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Study of national early warning score-2 (NEWS-2) Score on admission in COVID-19 positive patients and its association with mortality

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Abstract

Background: While several parameters have emerged as predictors of prognosis of COVID-19, a simple clinical NEWS2 score at baseline might help early risk stratification. Hence the present study was undertaken to assess the usefulness of NEWS-2 score on admission in COVID 19 positive patients and its use in assessing the mortality, also assessed COVID-19 patients based on CURB-65, NEWS-2 score and SIRS and which score among three is better in predicting outcome.

Method: A total 155 patients who had SARS-CoV-2 infection were enrolled and screened on the basis of the NEWS2 score, SIRS score and CURB 65 score on admission. Routine examination was carried out. RT-PCR/ RAT came to be positive, on admission based on score patient assessed and started on treatment. Patient was followed up till 28 days or discharge or death.

Results: On NEWS score, 31.6% cases had medium clinical risk (NEWS2 score 5-6) and 46.5% cases had low clinical risk (NEWS2 score 1-4). On SIRS criteria, majority 87.1% had scores 2 and 12.9% had score > 2. On CURB 65 majority 52.9% had score 0, 8.4% had 1, 28.4% had score 2, 2.6% had 3 and 7.7% had score 4. On final outcome 87.1% were discharged and 12.9% died. On association between NEWS score and mortality rate it was seen those having NEWS score more than 5 i.e., 74 cases, among them majority 20 cases died, ($p < 0.01$). On comparing all 3 scores i.e., NEWS, SIR and CURB 65, it was seen that among those who had raised scores had more mortality rate. Sensitivity for all 3 was 98.5%, 97% and 97.1% respectively.

Conclusion: Thus, such scoring system can definitely help in detecting the prognosis of disease which will ultimately help the treating doctor for planning the management of such cases.

Keywords: COVID-19, NEWS2 score, CURB-65, SIRS, Mortality

Introduction

When the COVID-19 pandemic first emerged as a major global healthcare challenge in early 2020, it soon became apparent that some patients experienced a severe pneumonia, often culminating in a rapid deterioration of respiratory function and the requirement for respiratory support. In those developing these severe symptoms in the first wave of the pandemic, mortality was high, typically over 20% in those needing hospitalisation, and much higher in those requiring intensive care and ventilation -. This created enormous pressure on the provision of acute hospital care and intensive care bed availability. Triage patients with COVID-19 in the community or on arrival at emergency departments and in those hospitalised, was challenging. This was not only due to the volume of cases but also the unpredictable and often rapid course of respiratory decline, and the emergent phenomenon termed 'silent hypoxia' in which severe and life-threatening hypoxia was seemingly well tolerated by some patients, often preceding a dramatic clinical deterioration [2].

Early and rapid detection to prevent death in critically high-risk COVID-19 patients depends on the effective primary diagnosis [3]. Prognostic scores can aid in clinical decision-making. There were several scores that international guidelines had confirmed to use for acute infectious disease before the COVID-19 pandemic [4]. The National Early Warning Score 2 (NEWS2), the quick Sequential Organ Failure Assessment (qSOFA), the Confusion, Urea, Respiratory Rate, Blood Pressure and Age Above or Below 65 Years (CURB-65) score, and the Systemic Inflammatory Response Syndrome (SIRS) criteria are among the most commonly used clinical risk scores, but so far, there is a lack of evidence supporting their use in COVID-19 patients [5, 6].

We are not aware of any studies that have evaluated the ability of NEWS2 scoring at admission to predict outcome in patients hospitalised with SARS-CoV-2 infection. Hence the present study was undertaken to assess the usefulness of NEWS-2 score on admission in COVID 19 positive patients and its use in assessing the mortality and also assessed COVID-19 patients based on CURB-65, NEWS-2 score and SIRS and which score among three is better in predicting outcome.

Materials and Methods

This was a cross-sectional, prospective, and observational study conducted at tertiary health care center during a period of 2 year from January 2021 to December 2022. A total 155 adult patients who had SARS-CoV-2 infection confirmed by reverse-transcriptase-polymerase-chain-reaction assay and/or Rapid Antigen test and admitted in medicine ward, were enrolled in the study. Patients referred from other hospital, patients of SARI with COVID-19 negative status and patients not willing to give informed consent were excluded. The National Early Warning Score (NEWS) was developed to standardize measurement and evaluation of physiological parameters in acutely ill patients [7]. NEWS is used to identify and monitor patients at risk of serious clinical deterioration. The score can be used in prehospital assessment and in emergency departments, and as a surveillance system for all hospitalised patients [8]. NEWS includes respiratory rate, oxygen saturation, need for supplemental oxygen, body temperature, blood pressure, heart rate and level of consciousness (alert, verbal, pain, unresponsive, AVPU). NEWS2 is an update of NEWS which also includes a dedicated oxygen scale for patients with hypercapnic respiratory failure and the addition of 'new confusion' as 'C' to the AVPU score which became ACVPU. It identifies need for urgent clinical action in patients with a score of 5 or above [9]. In the additional guidance of 2020, the Royal College of Physicians recommends four trigger levels for clinical alert and consequent response:

- Null score (0): Monitor patient every 12 hours.
- Low score (1-4): Monitor patients every 4-6 hours. A single red score (3 in a single parameter): rapid clinical evaluation to establish the cause.
- Medium score (5-6): Patients should initially be monitored hourly because the score indicates a potentially serious acute clinical deterioration. Assessment is recommended within 1 hour.
- High score (7 or above): Monitor patients every 30 minutes initially and complete the assessment within 30 minutes [7].

Age and sex of the patient, symptoms and their duration were noted. All patients included in the study were initially seen by the medicine residents who made the decision to admit. Detailed clinical examination and necessary laboratory investigations were done. Investigations to be conducted on patients before intervention: CBC CRP d-dimer Ferritin KFT LFT Blood glucose Sr. Electrolyte (Sodium, Calcium, Potassium) LDH. The patients were screened on the basis of the NEWS2 score, SIRS score and CURB 65 score on admission. Routine examination was carried out. RT-PCR/RAT (rapid antigen test) came to be positive, on admission based on score patient assessed and started on treatment. The patient was followed up till 28 days or discharge or death.

Data Analysis

Qualitative data was analysed in terms of percentage (%) and proportions and quantitative data was analysed in terms of mean, standard deviation (SD) & standard error (SE). For the comparison of qualitative data, Chi-square or Fishers exact test were used and for the comparison of quantitative data Student paired 't' test were used. The confidence limit for significance was fixed at 95% level with p value <0.05. Sensitivity and specificity, negative predictive value (NPV), positive predictive value (PPV) and positive and negative likelihood ratio (LR + and LR-) were calculated. P Value < 0.05 was considered as statistically significant. Data was analysed using SPSS software Version 21.0.

Observations and Results

A total of 155 adult patients who had SARS-CoV-2 infection confirmed by RT-PCR/ RAT and admitted in medicine ward, were enrolled in the study. The majority of the patients were in the age group of 61-80 years (37.45) followed by 41 to 60 years (31.6%) with male predominance (65.2%) as shown in table 1.

Table 1: Demographic profile of the patients

Demographic data	Frequency	Percentage	
Age in years	12 to 20	05	3.2
	21 to 40	31	20.0
	41 to 60	49	31.6
	61 to 80	58	37.4
	> 80	12	7.7
Gender	Male	101	65.2
	Female	54	34.8

Most of the patients (38.7%) had hypertension and diabetes mellitus (18.7%) while 37 patients had no comorbidities as depicted in figure 1.

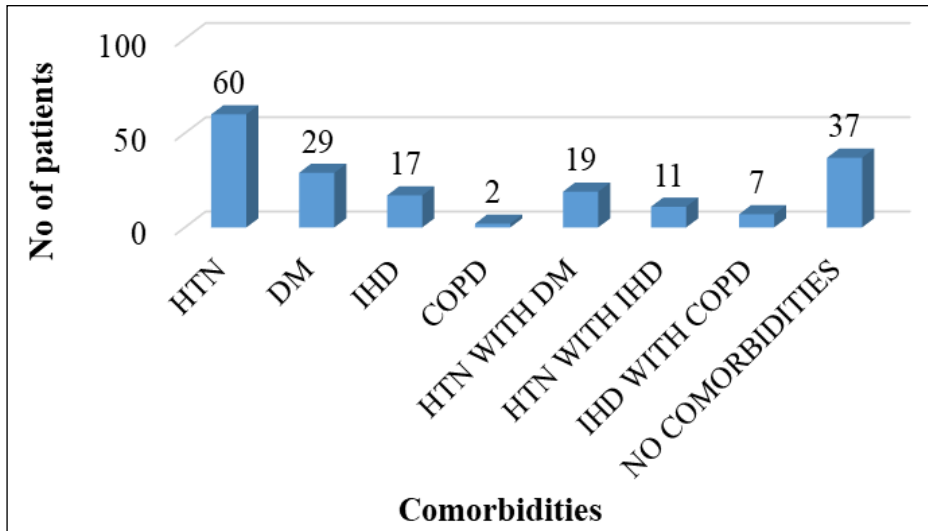


Fig 1: Comorbidities in COVID-19 patients

Maximum patients (82.6%) presented with fever which was most common symptom associated, followed by

breathlessness (79.4%), cough (72.9%) and myalgia (60%). Other symptoms are depicted in figure 2.

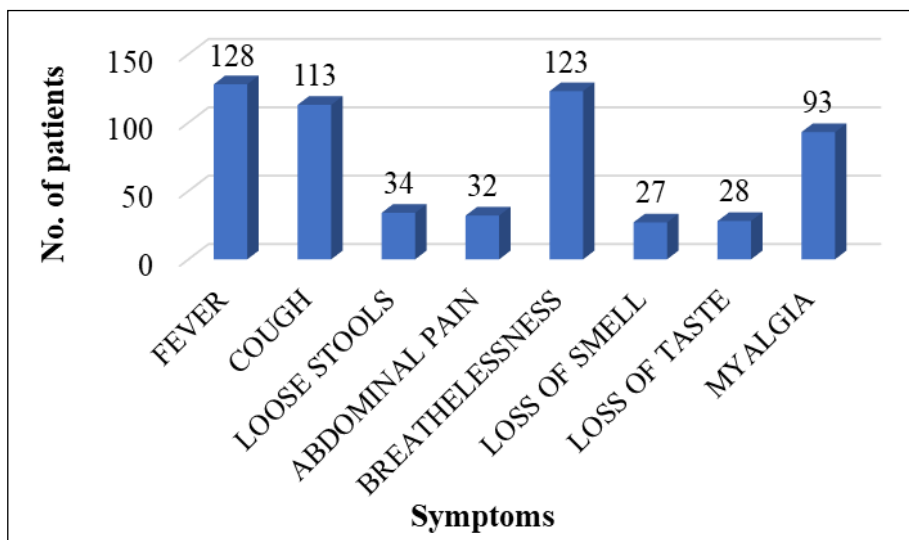


Fig 2: Symptoms in COVID-19 positive patients

Maximum patients (89.7%) had pulse rate < 90, respiratory rate between 12-20 (83.2%), temperature between 36 to 38⁰ C (45.2%), SpO₂% more than 96 (71%) and maximum patients had HRCT score ≤ 8 (83.2%) as shown in table 2.

Maximum patients (91;58.7%) were on room air followed by on O₂ mask (52; 33.5%), 2.6% patients were on HFNC and 5.2% were on CPAP.

Table 2: General Examination and HRCT score

Parameters	Frequency	Percentage	
Pulse	< 90	139	89.7
	91 to 110	10	6.5
	>111	06	3.9
Respiratory Rate	12 to 20	129	83.2
	21 to 24	17	11.0
	≥ 25	09	5.8
Temperature	≤ 36	34	21.9
	36 to 38	70	45.2
	≥ 38.1	51	32.9
SpO ₂ %	≤ 91	23	14.8
	92 to 93	04	2.6
	94 to 95	18	11.6
	> 96	110	71.0
HRCT score	≤ 8	129	83.2
	9 to 15	15	9.7
	16 to 25	11	7.1

Most of the patients (85.2%) were having WBC counts between 4000 to 12000, serum urea < 19 mg/dl (85.2%), CRP positive (98.1%), Serum SGOT levels > 45 (89%), serum SGPT levels > 56 (89.7%), serum creatinine levels ≤

1.5 (79.4%), D-dimer ≤ 0.5 (54.8%) and maximum patients had LDH > 210 (98.7%) as shown in table 3. 40% patients had serum Ferritin > 40.

Table 3: Laboratory parameters

Parameters	Frequency	Percentage	
WBC count	< 4000	09	5.8
	4000 to 12000	132	85.2
	≥ 12000	14	9.0
Urea (mg/dl)	> 19	23	14.8
	< 19	132	85.2
CRP	Positive	152	98.1
	Negative	03	1.9
SGOT	≤ 45	17	11.0
	> 45	138	89.0
SGPT	≤ 56	16	10.3
	> 56	139	89.7
Creatinine	≤ 1.5	123	79.4
	> 1.5	32	20.6
Ferritin	Positive	62	40.0
	Negative	93	60.0
D-dimer	≤ 0.5	85	54.8
	> 0.5	70	45.2
LDH	< 210	02	1.3
	> 210	153	98.7

Out of 155, 20 (12.9%) patients were died, thus the mortality was 12.9% as depicted in figure 3.

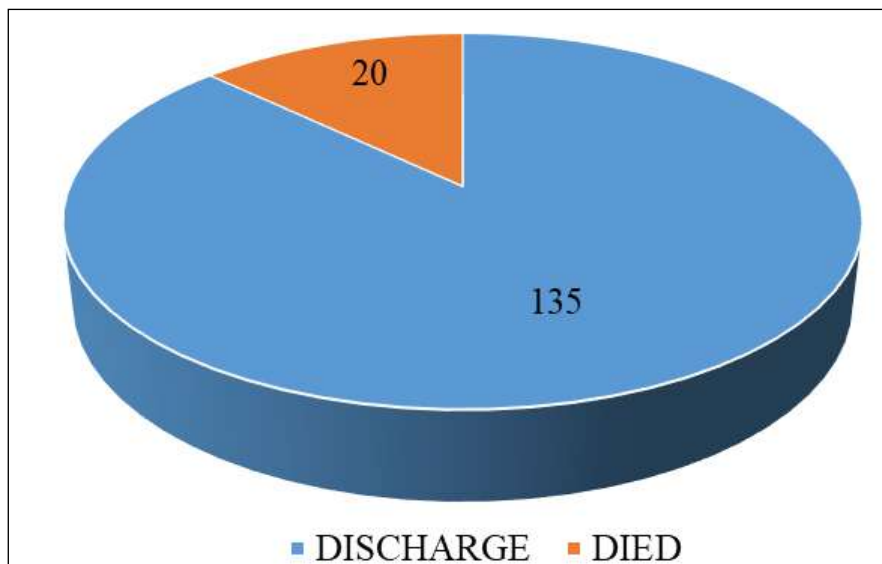


Fig 3: Outcome of the study

On comparing all 3 scores i.e., NEWS 2, SIR and CURB 65, it was seen that among those who had raised scores had

more mortality rate. Sensitivity for all 3 was 98.5%, 97% and 97.1% respectively as shown in table 4.

Table 4: Assessment of COVID-19 patients based on CURB-65, NEWS-2 score, SIRS

Final outcome	NEWS 2 score		SIR		CURB 65 score		Total
	< 5	> 5	2	> 2	2	3 to 5	
Discharged	79	56	131	04	135	00	135
Died	02	18	04	16	04	16	20
Total	81	74	135	20	139	16	155
P value	< 0.01		< 0.01		< 0.01		-
Sensitivity	98.5%		97%		97.1%		-

Discussion

In the present study, majority of cases (37.4%) were in 61-80 years age group followed by 41 to 60 years (31.6%). The

mean age of patients was 55.5±18.2 years, ranged from 17 to 95 years with male predominance (65.2%) and male to female ratio was 1.87:1. These findings are comparable with

the other studies [10-12]. However, a study by Chinese group Liao X *et al.* suggested an adapted version of the NEWS2 score with the addition of age > 65 years (3 points), reflecting evidence that increased age is associated with poor prognosis [13].

The most common comorbidity was hypertension seen in 38.7% cases, followed by DM seen in 18.7% cases, IHD seen in 11% cases, and COPD seen in 1.3% cases. In most of the research studies [10-12, 14] hypertension was most common comorbidity, which was also seen in current study. Maximum of our patients (82.6%) presented with fever followed by breathlessness (79.4%) and cough (72.9%). 17.4% cases had loss of smell, 18.1% cases had loss of taste, 20.6 % cases had abdominal pain, 21.9% cases had loose stools. Thus, fever was the most common symptom which is comparable with the study conducted by Wang D, *et al.* [15] and Ahmad M, *et al.* [16].

The majority of cases, 85.2% (132) had WBC count between 4000-12000/microliter, 9% (14) cases had WBC count >12000/microliter and 5.8% (9) cases had WBC count < 4000/microliter. Lowest WBC count seen was 600 WBCS/microliter while highest being 44,762 WBCS/microliter. Mean WBC count was 8.518 in the present study which was consistent with previous studies [17, 18]. Majority of 85.2% cases had serum urea < 19 mg/dl (< 7 mmol/L) and 14.8% cases had > 19 mg/dl (> 7mmol/L). Most of the patients had serum SGOT levels > 45 (89%), serum SGPT levels > 56 (89.7%) and serum creatinine levels ≤1.5 (79.4%). Similar results are reported in study conducted by Lu W, *et al.* [19]. In current study, inflammatory markers of COVID-19 patients were send, mean ESR was 54.2, CRP was 2.1, ferritin was 316.1, D Dimer was 2.1 and mean LDH was 587.8. Earlier reports have also indicated that CRP levels at the time of admission and prior to discharge or death are markers of poor prognosis in patients with COVID-19 [20]. Higher CRP values have been positively correlated with increased mortality in COVID-19 patients in similar study cohorts [21].

16.12% of patients had CTSS score between 16-25, 35.4% had between 9-15 and 48.3% had less than 8 score. Study showed that 5.2% cases were on CPAP, 2.6% cases were on HFNC, 33.5% cases were on oxygen mask while 58.7% cases were on room air. Similar findings are reported in study done by Saeed GA, *et al.* [22].

In current study it was observed that 21.9% cases had high clinical risk (NEWS2 SCORE > 7), 31.6% cases had medium clinical risk (NEWS2 SCORE 5-6) and 46.5% cases had low clinical risk (NEWS2 SCORE 1-4). 74 cases had news 2 score > 5 while 81 cases had news2 score 5. On SIRS criteria, majority 87.1% had scores 2 and 12.9% had score > 2. Whereas on CURB 65 majority 52.9% had score 0, 8.4% had 1, 28.4% had score 2, 2.6% had 3 and 7.7% had score 4. These findings are in accordance with the study conducted by Myrstad M, *et al.* [12], Baker K, *et al.* [23] and Jang JG, *et al.* [24].

On final outcome, 87.1% were discharged and 12.9% died which is comparable with the earlier studies [11, 14]. On association between NEWS score and mortality rate it was seen those having NEWS score more than 5 i.e., 74 cases and among them majority 20 cases died. P value < 0.01 shows statistical significance. This shows that as NEWS score increases the mortality rate also increases. On comparing all 3 scores i.e., NEWS, SIR and CURB 65, it was seen that among those who had raised scores had more

mortality rate. Sensitivity for all 3 was 98.5%, 97% and 97.1% respectively. The NEWS2 score showed to be more sensitive as compared to other scores studied. These findings are correlated with the study conducted by Myrstad M, *et al.* [12], Wibisono E, *et al.* [14], Baker KF, *et al.* [23] and Jang JG, *et al.* [24].

Conclusion

The present study concluded that on all 3 scores i.e., NEWS, SIR and CURB 65, it was seen that among those who had raised scores had more mortality rate. Sensitivity for all 3 was 98.5%, 97% and 97.1% respectively. Thus, such scoring system can definitely help in detecting the prognosis of disease which will ultimately help the treating doctor for planning the management of such cases.

Conflict of Interest

Not available

Financial Support

Not available

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