

OUTCOMES OF COVID-19 PATIENTS TREATED WITH NON-INVASIVE VENTILATION INSIDE THE INTENSIVE CARE UNIT AT ZAGAZIG CHEST HOSPITAL

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ABSTRACT:

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Background: When treating patients with acute respiratory failure (ARF) caused by a variety of etiologies, noninvasive ventilation (NIV) is often employed. NIV may be used early to avoid intubation, later as an alternative to endotracheal intubation, or as a way to ease weaning in cases of hypercapnic respiratory failure, which is often caused by COPD exacerbation.

Aim of the work: To identify the characteristics of a significant number of coronavirus illness 2019 patients getting NIV for hypoxemic respiratory failure within the intensive care unit (ICU) and to identify the mortality risk for patients needing intubation.

Patients and methods: This Retrospective research were conducted at Zagazig Chest Hospital from June 2020 to June 2021. The research included 120 patients with ARF due to Covid 19 infection confirmed by CT chest findings and PCR for Covid 19.

Result: Duration of NIV was ranged between 4 hours – 21 days with mean value 6.00 ± 3.956 days. Outcome show that 32(26.67%) were improved and transferred to ward and 88(73.33%) were died. Duration of MV was ranged between 1 –7 days with median value 3.46 ± 2.025 days. Duration of staying in ICU was ranged between 2 –21 days with median value 7.54 ± 4.476 days,

Conclusion: NIV could be a helpful respiratory aid in preventing silent hypoxia, a COVID-19 consequence. Also, NIV in COVID -19 patients with severe pneumonia was associated with high mortality rates.

Keywords: Noninvasive ventilation (NIV), acute respiratory failure (ARF) and coronavirus disease 2019 (COVID-19).

INTRODUCTION:

When treating patients with acute respiratory failure (ARF) caused by a variety of etiologies, noninvasive ventilation (NIV) is often employed. NIV may be used early to avoid intubation, later as an alternative to first-line endotracheal intubation, or as a way to ease weaning in cases of hypercapnic respiratory failure, which is mostly caused by COPD exacerbation. In patients with bouts of

cardiogenic pulmonary edema, guidelines strongly encourage the use of NIV for hypoxemic respiratory failure^[1].

Additionally, there is debate concerning the use of NIV in patients with acute respiratory distress syndrome (ARDS) aggravating viral pneumonia^[2].

In order to manage patients with severe pneumonia and ARDS who required respiratory assistance and monitoring,

hospitals raised the number of ICU beds and transformed several ordinary wards into respiratory intermediate care units (RICUs)^[3].

AIM OF THE WORK:

To identify the characteristics of a significant number of coronavirus illness 2019 patients getting NIV for hypoxemic respiratory failure within the intensive care unit (ICU) and to identify the mortality risk for patients needing intubation.

PATIENTS AND METHODS:

This retrospective research of covid-19 confirmed patients admitted with hypoxemic respiratory failure in Zagazig Chest Hospital intensive care unit in the period from June 2020 to June 2021.

Inclusion criteria:

We included age groups ranging from 16 to 70 years old patients with ARF due to Covid 19 infection confirmed by CT chest findings and PCR for Covid 19, these include severe cases and critically ill patients. **Sever cases of covid 19 characterized by:** PaO₂/FiO₂ ratio <300, RR > 30, SaO₂ 92 at room air, more than 50% of pneumonic lesions or lesions that will worsen within 24 to 48 hours are seen on chest imaging. **Critically ill patients:** RR>30, or SaO₂ <92 at room air, or PaO₂/FiO₂ ratio < 200 despite oxygen therapy.

Exclusion criteria:

Patients with ARF due to other causes rather than Covid 19; unconfirmed patient with COVID 19, acute infections other than Covid 19 e.g., abscess, UTI, appendicitis, ... etc.

Data were gathered from patients' medical records:

Complete full history, clinical examination, radiological investigations

(HRCT), PCR, CBC, D-dimer, ABG, renal function tests and liver enzymes. NIV used for patients with acute respiratory failure secondary to Covid 19 infection in ICU. ABG taken before initiation, during and after NIV. Intubation was the management of choice in NIV failure, trial of weaning was done for patients clinically and laboratory improved on NIV.

Statistical Analysis:

Utilizing the statistical program of special science SPSS version 22 (SPSS Inc. Chicago, IL, U.S.A.), all data were collected, tabulated, and statistically evaluated as follows: editing and coding, computerized data entry, quantitative data stated as mean±sd (standard deviation) for parametric data, median and range for non-parametric data, qualitative data stated as frequencies and relative percentage, and to check if the data were normally distributed, Shapiro-Wilk's test was performed.

Data were managed with the use of suitable statistical tests of significance such:

The difference in the quantitative factors in two groups was calculated utilizing the independent t-test and the Mann-Whitney test. The paired t-test was employed to compare two dependent groups of variables that were regularly distributed. The difference between the qualitative factors was calculated utilizing the chi square test (χ^2) and fisher exact.

A p-value of ≤ 0.05 indicates a significant variation, a p-value of <0.001 shows a very significant variation, and a p-value of >0.05 indicates a non-significant variation in all statistical comparisons.

Ethical consideration:

(Research Ethics Committee):

From Faculty of Medicine, Ain Shams University. [MS 407/2022].

Outcomes Of Covid-19 Patients Treated with Non-Invasive Ventilation.

Study Title: Outcomes of COVID-19 Patients Treated with Non-Invasive Ventilation inside the ICU at Zagazig Chest Hospital.

Department:

Chest Diseases

The FMASU REC is run under Federal Wide Assurance and organized and run as regard to the International Council on Harmonization (ICH), the Islamic Organization for Medical Sciences (IOMS), the United States Office for Human Research Protections, and the United States Code of Federal Regulations. **NO.FWA 000017585.**

In accordance with the University's and the REC's Standard Operating Procedures, the REC does not publicly disclose the identities of its members.

RESULTS:

This study was conducted retrospectively on 120 patients admitted to ICU at Zagazig Chest Hospital in the period between June 2020 to June 2021. Age was ranging between 16 –70 years with mean value 51.47 ± 12.964 years. Male cases were 90 (75.0%) while female cases were 30 (25.0%).

Table (1): Medical history of the studied group:

Medical History	Number	Percent
HTN	73	60.8
DM	45	37.5
CKD	19	15.8
COPD	15	12.5
ICH	7	5.8
Bronchial Asthma	5	4.2
Stroke	5	4.2
IHD	4	3.3
Hepatic	4	3.3
HCC	3	2.5
Ovarian Cancer	2	1.7
Cancer Prostate	2	1.7
Heart Failure	2	1.7
Hypothyroid	2	1.7
Breast Cancer	1	0.8
Colon Cancer	1	0.8
OHS	1	0.8
Total	120	100

Most of the patients had HTN, DM, CKD and COPD.

Table (2): Distribution of the examined sample in accordance with the radiological results.

Clinical Presentation	Number	Percent
GGO	76	63.3
Unilateral	16	13.3
Bilateral	60	50.0
Consolidation	67	55.8
Left	15	12.5
Right	12	10.0
Bilateral	40	33.3
Total	120	100

Radiological findings of the studied group showed that 76(63.3%) presented with GGO (16(13.3%) unilateral and 60(50.0%) bilateral), 67(55.8%) presented with Consolidation 15(12.5%) in left loop, 12(10.0%) in right loop and 40(33.3%) were bilatera

Table (3): Distribution of the examined sample in accordance with laboratory investigations:

	Number	Percent
TLC	4 – 38	14.67 ± 8.229
Lymphocyte count	0.1 – 2.3	0.94 ± 0.398
Creatinine	0.5 – 3.2	1.14 ± 0.568
D-dimer	200 – 2000	939.58 ± 469.984
ALT	6 – 87	24.58 ± 16.566
AST	7 – 82	25.92 ± 16.252

The laboratory investigations of the examined group showed TLC was ranging between 4 – 38 with median value

14.67 ± 8.229 . Lymphocyte count was ranging between 0.1 – 2.3 with mean value 0.94 ± 0.398 . Creatinine was ranging between

0.5 – 3.2 with mean value 1.14 ± 0.568 . D-dimer was ranging between 200 – 2000 with mean value 939.58 ± 469.984 . ALT was

ranging between 6 – 87 with mean value 24.58 ± 16.566 . AST was ranging between 7 – 82 with mean value 25.92 ± 16.252 .

Table (4): Outcome of the studied group:

	Number	Percent
Duration of NIV		
Range	4 hours – 21 days	
Mean±S.D.	6.00±3.956	
Outcome		
Improved and transferred to ward	32	26.67
Died	88	73.33
Duration of MV		
Range	1 – 7	
Mean±S.D.	3.46±2.025	
Duration of staying in ICU		
Range	2 – 21	
Mean±S.D.	7.54±4.476	

Duration of NIV was ranging between 4 hours – 21 days with mean value 6.00 ± 3.956 days. Outcome show that 32(26.67%) were improved and transferred to ward and 88(73.33%) were died. Duration of MV was ranged between 1 –7 days with mean value 3.46 ± 2.025 days. Duration of staying in ICU was ranging between 2 –21 days with mean value 7.54 ± 4.476 days.

DISCUSSION:

The 2019 corona virus illness (COVID-19) caused a global healthcare system collapse and an unparalleled disruption of daily life. Researchers worked very hard to understand the mechanism of the illness, identify efficient therapies, and create vaccines as a consequence. The respiratory system is generally affected by COVID-19, which may cause ARDS, which has a poor prognosis and often requires invasive mechanical ventilation. [4]. Current recommendations state that invasive mechanical ventilation (IMV) is the main treatment option for individuals with ARDS who need respiratory assistance. NIV, on the other hand, is only used in a restricted group of ARDS patients. It has to be used carefully and with a continual state of readiness for

endotracheal intubation. However, a substantial number of COVID-19 patients with ARDS have received noninvasive treatments, such as high-flow oxygen therapy and NIV, often outside the ICU, owing to the lack of accessible ICU beds. [5]. Elderly people who are seriously sick have an especially dismal prognosis due to multi-morbidity and frailty. Similar studies among COVID-19 participants indicated that poorer outcomes are associated with rising age and frailty levels in this cohort. Endotracheal intubation and IMV are more painful and have a larger risk of consequences, such as ventilator-associated pneumonia, as compared to NIV. NIV may thus be a particularly tempting treatment option for older COVID-19 patients [6].

Between June 2020 and June 2021, this retrospective investigation was carried out at the Zagazig Chest Hospital. 120 patients with ARF owing to Covid 19 infection, as determined by CT chest abnormalities and PCR for Covid 19, were included in the research.

Regarding the demographic information of the investigated group in the present research, age varied from 16 to 70 years with a median value of 51.47 ± 12.964 years. There were 90 male cases (75.0%)

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compared to 30 female cases (25.0%).

The study conducted retrospectively [7], upon 157 adult COVID-19 patients, multicenter cohort study, Italy, reported that A total of 157 patients were seen, of whom 40 (25%), or 74.5%, were men and had a median (IQR) age of 64 (55-75).

The current investigation demonstrated that as regard medical history of the studied group show that 73 patients (60.8%) had systemic hypertension (HTN), 45(37.5%) had diabetes (DM), 19 patients (15.8%) had chronic kidney disease (CKD), 15 patients (12.5%) had chronic obstructive pulmonary disease (COPD), 7 patients (5.8%) had ICH, 5 patients (4.2%) had Bronchial Asthma, 4 patients (3.3%) had Stroke, 4 patients (3.3%) had ischemic heart disease (IHD), 3 patients (2.5%) were Hepatic, 2 patients (1.7%) had hepatocellular carcinoma (HCC), 2 patients (1.7%) had Ovarian Cancer, 2 patients (1.7%) had Cancer Prostate, 2 patients (1.7%) had Heart Failure, 2 patients (1.7%) had Hypothyroid, 1 patient (0.8%) had Breast Cancer, 1 patient (0.8%) had Colon Cancer and 1 patient (0.8%) had obesity hypoventilation syndrome (OHS).

In the study [8], 659 consecutive COVID-19 patients, with age of the patient ranged from 14 and 90 years old, were retrospectively collected in hospitals from 11 regions, The study reported that HTN was found in 167/641 patients (26.1%), Heart disease in 23/628 patients (3.7%), DM in 66/628 patients (10.5%), COPD in 7/614 patients (1.1%), Asthma in 3/614 patients (0.5%), and Malignancy in 9/629 patients (1.4%).

Our results showed that regarding radiological presentation by chest computed tomography (CT) of the studied group show that 76 patients (63.3%) presented with GGO 16 patients (13.3%) unilateral and 60 patients (50.0%) bilateral), 67 patients (55.8%) presented with Consolidation (15

patients (12.5%) in left lobe, 12 patients (10.0%) in right lobe and 40 patients (33.3%) were bilateral).

Also, in the study [8], On chest CT scans, 74.7% of patients showed ground-glass shadows, and 28.3% had consolidation, according to radiologic results.

The current investigation demonstrated that as regard laboratory tests of the examined group. White blood cell count (WBC) was ranging between 4 – 38 with mean value 14.67 ± 8.229 . Lymphocyte count was ranging between 0.1 – 2.3 with mean value 0.94 ± 0.398 . Creatinine was ranging between 0.5 – 3.2 with mean value 1.14 ± 0.568 . D-dimer was ranging between 200 – 2000 with mean value 939.58 ± 469.98 . Alanine-aminotransferase (ALT) was ranging between 6– 87 with mean value 24.58 ± 16.566 . Aspartate-aminotransferase (AST) was ranging between 7 – 82 with mean value 25.92 ± 16.252 .

In our study [9], 82 consecutive COVID-19 patients, the laboratory findings were WBC was ranging between (8.1-13.3), lymphocytes was ranging between (536-999), D-dimer was ranging between (680-2495), AST was ranging between (25-48), ALT was ranging between (26-56), CRP was ranging between (3.6-12.7), creatinine was ranging between (0.6-0.9) .

In the study in our hands, comparison between, before and on NIV according to ABG data, we found PH before NIV was ranging between 7.23–7.57, PaCO₂ before NIV was ranging between 20–82 mmHg, PaO₂ before NIV was ranging between 42–61 mmHg. HCO₃ before NIV was ranging between 15–42 meq/L & SPO₂ before NIV was ranging between 71–91%.

In our study [10], 39 patients with COVID-19 receiving NIV were retrospectively analyzed and reported that: before non-invasive therapy, PH range from 7.43- 7.48, PaO₂ range from 61.1- 79.2 mmHg.

Duration of NIV was ranging between 4 hours – 21 days. Outcome showed that 32 (26.67%) were improved and 88 (73.33%) patients need for invasive mechanical ventilation (MV) and then all patients in invasive MV were died. Duration of invasive MV was ranging between 1 –7 days. Duration of staying in ICU was ranging between 2 –21 days.

In agreement with our study^[9], in order to incorporate all studies with data on in-hospital mortality in COVID-19 patients receiving NIV, a quick review approach was used; 23 articles totaling 4776 patients were included. Non-invasive respiratory assistance was given to 46 percent of patients; when it failed in 47.7 percent of those patients, 26.5% required intubation and 40.9% died.

On the contrary with Fu et al.^[10] reported that all patients who were treated with NIV during their hospital stay discharged from hospital 36 patients (92.30%), except 3 deaths (7.69%). This is due to the small number of patients who have been treated with NV compared with our study.

Conclusion:

NIV may be an effective respiratory aid in preventing silent hypoxia, a COVID-19 side effect. Throughout the study period, patients receiving NIV assistance should be continuously watched. Since delaying intubation raises the risk of problems and might have adverse effects, intubation should always be an option.

Conflict of interest:

(No conflict of interest)

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نتائج مرضى كوفيد 19- الذين تمت معالجتهم بالتهوية غير الغازية داخل وحدة العناية المركزة بمستشفى الصدر بالزقازيق

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المقدمة: يتم استخدام التهوية الغير جراحية بشكل شائع في العديد من أماكن الرعاية الحرجة عبر مجموعة متنوعة من مسببات الفشل التنفسي الحاد . بالنسبة لفشل التنفسي الناتج بشكل أساسي عن تقادم مرض الانسداد الرئوي المزمن ، يمكن استخدام التهوية الغير جراحية في مرحلة مبكرة لمنع التنبيب ، في مرحلة لاحقة كبديل للتنبيب الرغامي من الخط الأول ، أو كوسيلة لتسهيل الفطام.

الهدف من البحث: نحن نهدف إلى توصيف عدد كبير من مرضى فيروس كورونا المرضى الذين يعانون من نقص تأكسج الدم الحاد الذين يتلقون التهوية الغير جراحية داخل وحدة العناية المركزة ، واكتشاف خطر الوفاة للمرضى الذين يحتاجون إلى التنبيب.

المرضى وطرق البحث: المرضى الذين يعانون من فشل تنفسي حاد بسبب عدوى كوفيد 19 تم تأكيده من خلال نتائج التصوير المقطعي المحوسب و تفاعل البوليميراز المتسلسل لفيروس كوفيد 19.

النتائج: من خلال دراسته تم الحصول على النتائج التاليه :

اظهرت نتائج الدراسة مده استخدام المرضى للتهويه غير الجراحية تتراوح ما بين 4 ساعات الى 21 يوم وان نسبه تحسن الحالات 32 حالة بنسبة 26.67% ونسبه المرضى الذين استخدموا اجهزه التنفس الصناعي وتوفوا 88 حالة بنسبة 73.33%. كانت مده اقامه المرضى داخل الرعاية المركزه تتراوح ما بين يومين لواحد وعشرون يوما .

الاستنتاجات والتوصيات: قد تكون التهوية الغير جراحية مفيدة لمرضى الكوفيد 19 بحيث تمنع نقص الاكسجين الصامت الذى يكون كاحدى مضاعفات كوفيد 19 . ايضا تم ملاحظة زيادة نسبة الوفيات فى مرضى كوفيد 19 الذين احتاجوا إلى التهوية غير الجراحية و يعانون من الالتهاب الرئوى الشديد .