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# Co-infections In People With COVID-19

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Digital Congress of COVID-19 Management and Treatment



- In previous **influenza pandemics**, **bacterial co-infections** have been a major cause of mortality.
- Other coronaviruses, such as **MERS-CoV** and **SARS-CoV-1**, show differing levels of bacterial/fungal co-infection.
- whereas there is evidence that ***co-infections do not occur in patients infected with MERS-CoV*** and occur rarely in patients infected with SARS-CoV-1.

Co-infections in people with COVID-19: a systematic review and meta-analysis; 0163-4453/© 2020 The British Infection Association.



A multicenter retrospective cohort study of  
**critically ill patients**  
with **MERS-CoV** demonstrated that **18% and 5%** had  
*bacterial and viral* co-infections, respectively.

Arabi YM, Al-Omari A, Mandourah Y, Al-Hameed F, Sindi AA, Alraddadi B, et al. Critically ill patients with the Middle East Respiratory Syndrome: a multicenter retrospective cohort study. Crit Care Med 2017;45:1683e95.



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

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journal homepage: [www.e-jmii.com](http://www.e-jmii.com)

Review Article

# Co-infections among patients with COVID-19: The need for combination therapy with non-anti-SARS-CoV-2 agents?

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# Summary of studies that reported Co-infection in COVID-19

Study	country	No. of patients	Virus	Bacteria	Fungus
Chen	China	99	0	0.1%	Candida (0.4%)
Arentz	USA	21 (critically ill)	3 (14.3)	1 (4.8)	0
Wang	China	104	6 (5.8%): corona influenza A rhinovirus	0	0
Wuhan	China	201	1 (0.6): influenza A	0	0
Kim	USA	116	24 (20.7): influenza/rhinovirus /Enterovirus	0	0



Article Navigation

ACCEPTED MANUSCRIPT

## **Bacterial and fungal co-infection in individuals with coronavirus: A rapid review to support COVID-19 antimicrobial prescribing**



# Methods:

- **MEDLINE, EMBASE, and Web of Science** were searched using broad based search criteria relating to coronavirus and bacterial co-infection.
- Articles presenting clinical data for patients with coronavirus infection (defined as **SARS-1, MERS, SARS-COV-2**, and other coronavirus) and bacterial/fungal co-infection reported.
- **Secondary analysis** of studies reporting **antimicrobial prescribing** in **SARS-COV-2** even in the absence of co-infection was performed



# Results:

- **9/18 (50%)** studies reported on **COVID-19**, 5/18 (28%) SARS-1, 1/18 (6%) MERS, and 3/18 (17%) other coronavirus.
- For **COVID-19**, **62/806 (8%)** patients were reported as experiencing **bacterial/fungal co-infection during hospital** admission.
- On secondary analysis, **1450/2010 (72%)** of patients reported received **antimicrobial therapy**.





Contents lists available at [ScienceDirect](#)

## Journal of Infection

journal homepage: [www.elsevier.com/locate/jinf](http://www.elsevier.com/locate/jinf)



# Co-infections in people with COVID-19: a systematic review and meta-analysis



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## Methods:

- They systematically searched Embase, Medline, Cochrane Library, LILACS and CINAHL for eligible studies published from 1 January 2020 to 17 April 2020.
- They included patients of all ages, in all settings. The main outcome was the proportion of patients with a bacterial, fungal or viral co-infection.

## Results:

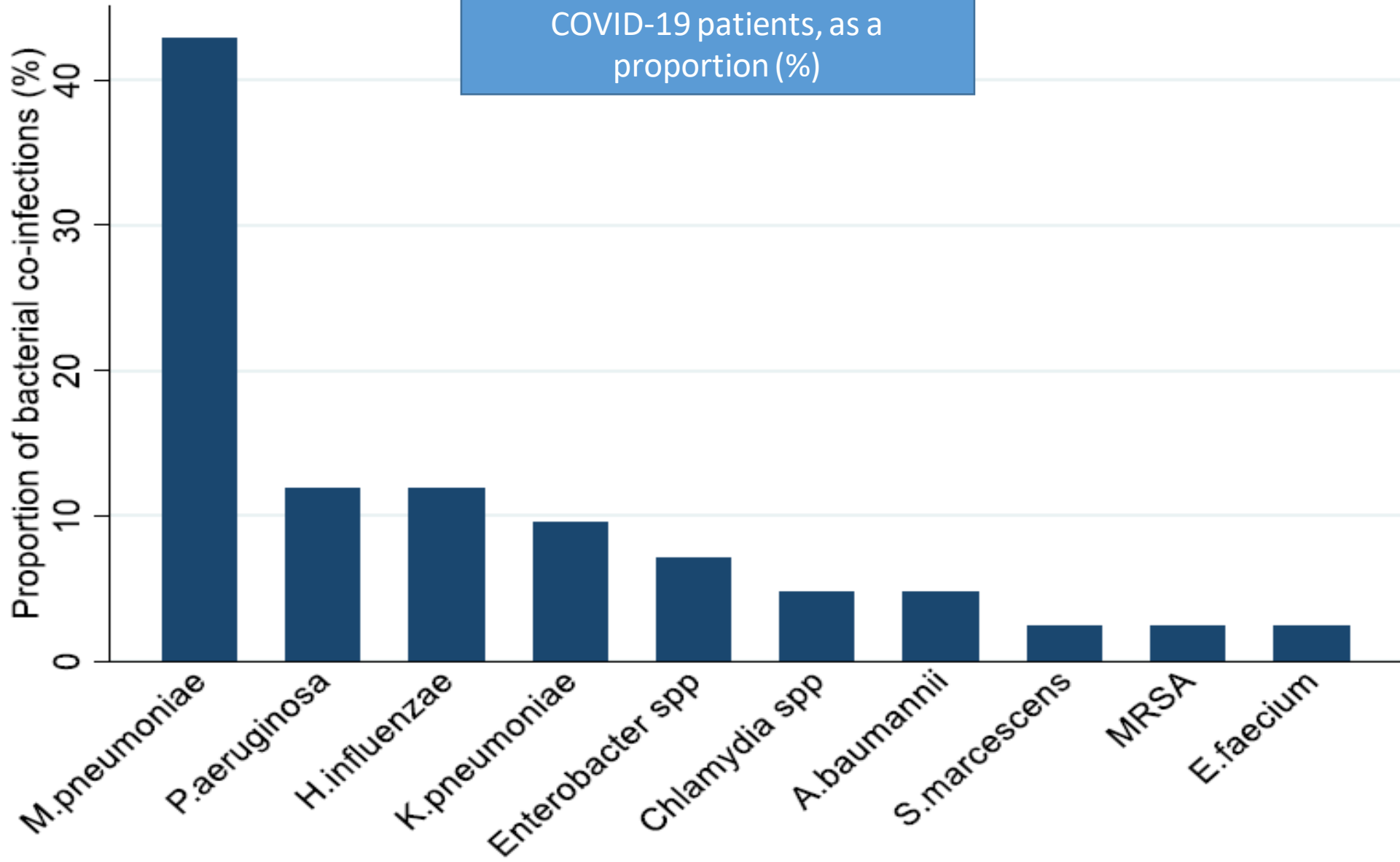
- Thirty studies including 3834 patients were included.
- Overall, 7% of hospitalised COVID-19 patients had a bacterial co-infection (95% CI 3-12%,  $n = 2183$ ,  $I^2 = 92.2\%$ ).
- A higher proportion of ICU patients had bacterial co-infections than patients in mixed ward/ICU settings (14%, 95% CI 5-26,  $I^2 = 74.7\%$  versus 4%, 95% CI 1-9,  $I^2 = 91.7\%$ ).



The commonest bacteria were Mycoplasma pneumoniae, Pseudomonas aeruginosa and Haemophilus influenzae .



Bacterial pathogens detected in COVID-19 patients, as a proportion (%)

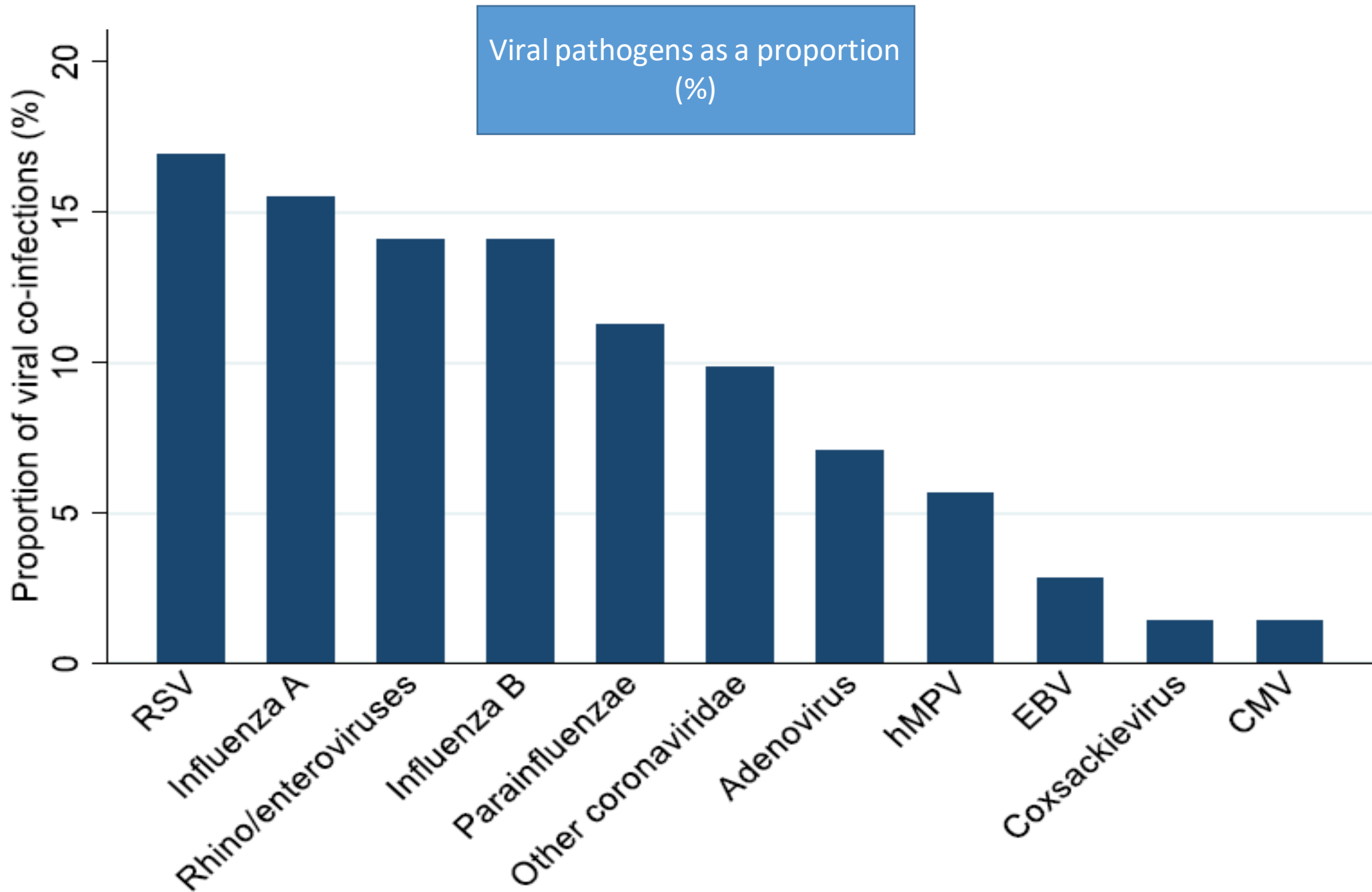


The pooled proportion with a viral co-infection

was 3% (95% CI 1-6, n = 1014,

12 = 62 · 3%), with Respiratory Syncytial Virus and

influenza A the commonest.



# Conclusions:

- *A low proportion of COVID-19 patients have a bacterial co-infection; less than in previous influenza pandemics.*
- *These findings do not support the routine use of antibiotics*  
in the management of confirmed COVID-19 infection.



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Articles

SW

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# Invasive aspergillosis in patients admitted to the intensive care unit with severe influenza: a retrospective cohort study



*Alexander F A D Schauwvlieghe\*, Bart J A Rijnders\*, Nele Philips, Rosanne Verwijs, Lore Vanderbeke, Carla Van Tienen, Katrien Lagrou, Paul E Verweij, Frank L Van de Veerdonk, Diederik Gommers, Peter Spronk, Dennis C J J Bergmans, Astrid Hoedemaekers, Eleni-Rosalina Andrinopoulou, Charlotte H S B van den Berg, Nicole P Juffermans, Casper J Hodiamont, Alieke G Vonk, Pieter Depuydt, Jerina Boelens, Joost Wauters, on behalf of the Dutch-Belgian Mycosis study group*



کنگره دیجیتال مدیریت و درمان  
COVID-19

# Methods

- They did a retrospective multicentre cohort study. Data were collected from adult patients with **severe influenza** admitted to **seven ICUs** across **Belgium** and The **Netherlands** during seven influenza seasons.
- Patients were older than 18 years, were admitted to the ICU for more than 24 h with **acute respiratory failure**, had pulmonary infiltrates on imaging, and a confirmed influenza infection based on a positive airway **PCR** test.

# Findings

- Data were collected from patients admitted to the ICU between **Jan 1, 2009, and June 30, 2016.**
- Invasive pulmonary aspergillosis was diagnosed in **83 (19%) of 432 patients** admitted with influenza (influenza cohort), a median of 3 days after admission to the ICU.
- For patients with influenza who were **immunocompromised**, incidence of **invasive pulmonary aspergillosis** was as high as 32% (38 of 117 patients)
- The 90-day **mortality was 51%** in patients in the influenza cohort with invasive pulmonary aspergillosis and **28%** in the influenza cohort **without invasive pulmonary aspergillosis** ( $p < 0.0001$ ).



Like severe influenza  
pneumonia, COVID-19 is associated with acute  
respiratory distress syndrome (ARDS), which  
might be considered  
a risk for fungal colonization and infection  
of the respiratory tract.

Possible explanations for development of fungal

co-infections include *immuneparalysis*

caused by COVID-19 infection-induced *ARDS*,

*diffuse alveolar damage* with *severe*

*inflammatory exudation*, and *lymphopenia*



# Mycoses

Diagnosis, Therapy and Prophylaxis of Fungal Diseases

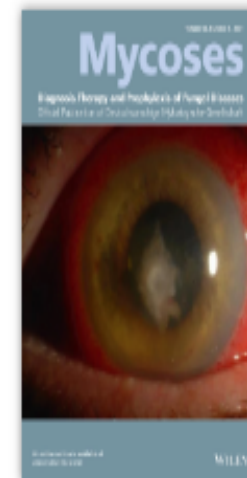
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## Proven *Aspergillus flavus* pulmonary aspergillosis in a COVID-19 patient; A case report and review of the literature

Mohammadreza Salehi, Nasim Khajavirad, Arash Seifi, Faezeh Salahshour, Behnaz Jahanbin, Hossein Kazemizadeh, Sayed Jamal Hashemi, Seyed Ali Dehghan Manshadi, Mohammad Kord, Paul E. Verweij, Sadegh Khodavaisy

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This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi:10.1111/myc.13255



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# Literature review

- The English literature was reviewed for published CAPA cases using search terms “corona”, “COVID-19”, “aspergillosis”, “CAPA” and “fungal”.
  - COVID-19 associated pulmonary aspergillosis (CAPA)
    - A total of 175 CAPA cases were found.
- Although variable case definitions were used, only 7 (4%) cases were classified as proven CAPA.

A major challenge remains diagnosing CAPA as the performance of diagnostic Aspergillus biomarkers remains suboptimal.

## Serum galactomannan (GM)

detection is commonly negative (74%) even in patients with proven CAPA.

COVID-19- associated invasive pulmonary aspergillosis. Annals of Intensive Care. 2020;10(1):1-4.





# Bronchoscopy with bronchoalveolar lavage (BAL)

remains the preferred

diagnostic procedure to diagnose CAPA, and

*GM was detected in 79% CAPA patients*

who underwent bronchoscopy.

There is conflicting evidence that supports both colonization and invasive infection in Aspergillus positive COVID-19 patients.

On the one hand COVID-19 patients with evidence for Aspergillus have survived without antifungal therapy, which suggests that a positive culture or GM represents colonization.

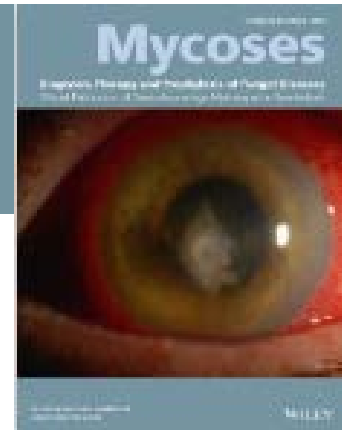
High prevalence of putative invasive pulmonary aspergillosis in critically ill COVID-19 patients. medRxiv. 2020; 8: e48-e49.



There was a trend towards **lower mortality** in CAPA patients receiving antifungal therapy, compared with untreated cases, which suggests that the mortality, at least in part, may be attributable to IA.

A national strategy to  
diagnose COVID-19 associated invasive fungal disease in the ICU. 2020;ciaa1298.





ORIGINAL ARTICLE



Free Access

## Oropharyngeal candidiasis in hospitalised COVID-19 patients from Iran: Species identification and antifungal susceptibility pattern

Mohammadreza Salehi, Kazem Ahmadikia, Shahram Mahmoudi, Saeed Kalantari, Saeidreza Jamalimoghadamsiahkali, Alireza Izadi, Mohammad Kord ... [See all authors](#) ▾

First published

Mycoses. 2020;63:771–778.



# Patients and Methods:

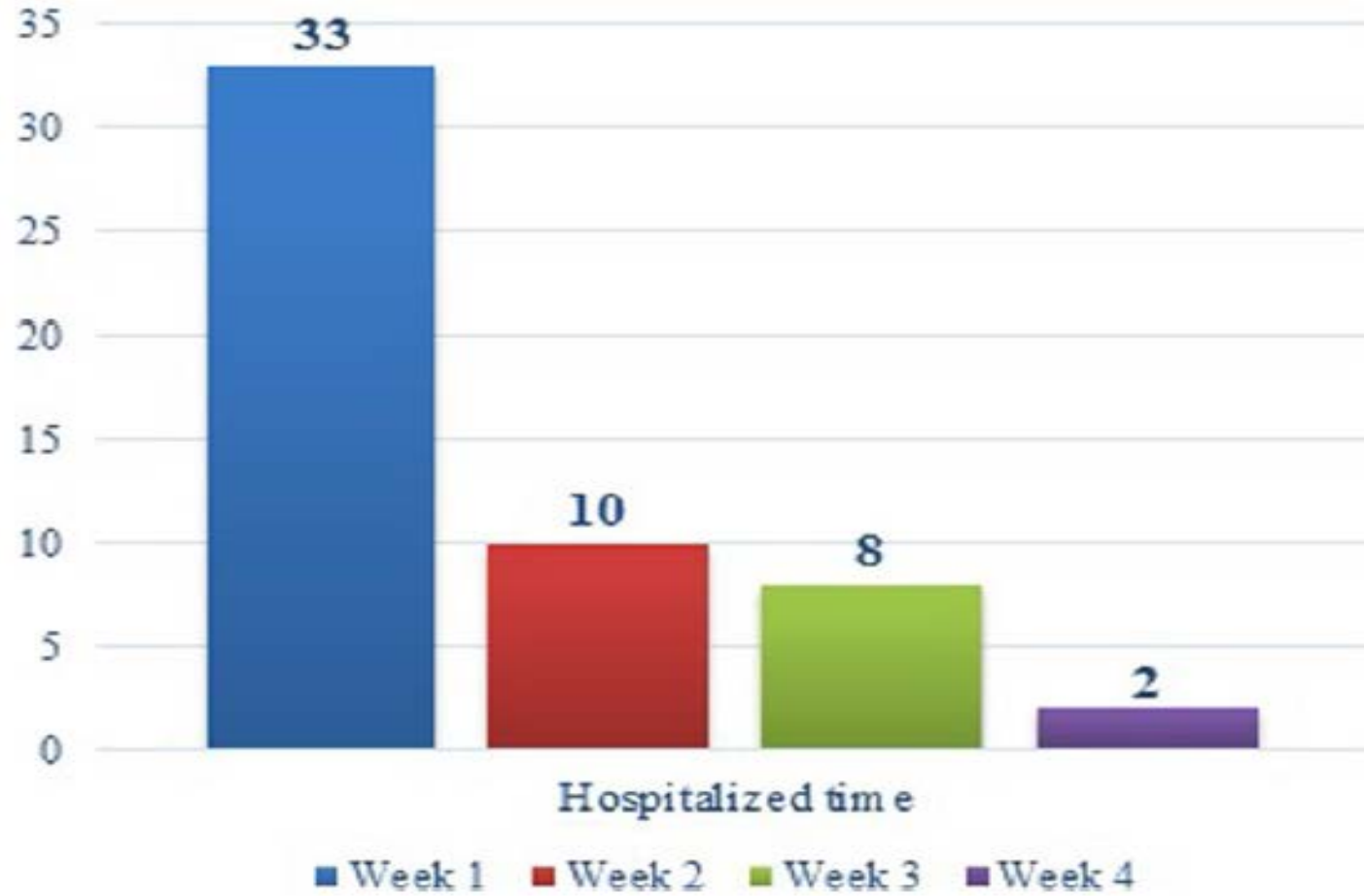
- We here aim to investigate the prevalence, causative agents and antifungal susceptibility pattern of OPC in COVID-19 patients.
- **Hospitalised COVID-19 patients** with OPC were studied. Relevant clinical data were mined. Strain identification was performed by 21-plex PCR.
- **Antifungal susceptibility** testing to fluconazole, itraconazole, voriconazole, amphotericin B, caspofungin, micafungin and anidulafungin was performed according to the CLSI broth dilution method.



# Results:

- In **53 COVID-19 patients with OPC**, **cardiovascular diseases (52.83%)** and **diabetes (37.7%)** were the principal underlying conditions.
- The most common risk factor was **lymphopaenia (71%)**.
- **C .albicans (70.7%)** was the most common, followed by C glabrata (10.7%), C dubliniensis (9.2%), C parapsilosis sensu stricto (4.6%), C tropicalis (3%) and Pichia kudriavzevii (=C krusei, 1.5%). Majority of the Candida isolates were **susceptible to all three classes** of antifungal drugs.





**FIGURE 1** Hospitalised time between diagnosis of COVID-19 and clinical presentations of OPC



### Underlying conditions

Cardiovascular diseases	28	52.8
Diabetes	20	37.7
Chronic kidney diseases	11	20.7
Haematological malignancies	5	9.4

### Risk factors

Recipient broad-spectrum antibiotics	49	92
Corticosteroid therapy	25	47
Admission to ICU	26	49
Mechanical ventilation	16	30

### Respiratory support

Non-invasive	49	92.4
Invasive	4	7.5





# Mucormycosis in Patients with COVID-19: A prospective multicenter study

- This was a prospective multicenter study on patients with **biopsy proven** mucormycosis during 2020 pandemic.
- Inclusion criteria :
  1. Mucormycosis should be confirmed on histopathologic examination
  2. A verified case was a positive result of real-time reverse-transcriptase–polymerase-chain-reaction (**rRT-PCR**)**SARS COV-2**
  3. The interval between two infections should not be more than three months.



# Results:

- finally **eighteen patients** with laboratory confirmed COVID-19 and Mucormycosis were included and evaluated.
- Mean age of patients was 50 and 60% were male.
- clinical manifestations of mucormycosis were averagely presented within **8** days (1-40) after COVID-19 infection.
- All patients had underlying diseases including **diabetes mellitus** and **hypertension** that were the most prevailing most common comorbidities documented in 85%, and 45%, respectively.
- 63% patients had been received intravenous corticosteroids (dexamethasone or methylprednisolone) for their COVID-19 management and one patient had history of mechanical ventilation.





Thank you for your attention