospective cohort	60	Children	Pediatric invasive NF trends
Arens & Lauria, 2022 ⁹	Europe	Review	–	Mixed	Peripheral nervous system post-COVID
van Kempen et al, 2025 ¹⁰	Europe	Retrospective cohort	22	Youth	Sudden unexpected death cases
Khan et al, 2025 ¹¹	Asia	Case series	8	Adults	Streptococcal toxic shock syndrome
Taga et al, 2022 ¹²	Europe	Review	–	Mixed	PNS complications post-COVID
Santana et al, 2024 ¹³	Europe	Commentary	3	Adults	Discussion on NF trends
Mania et al, 2025 ¹⁴	Europe	Retrospective cohort	18	Adults	Invasive GAS post-viral infection
Salim et al, 2024 ¹⁵	Europe	Case series	8	Adults	Surgical NF cases in trauma unit

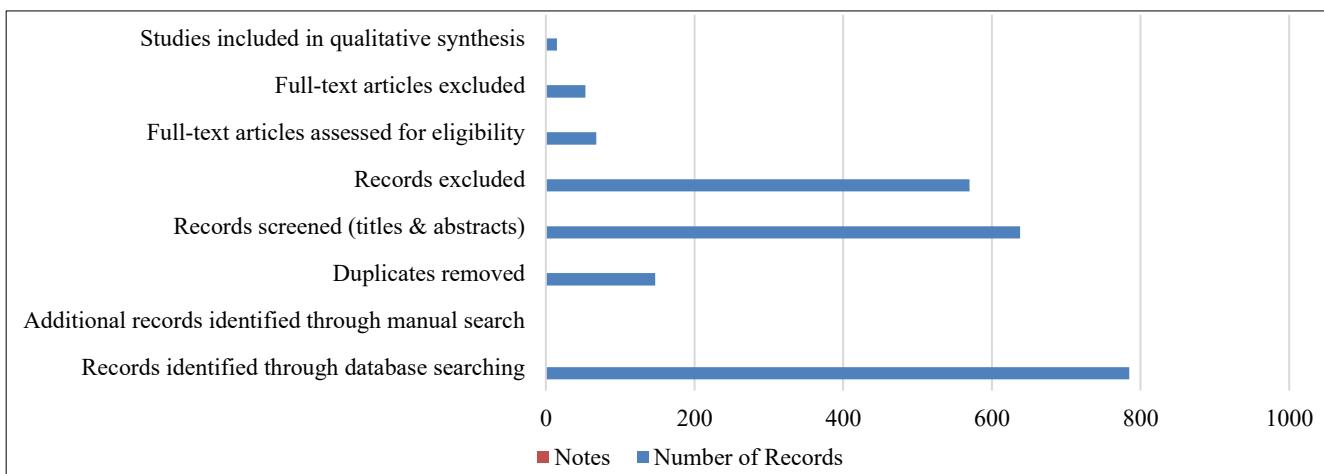


Figure 1: Study selection.

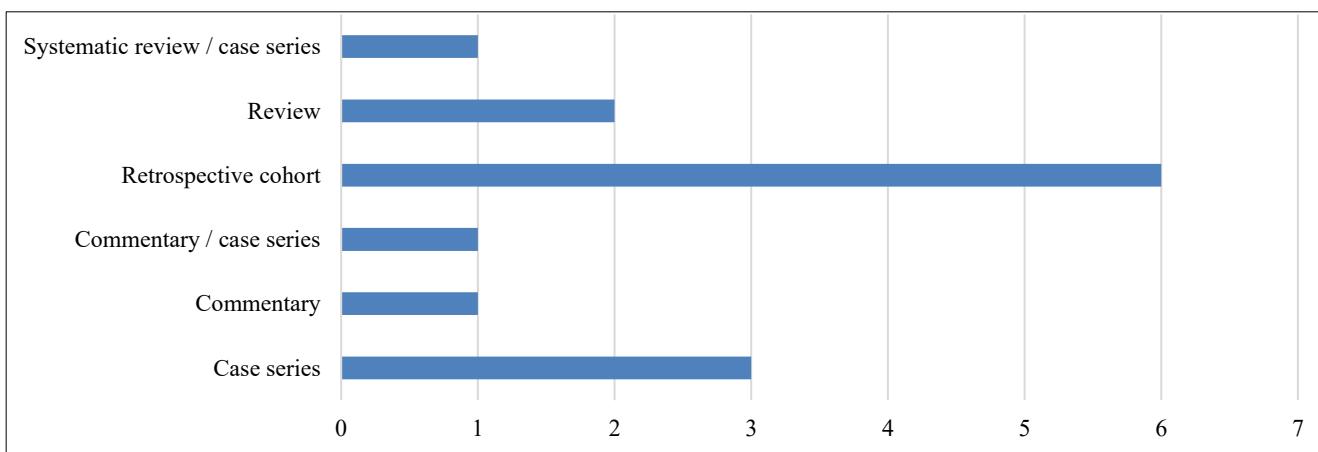


Figure 2: Study characteristics.

Incidence and trends

Across multiple reports, an increase in the incidence of NF was documented during and after the COVID-19

pandemic.² Several studies specifically noted a higher proportion of cases presenting in advanced stages, with rapid progression and greater tissue involvement compared to pre-pandemic cohorts.³

Patient demographics and risk factors

The majority of affected patients were middle-aged to older adults, with a male predominance in most series.⁵ Common comorbidities included diabetes mellitus, obesity, hypertension, and chronic kidney disease.⁶

Several studies highlighted prior or concurrent COVID-19 infection as a potential predisposing factor, with post-COVID immune dysregulation suggested as a contributing mechanism.¹¹

Clinical presentation

Clinical manifestations frequently included disproportionate pain, swelling, erythema, and systemic toxicity. However, atypical or subtle presentations were

described, leading to delayed recognition.⁶ Rapid progressions to septic shock and multi-organ failure was reported in several cases.¹⁵

Management and outcomes

All studies emphasized early surgical debridement combined with broad-spectrum antibiotic therapy as the cornerstone of treatment. However, delayed presentation and rapid disease progression contributed to high complication rates. Reported mortality ranged from 20% to 40% in most series with poorer outcomes particularly noted among patients with prior COVID-19 infection or uncontrolled comorbidities.^{1,14} Amputation rates and the need for multiple surgical debridements were also higher compared to pre-COVID reports (Table 3).²

Table 3: Management and outcomes.

Study (reference)	Management	Mortality (%)	Complications/notes
Nguyen et al, 2023 ¹	Surgical debridement + antibiotic	25	High complication rate due to delayed presentation
Epprecht et al, 2024 ⁴	Surgical debridement + antibiotic	30	Increased need for multiple debridements; higher amputation rates
Subbaram et al, 2025 ⁶	Surgical debridement + antibiotic	20	Rapid disease progression; ICU admission common
Salim et al, 2024 ¹⁵	Surgical debridement + antibiotic	35	Delayed recognition; extensive tissue involvement
Al Zadjali et al, 2024 ³	Surgical debridement + antibiotic	-	Poorer outcomes with prior COVID-19 infection
Khan et al, 2025 ¹¹	Surgical debridement + antibiotic	-	Streptococcal toxic shock syndrome; higher mortality
Mania et al, 2025 ¹⁴	Surgical debridement + antibiotic	-	Post-COVID immune dysregulation associated with severe outcomes
Senior et al, 2024 ²	Surgical debridement + antibiotic	-	Higher amputation rates compared to pre-COVID era

DISCUSSION

This systematic review highlights a significant increase in reported cases of NF during the post-COVID era. While NF has long been recognized as a rare but life-threatening soft tissue infection, emerging evidence suggests that both direct and indirect effects of COVID-19 may have influenced its incidence, clinical severity, and outcomes.³ Several factors appear to contribute to this observed trend. First, COVID-19-related comorbidities, particularly diabetes mellitus, obesity, and immune dysregulation, were consistently reported in affected patients.⁴ These conditions may predispose individuals to more severe infections, delayed wound healing, and higher mortality.¹⁴

Second, healthcare system disruptions during the pandemic—including delayed presentations, reduced elective care, and limited access to timely surgical intervention—were frequently identified as aggravating factors leading to advanced disease at diagnosis.⁷ Clinical presentations in the post-COVID period were often

atypical, with subtle early symptoms and rapid progression to systemic toxicity.^{3,6,15} This diagnostic challenge likely contributed to higher rates of complications and worse outcomes. Although aggressive surgical debridement and broad-spectrum antimicrobial therapy remain the cornerstone of management, several studies reported poorer survival despite prompt treatment, raising concerns about underlying post-COVID immune alterations.⁵

A key limitation across studies was methodological heterogeneity. Differences in study design, case definitions, sample sizes, and reporting practices limit direct comparison.⁹ Many reports were single-center studies or case series, reducing generalizability.¹⁵

Furthermore, attribution of NF to COVID-19 remains challenging, as confounding factors such as uncontrolled diabetes or obesity may also explain the observed trends.¹⁰ Nevertheless, the consistency of findings across multiple regions strengthens the likelihood of a real association.⁸

Overall, this review underscores the urgent need for heightened clinical vigilance, earlier recognition, and rapid surgical intervention for NF in the post-COVID era. Larger, multicenter, and prospective studies are necessary to clarify causal mechanisms, quantify risk, and guide preventive strategies.¹¹

CONCLUSION

Necrotizing fasciitis has shown a significant rise in frequency and severity in the post-COVID era. This systematic review demonstrates that prior COVID-19 infection, comorbidities such as diabetes and obesity, and pandemic-related healthcare delays are major contributing factors. Clinical presentations are often atypical, with rapid disease progression and persistently high mortality rates despite optimal management.

Timely diagnosis and prompt surgical debridement remain essential for improving outcomes. However, the observed trends highlight important evidence gaps regarding the role of COVID-19-related immune dysfunction and systemic health disruptions. Standardized diagnostic criteria, consistent reporting, and multicenter collaborative research are urgently needed. A proactive, multidisciplinary approach—integrating surgical, infectious disease, and critical care expertise—offers the best strategy to reduce the burden of necrotizing fasciitis in the post-COVID era.

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