Health Scope. 2026 February; 15(1): e164217 https://doi.org/10.5812/healthscope-164217

Published Online: 2025 September 29 **Systematic Review**

Strategies for Preventing of *Fusarium* Species Infections in Burn Patients: A Systematic Review

Hossienali Danesh [1], Abdolahad Nabiolahi [2], Leila Keikha [3], Fateme Koul [4], Amirhossein Keikha [5], Hossein Moein [6], Nasser Keikha [7,*]

[1] Department of Surgery, Ali Ibne Abitaleb Hospital, School of Medicine, Zahedan University of Medical Sciences, Zahedan, Iran
[2] Department of Medical Library and Information Sciences, School of Allied Medical Sciences, Zahedan University of Medical Sciences, Zahedan, Iran
[3] Zahedan University of Medical Sciences, Zahedan, Iran
[4] Cellular and Molecular Research Center, Research Institute of Cellular and Molecular Sciences in Infectious Diseases, Zahedan University of Medical Sciences, Zahedan, Iran
[5] National Organization for Development of Exceptional Talents, Hazrat Mohammad Secondary School, Education and Training Administration of Sistan and Baluchestan, Zahedan, Iran
[6] Department of Environmental Health, Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, Iran
[7] Infectious Diseases and Tropical Medicine Research Center, Research Institute of Cellular and Molecular Sciences in Infectious Diseases, Zahedan University of Medical Sciences, Zahedan, Iran

[*] ***Corresponding Author:*** Infectious Diseases and Tropical Medicine Research Center, Research Institute of Cellular and Molecular Sciences in Infectious Diseases, Zahedan University of Medical Sciences, Zahedan, Iran. Email: nasserkeikha@yahoo.com

Received: 7 July, 2025; **Revised:** 22 September, 2025; **Accepted:** 24 September, 2025

Abstract

Context: Burn infections are a major public health problem for individuals suffering from burn wounds.

Objectives: The present study was conducted with the aim of analyzing the literature on *Fusarium* infection in burn patients to determine the mortality rate, types of fungal infections, cultures, and prevention strategies.

Methods: This systematic review analyzes scientific literature related to *Fusarium* species (spp.) infections in burn patients. A search was performed to identify relevant studies in PubMed, Web of Science, Scopus databases, and Google Scholar search engine from 2000 to August 2025 using specific keywords and their equivalents. The inclusion criteria comprised English-language articles pertinent to the research objectives and the subject area of *Fusarium* infections. Non-English-language articles or studies lacking full-text availability were excluded. Content analysis was employed to examine the data.

Results: The first section of the findings shows that 34 related articles were identified concerning *Fusarium* spp. infections. The highest mortality rate was 45% in burn patients with *Fusarium* fungus. The detected spp. was *Fusarium solani* based on diagnostic samples taken from biopsy and histopathological examinations. The type of treatment was amphotericin B and voriconazole, and 83% of burns occurred among men.

Conclusions:*Fusarium* infections among burn patients were among the factors affecting mortality. Strategies to prevent and reduce mortality in burn patients with *Fusarium* spp. infections include early diagnosis, appropriate antifungal treatment, air ventilation, patient isolation, elimination of flowers, and use of chemoprophylaxis. Additionally, healthcare workers are required to distinguish predisposing factors for visceral fungal disease.

Keywords: Prevention and Control, *Fusarium*, Burns, Mortality, Pathology

1. Context

Today, burn wounds are common and cause major health problems in different parts of the world. In addition, burns are known as one of the major types of injury, and statistics indicate that 1% of people around the world are affected by actual burns, with 70% of deaths in burn patients occurring due to wound infections (1). The latest reports from the World Health Organization also state that 180,000 deaths occur due to burns, leading to a global health challenge that imposes significant costs on healthcare systems (2). Burns are

How to Cite: Danesh H, Nabiolahi A, Keikha L, Koul F, Keikha A, et al. Strategies for Preventing of *Fusarium* Species Infections in Burn Patients: A Systematic Review. Health Scope. 2026; 15 (1): e164217. https://doi.org/10.5812/healthscope-164217.

mainly caused by exposing the body to heat, which results from the transfer of energy from a heat source to the body. The severity of the burn depends on the intensity of the heat, the length of time the body is exposed to the heat, and the ability of the involved tissues to withstand it. Burns cause necrosis of subcutaneous tissues and result in cell damage to varying degrees (3,4).

Researchers believe that the type of burn and the cause of death are related to the age, social status, and occupation of individuals. Additionally, it has been stated that about 75% of burn cases are due to accidents. In home settings, burns occur due to problems escaping from fire and its dangers, which in most cases lead to hospitalization. About 30% of people get burned due to contact with hot liquids (5, 6). Also, bacterial infections of burn wounds are common, with gram-negative organisms such as *Klebsiella*, *Serratia*, *Pseudomonas*, and *Enterobacteriaceae* being isolated from these wounds. Furthermore, endotoxin secretion by some gram-negative bacteria causes toxic effects on cell division, inhibiting the immune system along with systemic symptoms and shock (5, 7-9).

In an Iranian study on burn patients in the southeast of Iran, 33 cases (25.41%) had bacterial infections (10). In the study by Mamani et al. in Hamadan, bacterial infection was most common among burn patients, with *Pseudomonas aeruginosa* reported in 27.7% of cases (10). Furthermore, fungal burn wound infections are among the most severe problems in patients who are seriously burned (11). Burn wound infections remain the most important factor limiting survival in burn patients. Damaged immune systems and broad-spectrum antibiotic therapy facilitate the growth of opportunistic fungal species (spp.). Other predisposing factors include increased age, long hospital stays, steroid treatment, long-term mechanical ventilation, uncontrolled diabetes, and the presence of central venous catheters (12, 13). More severely injured patients with greater total body surface area (TBSA) burn injury and full-thickness burns require a longer recovery period, resulting in a longer hospital stay. The tendency for fungal infection increases the longer the wound is present (14). *Fusarium* spp. are pervasive fungi recognized as opportunistic agents of human infections and can produce acute infections in burn patients (15). Infection starts with the inhalation of *Fusarium* conidia or direct contact with substances contaminated with *Fusarium* conidia. Subsequently, conidia germinate and form filaments that attack the surrounding tissue when an appropriate environment is provided (16). Burned skin acts as a gateway for the entry of fungi, and the compromised immune status facilitates deep invasion (17). To the best of our knowledge, no study has comprehensively analyzed the different dimensions of fungal infections and strategies for prevention in burn patients.

2. Objectives

This systematic review responds to the following research questions:

- RQ 1: What is the mortality rate of burn patients with *Fusarium* fungus?

- RQ 2: Which spp. of *Fusarium* fungus most affect burn patients?

- RQ 3: What types of media have been used to identify *Fusarium* fungus?

- RQ 4: What treatment methods have been used for burn patients with *Fusarium* fungus?

- RQ 5: What is the percentage of burn (total body surface) in patients?

- RQ 6: What are the age and sex of people with *Fusarium* burns?

- RQ 7: What are the best strategies to prevent fungal infections in burn patients?

3. Methods

3.1. Study Design

This systematic review was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) proposed by Moher et al. (18). Figure 1 displays the PRISMA process for data collection and analysis.

3.2. Search Strategy

The papers from PubMed, Scopus, Web of Science databases, and Google Scholar search engine were searched with a time limitation (2000-August 2025). The PICO criteria were used to define the search string: Population (P), intervention (I), comparison (C), and outcome (O) (19). The population was burn patients, interventions included *Fusarium* fungus, comparison was excluded, and the outcomes were the results of treatment of patients and mortality rate.

The search string in PubMed was: [*Fusarium* (MeSH) OR "*Fusarium**" (tiab) OR "*Gibberella*" (tiab) OR Fusariosis (MeSH) OR "Fusariosis" (tiab) OR "*Fusarium* infection" (tiab)] AND [burns (MeSH) OR "burn*" (tiab)].

In Scopus, the search string was: TITLE-ABS-KEY: ("*Fusarium**" OR "*Gibberella*" OR "fusariosis" OR "*Fusarium* infection") AND ("burns" OR "burn*").

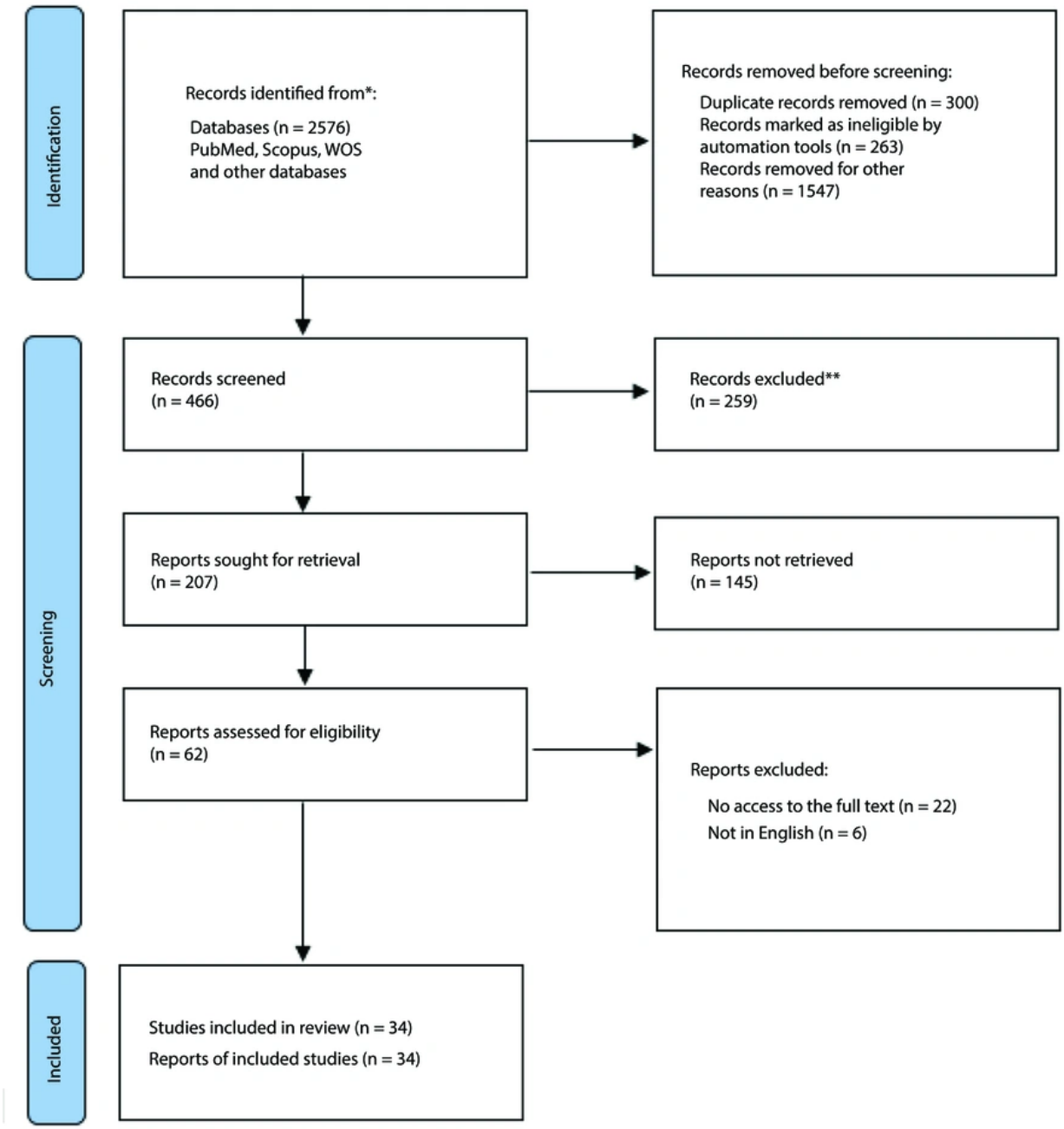

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram for retrieved and selecting studies

In Web of Science, the search string was: [TS= (“*Fusarium**” OR “*Gibberella*” OR “fusariosis” OR “*Fusarium* infection”)] AND TS=("burns" OR "burn*").

3.3. Study Selection

The criteria for including the retrieved articles in the study were that the articles addressed at least one of the

objectives of the current research within the period from 2000 to August 2025. Articles published outside this period, in languages other than English, or without available full-text formats were excluded from the study. It is important to note that gray literature was not included in this study. Articles or case series primarily focusing on fungal infections resulting from burns were analyzed. Using different search strategies in the first stage, 2,576 documents were retrieved from the selected databases. The bibliographic information of the retrieved primary documents was transferred to the 7th edition of EndNote resource management software. After removing duplicates based on inclusion criteria, the titles and abstracts of articles were reviewed by two independent reviewers, and if any disagreement was observed, the explanations of a third reviewer were applied. After identifying and removing duplicate and unrelated documents, 34 related studies were selected for final review (Figure 1).

3.4. Quality Appraisal of Studies

After the initial review of the studies, three authors convened a meeting and reached a consensus on the quality assessment of each study. Due to the diversity of available articles and methods, the Mixed Methods Assessment Tool (MMAT) 2018 version was employed to evaluate each study (20). To minimize bias, three independent evaluators assessed the studies, and any disagreements were resolved through discussion or with the involvement of a fourth evaluator.

4. Results

4.1. Study Selection

The systematic review of the databases included 2,576 articles, of which 300 were duplicates and excluded. Of the remaining articles, 1,547 were excluded based on their titles, and 263 were excluded based on their abstracts. After full-text screening of the remaining 62 articles, 28 were excluded according to the specified inclusion and exclusion criteria. Finally, 34 articles were identified as eligible for review (Figure 1).

4.2. Quality Appraisal

Findings from the quality assessment of the articles showed that all articles were eligible based on MMAT scores ranging from 80 (moderate, n = 3, 17.22%) to 100 (high, n = 29, 82.2%). Given the different study designs in the reviewed studies, we used the MMAT tool to assess their quality. The research questions in all studies were clearly stated, and the data collected provided an opportunity to answer these questions.

4.3. Study Characteristics

The results of the study show that, from a methodological point of view, the 34 retrieved articles were mostly case reports. Analysis of the demographic information of burn patients in the studies indicated that they are in the age groups between 3 to 82 years. Fungal spp. *Fusarium*, *Aspergillus*, and *Mucor* were observed in different histopathological cultures and biopsies. Other findings related to the aims are presented in Table 1.

5. Discussion

A burn wound provides an ideal environment for the growth and proliferation of microorganisms. The tissues within the burn wound are non-viable and lack blood vessels. Due to the absence of polymorphonuclear cells, antibodies, and systemic antibiotics, the conditions inside the wound create a favorable setting for the growth of bacteria and fungi, particularly *Fusarium* spp. (47-49). On the other hand, various strategies for preventing infections, particularly fungal infections resulting from burns, in hospital settings and across different patient groups are among the challenges that have garnered attention today, making effective prevention and treatment strategies for burn patients crucial (17, 50, 51).

The present study was conducted to achieve the objectives of the study, specifically to determine the mortality rate among burn patients with fungal infections caused by *Fusarium* spp., identify the media for *Fusarium* detection, explore the best treatment methods, and assess effective prevention and treatment strategies, as well as the percentage of burns and demographic information. Examining the first objective of the research, the mortality rate, the survey results indicate that the most reported cases of mortality were less than half of the sample population. In some instances, due to the large number of samples, the death rate reported was slightly higher (5, 29, 32, 44). Additionally, researchers have noted in various studies that early sample examinations have revealed that opportunistic fungi in the *Fusarium* spp. are clinically significant in burn wounds, leading to systemic infections and mortality in burn patients (11). A study sampling individual in the intensive care unit also demonstrated that twenty-four percent of patients with filamentous fungi succumbed, while fifty percent were infected with *Fusarium* spp. Furthermore, filamentous fungi have been observed in some cases among burn

patients in Spain. Notably, about half of the patients who died were attributed to *Fusarium* spp., underscoring the necessity for rapid laboratory diagnosis of fungal infections among patients. Understanding the prevalence and type of fungus in each burn center facilitates the selection of the most appropriate experimental treatment (16).

In response to the second research question, findings showed that fungal infections identified by type of fungus are predominantly *F. solani*, an opportunistic fungus found in burn lesions. While antibiotic drug regimens effectively control bacterial infections, these opportunistic fungal infections should be tested histologically to rule out further involvement of the burn tissue. Conversely, the identification of molecules to discover spp. and drug tests should be employed to select the appropriate antifungal treatment (15).

Schaal et al. have shown that epidemiologically, *Aspergillus* fumigatus has the highest prevalence among burn patients compared to *Fusarium*, which exhibits a markedly different prevalence in Indian and North American countries (17). Additionally, several cases of burn patients with diabetes have been reported who had *Fusarium* infections. *Fusarium* osteomyelitis has been documented in diabetic patients across various regions, including developed countries such as the United States. In India, a sample of *F. solani* was identified in cases of *Fusarium* endophthalmitis among diabetic patients. In Turkey, *Fusarium* spp. were found to be one of the causes of diabetic foot wound infections (22, 33, 52-55). Therefore, it can be stated that fungal infections caused by *Fusarium* in diabetic groups should be considered, along with the presence of burn wounds as a risk factor for these infections.

Rosanova et al. (2016) believed their study was the first case of skin infection caused by an emerging fungus identified as an unusual pathogen (21). Evidence from other studies indicated that wound infections in burn patients represent a small percentage of fungal infections, with *Neurospora sitophila* types being found (26-28, 33). To identify the spp., the findings show that most samples for identifying *Fusarium* are taken from burnt tissue for biopsy diagnosis (15, 17, 21, 23, 24). Other findings revealed that the use of drugs such as amphotericin B and voriconazole has been suggested in several studies for treatment. The researchers also indicated that the development of antifungal medications is essential due to the existence of drug-resistant fungi (21, 23, 29).

Additionally, the analysis of relatively small burns in a young patient, as studied by Smolle et al., has demonstrated that appropriate infection control and prevention strategies — such as addressing additional trauma, managing wound infections with resistant bacterial strains, performing complete debridement, preparing wounds, applying subsequent dressings to burn wounds, administering renal replacement therapy, and implementing targeted antibiotic therapy along with early patient discharge — can be beneficial (38). Schaal et al.'s study underscores that systemic treatment with amphotericin B or sodium hypochlorite should also be administered in cases of simultaneous bacterial infections (17).

In reply to the fifth and sixth aims of the research, the review has shown that among the examined cases of total TBSA, the most reported cases were of considerable extent in the texts (12, 15, 29, 32). Moreover, men have more cases of *Fusarium* fungal infections than women (29, 30, 32, 43).

In response to another research objective, the analysis of strategies for preventing fungal infections in burns revealed that meticulous wound care and microbial surveillance were identified as two critical factors. Another study stated that, alongside careful wound care, clean and sterile techniques should be employed in burn patients to prevent fungal contamination (11). In the study by Schaal et al., three key prevention strategies were also emphasized, including environmental controls (high air exchange rates, over-pressurized operating rooms, etc.), the use of HEPA filtration and quiet airflow in surgical wards, and structural measures such as separate access points, individual rooms, closed doors/windows, and spatial separation of patients to reduce external contact (17). The results show that infection control practices have relied on factors such as strict aseptic techniques during dressing changes, the use of sterile gloves, masks, gowns, and caps, demarcation of work areas — especially during reconstruction — and the maintenance and proper functioning of protective devices (12, 14, 17). Ensuring minimal disruption during patient transport to reduce the risk of contamination has also been recommended as a strategic measure for monitoring infection (32). Some researchers have suggested that early radical debridement and wound closure are crucial to preventing infection. Empirical prophylactic drug therapy should be considered for those at high risk of invasive burn wound infection (23). Furthermore, early closure of burn wounds, frequent microbiological evaluation of burn wounds, and aggressive surgical debridement of burn wounds have been emphasized to prevent infection (25, 29). In burn patients resulting from accidents, contact with water or soil should be regarded as a potential pathogen and a promoter of

infection to enhance prevention efforts (32, 36). Other studies have also indicated that reviewing culture protocols in burn patients is vital for prevention and optimal patient management (41).

5.1. Conclusions

Considering the identification of *F. solani* spp., particularly in men with burns and the associated high mortality rate, healthcare providers should prioritize early diagnosis and appropriate antifungal treatment as a key strategy for the future. Conversely, since *Fusarium* fungal infection leads to angioinvasion, especially in high-risk patients, diagnosis and treatment must be prioritized.

5.2. Limitation

The limitation of the study was access to the full text of some articles. To overcome this limitation, the research team tried to collect articles by contacting their authors or publishers.

Footnotes

Authors' Contribution: Study concept and design: H. A. D. and N. K.; Analysis and interpretation of data: H. A. D., N. K., F. K., A. N., and A. K.; Drafting of the manuscript: H. A. D., N. K., L. K., and H. M.; Critical revision of the manuscript for important intellectual content: N. K. and A. N.; Statistical analysis: A. K. and F. K.

Conflict of Interests Statement: The authors declare no conflict of interests.

Data Availability: The data supporting the findings of this study are available upon request from the corresponding author.

Funding/Support: The present study received no funding/support.

References

1. Stokes MAR, Johnson WD. Burns in the Third World: an unmet need. *Ann Burns Fire Disasters*. 2017;**30**(4):243-6. [PubMed ID: 29983673]. [PubMed Central ID: PMC6033471].
2. World Health Organization. *Burns*. Geneva, Switzerland; 2024. Available from: https://www.who.int/news-room/fact-sheets/detail/burns.
3. Goodwin CW, Pruitt BA. Burn. In: Davis L, Christopher F, Sabiston DC, editors. *Textbook of surgery: the biological basis of modern surgical practice*. Philadelphia, USA: Saunders; 1972.
4. Kerr Muir IF, Barclay TL. *Burns and Their Treatment*. Washington, United States: Butterworths; 1974.
5. Samarbakhsh S. *[Evaluation of Microorganisms and the Antibiotic Sensitivity in Acute Burns] [Dissertation]*. Tehran, Iran: Iran University of Medical Sciences; 1995. FA.
6. Abbaspour A, Dolatshahi M. *[Burn Emergencies (EMS) and Generic Drugs Used]*. Tehran, Iran: Esharat Publication; 1996. FA.
7. Keikha A, Keikha N. Zygomycosis and Post SARS-CoV-2. *Gene Cell Tissue*. 2024;**11**(4). https://doi.org/10.5812/gct-150840.
8. Sharma S, Bajaj D, Sharma P. Fungal Infection in Thermal Burns: A Prospective Study in a Tertiary Care Centre. *J Clin Diagn Res*. 2016;**10**(9):PC05-7. [PubMed ID: 27790507]. [PubMed Central ID: PMC5072007]. https://doi.org/10.7860/JCDR/2016/20336.8445.
9. Pruitt BA, McManus AT. Opportunistic infections in severely burned patients. *Am J Med*. 1984;**76**(3A):146-54. [PubMed ID: 6369976]. https://doi.org/10.1016/0002-9343(84)90334-6.
10. Mamani M, Derakhshanfar A, Niayesh A, Hashemi SH, Yousefi MR, Zavar S. [Frequency of bacterial burn wounds infection and antimicrobial resistance in burn center of Bessat hospital of Hamedan]. *Iran J Surg*. 2009;**17**(1):81-8. FA.
11. Wheeler MS, McGinnis MR, Schell WA, Walker DH. Fusarium infection in burned patients. *Am J Clin Pathol*. 1981;**75**(3):304-11. [PubMed ID: 7211751]. https://doi.org/10.1093/ajcp/75.3.304.
12. Latenser BA. Fusarium infections in burn patients: a case report and review of the literature. *J Burn Care Rehabil*. 2003;**24**(5):285-8. [PubMed ID: 14501396]. https://doi.org/10.1097/01.BCR.0000085845.20730.AB.
13. Hai TX, Minh NTN, Dung TN, Chau NTM, Tran-Anh L. A rare Fusarium equiseti infection in a 53-year-old male with burn injury: A case report. *Curr Med Mycol*. 2021;**7**(1):59.
14. Tu Y, Lineaweaver WC, Breland A, Zhang F. Fungal Infection in Burn Patents: A Review of 36 Case Reports. *Ann Plast Surg*. 2021;**86**(4S Suppl 4):S463-7. [PubMed ID: 34002720]. https://doi.org/10.1097/SAP.0000000000002865.
15. Tram QA, Minh NTN, Anh DN, Lam NN, Dung TN, Thi Minh Chau N, et al. A Rare Case of Fungal Burn Wound Infection Caused by Fusarium solani in Vietnam. *J Investig Med High Impact Case Rep*. 2020;**8**:2324709620912120. [PubMed ID: 32400199]. [PubMed Central ID: PMC7223860]. https://doi.org/10.1177/2324709620912122.
16. Spesso F, Aiassa S, Garutti A, Carballo GM, Dotto G. Filamentous fungal infection in burned patients: retrospective study. *Rev Fac Cien Med Univ Nac Cordoba*. 2018;**75**(2):128-33. [PubMed ID: 30273536]. https://doi.org/10.31053/1853.0605.v75.n2.17841.
17. Schaal JV, Leclerc T, Soler C, Donat N, Cirrode A, Jault P, et al. Epidemiology of filamentous fungal infections in burned patients: A French retrospective study. *Burns*. 2015;**41**(4):853-63. [PubMed ID: 25681957]. https://doi.org/10.1016/j.burns.2014.10.024.
18. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev*. 2015;**4**(1):1. [PubMed ID: 25554246]. [PubMed Central ID: PMC4320440]. https://doi.org/10.1186/2046-4053-4-1.
19. Stone PW. Popping the (PICO) question in research and evidence-based practice. *Appl Nurs Res*. 2002;**15**(3):197-8. [PubMed ID: 12173172]. https://doi.org/10.1053/apnr.2002.34181.
20. Hong QN, Fàbregues S, Bartlett G, Boardman F, Cargo M, Dagenais P, et al. The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. *Educ Inf*. 2018;**34**(4):285-91. https://doi.org/10.3233/efi-180221.
21. Rosanova MT, Brizuela M, Villasboas M, Guarracino F, Alvarez V, Santos P, et al. Fusarium spp infections in a pediatric burn unit: nine years of experience. *Braz J Infect Dis*. 2016;**20**(4):389-92. [PubMed ID: 27235982]. [PubMed Central ID: PMC9427570]. https://doi.org/10.1016/j.bjid.2016.04.004.

22. Park JH, Oh J, Song JS, Kim J, Sung GH. Bisifusarium Delphinoides, an Emerging Opportunistic Pathogen in a Burn Patient with Diabetes Mellitus. *Mycobiology*. 2019;**47**(3):340-5. [PubMed ID: 31565470]. [PubMed Central ID: PMC6758602]. https://doi.org/10.1080/12298093.2019.1628521.
23. Palackic A, Popp D, Tapking C, Houschyar KS, Branski LK. Fungal Infections in Burn Patients. *Surg Infect*. 2021;**22**(1):83-7. [PubMed ID: 33035112]. https://doi.org/10.1089/sur.2020.299.
24. Khalid SN, Rizwan N, Khan ZA, Najam A, Khan AM, Almas T, et al. Fungal burn wound infection caused by Fusarium dimerum: A case series on a rare etiology. *Ann Med Surg*. 2021;**70**:102848. [PubMed ID: 34540224]. [PubMed Central ID: PMC8435921]. https://doi.org/10.1016/j.amsu.2021.102848.
25. Katz T, Wasiak J, Cleland H, Padiglione A. Incidence of non-candidal fungal infections in severe burn injury: an Australian perspective. *Burns*. 2014;**40**(5):881-6. [PubMed ID: 24380706]. https://doi.org/10.1016/j.burns.2013.11.025.
26. Goussous N, Abdullah A, Milner SM. Fusarium Solani Infection Following Burn Injury: A Case Report. *World J Plast Surg*. 2019;**8**(3):406-9. [PubMed ID: 31620346]. [PubMed Central ID: PMC6790252]. https://doi.org/10.29252/wjps.8.3.406.
27. Carrillo-Esper R, Porras-Méndez CMV, Tamez-Coyotzin EA, Garnica-Escamilla MA. [Fusariosis in Burn Patients: An Emergent Infection]. *Med Interna Mex*. 2017;**33**(1):84-90. ES.
28. Barrios EL, Drabick Z, Rodriguez J, Fahy BG, Cochran AL, Driscoll IR, et al. Precision Medicine Approach Using Triple Combination Antifungal Therapy for Fusarium Brain Abscesses and Endocarditis in an Adult Burn Patient. *Mil Med*. 2025;**190**(3-4):e869-72. [PubMed ID: 38836840]. https://doi.org/10.1093/milmed/usae284.
29. Piccoli P, Lucini F, Al-Hatmi AMS, Rossato L. Fusariosis in burn patients: A systematic review of case reports. *Med Mycol*. 2024;**62**(3). [PubMed ID: 38379099]. https://doi.org/10.1093/mmy/myae013.
30. Yen JS, Chang SY, Sun PL. Extensive primary cutaneous fusariosis in a patient with burns: A case report and review of the literature. *J Mycol Med*. 2024;**34**(1):101450. [PubMed ID: 38042017]. https://doi.org/10.1016/j.mycmed.2023.101450.
31. Barragan-Reyes A, Jacome LEL, Perales-Martinez D, Nava-Ruiz A, Hernandez MLG, Cornejo-Juarez P, et al. Fusariosis in Mexico: A 10-year retrospective series. *Med Mycol*. 2023;**61**(12). [PubMed ID: 37944000]. https://doi.org/10.1093/mmy/myad112.
32. Jin R, Yang M, Weng T, Shao J, Xia S, Han C, et al. Epidemiology and Early Bacteriology of Extremely Severe Burns from an LPG Tanker Explosion in Eastern China. *J Epidemiol Glob Health*. 2022;**12**(4):478-85. [PubMed ID: 36166166]. [PubMed Central ID: PMC9723001]. https://doi.org/10.1007/s44197-022-00066-0.
33. Akhavan AA, Shamoun F, Lagziel T, Rostami S, Cox CA, Cooney CM, et al. Invasive Non-Candida Fungal Infections in Acute Burns-A 13-Year Review of a Single Institution and Review of the Literature. *J Burn Care Res*. 2023;**44**(5):1005-12. [PubMed ID: 37432077]. https://doi.org/10.1093/jbcr/irad105.
34. Stevens A, Waldrop C, Mandell S, Abdelfattah K, Arnoldo B, Akarichi CO, et al. Fungal brain abscess in a severely burned patient. *J Burn Care Res*. 2023;**44**(5):1253-7. [PubMed ID: 37486798]. https://doi.org/10.1093/jbcr/irad111.
35. Delliere S, Guitard J, Sabou M, Angebault C, Moniot M, Cornu M, et al. Detection of circulating DNA for the diagnosis of invasive fusariosis: retrospective analysis of 15 proven cases. *Med Mycol*. 2022;**60**(9). [PubMed ID: 36044994]. https://doi.org/10.1093/mmy/myac049.
36. Farooqi J, Akbar Ladak A, Shaheen N, Jabeen K. Fungal isolation from wound samples submitted for culture at a tertiary care hospital laboratory. *J Pak Med Assoc*. 2022;**72**(8):1622-5. https://doi.org/10.47391/jpma.2105.
37. Louie E, Young S, Virk M, Barsun A, Sen S. Topical Liposomal Amphotericin (Ambisome(R)) for the Treatment of Cutaneous Fusarium in a Burn-Injured Patient. *J Burn Care Res*. 2023;**44**(1):207-9. [PubMed ID: 36227770]. https://doi.org/10.1093/jbcr/irac152.
38. Smolle C, Holzer-Geissler JCJ, Auinger D, Mykoliuk I, Luze H, Nischwitz SP, et al. Management of Severe Burn Wounds Colonized With Multi-resistant Pseudomonas aeruginosa and Fusarium Using Marine Omega3 Wound Matrix in a Female Victim of War. *Mil Med*. 2024;**189**(1-2):e424-8. [PubMed ID: 37668495]. [PubMed Central ID: PMC10824477]. https://doi.org/10.1093/milmed/usad338.
39. Stempel JM, Hammond SP, Sutton DA, Weiser LM, Marty FM. Invasive Fusariosis in the Voriconazole Era: Single-Center 13-Year Experience. *Open Forum Infect Dis*. 2015;**2**(3):ofv099. [PubMed ID: 26258156]. [PubMed Central ID: PMC4525012]. https://doi.org/10.1093/ofid/ofv099.
40. Pruskowski KA, Mitchell TA, Kiley JL, Wellington T, Britton GW, Cancio LC. Diagnosis and Management of Invasive Fungal Wound Infections in Burn Patients. *Eur Burn J*. 2021;**2**(4):168-83. https://doi.org/10.3390/ebj2040013.
41. Jabeen K, Khan M, Umar S, Shaheen N, Farooqi J. Spectrum of Fungal Pathogens in Burn Wound Specimens: Data From a Tertiary Care Hospital Laboratory in Pakistan. *J Burn Care Res*. 2021;**42**(2):241-4. [PubMed ID: 32844184]. https://doi.org/10.1093/jbcr/iraa148.
42. Branski LK, Al-Mousawi A, Rivero H, Jeschke MG, Sanford AP, Herndon DN. Emerging infections in burns. *Surg Infect*. 2009;**10**(5):389-97. [PubMed ID: 19810827]. [PubMed Central ID: PMC2956561]. https://doi.org/10.1089/sur.2009.024.
43. Atty C, Alagiozian-Angelova VM, Kowal-Vern A. Black plaques and white nodules in a burn patient. Fusarium and Mucormycosis. *JAMA Dermatol*. 2014;**150**(12):1355-6. [PubMed ID: 25338100]. https://doi.org/10.1001/jamadermatol.2014.2463.
44. Young SR, Stoianovici RN, Louie EL. 505 Fusarium Isolates in Burn-injured Patients: Clinical Characteristics and Susceptibility Patterns. *J Burn Care Res*. 2024;**45**(Supplement_1):115. https://doi.org/10.1093/jbcr/irae036.140.
45. Stoianovici R, Young S, Duby JJ, Hauser N, Louie E. Fusarium isolates in burn-injured patients: Clinical characteristics and susceptibility patterns. *Burns Open*. 2025;**11**. https://doi.org/10.1016/j.burnso.2025.100407.
46. Gonzalez Guerrero MC, Mondragon Eguiluz JA, Garcia Hernandez ML, Ceron Gonzalez G, Colin Castro CA, Cruz Arenas E, et al. Fungal infections in burn patients: The rise of Fusarium as the most prevalent in a burn center in Mexico City. *Med Mycol*. 2025;**63**(7). [PubMed ID: 40690277]. [PubMed Central ID: PMC12284474]. https://doi.org/10.1093/mmy/myaf059.
47. Lotfi N, Shokohi T. [A review on fungal infection in burn patients, diagnosis and treatment]. *J Mazand Univ Med Sci*. 2013;**23**(108):151-65. FA.
48. Keikha N, Shafaghat M, Mousavia SM, Moudi M, Keshavarzi F. Antifungal effects of ethanolic and aqueous extracts of Vitexagnus-castus against vaginal isolates of Candida albicans. *Curr Med Mycol*. 2018;**4**(1):1-5. [PubMed ID: 30186986]. [PubMed Central ID: PMC6101154]. https://doi.org/10.18502/cmm.4.1.26.
49. Ayatollahi-Mousavi SA, Asadikaram G, Nakhaee N, Izadi A, Keikha N. The Effects of Opium Addiction on the Immune System Function in Patients with Fungal Infection. *Addict Health*. 2016;**8**(4):218-26. [PubMed ID: 28819552]. [PubMed Central ID: PMC5554801].
50. Fazeli S, Karami Matin R, Kakaei N, Pourghorban S, Amini Moghadam M, Safari Faramani S, et al. Self-Inflicted Burn Injuries in Kermanshah: A Public Health Problem. *Health Scope*. 2014;**3**(3). e17780. https://doi.org/10.17795/jhealthscope-17780.
51. Rabbani Y, Keshavarz H, Hosseinpour A, Nourmohammadi M, Mortazavi M. Air Quality and Hospital-Acquired Infections: A Case

Study of Ventilation and Bioaerosols in an Educational Hospital. *Health Scope*. 2025;**14**(3). https://doi.org/10.5812/healthscope-159328.

52. Capoor MR, Sarabahi S, Tiwari VK, Narayanan RP. Fungal infections in burns: Diagnosis and management. *Indian J Plast Surg*. 2010;**43**(Suppl):S37-42. [PubMed ID: 21321655]. [PubMed Central ID: PMC3038393]. https://doi.org/10.4103/0970-0358.70718.
53. Bader M, Jafri AK, Krueger T, Kumar V. Fusarium osteomyelitis of the foot in a patient with diabetes mellitus. *Scand J Infect Dis*. 2003;**35**(11-12):895-6. [PubMed ID: 14723375]. https://doi.org/10.1080/00365540310016565.
54. Kameshki B, Chadeganipour M, Chabavizadeh J, Yadegari S. [The survey of fungal wounds infections in burn patients in Isfahan, Iran]. *J Isfahan Med Sch*. 2017;**35**(447):1225-32. FA.
55. Rafiei A, Hemadi A, Hamzehlouei F. [Determination of fungal colonization among burn patients referred to Taleghani Hospital, Ahwaz]. *Iran J Infect Dis Trop Med*. 2006;**11**(34):41-4. FA.

Table 1. Characteristics of Publications Based on Research Objectives

Writers and References	Type of Study	Demographic/Mortality Rate/Burning Percent	Types of Fungi	Specimens	Important Results/Signs and Symptoms; Prevention or Treatment Strategy
Wheeler et al. (11)	Case reports	NA	*Fusarium* spp., *Fusarium oxysporum*	Burn wounds	The incidence of fungal infections in burn patients has been growing because of the enhancement in antibacterial chemotherapy. Best strategy prevention: (1) Careful wound care: Usage of clean and sterile techniques in burn wound care and prevent fungal infections; (2) microbial surveillance: Perform regular microbiological tests, including colonic biopsies and histological and mycological examinations, for rapid and accurate identification of fungal infections.
Latenser (12)	Case report	A 40-year-old white male; 73% grease scald injury/patient died 55 days after injury	*Fusarium* spp., *Candida* spp.	Debridement, excision, and skin grafting	Deep-tissue involvement happens in immunocompromised patients with hematologic malignancies, aplastic anemia, and chemotherapy treatment. Monitoring high-risk patients: Cancer patients, those undergoing chemotherapy, and those with extensive burns should receive special care and close monitoring.
Hai et al. (13)	Case report	53-year-old patient/the patient not recovered	*F. equiseti*	Histological examination (periodic acid-Schiff) and biopsy sampling	Antifungal susceptibility test is essential because multidrug resistance is usual among *Fusarium* strains/aggressive treatment/IV voriconazole. Management of the use of unconventional herbal medicines in burns, standard care and infection control measures, active surveillance, and increased attention to traditional medicines should be considered.
Tu et al. (14)	Case report	44 burn patients/overall mortality rate 27.27%	*Candida albicans*, *Fusarium* spp., *Zygomycetes*	Surgical excision, debridement, skin graft, vitrectomy, teeth extraction, valve replacement, or amputation	The general mortality of fungal wound infection is high in burn patients around the world, markedly those infected with non-*Candida* spp. The three key factors or appropriate strategies are early diagnosis of fungal infection, early initiation of appropriate antifungal therapy, and effective surgical intervention to follow up on infection in burn patients.
Tram et al. (15)	Case report	24-year-old male; extensive injuries 75% of body/the patient did not recover	*F. solani; C. tropicalis*	Histological examination of skin biopsy speimens; blood culture	*F. solani* was identified the most frequent pathogenic agent among *Fusarium* spp. 3 antifungal drugs caspofungin, fluconazole (for C. tropicalis), and voriconazole have been used for treatment, but were not effective against *Fusarium*.
Spesso et al. (16)	Retrospective study	168 patients admitted to ICU, 29 burn patients; 13 male and 16 female; mortality rate of patients (24%)	*Aspergillus* spp.; *Fusarium* spp.; *Mucor* spp.; dematiaceous fungi	Skin biopsies and bedsores	Mortality among patients was 24% and *Fusarium* was involved in the highest number of deaths (50%).
Schaal et al. (17)	Retrospective study	1849 patient/31 case have fungal infection/24 male and 7 female/6 cases of 22 people died	*Aspergillus* spp. (24 case); *Fusarium* spp. (3 case); *Mucor* spp. (9 case)	Biopsies or superficial swabs; wound biopsy; Sabouraud's dextrose agar with and without chloramphenicol and blood agar	Filamentous fungal infections are basically cutaneous and rare and occur in the most severe burns. Voriconazole; amphotericin B; itraconazole; posaconazole; flucytosine; lipid formulations of amphotericin B three key prevention strategies include environmental controls (high air exchange rates, overpressurized operating rooms and operating theatres, etc.), use of infection control practices (strict aseptic techniques during dressings), and other additional measures such as proper maintenance and operation of preventive devices.
Rosanova et al. (21)	Retrospective, descriptive study	15 patients/burn surface area (45%)/1 patient died	*Fusarium* spp.	Burn wound	*Fusarium* spp. was an unusual pathogen in severely pediatric burnt patients (amphotericin B, voriconazole).
Park et al. (22)	Case report	82-year-old man with diabetes	Bisi*fusarium* delphinoides, *F. dimerum* spp. complex	Deep swab specimen	Both diabetes mellitus and burns can be risk factors for *Fusarium* infection.
Palackic et al. (23)	Review	NA	*C. albicans*, *Aspergillus* and *Zygomycetes*, non-albicans *Candida* spp.	Debridement	The development of antifungal drugs is necessary due to the presence of drug-resistant fungi. Amphotericin B and voriconazole; Early radical debridement and wound closure are essential to prevent infection. Empirical prophylactic drug therapy should be considered for individuals at high risk of invasive burn wound infection.
Khalid et al. (24)	Case report	8 patients from 3 - 57 y	*F. dimerum*	Debridement	*Fusarium* was responsible for 50% of deaths in burn patients (amphotericin B or voriconazoles).
Katz et al. (25)	Retrospective Study	Adult burns patients/two case died	*Aspergillus* fumigatus, *Scedosporium prolificans*, *F. solani*, *Mucor* spp., *Absidia corymbifera*, *Penicillium* spp., *Alternaria* spp.	Biopsy	Fungal or *Candida* infections have low mortality in the context of primary antifungal treatment; Important strategy early antifungal therapy extensive surgical debridement. Early closure of burn wounds, frequent microbiological evaluation of burn wounds, and aggressive surgical debridement of burn wounds are emphasized to prevent infection.
Goussous et al. (26)	Case report	55-year-old male/35% TBSA	*F. solani*	Debridement tissue/elbow	

Writers and References	Type of Study	Demographic/Mortality Rate/Burning Percent	Types of Fungi	Specimens	Important Results/Signs and Symptoms; Prevention or Treatment Strategy
				amputation	The risk factors of *Fusarium* are increased burns on total body surface, length of hospitalization, polymicrobial infections and the presence of inhalation injury; aggressive approach
Carrillo-Esper et al. (27)	Review	26 cases	*F. solani*	NA	Immunosuppression and skin loss increase the frequency of fungal infections; voriconazole, posaconazole, and the lipid formulations of amphotericine B
Barrios et al. (28)	Case report	An adult burn patient/35% total body surface/improved	*F. solani*	NA	Focal neurologic deficits; Prolonged course of IV triple antifungal therapy
Piccoli et al. (29)	Review/24 case reports	87 burn patients/1 to 85 y/male (53%) and female (47%)/78% burn surface/23 patients (37%) died	*F. dimerum* spp. complex	Histopathology	Amphotericin B voriconazole given the relatively high reported mortality rate of 37% of case reports, increasing understanding of the epidemiology of *Fusarium* and emphasizing clinical care among burn patients is critical for prevention.
Yen et al. (30)	Review	81-year-old male/45 % of body surface	*Fusarium* spp.	Biopsy	*Staphylococcus* and *Bacillus* burn wound infections; *Acinetobacter pneumonia*; Cefazolin, ceftazidime, gentamycin
Barragan-Reyes et al. (31)	Retrospective series	49 cases/22% of patients not recover.	*Fusarium* spp.	Biopsy/histopathology	Burn injuries (49%)/37% had hematological malignancies/monotherapy voriconazoleamphotericin B.
Jin et al. (32)	Case report	Average burnt 83.03% TBSA/13 male and 3 female/mortality rate (43.75%)	*Candida* spp., *Fusarium* spp., *Aspergillus* spp.	Bacteriological/organism	The most common fungi were *Candida*, *Fusarium*, *Aspergillus*, and fumigatus; In patients with burns caused by mass burn accidents, contact with water or soil should be considered as pathogenic and accelerating factors for infection for better prevention.
Akhavan et al. (33)	Retrospective review	37 patients with atypical invasive fungal infections/five patient deaths (13.8%)	*Aspergillus* spp., *Fusarium* spp., *Mucor* spp.	NA	Aggressive treatment, first infectious disease consultation
Stevens et al. (34)	Case report	40-year-old/died on hospital day 167	*Fusarium* spp.	NA	Fungal brain abscess aspiration antifungal therapies
Delliere et al. (35)	Retrospective analysis	15 patients	*F. solani*	Biopsy/histopathology	Pan-*Fusarium* qPCR assay in serum/plasma with high sensitivity, specificity, and reproducibility/circulating DNA for the diagnosis
Farooqi et al. (36)	Case report	140 cases	*Candida* spp. *Fusarium* spp.	Bacterial cultures	Control and assess the frequency of fungal isolation in wound specimens
Louie et al. (37)	Case report	1 case ill burn-injured patient	*Fusarium* spp.	Biopsy/scrapping	Topical liposomal amphotericin
Smolle et al. (38)	Case report	17-year-old woman; 17% total body surface	*Fusarium* spp.	Wound swabs	Omega 3; Appropriate infection control and prevention strategies, in case of additional trauma complications, wound infection with resistant bacterial strains, complete debridement, wound preparation and subsequent dressing of burn wounds
Stempel et al. (39)	Retrospective analysis	15 cases; average age 60 (26 - 78)/high mortality rate	*F. solani*	NA	Systemic glucocorticoids/voriconazole, terbinafine, amphotericin
Pruskowski et al. (40)	Analytical	NA	*Aspergillus* spp., *Mucor* spp.	NA	Histopathological evaluation/tissue culture surgical management systemic antifungals amphotericin B triazole antifungals
Jabeen et al. (41)	Retrospective study	19 cases	*Fusarium* spp., *Aspergillus flavus*	Tissue cultures	Broad-spectrum antibiotics; Stated that it is crucial to review culture protocols in burn patients for prevention and optimal patient management.
Branski et al. (42)	Retrospective study	398 patient/burns > 40% TBSA	*Candida* spp., *Aspergillus* spp., and *Fusarium* spp.	NA	*Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Acinetobacter* spp., and various fungal strains lead to increasing mortality rate.
Atty et al. (43)	Case report	Male, 92% TBSA	*Fusarium* and *Mucor* spp.	NA	Debridement and grafting
Farooqiet al. (36)	Retrospective study	140 cases	*Fusarium* spp.	Bacterial cultures	Tissue cultures in local settings, accurate diagnosis and treatment are urgently needed.
Young et al. (44)	Retrospective study	18 patients/average age (38.4 ± 11.9 y)/TBSA (54.5 ± 23.4 percent) mortality 45 percent	*Fusarium* spp.	NA	Clinical characteristics of *Fusarium* isolated cases
Stoianovici et al. (45)	Retrospective study	median age 35 (32 - 41); 28% female; TBSA (55 ± 23%) mortality 45 percent	*Fusarium* spp.	Tissue cultures	The cause of death was infection with multisystem organ failure and sepsis, which occurred in 88% of cases. The use of prolonged mechanical ventilation and central venous catheterization is essential. Given the high mortality rate associated with *Fusarium* infection and the long time to antifungal susceptibility results, an appropriate empiric treatment strategy is emphasized.
Gonzalez et al. (46)	Retrospective study	Male (69.8%), and the median age (5 y); 22 patients (35.48%) died	*F. solani; F. oxysporum; Aspergillus* spp.,	Biopsies of burn patients	Suspicion of *Fusarium* infection is essential for the appropriate treatment strategy for burn patients, including prompt initiation of antifungal therapy and wound debridement. Other appropriate strategies to reduce patient mortality include the development of a comprehensive protocol for the evaluation of burn patients, implementation of an early surgical approach,

Writers and References	Type of Study	Demographic/Mortality Rate/Burning Percent	Types of Fungi	Specimens	Important Results/Signs and Symptoms; Prevention or Treatment Strategy
					use of early molecular methods and markers, and timely administration of antifungal therapy.

Abbreviations: Spp., species; IV, intravenous; TBSA, total body surface area.