IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 21, Issue 2 Ser.2 (February. 2022), PP 04-09
www.iosrjournals.org

Outcomes of HFNC and NIV in patients with COVID-19- A retrospective observational study

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ABSTRACT
INTRODUCTION: *Covid-19 is potentially fatal infection caused by novel severe acute respiratory syndrome coronavirus-2(SARS-COV-2).The use of HFNC and NIV in patients with covid-19 is debated.*
AIM: *To assess outcomes of HFNC and NIV in patients with covid-19.*
METHODOLOGY: *A retrospective observational study was done in 18 and 24 covid19 patients confirmed by RTPCR who used HFNC and NIV as first line therapy respectively from july-august 2020.*
RESULTS: *Mean age in HFNC and NIV group was 62 and 58 respectively.There was no difference in disease severity , proportion of comorbidities and oxygenation level between 2 groups.Among 18 patients who used HFNC as a first line therapy 5 experienced HFNC failure and used NIV as rescue therapy.Among 24 patients with NIV as first line therapy 3 used HFNC as rescue therapy due to NIV intolerance. The duration of HFNC+NIV(median 7 vs 8), intubation rate (16% vs 20%) and mortality (11%vs 16%) did not differ significantly(p.0.01) in patients who used HFNC and NIV as a first line therapy respectively.There was no difference in disease severity , proportion of comorbidities and oxygenation level between 2 groups.*
CONCLUSION: *In COVID-19 pneumonia/respiratory failure HFNC and NIV were found to be equally efficacious.In a pandemic situation where the ICU'S are overwhelmed, these 2 non invasive modalities can save many lives, avoiding intubation risks.*
KEY WORDS: *HFNC, NIV*

Date of Submission: 20-01-2022 Date of Acceptance: 03-02-2022

I. Introduction

COVID-19 pandemic will be remembered for the rapidity with which it spread, morbidity and mortality associated with it and paucity of evidence based management guidelines. Oxygen therapy and supportive care are still mainstay of therapy for SARS-COV-2 pneumonia.***Non invasive respiratory therapies*** like HFNC and NIV may offer respiratory support to patients with COVID-19, if standard oxygen therapy fails to maintain optimal oxygen .The use of HFNC and NIV in patients with COVID-19 is debated.To date there are only few studies regarding the use of HFNC and NIV in these patients.My study aims to assess the outcomes of HFNC and NIV in patients with covid 19.

II. Materials and methods

This was a retrospective observational study performed in ***Government hospital for chest and communicable diseases*** , Vishakapatnam from **July- August 2020**.

Study Design: A retrospective observational study.
Study Setting: *Government hospital for chest and communicable diseases* , Visakhapatnam
Study Period: July- August 2020.
In suspected patients, RTPCR was performed according to guidelines of the Ministry of Health and Family welfare to confirm the diagnosis of covid19.
The study enrolled 18 and 24 covid 19 patients confirmed by RTPCR who used HFNC and NIV as first line therapy respectively.

III. Methodology:

Before the use of NIV and HFNC all the demographic, vital signs, laboratory tests and arterial blood gas tests were collected. The baseline PaO2/FiO2 was measured with the use of conventional oxygen therapy before the use of HFNC or NIV. We estimated the FiO2 as follows: FiO2 (%) = 21 + 4*flow (L/min). NIV was managed according to current guidelines(ATS/ERS)[1] . Face mask was used to deliver NIV to the patients.Optimal size of the mask was selected.PSV mode was used .The initial PEEP was 5 cm H2O and titrated up until expected goal of saturation (88%-95%) is reached.Fio2 was titrated accordingly to maintain saturation. The PS was between 5-20 cm H2O to target TV of 6-7 ml/kg. When the NIV intolerance occurred, HFNC was used as a rescue therapy and closely monitored provided the patient does not require urgent intubation. For HFNC *Fisher and Paykel AIRVO-2* HFNC was used. The temperature was set at 37 °C, the flow was set between 30 and 60 L/min, and the FiO2 was set accordingly to maintain the SpO2 more than 93%. When the HFNC failed to maintain the oxygenation or relieve dyspnea, NIV was used as a rescue therapy and closely monitored if the patient does not require urgent intubation.

When the respiratory distress and oxygenation progressively deteriorated, **intubation** for invasive mechanical ventilation was performed. When patients respiratory distress relieved and oxygenation improved weaning was planned.

IV. Results

Among the 42 enrolled patients HFNC was used as first line therapy in 18 patients and NIV was used as a first line therapy in 24 patients.

The mean age in HFNC group was 64 and in NIV group was 58.

There was no significant differences in disease severity,comorbidities and level of oxygenation between 2 groups.

Flow chart of the enrolled patients:

Figure no. 1: Flow chart of HFNC group

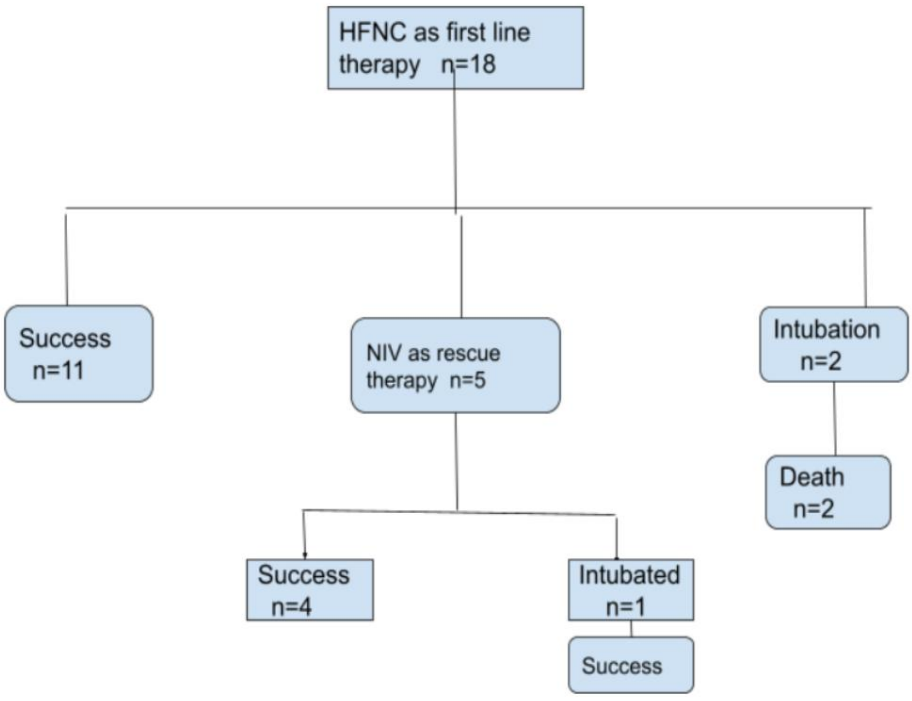

Figure no. 2: Flow chart of niv group

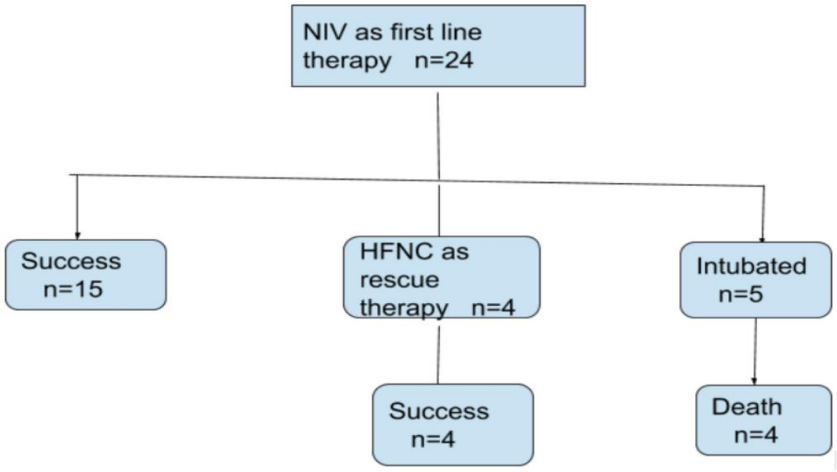

Table no 1: Clinical characteristics of the enrolled patients before the use of HFNC and NIV

Clinical Parameters	HFNC group (n=18)	NIV group(n=14)	P value
Mean age	64 years	58 years	
Male%	66.6%(12)	66%(15)	0.96
Female%	33.4%(6)	34%(9)	0.97
HTN	44.4%(8)	50%(12)	0.70
DM	22%(4)	25%(6)	0.82
Chronic heart diseases	4%(1)	5%(1)	0.87
others	4%(1)	-	0.76

Table no 2: Clinical characteristics of the enrolled patients before the use of HFNC and NIV

Level of PaO2/FiO2	HFNC group	NIV group	P value
200-300mmHg	33.3%(6)	29%(7)	0.76
150-200mmHg	50%(9)	45.8%(11)	0.78
100-150mmHg	16%(3)	33%(5)	0.21

Figure no. 3: Vital signs and oxygenation level of patients at presentation

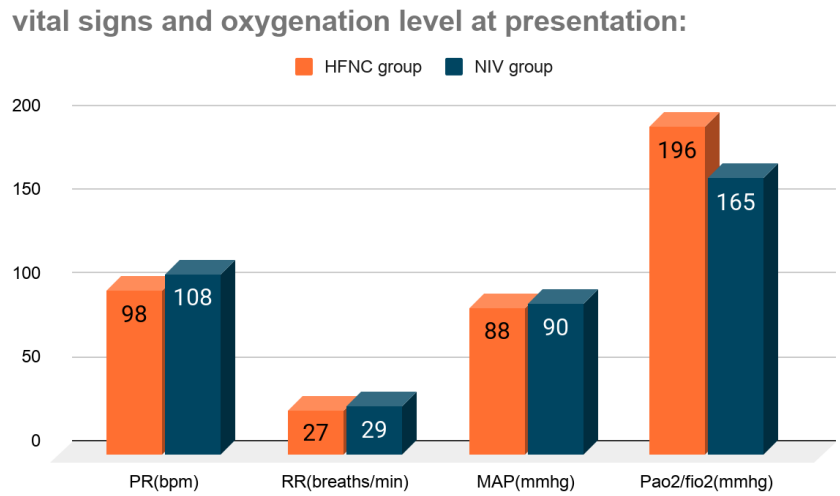

Figure no. 4: Vital signs and oxygenation level of patients at 1-2hrs of presentation

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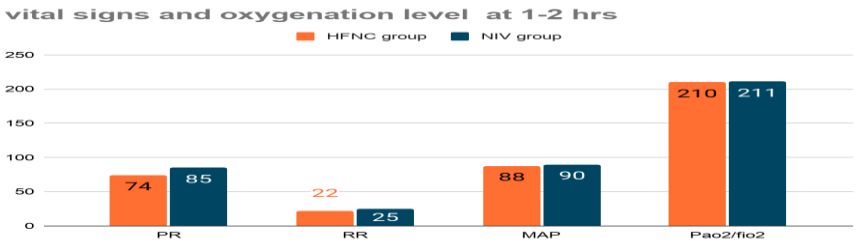
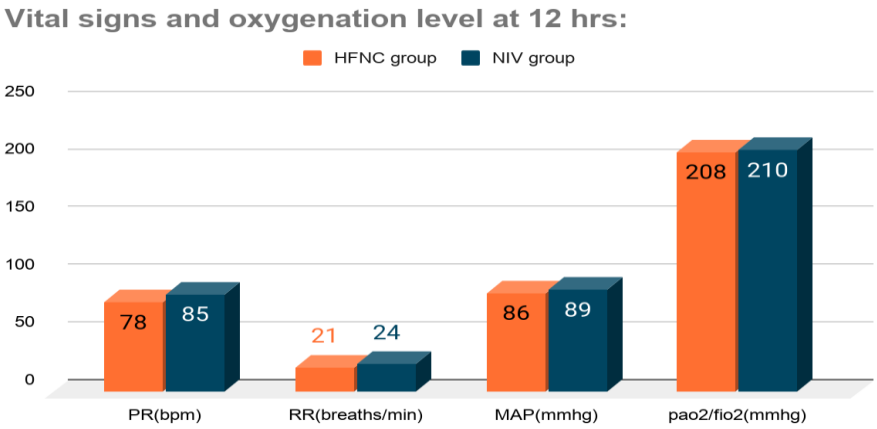


Figure no. 4: Vital signs and oxygenation level of patients at 12hrs of presentation

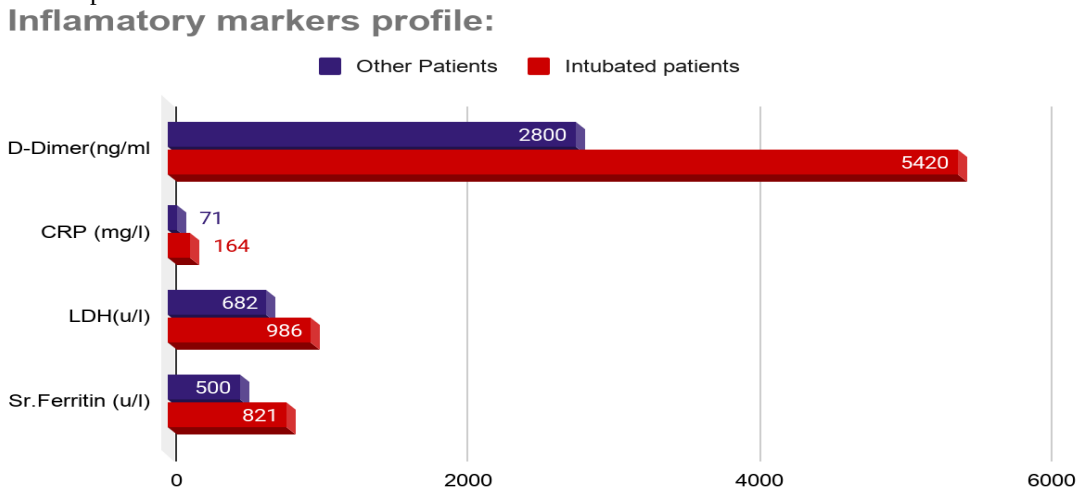


There was no difference in vital signs and oxygenation levels between 2 groups at baseline, 1-2 hr and 12 hrs except for RR which was high in NIV group.
The maximum PEEP used in NIV group was 12cmH2O and minimum PEEP was 6 cm H2O.
In HFNC group the maximum flow rate used was 60l/min and minimum flow rate used was 30l/min.

Table no 3: Outcomes

Parameters	HFNC group (n=18)	NIV group (n=24)
Median duration of HFNC(days)	5	6
Median duration of NIV(days)	6	7
Median duration of HFNC+NIV (days)	7(5-10)	8(6.5-8.5)
HFNC as a rescue therapy	-	4(16.6%)
NIV as a rescue therapy		-
Intubation rate	5(27.7%)	20%(5)
Mortality	11%(2)	11%(4)

Out of total 42 patients 8 were intubated.



V. Discussion

Out of 18 patients who used HFNC as a first line therapy 5 were transitioned to NIV as a rescue therapy.
Out of 24 patients who used NIV as first line therapy 4 used HFNC as a rescue therapy due to NIV intolerance.
The Surviving Sepsis Campaign COVID-19 subcommittee has suggested that HFNC is superior to NIV in COVID-19 patients with acute hypoxemic respiratory failure However, the level of evidence is weak since most of the recommendations were based on the experts suggestion[2].
Asian critical care clinical trial group suggested that HFNC and NIV can be used in mild ARDS[3].
On the contrary (16% in HFNC and 33% in NIV group) with Pao2/Fio2 between 100-150 mmHg (moderate ARDS) used HFNC and NIV as first line therapy and closely monitored.
And among all the patients the duration of HFNC+NIV(median 7 vs 8), intubation rate (16% vs 20%) p=0.74and mortality (11%vs 16%)p=0.64 did not differ significantly in patients who used HFNC and NIV as a first line therapy respectively(p>0.01).
Even *FLORALI trial*(Clinical effects of association of HFNC and NIV in resuscitation of patients with ALI) found no difference in intubation rate between 2 groups[4].
In our study, patients who were intubated had very high levels of inflammatory markers.
Close monitoring of such patients should be done to avoid delayed intubation.
My data provides an important reference for critical care physicians to select respiratory support devices in patients with COVID-19(especially in any pandemic situation where the ICU's are overwhelmed).
Fear of aerosolized transmission was the major problem with use of HFNC and NIV.
In our study the use of HFNC and NIV was in negative pressure ward and ICU and adequate PPE were provided to all medical staff and hence rate of nosocomial infection among medical staff was very low.

Limitations

It is a retrospective study , use of HFNC and NIV was decided based on experts suggestions and physician experience.

The small sample size may skew the results. Studies with larger sample size are required to confirm my results.

VI. Conclusion

In COVID-19 pneumonia/respiratory failure HFNC and NIV were found to be equally efficacious.

In a pandemic situation where the ICU'S are overwhelmed, these 2 non invasive modalities can save many lives, avoiding intubation risks.

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Dr. P. Alekya, et. al. "Outcomes of HFNC and NIV in patients with COVID-19-A retrospective observational study." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 21(02), 2022, pp. 04-09.