International Journal of Innovative Research in Medical Science (IJIRMS)
Volume 08, Issue 09, September 2023,
https://doi.org/10.23958/ijirms/vol08-i09/1742

Original article

Scoping Review of the Use of High-Flow Nasal Cannulas in Covid-19 Patients

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Received 07 August 2023; Accepted 27 August 2023; Published 02 September 2023

Abstract

This study aimed to explore the outcomes of using HFNC for patients with COVID-19. Forty-two studies were scanned using a scoping review, of which 22 were found eligible, satisfying the inclusion and inclusion criteria. Multiple patient outcomes were considered, including recovery time, oxygenation levels, reduced need for intubation in the future, ICU avoidance, and chances of respiratory distress. The findings suggest that HFNC remains more effective in treating patients with COVID-19-induced respiratory problems than traditional methods by indicating significantly improved oxygenation, reduced recovery time, reduced respiratory distress levels, and the need for invasive methods in the future. However, a few complications were also notable while considering its implementation on a wider scale, the most prominent being particle dispersion or airborne infection. However, the studies indicate that the complications and risks can be mitigated using precaution. The research seeks the validation of its findings through more comprehensive research in the future.

1.0. Introduction

According to the most recent findings of Worldometer, COVID-19, an infectious illness caused by the virus named Sars-CoV-2, has affected 690 million people worldwide, causing more than six million deaths (Worldometer, 2023; WHO, 2023). The primary effect of the disease in on the respiratory system, and patients at a critical stage may suffer from severe acute respiratory problems requiring oxygen therapy (Rezaei, 2021). The therapy can be provided either by using traditional ventilation or high-flow nasal cannulas (HFNC). HFNC serves as a noninvasive oxygen-delivery system that supplies heated and humidified oxygen to patients needing oxygen therapies in high volumes thanks to its high flow (Zirpe et al., 2022). However, the evidence relating to the efficacy of HFNC in dealing with the respiratory issues associated with COVID-19 is limited. The objective of this scoping review is to explore and summarize the existing literature on the use of HFNC in COVID-19 patients.

It is important to note that HFNC has several advantages over the traditional methods, such as improved oxygenation, reduced need for intubation, reduced hospital stay, and enhanced patient comfort (Karamouzos et al., 2020l; Ospina-Tascón et al., 2022; Teng et al., 2020). These hypothetical benefits provide the basis for the direction of the study and outcomes to the measured.

2.0. Methods

The study has used the scope analysis to investigate the empirical evidence about the use of HFNC to deal with the cases of respiratory failure to COVID-19. The scoping review is generally used to sum up the key points quantitatively based on the data extracted from the existing literature around a given topic area (Hammond et al., 2014). The characteristics of scoping review for the current investigation include as follows:

Scoping Horizon: All studies from January 1, 2020 onwards. The starting date is significant since it ensures currency while representing a period by which the disease spreads worldwide, and findings have started appearing on vital interrelated issues.

Databases Used: Google Scholar, PubMed, and Cochrane Library

Inclusion Criteria
All studies published from Jan 1, 2020
Studies dealing with respiratory issues associated with COVID-19.
Peer-reviewed journal articles.

Exclusion Criteria
Studies published before Jan 1, 2020
Studies dealing with respiratory issues associated with diseases other than COVID-19 or dealing with mild cases of COVID-19 with no reference to respiratory problems.
Blogs, books, and other untrusted non-scholarly sources (such as Wikipedia).

Number of Studies: 22 from the three databases mentioned above

3.0. Results

The results of the review extend into various dimensions. Firstly, it is important to note that the majority of studies (13) were retrieved by using PubMed, with Google Scholar being the second best source of relevant information (with seven studies), as shown below:

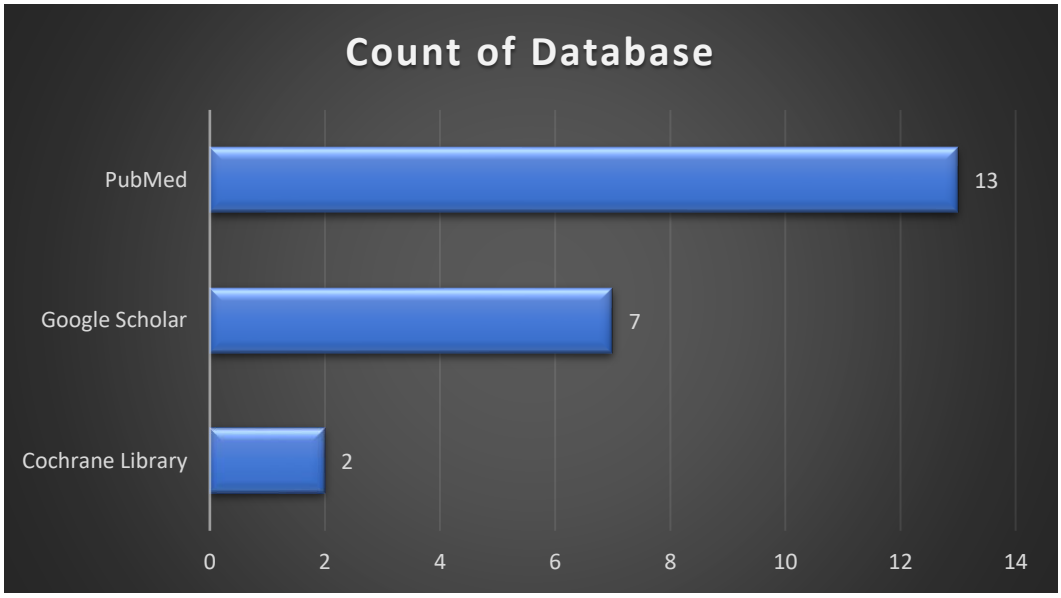

Figure 1: Count of Database

More importantly, cohort study, systematic review, and literature review were found to be the most frequently used research designs. These findings are also visualized below:

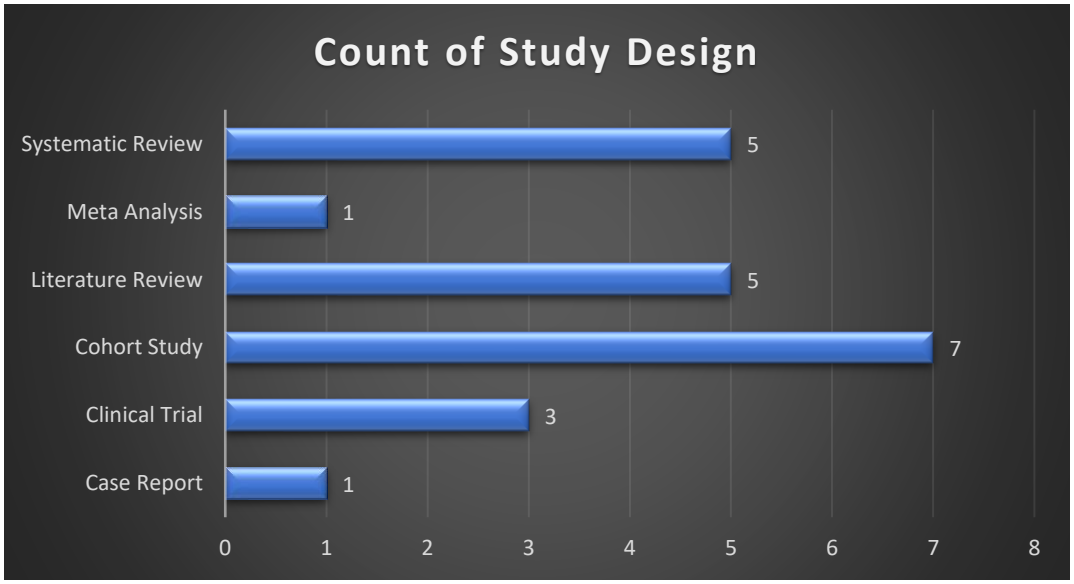

Figure 2: Count of Study Design

The findings above contribute to the reliability of current research as most of the studies (11) are based on evidence from primary research. The systematic reviews are also based on a rich collection of empirical evidence. The cohort studies and clinical trials have offered significant insights into before and after the intervention and its comparison with traditional methods.

It is also important to look into the patient characteristics who were treated as the sample population for the study. The relevance of the patient informs the extent to which the study's findings are transferable. The patients were grouped into following three categories:

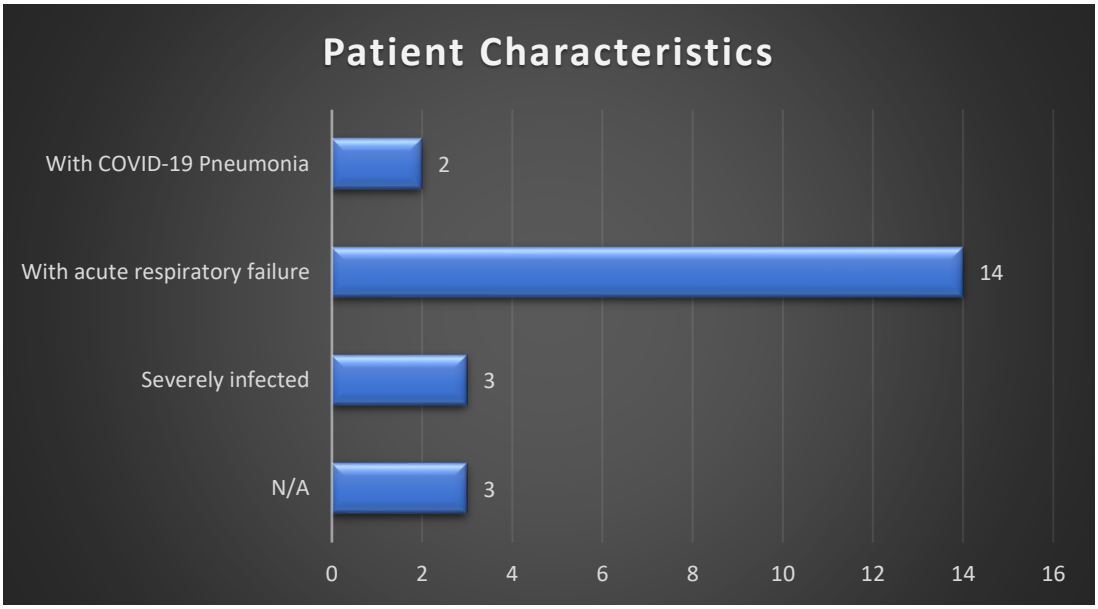

Figure 3: Patient Characteristics

As shown, the majority of the patients were suffering from acute respiratory failure. The severely infected patients can also be grouped with the patients with acute respiratory failure since severely infected patients are likely to present the symptoms of acute respiratory problems. Two studies focusing on patients with COVID-19-induced Pneumonia are also relevant since pneumonia also relates to lung infection and subsequent respiratory problems.

Most importantly, it is crucial to have an overview of the findings about the outcomes and results of interventions. Two important charts to address the outcomes are provided below, followed by an interpretation of the results:

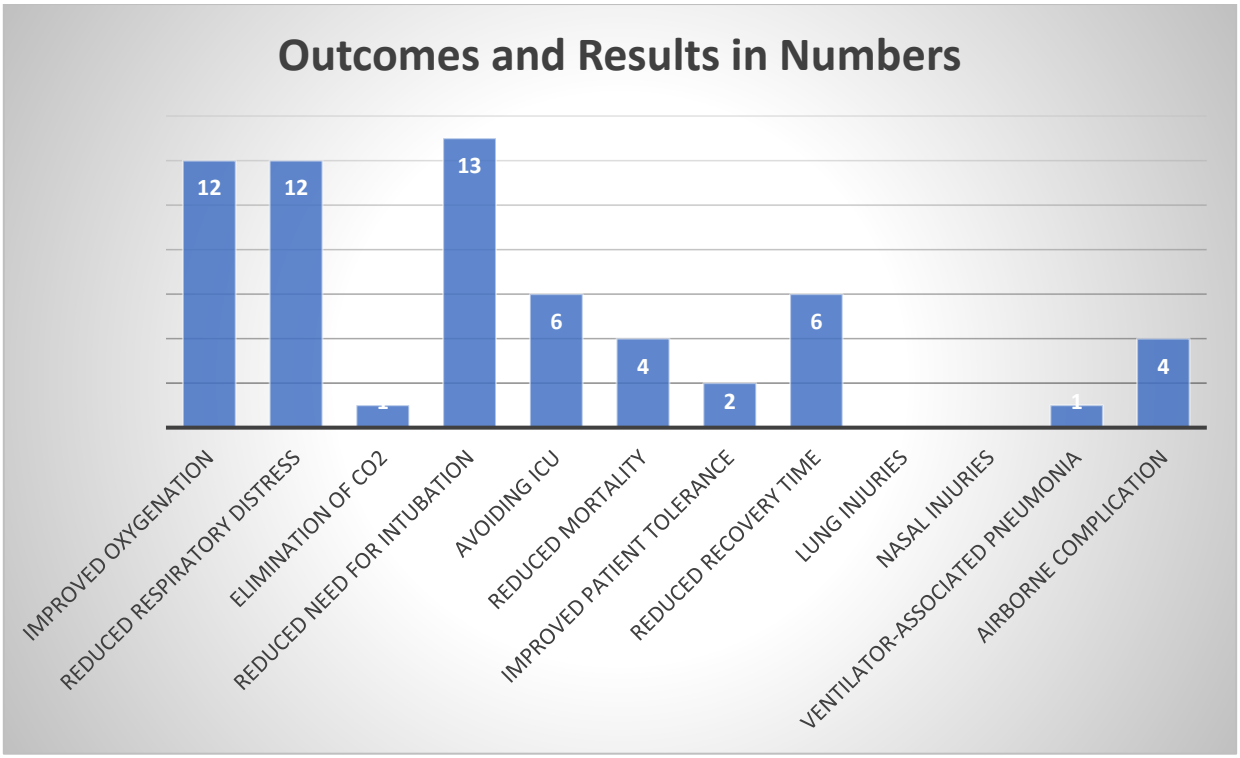

Figure 4: Outcomes and Results in Numbers

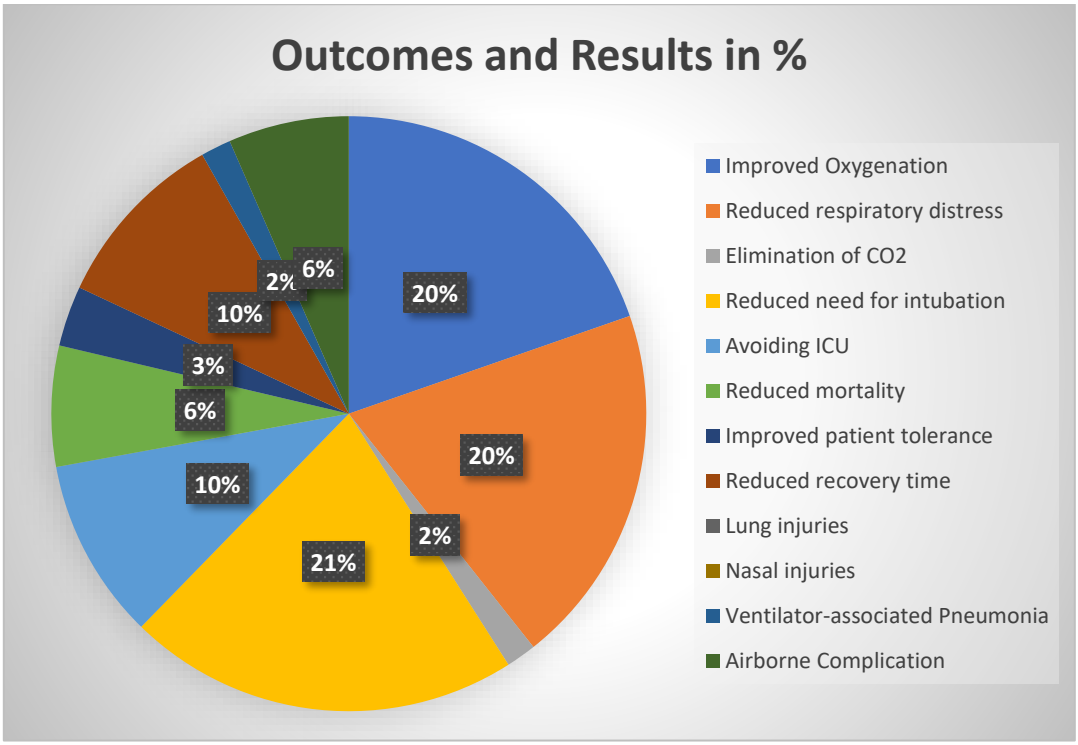

Figure 5: Outcomes and Results in %

As mentioned, the review is focused on 22 relevant studies. The most notable outcomes belong to three categories: reduced need for intubation (n=13), reduced respiratory distress (n=12), and improved oxygenation (n=12). Besides, other important positive outcomes include reduced recovery time, reduced mortality rate, and ICU avoidance.

These findings suggest that 46 positive outcomes were noticed in total for the use of HFNC. These outcomes align with the general hypothetical benefits of administrating HFNC to manage acute respiratory problems (Zirpe et al., 2022). These findings suggest that the use of HFNC helps patients achieve faster recovery and avoid the need for ICU (or reduced stay in ICU). Similarly, the patients felt reduced respiratory distress as compared to traditional methods or before the administration of HFNC, which is attributable to the comparatively higher flow of humid and heated oxygen in the HFNC method (Zirpe et al., 2022). Similarly, an added benefit of HFNC is that higher oxygen concentration and optimized oxygen levels associated with this method reduce the possibility of further deterioration of the respiratory system (Zirpe et al., 2022). These benefits reflect in the findings, suggesting that a considerable percentage of patients showed reduced reliance on other invasive methods, such as intubation, after using HFNC.

However, a few studies have also indicated the complications or side effects associated with the use of HFNC. The most prominent of these issues is airborne complications, such as aerosol or particle dispersion (n=4). However, it was evident that positive outcomes significantly outweighed the risks and complications.

4.0. Discussion

The findings of the scoping review indicate that the findings are significantly credible and generalizable since the majority of studies agree on key points. The findings suggest that using HFNC to deal with the respiratory problems associated with COVID-19 is highly recommendable and preferable over traditional methods. The improved oxygenation and reduced need for intubation are crucial for clinicians since the avoidance of the recurrence of the problem reduces the burden of healthcare (Khan et al., 2020). It is an important outcome considering that COVID-19 is a critically contagious illness and has already critically contributed to healthcare challenges by overcrowding the healthcare centers (Khan et al., 2020).

Similarly, the reduced recovery time and avoidance of ICU or reduced stay in ICU ensure mutual benefits for the patients, the clinicians, and all other stakeholders associated with the healthcare. The expedited recovery means higher turnaround and enhanced capacity for the sector (Leite et al., 2020). These findings indicate the need for using HFNC more frequently than traditional methods to treat patients with acute respiratory failure or similar systems associated with COVID-19.

However, despite these optimistic indications, a few challenges cannot be overlooked. For example, the empirical research about the comparison between the advantages and demerits of using HFNC for COVID-19 is limited, and the current scoping review also draws on the findings from 22 studies only. Therefore, more research is needed as a few studies indicate that in certain cases, HFNC was found to be insignificantly better than the traditional methods (Nair et al., 2021). Therefore, it is important to investigate further the preconditions required to maximize the benefit of HFNC and optimize the outcomes.

Similarly, certain complications associated with HFNC are also highlighted in the existing literature. For example, it was found that HFNC can cause airborne complications due to particle dispersion while addressing the respiratory problems of patients with COVID-19 (Slessarev et al., 2020; Xu et al., 2020). It means that the concerned authorities will have to be careful while mandating the use of HFNC on a wider scale. Since current findings and insights are based on limited research, more research is required focusing on the complications associated with using HFNC and critical risk factors.

Besides, a few studies have also indicated the possibility of effectively addressing the risk factors while administrating HFNC for the cases of COVID-19. For example, Slessarev et al. (2020) argue that using a surgical mask by patients while using HFNC reduces the chance of particle dispersion. A similar solution is also

advised by XU et al. (2020), who conducted a study on using the mask to overcome particle dispersion while administrating HFNC. These studies have found that the key barrier to implementing HFNC can be removed by adding a surgical mask. Furthermore, the risk of avoiding airborne infection can also be avoided if the medical staff follows proper safety protocols while dealing with the infected patients (Shah et al., 2021). Therefore, the risk of aerosol may be mitigated using precautionary methods and is unlikely to be regarded as a critical deterrent to the implementation of HFNC if other indications remain positive after further research. However, it is important to use this study as a departure point and rely on more comprehensive datasets after more relevant studies are published.

5.0. Conclusion

The findings suggest that HFNC is preferable to administering oxygen therapy for COVID-19 patients. The reduced recovery time, enhanced oxygenation, reduced recurrence, and long-lasting impact of this method imply that the healthcare sector can achieve greater efficiency, improved turnover, enhanced capacity, and improved patient outcomes if the use of HFNC is preferred over the traditional methods for the cases of COVID-19.

However, it is important to draw on the current study's findings to engage in more comprehensive research in the future before finalizing the policies and decisions in this regard. An important area for future research is the outcomes associated with short-term versus long-term exposure to HFNC compared to traditional methods. Similarly, future studies may also consider the extent to which the risks identified in this study are genuine and the methods that can be used to mitigate those risks. For example, an inquiry into the effectiveness of masks to minimize the risk of airborne infection is a potential avenue for the future. More research can also be directed to any other barriers to implementing HFNC identified in the future.

Conflicts of Interest

“The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.”

Funding Statement

No funding received

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