

*Aktuelne teme /
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ASSESSMENT OF NONINVASIVE
VENTILATION (NIV) EFFECTIVENESS IN
THE COVID19 INFECTION: A CLINICAL
REVIEW

PROCENA EFIKASNOSTI NEINVAZIVNE
VENTILACIJE (NIV) U COVID19 INFEKCIJE:
KLINIČKI PREGLED

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Ključne reči

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Abstract

Introduction: Noninvasive ventilation (NIV) refers to the administration of ventilatory support without using an invasive artificial airway, endotracheal, or tracheostomy tube. The use of NIV worldwide is on the rise, and the number of indications increases every day, especially its use in SARS-CoV2 infection where there is still uncertainty about its effectiveness. **Materials and methods:** We searched three electronic databases: PubMed, Embase, and Cochrane Library with the following keywords: “NIV and COVID19” OR “SARS-CoV-2 and NIV” OR “NIV failure in COVID19”, and “NIV in respiratory failure during COVID19”. We found 56 papers of which 21 were included in the study. In the table, we present significant data from retrospective, observational and cross-sectional studies related to the application of NIV in COVID19, the countries where the studies were conducted, the median age of respondents, the number of respondents on NIV, and its failure. **Conclusion:** According to available data, the NIV failure ranges between 10,93% to 74% depending on the number of respondents who were included in the research. NIV continues to be the method of choice in the treatment of COVID19 patients but its efficacy should be examined through more studies.

INTRODUCTION

Noninvasive ventilation (NIV) refers to the administration of ventilatory support without using an invasive artificial airway, endotracheal or tracheostomy tube^[1]. The use of NIV aims to avoid some of the complications characteristic of invasive ventilation, such as the need for sedation, which can lead to hemodynamic instability, decrease the possibility of developing delirium, nosocomial infections, spontaneous pneumomediastinum, etc. The use of NIV is widespread, especially in the treatment of epidemics/pandemics^[2, 3]. According to data NIV had become broadly used during the poliomyelitis epidemics in the 1920s till the 1950s, then the use of continuous positive airway pressure (CPAP), as one of the modalities of NIV, was described in the early 1980s. Nowadays, according to data from the liter-

ature, the use of NIV has been on the rise for the last two decades, in the period from 2001.-2004. it increased from 4% to 11%, especially in European countries^[4, 5, 6]. The most of the evidence in favor of the use of spontaneous breathing activity come from unsupported breathing, which has been achieved mainly by modes like bilevel positive airway pressure (BiPAP) or with airway pressure release ventilation (APRV)^[7]. According to QEDSAP/SICCN/SWAPNET routine use of NIV in COVID19 hypoxemic respiratory failure is not recommended because of its association with high failure rate, delayed intubation and possibly increased risk of aerosolization with poor mask fit^[8] while some of the authors believe that NIV application is effective. In this paper, we will present literature and discuss the effectiveness of NIV in COVID19.

MATERIALS AND METHODS

We performed systematic research of three electronic databases: PubMed, Embase, and Cochrane Library from inception in November 2020 until March 2021 using the next key words: "NIV in COVID19" OR "SARS-CoV-2 and NIV" OR "NIV failure in COVID19" OR "NIV in respiratory failure during COVID19". A total of 56 articles were found, of which 21 were used.

The title, abstract, and full text of all documents were reviewed independently by two investigators. We did not use data from studies performed in the pediatric population.

COVID19 infection definition, epidemiology, and symptoms.

SARS-CoV2 is a newly appearing human infectious coronavirus that causes COVID19 which has been recognized by the World Health Organisation (WHO) on March, 11th. Though the first case was reported earlier, in Wuhan, China, in December 2019^[9, 10] as an outbreak of pneumonia of unknown origin. According to the data from the Chinese Center for Disease Control and Prevention 81% of cases were classified as mild (without pneumonia or mild pneumonia), 14% as severe, and 5% as critical (septic shock, respiratory failure, and/ or multiorgan failure). Fever is probably the most common manifestation of disease presented in 44% of patients on examination but after admission to the hospital, 88% of patients developed fever; dry cough in 65-70%; anosmia/hyposmia and loss of taste have been reported in 85-88% of cases; myalgia and dyspnea were seen in approximately 30% of cases. Gastrointestinal (GI) symptoms like diarrhea (13%), abdominal pain (9%), and vomiting or nausea (10%) were reported as well^[11].

The benefits of NIV in COVID19.

Based on data from the studies, in cases with severe impairment of respiratory function in COVID19, the use of non-invasive mechanical ventilation is something that is

considered the best treatment, especially continuous positive airway pressure (CPAP). Some doctors consider CPAP to be beneficial for patients, especially in the early period of the disease, and as such can reduce the need for IMV. NIV assists with supplying the airways with a certain amount of oxygen and air mixture under positive pressure that aids the patient to breathe deeper and leads to better oxygenation^[12]. Regarding the data of NIV failure, we found nine studies, and data from retrospective, cross-sectional and observational studies were analyzed. The data are shown in Table 1. Most studies were conducted in Italy, as many as four. The youngest patient was 25 years old and the oldest 86 except for a study in which there was no data regarding the age of the patients. The highest number of patients on NIV was 286(44%), in a study performed in China, with the highest percentage of NIV failure of 74%, also in the mentioned study. How safe is NIV actually and is the mortality rate with it higher than that of patients on IMV? This was not the subject of our study, but according to some authors NIV is considered very useful, and the mortality rate in some cases was lower than IMV (66.7% vs 93.6%)^[19] while others counted 26,4% of deaths^[16].

CONCLUSION

Opinions of experts from different parts of the world vary. According to data, we showed that the percentage of NIV failure ranges from 10,93% to 74% depending on the number of respondents.

Literature on this topic is scarce, but some authors still claim that this type of mechanical support has proved to be more effective than other types of ventilatory support. More detailed research on this topic is needed in the future.

Table 1. Published data on NIV during COVID19 infection.

First author [ref.]	Year of study	Country	Study design	Year, the median	Total number of all cases	Received NIV ¹ (%)	NIV failure (%)
Di Domenico SL. ^[13]	2020.	Italy	A single-center retrospective study	64 (52-76)	276	90 (32,6)	36 (40)
Gundem T. ^[14]	2020.	Norway	Retrospective study	56 (25-78)	22	4 (18,2)	No data
Brusasco C. ^[15]	2020.	Italy	Retrospective study	25-86	258	64 (24,8)	7 (10,93)
Avdeev SN. ^[16]	2020.	Russia	Retrospective cohort study	62 (53-70)	61	44 (72,1)	17 (38,63)
Bastoni D. ^[17]	2020.	Italy	Observational study	No data	210	6 (2,85)	No data
Zheng Yi. ^[18]	2020.	China	Retrospective study	66 (58-76)	34	19 (55,9)	No data
Rahim F. ^[19]	2020.	Pakistan	Cross-sectional study	44-67	204	126 (61,8)	0 (0)
Liu L. ^[20]	2021.	China	Retrospective multicenter study	65 (56-72)	652	286 (44)	211 (74)
Diaz de Teran T. ^[21]	2021.	Spain, Italy	Retrospective multicenter study	70,98±14,75	162	138 (85,2)	38 (27,5)

¹ Noninvasive ventilation

Sažetak

Uvod: Neinvazivna ventilacija (NIV) predstavlja primenu ventilatorne podrške bez upotrebe invazivnih, arteficialnih disajnih puteva, endotrahealne kanile ili traheostome. Upotreba NIV-a širom sveta je u porastu a broj indikacija se povećava svakim danom, posebno je značajna njegova primena kod SARS-CoV2 infekcije gde još uvek postoji nedoumica u pogledu njegove efikasnosti. **Materijal i metode:** Pretražili smo tri elektronske baze: PubMed, Embase i Cochrane Library sa sledećim ključnim rečima: "NIV i COVID19" ili "SARS-CoV2 i NIV" ili "neuspeh NIV-a u COVID19" i "NIV u respiratornoj insuficijenciji tokom COVID19". Pretražili smo 56 radova od kojih je 21 uključen u studiju. Tabelarno smo prikazali podatke iz retrospektivnih, opservacionih i studija preseka vezanih za primenu NIV-a u COVID19 infekciji, zemlje u kojima su studije sprovedene, prosečnu starost ispitanika, broj ispitanika kod kojih se primenjivao NIV i njegov neuspeh u primeni. **Zaključak:** Prema dostupnim podacima neuspeh u primeni NIV-a kreće se između 10,93% i 74% u zavisnosti od broja ispitanika koji su bili uključeni u istraživanja. NIV je i dalje metod izbora u lečenju pacijenata sa COVID19 infekcijom ali njegovu efikasnost treba ispitati kroz više studija.

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