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Determine the Severity of Acute Respiratory Infections by Using Pediatric Respiratory Severity Score (PRESS) in Children Visiting Federal Govt. Polyclinic hospital, Islamabad

Naveed Ashraf[1], Naveed Butt[2], Kaneez Fatima[3], Atiqa Minhas[4], Rabia Tabasum[5], Shahzad Munir[6], Amna Gul[7], Maham Zahid[8]

[1]Assistant Professor, [2]Physician, [3]Neonatologist, [4]Registrar, [5]Medical Officer, [6]Professor & Consultant Physician, [1-7] Paediatric Department, Federal Govt. Polyclinic Hospital (PGMI), Islamabad
[8]Clinical Research certified Professional, Research Officer R&D Department, AFIC, Rawalpindi.

Author`s Contribution

[1]Conception, synthesis, planning of research and writing of manuscript
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Address of Correspondent
Dr Naveed Ashraf
Assistant Professor
Paediatric Department, Federal Govt. Polyclinic Hospital (PGMI), Islamabad
naveedashraf70@yahoo.com

ABSTRACT

Objective: To determine the severity of acute respiratory infections in children by using Pediatric Respiratory Severity Score (PRESS).

Methodology: This descriptive cross sectional study was conducted at the outpatient and emergency paediatric department of the Federal Govt. Polyclinic hospital, Islamabad, from October 2017 to December 2019. One hundred and seventeen children with acute respiratory infections were enrolled in the study by a non-probability sampling technique. Epidemiologic variables of interest included age, sex, and breastfeeding or not. Clinical variables of interest included respiratory rate, use of accessory respiratory muscle, wheeze on auscultation, and oxygen saturation at room air. PRESS assessed tachypnea, wheezing, accessory muscle use, SpO2 and feeding difficulties with each component given a score of 0 or 1, and the total score were categorized as a mild(0-1), moderate (2-3) or severe(4-5).

Results: Out of 117 children, 98 (83.8%) belonged to the age group > 2 months– 12 months, while 19 (16.2%) belonged to the age group > 12 months– 24 months. Among them, 17 (14.5%) were mild, 53 (45.3%) were moderate, and 47 (40.2%) were severe according to their severity of respiratory distress. The hospitalization rate for moderate infection was 84.9% while 100% for severe infection and none of the patient with mild infection was hospitalized (p<0.001).

Conclusion: Early assessment by simple bedside technique will help in managing the respiratory distress according to its severity, reducing the undue investigation and improving the outcome of illness. Moreover it can be easily administered at primary health care facilities for triage of pediatric patients with respiratory distress.

Keywords: Pediatric Respiratory Severity score; child; Respiratory distress; Triage.

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Introduction

Acute respiratory infections (ARI) are a leading cause of morbidity and mortality in under-five children worldwide. [1] About 6.6 million children less than 5 years of age die every year in the world; 95% of them in low-income countries and one third of the total deaths being due to ARI. [2] In Pakistan the childhood mortality rate is 67 deaths per 1000 live births and there are 640,000 deaths per year associated with pneumonia that is a severe form of acute respiratory infection. [3] The trend of deaths associated with pneumonia has declined to 14% in 2018 from 16% reported in 2013. [4]

Acute respiratory infection can involve upper, middle or lower parts of respiratory system. Infection limited to ear, nose and throat are usually mild in nature, but when lungs

are involved, acute respiratory infection takes the severe form of pneumonia which can be life-threatening in infants. Sometimes in high-risk children with low immunity and other associated comorbidities, even the mild infection can take form of severe illness. [5]

Both bacteria and viruses can cause acute respiratory infection but in young children the most common cause of acute respiratory infection is viral in nature. Acute respiratory viral infections commonly present with tachypnea, wheezing, cyanosis, respiratory distress and decreased feeding which may reflect the severity of illness. [6] Therefore, it is crucial to treat the acute respiratory infections timely to prevent the complications and burden of disease among young children.

There are many tools and scoring systems developed to predict the severity of acute respiratory infection in peadiatric population. [7-8] Among various tools, Pediatric Respiratory Severity Score (PRESS) is a validated clinical tool that can be very helpful in assessing the severity of illness in children with acute respiratory illnesses. [9-10] This tool utilizes clinical characteristics and clinical investigations to calculate the score which reflects the severity of illness. It is important to identify the high-risk children who are suffering from severe illness in order to provide them with appropriate and timely management. [11-12]

The objective of the current study was to assess the severity of acute respiratory illness using a peadiatric respiratory severity score among children in a tertiary care hospital. Another objective was to determine the association of hospital admission, length of stay, and outcome with disease severity.

Methodology

This study was carried out at the Department of Pediatric, Federal Govt. Polyclinic Hospital, Islamabad from October 2017 to December 2019. We enrolled 117 children who visited outpatient and emergency of Pediatric department because of acute respiratory symptoms. A written informed consent was obtained from parents. The study was approved by Ethical committee of the hospital.

Inclusion criteria comprised of age >2 months to <24 months, acute respiratory infections in the form of fever, cough, wheeze, increase work of breathing, feeding difficulty and first-time reporting to the hospital. Exclusion criteria comprised of cardiac disease (Congenital and acquired heart disease), anatomic airway defect, neuromuscular disease, immunodeficiency, recurrent wheeze or asthma and chronic lung disease. Sample size was based on 7% prevalence of respiratory tract infection. The minimum required sample size of 100 children with respiratory distress was calculated at 95% confidence level and 80% study power.

Data was collected on five components using PRESS namely respiratory rate, wheezing accessory muscle use, SPO_2 and feeding difficulty. Respiratory rate more than upper limits for age were considered as per WHO guidelines. Wheezing was defined as high pitched whistling sound on auscultation, use of accessory muscles including nasal flaring, head bobbing, grunting, subcostal and intercostal recessions. Oxygen saturation was monitored by pulse oximeter categorized as >95% and <95%. Feeding difficulty was defined as <50-75% of usual feed. Complete blood count, C- Reactive protein (qualitative) and X Ray Chest were done. Treatment and disease management for mild, moderate and severe illness was provided in accordance with the WHO guidelines. [13-14]

Study data was analyzed using IBM SPSS (version 23.0) data management software. Data was checked for normality by histograms using normality curves and Shapiro Wilk statistical test. Continuous data was presented as mean and standard deviation whereas the categorical data was presented as frequency and percentage. Quantitative variables were compared using student's t-test, chi-square test was used to compare qualitative variables while ANOVA was applied for qualitative variables with more than two categories. A p-value of less than 0.05 was considered to be statistically significant in this study.

Results

There were 117 children enrolled in the study, out of which 68 (58.1%) and 49 (41.9%) were males and females respectively. Majority of the children, 98 (83.8%) belonged to age group of 2 – 12 months whereas remaining 19 (16.2%) had age group of 12 – 24 months.

Table 1 summarizes the baseline clinical characteristics of children enrolled in study. Pediatric respiratory severity score (PRESS) was calculated for each patient, where 17 (14.5%), 53 (45.3%) and 47 (40.2%) were classified as mild, moderate and severe infection respectively. Out of total 117 children, 92 (78.6%) were admitted in the hospital for respiratory distress syndrome, with 84.9% hospitalization rate for moderate while 100%

hospitalization for severe infection and none of the patient with mild infection was hospitalized (p<0.001) as shown in figure 1.

Mean length of stay was significantly different among moderate and severe infection groups 2.78±1.25 vs 4.19±1.90 days respectively (p<0.001). It was observed that positive CRP test and positive chest x-ray were not significantly different among mild, moderate and severe infection groups. Blood test results for total leukocyte count, hemoglobin level, platelets, lymphocytes and neutrophils count were also not significantly different with respect to severity of infection, as shown in table II.

Table I: Summary statistics of study population

Parameters	N (%)
Age (years)	
2 – 12 months	98 (83.8%)
12 – 24 months	19 (16.2%)
Gender	
Male	68 (58.1%)
Female	49 (41.9%)
Pediatrics Respiratory Severity Score	
Mild (0 – 1)	17 (14.5%)
Moderate (2 – 3)	53 (45.3%)
Severe (4 – 5)	47 (40.2%)
CRP	
Positive	48 (41.0%)
Negative	69 (59.0%)
Chest X-ray	
Positive	44 (37.6%)
Negative	73 62.4%)
Treatment	
Mild	19 (16.2%)
Moderate	51 (43.6%)
Severe	47 (40.2%)

Discussion

The Pediatric Respiratory Severity Score is a significant bedside clinical method to assess the severity of patients with respiratory distress, and the tool was reported to be used in many other similar studies.[15-18] The most commonly reported sign and symptom was wheezing and

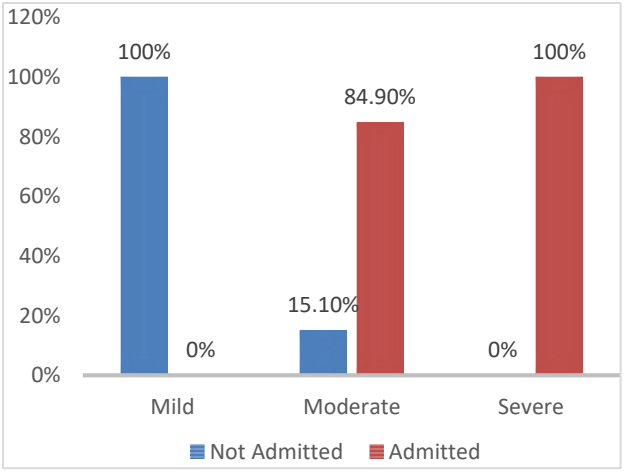

Figure 1: Comparison of hospitalization rate among mild, moderate and severe acute respiratory illness cases.

Table II: Comparison of PRESS Score with clinical characteristics.

Parameters	Pediatrics Respiratory Severity Score			P-value
	Mild (n=17)	Moderate (n=53)	Severe (n=47)	
Age (years)				
2 – 11 months	14 (82.4%)	44 (83.0%)	40 (85.1%)	0.947
12 – 24 months	3 (17.6%)	9 (17.0%)	7 (14.9%)	
Gender				
Male	8 (47.1%)	27 (50.9%)	33 (70.2%)	0.091
Female	9 (52.9%)	26 (49.1%)	14 (29.8%)	
CRP				
Positive	3 (17.6%)	23 (43.4%)	22 (46.8%)	0.100
Negative	14 (82.4%)	30 (56.6%)	25 (53.2%)	
Chest X-ray				
Positive	3 (17.6%)	22 (41.5%)	19 (40.4%)	0.184
Negative	14 (82.4%)	31 (58.5%)	28 (59.6%)	
Treatment				
Mild	16 (100%)	2 (3.8%)	-	<0.001*
Moderate	-	50 (94.3%)	1 (2.1%)	
Severe	-	1 (1.9%)	46 (97.9%)	
Laboratory Values (Mean±SD)				
TLC (x1000)	11.27±4.81	11.33±5.37	10.6±4.42	0.739
Hb	11.04±0.97	10.21±1.64	10.41±1.23	0.113
Platelets (x1000)	48.38±17.8	43.73±17.86	47.91±18.96	0.453
Lymphocytes	39.44±14.7	44.00±14.84	43.30±14.35	0.534
Neutrophils	55.70±15.35	48.74±19.90	49.09±13.9	0.193
Hospital admission	-	45 (84.9%)	47 (100%)	<0.001*
Length of Stay (days) Mean±SD	-	2.78±1.25	4.19±1.90	<0.001*

fever. [19-20] In our study, we found 14.5% of mild, 45.3% moderate and 40.2% of severe cases possibly. The percentage of severe cases was comparatively higher as compared to other studies, probably due to the fact that majority of children enrolled in the study were inpatient 85.4% (n=100) as compared to 14.5% (n=17) enrolled in outpatient. Similar trends were observed in a study conducted by Feldman AS et al [16] and Hector R et al. [21]

A significantly greater number of children, 83.8% belonged to age group of 2-12 months as compared to 16.2% belonging to 13-24 months of age. Similar trends were reported in a study conducted by Nayani K et al. [22]

There was no gender differentiation noted in our study. Similar results were reported by Hector R et al. [21] where there was no significant difference found in terms of gender with 55% males and 45% females. However, male preponderance was noted by Nayani K et al [22] where 69.6% were males and 30.4% were females. The occurrence of hospitalization was 0% in mild cases, 84.9% in moderately distressed cases and 100% in severely distressed children. Similar hospitalization trends were reflected in results reported in study conducted by Yumiko Miyaji et al[11] where hospitalization was significantly higher for moderate/severe cases as compared to mild cases ($p<0.001$). Length of stay in the hospital was significantly more for severely distressed children as compared to moderately distressed children. Several authors reported similar findings, observing admission to the PICU with an increased severity of score. [15,22,23]

In our study, we observed that positive CRP test and positive chest x-ray were not significantly different among mild, moderate, and severe infection groups. Similarly, blood test results for total leukocyte count, hemoglobin level, platelets, lymphocytes and neutrophils count were also not significantly different with respect to the severity of infection. Similar insignificant associations were reported by studies conducted by Yumiko Miyaji.[11] One of the limitations in our study was that the study was conducted in only one center and there was low enrollment of mild cases due to loss follow up.

Conclusion

Early assessment by simple bedside technique will help in managing the respiratory distress according to its severity, reducing the undue investigation and improving the outcome of illness. Moreover, it can be easily administered at primary health care facilities for triage of pediatric patients with respiratory distress.

References

1. World Health Organization. Pneumonia Fact sheet N°331 2013.
2. TM Wardlaw, EW Johansson, MJ Hodge. Pneumonia, the forgotten killer of children. UNICEF/WHO. Geneva. 2006. [available at: https://apps.who.int/iris/bitstream/handle/10665/43640/9280640489_eng.pdf?sequence=1&isAllowed=y]
3. UNICEF. One is Too Many: Ending Childhood Deaths from Pneumonia and Diarrhoea. New York: NY: UNICEF (2016).
4. NIPS ICF. Pakistan Demographic and Health Survey 2017–18. Islamabad, Pakistan, Rockville, MD: National Institute of Population Studies (NIPS) [Pakistan] and ICF (2019).
5. Alexis A.Tazinya, Gregory E.Halle-Ekane, Lawrence T.Mbuagbaw, Martin Abanda, Julius Atashili & Marie Therese Obama. Risk factors for acute respiratory infections in children under five years attending the Bamenda Regional Hospital in Cameroon. BMC Pulmonary medicine.2018; 18:7. https://doi.org/10.1186/s12890-018-0579-7
6. Lee WM, Lemanske RF, Evans MD et al. Human rhinovirus species and season of infection determine illness severity. Am J Respir Crit Care Med. 2012;186:886–91 https://doi.org/10.1164/rccm.201202-0330OC
7. Jackson DJ, Evans MD, Gangnon RE, et al. Evidence for a causal relationship between allergic sensitization and rhinovirus wheezing in early life. Am J Respir Crit Care Med 2012;185:281–85. https://doi.org/10.1164/rccm.201104-0660OC
8. Mir F, Ariff S, Bhura M, Chanar S, Nathwani AA, Jawwad M, Hussain A, et al. Risk factors for acute respiratory infections in children between 0 and 23 months of age in a peri-urban district in Pakistan: A matched case–control study. Frontiers in pediatrics. 2022 10;9:704545. https://doi.org/10.3389/fped.2021.704545
9. Poehling KA, Edwards KM, Weinberg GA, Szilagyi P, Staat MA, Iwane MK, et al. The underrecognized burden of influenza in young children. N. Engl. J. Med. 2006; 355: 31–40. https://doi.org/10.1056/NEJMoa054869
10. Marcone DN, Ellis A, Videla C, Ekstrom J, Ricarte C, Carballal G, et al. Viral etiology of acute respiratory infections in hospitalized and outpatient children in Buenos Aires, Argentina. Infectious Disease Journal. 2013; 32: 105-10. https://doi.org/10.1097/INF.0b013e31827cd06f

11. Carroll KN, Wu P, Gebretsadik T, Griffin MR, Dupont WD, Mitchel EF, Hartert TV. . The severity-dependent relationship of infant bronchiolitis on the risk and morbidity of early childhood asthma. J Allergy Clin Immunol 2009;123:1055–1061 https://doi.org/10.1016/j.jaci.2009.02.021
12. Yorita KL, Holman RC, Sejvar JJ, Steiner CA, Schonberger LB. Infectious disease hospitalizations among infants in the United States. Pediatrics 2008;121:244–52 https://doi.org/10.1542/peds.2007-1392
13. World Health Organization. Technical bases for the WHO recommendations on the management of pneumonia in children at first-level health facilities. World Health Organization; 1991.
14. World Health Organization. (1995). The Management of acute respiratory infections in children: practical guidelines for outpatient care. World Health Organization. [available at: https://apps.who.int/iris/handle/10665/41803]
15. Miyaji Y, Sugai K, Nozawa A, Kobayashi M, Niwa S, Tsukagoshi H, Kozawa K, Noda M, Kimura H, Mori M. Pediatric respiratory severity score (PRESS) for respiratory tract infections in children. Austin Virol Retrovirol. 2015;2(1):1009-15.
16. Feldman AS, Hartert TV, Gebretsadik T, Carroll KN, Minton PA, Woodward KB, Larkin EK, Miller EK, Valet RS. Respiratory severity score separates upper versus lower respiratory tract infections and predicts measures of disease severity. Pediatric allergy, immunology, and pulmonology. 2015 Jun 1;28(2):117-20. https://doi.org/10.1089/ped.2014.0463
17. Arnold DH, Gebretsadik T, Abramo TJ, Moons KG, Sheller JR, Hartert TV. The RAD score: a simple acute asthma severity score compares favorably to more complex scores. Annals of Allergy, Asthma & Immunology. 2011 Jul 1;107(1):22-8. https://doi.org/10.1016/j.anai.2011.03.011
18. Rodriguez H, Hartert TV, Gebretsadik T, Carroll KN, Larkin EK. A simple respiratory severity score that may be used in evaluation of acute respiratory infection. BMC research notes. 2016 Dec;9(1):1-4. https://doi.org/10.1186/s13104-016-1899-4
19. Kotaniemi-Syrjänen A, Vainionpää R, Reijonen TM, Waris M, Korhonen K, Korppi M. Rhinovirus-induced wheezing in infancy—the first sign of childhood asthma?. Journal of Allergy and Clinical Immunology. 2003 Jan 1;111(1):66-71. https://doi.org/10.1067/mai.2003.33
20. McCallum GB, Morris PS, Wilson CC, Versteegh LA, Ward LM, Chatfield MD, Chang AB. Severity scoring systems: are they internally valid, reliable and predictive of oxygen use in children with acute bronchiolitis? Pediatric pulmonology. 2013 Aug;48(8):797-803. https://doi.org/10.1002/ppul.22627
21. Hector Rodriguez, Tina V. Hartert, Tebeb Gebretsadik, Kecla N. Carroll, and Emma K. Larkin. A simple respiratory severity score that may be used in evaluation of acute respiratory infection. BMC Research notes.2016;9:85.
22. Nayani K, Naeem R, Munir O, Naseer N, Feroze A, Brown N, Mian AI. The clinical respiratory score predicts paediatric critical care disposition in children with respiratory distress presenting to the emergency department. BMC pediatrics. 2018 Dec;18(1):1-8. https://doi.org/10.1186/s12887-018-1317-2
23. Duarte-Dorado DM, Madero-Orostegui DS, Rodriguez-Martinez CE, Nino G. Validation of a scale to assess the severity of bronchiolitis in a population of hospitalized infants. Journal of Asthma. 2013 Dec 1;50(10):1056-61. https://doi.org/10.3109/02770903.2013.834504