EPH117

Coinfection in COVID-19 patients in India: A Systematic Review

Divya Patel[a], Vatsal Chhaya[a], Kapil Khambholja[a,b], Sonal Sekhar[c]

[a]Genpro Research Pvt. Ltd., India
[b]Genpro Research Inc., USA
[c]Manipal University, India

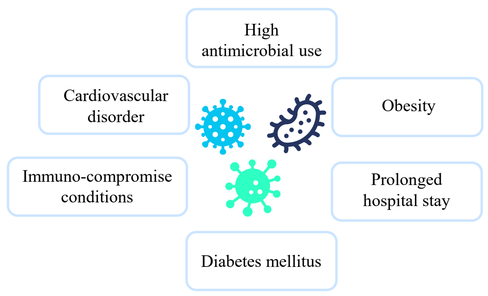
INTRODUCTION

- **Infection prevention and control (IPC),** an evidence-based approach to prevent infection in patients and healthcare workers has become one of the *public health priorities*[1]
- COVID-19 crossed the mark of **620 million cases** worldwide as of Oct'2022.
- The burden of COVID-19 became heftier due to ***coinfections*** of concurrently evolved other non-COVID respiratory pathogens.

What is coinfection?

Infections occurring simultaneously or concurrent with the initial infection

Contributing factors



- Role of Age: Older age increases susceptibility for coinfection(s).
  - Age-specific changes in T-cell and B-cell function causes excess production of cytokines leading to prolonged proinflammatory responses.[2]
- Role of gender: male have higher probability for coinfection(s) than female.[2]

What are the consequences?

- **Worsened clinical outcomes**
- **Increased disease severity**
- **Increased susceptibility to other pathogens**
- **Higher ICU admission**
- **Increased mortality risk**

Gaps in research

- Data on the COVID-19 coinfection epidemiology is sparse
- Further, lack of focused research studies or practice guidelines, especially in low- and middle-income countries (LMICs).
- India has high burden of COVID-19, plus the not-so-developed ***healthcare infrastructure*** – makes it hotspot for coinfections

OBJECTIVES

- To consolidate the existing literature on the **rate of coinfection(s)** and its subsequent **impact on mortality rate** in Indian COVID-19 patients.

- This systematic review was conducted with support of Genpro's proprietary evidence synthesis platform
- We included prospective and retrospective cohorts, case-control studies, case series, and cross-sectional studies to corroborate high-quality evidence.
- Study retrieval and selection based on ***CoCoPop*** *(Condition, Context, Population)* framework.

Population: Studies on COVID-19 patients with manifestation of co-infection(s) (irrespective of the type)

Condition: Studies containing information on rate of co-infections (also including malaria, dengue, and leptospirosis) in COVID-19 patients.

Context: Studies within India

- A subgroup analysis was performed based on the coinfecting pathogen *(bacterial, viral, or fungal).*
- Due to limited studies and high heterogeneity (I^2>97%), we could not perform meta-analysis.
- **Software**: The data was extracted and synthesized in Excel (version 16.0.1). Further, descriptive statistics including mean±SD was calculated for average length of stay (LOS) using R software (version 4.1.2).
- **Risk of bias** among the included studies was assessed using JBI critical appraisal tools *(checklist for prevalence studies and case series).*

RESULTS

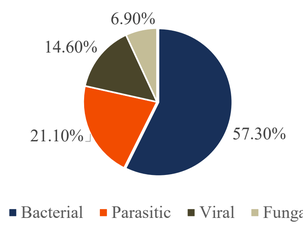
- The review included a total of 8 eligible articles.

Retrieved results (N = 4438) → Assessed for eligibility (N = 97) → Included articles (N = 8)

Prevalence

- The overall prevalence of coinfections ranged from **4% to 46%.**

Prevalence stratified by organisms



- Pathogen-wise distribution showed Klebsiella Pneumoniae and Streptococcus Pneumoniae (among bacterial), and Dengue virus (among viral) had highest prevalence.

Figure-1: Prevalence based on type of organism

Pathogen-based distribution

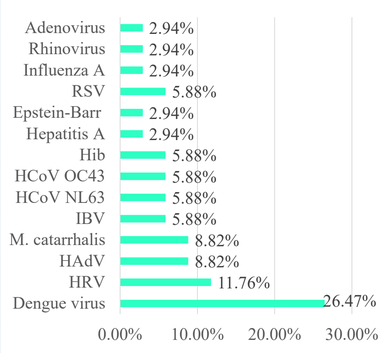


Figure-2: Viral pathogens as a proportion of total number of organisms per pathogen (%)

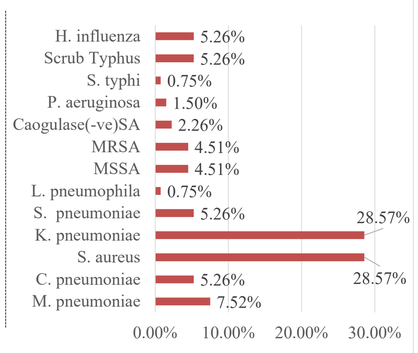


Figure-3: Bacterial pathogens as a proportion of total number of organisms per pathogen (%)

Abbreviations: MSSA: methicillin sensitive staphylococcus aureus, MRSA: methicillin resistant staphylococcus aureus, P. (pseudomonas) aeruginosa, S. (salmonella) typhi, M. (mycoplasma) pneumoniae, C. (chlamydia) pneumonia,, SA: staphylococcus aureus, S. (streptococcus) pneumoniae, K. (klebsiella) pneumoniae, L. (legionella) pneumophilia, H. (haemophilus) influenzae, RSV: respiratory syncytial virus, HAdV: human adenovirus, HRV: human rhinovirus, M. (Moraxella) catarrhalis, IBV: infectious bronchitis virus, HCoV: human coronavirus, Hib: haemophilus influenza type b

Comorbidities

- Of the three studies who presented comorbidities data, two studies reported *diabetes mellitus* and *hypertension* as majorly present comorbidities in **~30%-42%** patients.

ICU
Proportion of COVID-19 patients with coinfections requiring ICU admissions ranged from 60% to >80%

LoS
Average LoS among coinfected COVID-19 patients was 13.67±3.51 days.

Mortality Rate

- Mortality rate in COVID-19 patients with coinfections ranged from **9% to 65%.**

Bias Assessment

- The overall assessment showed low risk of bias.

CONCLUSION

- We studied COVID-19 patients with coinfection of three major species – bacteria, virus, and parasites.
- **Being the first evidence synthesis report on coinfections, the review findings could be utilized to inform and develop antibiotic stewardship strategies.**

Need of hour

- **Large-scale epidemiological studies** to determine the disease burden of COVID-19 coinfections globally.
- **Clinical and diagnostic guidelines** for COVID-19 coinfected patients, *especially in LMICs.*
- Robust **reporting practices** at patient and hospital levels to reinforce infection control practices.
- Lack of **bioinformatic/genomic data** to assess a causal relationship between specific strains of causative organisms

Recommendations

- Researchers, clinicians, and industry could **collaboratively work** - build a consensus on management of coinfected COVID-19 patients.
- Effective, timely and accurate **diagnostic practices, microbiological investigations** – to curate proper antibiotic regimen
- Implementation of effective **antibiotic stewardship program**. *In case, antibiotics are recommended – de-escalation should be considered based on culture reports*

Contact

KAPIL KHAMBHOLJA
Genpro Research Inc.
Email:
Kapil.Khambholja@genproresearch.com
Phone: +91-7702949998

References

1. Infection Prevention and Control. WHO. Available at: https://www.who.int/teams/integrated-health-services/infection-prevention-control#:~:text=Infection%20prevention%20and%20control%20(IPC,a%20result%20of%20antimicrobial%20resistance.
2. Saad A et al. Coinfections with Bacteria, Fungi, and Respiratory Viruses in Patients with SARS-CoV-2: A Systematic Review and Meta-Analysis. Pathogens. Doi: https://doi.org/10.3390/pathogens10070809