Correlation between Respiratory Index of Severity (RISC) Scores and Paediatric Respiratory Infections

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ABSTRACT: Objective:- Respiratory Infections are the most common cause of hospitlisation and mortality in children less than five years of age. A simple scoring system based on clinical signs and symptoms at presentation would help in immediate management and effective refferals incase of emergency.

Methods:- A total of 145 children with signs and symptoms of respiratory infections confirmed by the paediatrician are enrolled in the study. All children are less than five years of age. The RISC scoring was done for all children by the paediatrician and chest xray graded by radiologist as per who guidelines.

Results:- There was stastically signficant pasitive corelation between the two scores RISC score of >1 had a sensitivity of 82.3% and RISC score of >3 had a specificity of 88.3%.

Conclusion: This simple scoring system can be used to access the severity of respiratory infetions in settings where there is no immediate access to chest xray's and referrals.

Keywords:Respiratory Infections, pneumonia, chest xray, RISC score.

I. BACKGROUND

Children's hospitalisations are typically caused by respiratory infections. They contribute significantly to the mortality of children under the age of five (1). Pneumonia is the main cause of death in areas with poor resources and in children under 24 months (2). Early detection of children at risk for complications from pneumonia aids in the development of appropriate treatments, ventilator support, and oxygen support that have the ability to reduce the risk of serious sequelae. The existence of symptoms and indications at the time of presentation is a widely used method of determining the severity of pneumonia (3). Using the Respiratory Index of Severity Score in Children (RISC), it is also possible to gauge the severity of respiratory infections in children (4).However the gold standard for diagnosis continues to be the chest x-ray (5)(6).The study's primary goal is to clarify the relationship between the RISC scores and chest X-ray interpretation.If the RISC scoring system and chest X-ray have a good correlation, it can be employed in rural areas where immediate access to resources like chest X-rays is difficult or impossible.

During a 9-valent pneumococcal conjugate vaccine study in South Africa between 1998 and 2001, over 4,000 hospitalised children aged 0 to 24 months with around 300 deaths provided the data for the Respiratory Index of Severity in Children (RISC) score (7).The third score, the RISC-Malawi score, was created retroactively using clinical data that was routinely collected from a cohort of more than 14 000 hospitalised infants between the ages of 2-59 months in Malawi, including more than 400 deaths between 2011 and 2014(8).These scores are not commonly used because there are no reliable reports on how to interpret them.

II. METHODS

.In India, a community hospital hosted the trial from July 2021 to February 2022. The institutional ethics committee gave its approval to the study, and parents' informed consent was obtained before enrollment. Patients who visited the OPD with signs and symptoms of pneumonia and ranged in age from 1 month to 5 years were found and recruited in the study. Then the radiologist took the chest X-rays of all the patients who had been clinically diagnosed with pneumonia or respiratory tract infections. The Radiologist then scored the chest X-ray and RISC scores are generated based on the signs and symptoms by paediatrician(7) The severity of respiratory infections and pneumonia were also assessed, along with the RISC scores and chest X-ray results. Those with congenital heart disease, chronic respiratory illnesses, congenital lung issues, immunosuppressive conditions, or known respiratory system-related neuromuscular disorders were excluded from the study (9). A thorough examination is performed, and a history of

symptoms and indicators is kept. With a maximum score of 8 points, the RISC score's variables indicate established risk factors for pneumonia in children that result in serious outcomes.

Analysis using Spearman rho () correlation is utilised to determine the correlation between the WHO CXR score and the RISC score.Children who had been clinically diagnosed by a paediatrician as having pneumonia or a respiratory tract infection based on signs and symptoms and whose chest X-ray score was >3 were placed in one group, while children who had no such signs and symptoms and whose chest X-ray score was 3 were placed in the other group.We assessed the link between the RISC score and the severity of respiratory infections by plotting the receiver operating characteristic (ROC) curve and calculating specificity and sensitivity

III.   RESULTS

In this study, 179 kids with pneumonia as determined by a paediatrician were taken into account.They were assessed to see if they qualified to participate in the study.16 kids with congenital heart conditions, kids with genetic abnormalities, and kids taking steroids were all disqualified based on the exclusion criteria.Due to the lack of available chest X-ray reports, 12 children were omitted.Finally, 145 youngsters were counted in the study.The table lists the clinical traits taken into account for scoring.20 (13.7%) of the findings had a RISC score below three, while 36 (24.8%) had a CXR score below three.Between the WHO CXR score and the RISC score, there was a statistically significant positive association (r=0.4505, P=0.011).WHO CXR score of 3 (lobar pneumonia score 3) is considered severe pneumonia according to the RISC score, which has a sensitivity of 82.3% and a specificity of 25.3%.For diagnosis and determining the severity of pneumonia, a RISC score of three exhibited a sensitivity of 21.3% and a specificity of 88.3%.

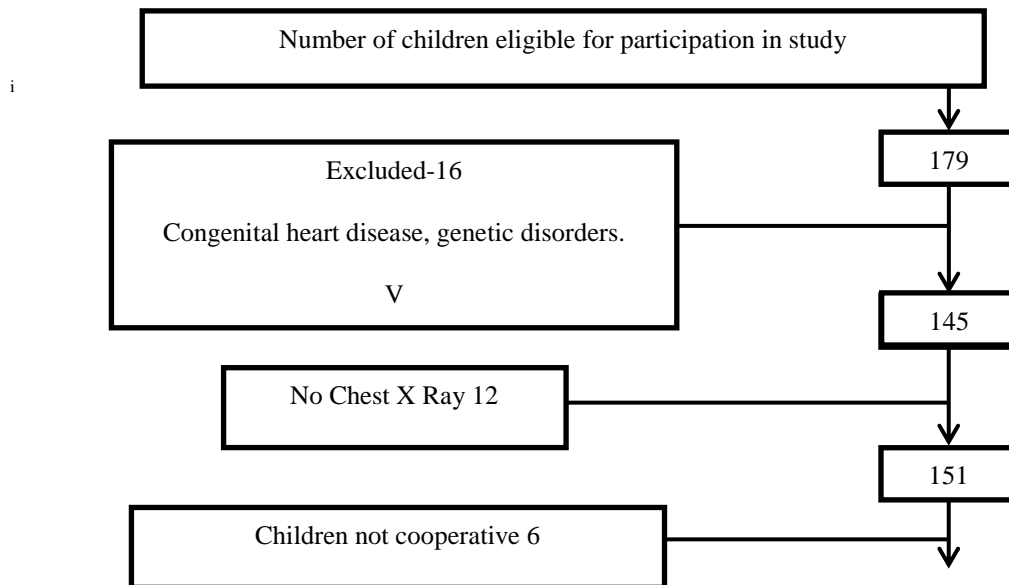**Figure 1 Demonstrating the method used for children enrollment.**

Table 1Clinical Profile, disease severity of children.

Characteristics	No (%)
Male	78 (53.7%)
Age	
1-12 months	30(20.6%)
12-24 months	58(40%)
2-5 years	57(39.31)
Symptoms	
Fever	135(93.1%)
URI symptoms	141(97.23%)

Breathlessness	21(14.48%)
Feed refusal	138(95.17%)
Immunisation as per NIS	143(98.62%)
Disease severity based on treatment	
Outpatient treatment	52(35.86%)
Admission as inpatient	85(58.62%)
Paediatric intensive care unit admission	8(5.51%)

Table 2 Chest X-ray Score of enrolled children

CXR score	No (%)
1	64(44.13%)
2	45(31.03%)
3	22(15.17%)
4	11(7.58%)
5	3(2.06%)

Table 3, Respiratory Index of Severity (RISC) score of enrolled children

RISC score	No (%)
1	36(24.82%)
2	89(61.37%)
3	12(8.27%)
4	5(3.44%)
5	3(2.06%)

IV.   DISCUSSION

This prospective study, carried out at a community hospital, shows a strong relationship between the RISC and CXR scores.Hence, this rating can be applied in situations where a chest x-ray (6)(10) cannot be quickly obtained.Objective bedside examination of respiratory symptoms is used to determine RISC scoring (7).This would allow for the prompt start of additional tests and treatments.

The study takes into account elements like fever, indications of URT infections, and feeding refusal (4).Confounding effects are eliminated from the study by excluding children with congenital cardiac conditions and steroids.When used to diagnose pneumonia, the RISC Score had a sensitivity of 82.5% and a specificity of 25.3%.Hence, it is regarded as a modest screening test for the detection of pneumonia (7)(9).

The main cause of death and hospital admissions for children under the age of five is pneumonia (11)(12)Adults' pneumonia severity was measured using a variety of scoring systems, however there are no valid scoring systems for children (13).

Children who have respiratory tract infections can develop severe respiratory distress and hypoxia that necessitate additional admissions and hospitalisations (12).Further evaluations and early treatment using this RISC scoring system would be beneficial in halting the situation's deterioration (4)(13).

Severe pneumonia can be treated at home, according to recent studies by IMCI Criteria.In order to identify instances that can be managed at home or require referral and additional supportive therapy, the RISC score will also be beneficial (9).

To sum up, this straightforward scoring system would help kids at community hospitals who need quick medical attention and urgent referrals.In areas with limited resources, this rating will be very helpful in determining the severity of disease in children.

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