How a Clinical Respiratory Score helps to decide critical care for children in the ER

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Introduction

Acute respiratory illnesses represent a significant portion of the global disease burden, particularly in pediatric populations, where it remains one of the leading causes of illness and death. Conditions such as asthma, which affects approximately 10% of children, and acute respiratory infections significantly contribute to mortality and place a heavy strain on healthcare systems[1].

In children, the signs of respiratory distress can range from mild symptoms, such as a faster-than-normal breathing rate, to severe manifestations like intercostal retractions and cyanosis[2]. Despite its impact, standardized methods for assessing and managing pediatric respiratory distress remain underdeveloped. Although several respiratory scoring systems are available, many lack rigorous validation, particularly in terms of their reliability and clinical relevance. Additionally, these tools often target specific age groups or conditions, limiting their applicability in diverse clinical scenarios[3].

There is a pressing need for a validated, user-friendly tool to assess respiratory distress severity across all pediatric age groups and varied clinical environments. The Clinical Respiratory Score (CRS) is a promising tool that evaluates respiratory distress using a combination of clinical parameters, such as respiratory rate, oxygen saturation, wheezing, and mental status. It is designed to provide a systematic and quantifiable method for grading the severity of respiratory distress, facilitating uniform decision-making across various clinical settings. By assigning scores to key clinical signs, the CRS enables healthcare providers to stratify patients based on the severity of their condition, identify those at risk of deterioration, and prioritize interventions accordingly[4,5].

While the CRS has demonstrated potential in high-income countries for conditions like asthma and acute chest syndrome, its validation in low- and middle-income countries (LMICs) across a broader range of respiratory conditions is still limited. Examining its utility in diverse clinical settings, including presentations not directly related to respiratory illnesses, is essential for establishing its broader relevance and adoption in emergency department (ED) triage protocols[6]. The study aimed to improve the triage and management of pediatric patients with respiratory distress in the emergency department by applying the Clinical Respiratory Score.

Objectives:

- To assess the severity of respiratory distress in children by clinical respiratory score and determine whether they need critical care intervention.
- To triage the treatment and decide on escalating or deescalating the treatment after reassessing the clinical respiratory score.

Methodology:

An observational study was conducted in V.M.K.V. MEDICAL COLLEGE HOSPITAL, in the Department of Paediatrics from October 2023 and July 2024. A total of 100 children presented with respiratory symptoms to the Emergency department and pediatric outpatient department were included in the study.

Eligibility Criteria:

Inclusion Criteria:

All children between 1 month and 12 years of age presenting with respiratory symptoms to the VMKVMCH Emergency room and pediatric outpatient department.

Exclusion Criteria:

- Patients with respiratory distress who were born premature (< 37 weeks gestation)
- Known metabolic disorder, congenital heart disease, immunodeficiency disorder
- Past history of ventilator support
- Those who are not willing for admission.

Data collection:

A written consent form was obtained from all the study participants. Demographic information such as age, gender, socio-economic status, and immunization status were collected. The Clinical severity was assessed, and the initial Clinical Respiratory Score (CRS) was calculated for each patient, capturing their respiratory status before any medical interventions. Based on the initial scoring, initial treatment started according to treatment Protocols. CRS were reassessed after a standardized period of 2 hours following the commencement of treatment. After reassessing, the patients were categorised into 3 forms MILD, MODERATE, and SEVERE cases. Patients falling under the mild category were shifted directly to the ward and Moderate to severe cases were directly shifted to PICU. In PICU every 2nd hour the CRS score were reassessed. In wards, when the patient was found to have worsening distress, the CRS scoring was implemented. The patients with moderate to severe score were shifted immediately to PICU and subjected to radiological and blood investigations. The effectiveness of picking up the worsening in respiratory distress at an earlier stage were compared between investigations and a simple scoring system. When the score came to mild form, the patient was shifted to the wards for further management.

Data Analysis:

The data was entered in MS EXCEL 2019 and analyzed using SPSS Statistics 16.0. Quantitative variables were expressed in mean standard deviation and qualitative variables were expressed in proportions. To find the significance of the study, appropriate statistical tests were used.

Data Variables:

Clinical Respiratory Score (CRS)[7-9]:

Assess	Score 0	Score 1	Score 2
Respiratory rate	Age1–5 years:< 30 Age > 5 years: < 20	Age 1–5 years: 30-40 Age > 5 years: 20–30	Age 1–5 years: > 40 Age > 5 years: > 30
Auscultation	Good air movement, Expiratory scattered wheezing or loose rales/crackles	Depressed air movement, inspiratory and expiratory wheezes or rales/crackles	Diminished or absent breath sounds, severe wheezing or rales/crackles or

			marked prolonged expiration
Use of Accessory Muscles	Mild to no use of accessory muscles. Mild to no retractions or nasal flaring on inspiration	Moderate intercostal retractions, mild to moderate use of accessory muscles, nasal flaring	Severe intercostal and substernal retractions, nasal flaring
Mental Status	Normal to Mildly irritable	Irritable, agitated, restless	Lethargic
Room Air $Sp0_2$	> 95%	90–95%	< 90%
Color	Normal	Pale to normal	Cyanotic, dusky

Based on the total score obtained, there can be divided into 3 categories of respiratory distress:

Mild: <3 score

Moderate: 4–7 score

Severe: 8–12 score

Results:

In the present study, 100 children presented with respiratory symptoms to the Emergency department and pediatric outpatient department were included in the study. The mean age (SD) of the study participants was 28 months (13 months). The majority of patients were under 5 years of age (70.0%), 58.0% were male and 42,0% were female. The majority of the patients belonged to Upper middle socio-economic status (34.0%), Middle class (24.0%) and Upper class (17.0%).

Regarding the immunization status, 83.0% of the participants were fully immunized, 15.0% of the study were partially immunized and 2.0% were unknown about the immunization status. The Clinical Respiratory Score of the patients at initial presentation were 48.0% with moderate, 31.0% with severe, and 21.0% with severe scores. At 2nd hour CRS, 45.0% with moderate, 42.0% with mild and 13.0% with severe score.

In this study, the CRS at presentation and its change at 2 hours effectively predicted the need for advanced care, as 79.0% of them were improved with symptoms. At the 2nd hour, 85% of children either resolved their symptoms or had reduced severity, while 15% required escalation to critical care.

Discussion:

Respiratory distress is a leading cause of pediatric emergency visits, requiring timely and accurate assessment to prevent complications and improve outcomes. The Clinical Respiratory Score (CRS) is a valuable tool that standardizes the evaluation of respiratory distress and aids in determining the need for critical care interventions in the emergency room (ER)[10,11]. The present study aimed to improve the triage and management of pediatric patients with respiratory distress in the emergency department by applying the Clinical Respiratory Score.

In the present study, the majority of patients were under 5 years of age (70.0%), 58.0% were male and 42,0% were female. Jagalamarri et al[12] study (2021) reported that the mean age of the children was 12.44 ± 14.83 months with a male preponderance of 59(65.56%) males and 31(34.44%) females. In this study, regarding the immunization status, 83.0% of the participants were fully immunized, 15.0% of the study were partially immunized and 2.0% were unaware of the immunization status. Similarly, a study by Nayani et al[13] (2018) found that 91.1% of the

patients were vaccinated, 6.1% were not vaccinated and 2.7% of them were unknown about the vaccination status.

In the current study, the Clinical Respiratory Score of the patients at initial presentation were 48.0% with moderate, 31.0% with severe, and 21.0% with severe scores. At 2nd hour CRS, 45.0% with moderate, 42.0% with mild and 13.0% with severe score. Nayani et al[13] study (2018) reported that CRS at the initial phase, 31.3% had mild, 59.8% had moderate and 8.9% had severe score. At 2nd CRS, 66.1% had mild, 31.3% had moderate and 2.7% had severe score. In the present study, the CRS at presentation and its change at 2 hours effectively predicted the need for advanced care, as 79.0% of them were improved with symptoms. The CRS was assessed at the time of presentation and after two hours of treatment, revealing significant predictive value in determining the need for escalation to critical care. Improvement in CRS by at least two points following initial management correlated with stabilization, whereas unchanged or worsening scores indicated the need for advanced interventions[14,15].

In this study, at the 2nd hour, 85% of children either resolved their symptoms or had reduced severity, while 15% required escalation to critical care. Jagalamarri et al[12] study (2021) observed that out of the 90 children, 71.1% were admitted to PICU and 28.9% were admitted to the ward.

Conclusion:

The Clinical Respiratory Score is a practical and effective tool for assessing pediatric respiratory distress and guiding critical care decisions in the ER. The integration of CRS into ER protocols could enhance the standardization of care, ensuring that critical cases are promptly identified and managed. By standardizing the assessment process and enabling timely interventions, the CRS has the potential to significantly improve outcomes for children with respiratory distress.

Conflict of interest: None

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Table 1: Demographic profile of the study participants (N=100)

Variables	**Frequency**	**Percentage**
Age group		
<5 years	70	70.0
≥5 years	30	30.0
Gender		
Male	58	58.0
Female	42	42.0
Socioeconomic Status		
Upper	17	17.0
Upper Middle	34	34.0
Middle	24	24.0
Upper Lower	13	13.0
Lower	12	12.0

Figure 1: Distribution of the study participants based on their vaccination status (N=100)

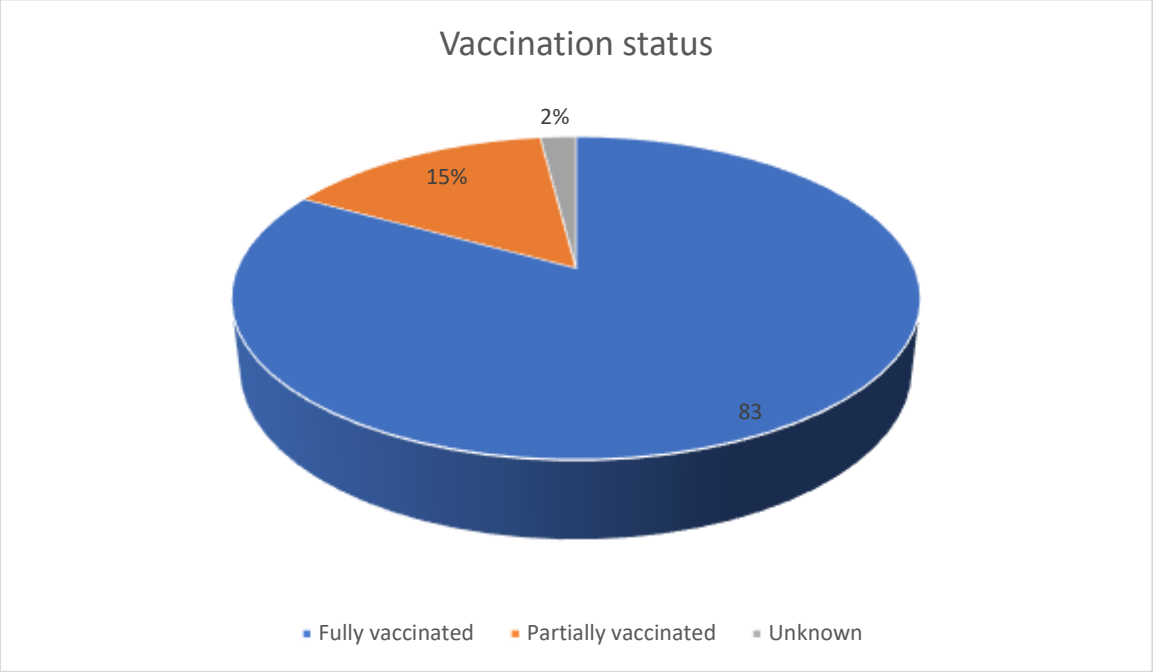

Table 2: Distribution of the study participants based on their Clinical Respiratory Score (CRS) (N=100)

Variables	Characteristics	Frequency	Percentage
Clinical Respiratory Score at initial presentation	Mild (≤ 3)	21	21.0
	Moderate (4-6)	48	48.0
	Severe (≥7)	31	31.0
Clinical Respiratory Score at 2nd hour	Mild (≤ 3)	42	42.0
	Moderate (4-6)	45	45.0
	Severe (≥7)	13	13.0

Table 3: CRS Change by Intervention (N=100)

CRS	Frequency	Percentage
Improved	79	79.0
No improvement	21	21.0

Table 4: CRS and Critical Care Outcomes among the study participants (N=100)

Outcome	Frequency	Percentage
Resolved In ER	85	85.0
Admitted in PICU	15	15.0