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Comparative evaluation of AIOS score with its radiological findings in children with respiratory illness

Vinod Kumar Mishra[1], Shobha Kant Chaudhary[2], Tushar Kumar[3*]

[1]*Associate Professor, Department of Paediatrics, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India*
[2]*Associate Professor, Department of Paediatrics, Vardhman Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India*
[3]*M.D. (Radiodiagnosis), Fellowship (contd) in Vascular and Interventional radiology, Manipal Hospital, Banglore, Karnataka,India*

Abstract

Background: Community-acquired pneumonia (CAP) is one of the primary causes of mortality in infants and young children. Acute Illness Observation Score (AIOS) - act as the best and accurate indicator for the same. Hence in this study, AIOS was used to relate X-ray abnormalities and pulse oximeter finding for early assessment in children with ARI. **Aim and objective:** the aim of the present study to compare the acute illness observational scale with radiological findings in children with respiratory illness at tertiary health care centre. **Material and methods:** This was a prospective, observational study was done in the Department of Paediatrics, Vardhman Institute of Medical Science (VIMS) Pawapuri, Nalanda, Bihar, India for one year. Total 100 Children in the age group of 2 months -59 months with fever less than 3 days, with cough or difficult breathing with any of the following: Fast breathing, chest in drawing, stridor in calm child, grunting, lethargy, convulsions, inabilityto drink were included in this study. **Results:** There were 13 children who scored 10 and showed no clinical features of respiratory distress. In the 22 children who scored 11-15 there was mildto moderate respiratory distress and there were 65 children with severe respiratory distress who scored >16. Among the 100 children 7% of the children had normal x-rays. Hyperinflation pertinent to bronchiolitis was seen in 25 children, End point consolidation (include dense opacity that may be a fluffy consolidation) suggestive of lobar pneumonia was present in 33 patients (33%). Non end point infiltrates defined as linear andpatchy densities with peribronchial thickening and many areas of atelectasis pertinent to bronchopneumonia was seen in 23 patients (23%). The other radiological abnormalities which were rare in the study were steeple sign (5%), shock lung (5%) and pleural effusion (2%). Hyperinflation (Bronchiolitis) was present in 25 children of which 4 (16%) scored 11-15, and 19 (76%) of the patients were in >16 group. Radiological abnormalities suggestive of pneumonia was seen in 56 patients of which 14 children (25%) were in 11-15 group and 42 (75%)scored >16 of AIOS score. There was noteworthy difference in the frequency of x-rayabnormalities between children who scored <10 and children who scored >16. **Conclusion:** AIOS scoring is useful in predicting abnormal x-ray findings in respiratory illness in2-59 months old children.
Keywords: Community-acquired pneumonia, Acute Illness Observation Score.

Introduction

Worldwide, respiratory diseases are a significant cause of morbidity in the pediatric age group. It is one of the most usual reasons with which parents bring their children to pediatric OPD as well as an emergency unit.[1] The burden of ARI is significantly more in developing countries when compared to industrialized countries due to various reasons. In developing countries, the incidence of ARIs in children aged less than 5 years is about 0.29 episodes per child-year accounting for up to 151 million new episodes per year. Whereas in developed countries about 5 million new cases occur each year which is approximately 0.05 episodes per child year.[2] 12-20 of every 1000 children born per year succumb to death before 5 years of life. This shows that pneumonia accounts for about 21% of all deaths in these children.[3] Hence, it is important to formulate criteria for the effective and optimal management of Pneumonia in less developed

countries. AIOS is a threepoint scale with a total score ranging from 6-30. It has 6 ordinal components. If the AIOS score is 10 or less than 10, the incidence of significant bacterial infection is less than 2-3%, whereas the incidence rises to 26% for scores between 11-15 and 92% for scores equal to 16 or more.[4] Hence this score was used in the study to validate the correlation with radiological abnormalities and pulse oximetry reading in children with ARI. IMNCI strategy will be more effective when supplemented by an illness severity scoring system that can quickly quantify the severity of illness at all stages from onset to recovery.[4] In this regard use of Acute Illness Observation Scale (AIOS), a generic illness severity scale developed by P.L. McCarthy, based on simple observations instead of complex symptomatology, is found to be useful. [5,6] AIOS focuses on six easily observed factors that, taken together, are a sensitive, indicator of serious illness in children. Total score of AIOS ranges from 6-30.[7] Hence the aim of the present study to compare the acute illness observational scale with radiological findings in children with respiratory illness at tertiary health care centre

Material and methods

This was a prospective, observational study was done in the Department of Paediatrics vardhman institute of medical science (VIMS) Pawapuri, Nalanda, Bihar, India for one year.

*Correspondence
Dr. Tushar Kumar
M.D. (Radiodiagnosis), Fellowship (contd) in Vascular and interventional radiology, Manipal Hospital, Banglore, Karnataka, India.
E-mail: tusharkumar.1191@gmail.com

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Methodology

Total 100 Children in the age group of 2 months -59 months with fever less than 3 days, with cough or difficult breathing with any of the following: Fast breathing, chest in drawing, stridor in calm child, grunting, lethargy, convulsions, inability to drink were included in this study. Children with Illness duration >2 weeks, respiratory distress with prominent wheezing, upper respiratory infections with less severe respiratory symptoms, ex; acute otitis media, acute pharyngitis etc. were excluded from this study.

Table 1: AIOS score: composition and score description

Variables	Score = 1	Score=3	Score=5
Quality of Cry	Strong cry with normal tone or contented and not crying	Whimpering or sobbing	Weak cry/ moaning, or high-pitched cry
Reaction to Stimulation to parent	Cries briefly and stops, or is content and not crying	Cries on and off	Cries continuously or responds hardly
State Variation	when awake, stays awake, or if stimulated while sleeping, awakens quickly	Closes eyes for short period when awake, or awakens when stimulated for long time	Fast asleep or not arousable
Color	Pink	Pale extremities /acrocyanosis	Pale/ cyanotic/, mottled /ashen
Hydration	Normal skin and eyes and moist mucous membranes	Normal skin and eyes, mouth slightly dry	Poor recoiling of skin, mucous membranes dry and/or eyes sunken
Response to social overtures	Smiles or alerts	Smiles for a brief period or alerts briefly	No smile, anxious face, no expressions, or not alert

Results

The 100 children who fit in the inclusion criteria were included in this study in and scored according to acute illness observation scale. In those children it was observed that 72% of children with respiratory illness scored abnormally (AIOS>10) at initial evaluation. The mean score for AIOS on Day 1 was around 19. Based on the score the children were grouped and correlated with x-ray abnormalities. There were 13 children who scored 10 and showed no clinical features of respiratory distress. In the 22 children who scored 11-15 there was mild to moderate respiratory distress and there were 65 children with severe respiratory distress who scored >16. Among the 100 children 7% of the children had normal x-rays. Hyperinflation pertinent to bronchiolitis was seen in 25 children, End point consolidation (include dense opacity that may be a fluffy consolidation) suggestive of lobar pneumonia was present in 33 patients (33%). Non end point infiltrates defined as linear and patchy densities with peribronchial thickening and many areas of atelectasis pertinent to bronchopneumonia was seen in 23 patients (23%).

The other radiological abnormalities which were rare in the study were steeple sign (5%), shock lung (5%) and pleural effusion (2%).

Table 2:Gender distribution of patients

Gender	No. of patients =100	Percentage
Male	55	55
Female	45	45

Table 3: X-ray findings of patients

X-ray findings	No. of patients	Percentage
Normal study	7	7
Hyperinflation	25	25
End point infiltrates	33	33
Non end point infiltrates	23	23
Steeple sign	5	5
Shock lung	5	5
Pleural effusion	2	2
Total	100	100

Comparison of AIOS score and radiological abnormalities

Hyperinflation (Bronchiolitis) was present in 25 children of which 4 (16%) scored 11-15, and 19 (76%) of the patients were in >16 group. Radiological abnormalities suggestive of pneumonia was seen in 56 patients of which 14 children (25%) were in 11-15 group and 42 (75%) scored >16 of AIOS score. There was noteworthy difference in the frequency of x-ray abnormalities between children who scored <10 and children who scored >16.

Table 4: Comparison of AIOS score and radiological findings

	AIOS Level			Total
X-ray	<10	11-15	>16	
Normal study	4	2	1	7
Hyperinflation	2	4	19	25
End point infiltrates	7	8	18	33
Non end point infiltrates	0	8	15	23

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Steeple sign	0	0	5	5
Shock lung	0	0	5	5
Pleural effusion	0	0	2	2
Total	13	22	65	100

The other radiological abnormalities of steeple sign (Acute laryngo tracheo bronchitis), shock lung (ARDS), pleural effusion fell only in the >16 group.

The significance of AIOS score in predicting abnormal x-rays in ARI was analysed and was found to be statistically significant (p value = 0.003).

Discussion

In underdeveloped and developing countries, Childhood pneumonia is one of the most common infective illnesses. It holds a pivotal role as it is one of the preventable causes of mortality in children. In comparison to the traditional history taking and physical examination which has poor sensitivity, our study showed that history and examination when combined with AIOS scoring have a higher sensitivity and correlation for serious illness. Childhood pneumonia clearly represents one of the most common infective illnesses in developing countries and is of great importance as a cause of preventable mortality in children. Mc Carthy et al, had already demonstrated that AIOS is useful in identifying febrile children who have serious illness.[8,9]

McCarthy PL et al in 1982 conducted a study to determine if observational assessment performed in a systematic manner adds to the effectiveness of the method of traditional history taking and physical examination in identifying serious illness in febrile children. To determine the sensitivity of the combined evaluation, he sequentially evaluated children of less than 24 months of age who presented with fever.[7] This study showed that combination of AIOS scoring, history, and physical examination had a higher sensitivity and correlation for serious illness than did the traditional history and physical examination alone. Three children who had serious illness but showed no abnormalities on history and physical examination, were identified only by the use of AIOS. This AIOS scoring system was studied by Bhavneet Barathi et al for assessing its usefulness in managing severe childhood pneumonia in 2-59 months.[10] Akash Bang et al and Prerena et al used this score for prediction of bacteremia in children aged <36 months with fever.[11,12] Murali B.H et al compared AIOS score with IMCI and studied its sensitivity and specificity in prognosticating children with pneumonia in the age group of 2 to 59 months.[13] In the current study AIOS score was correlated with radiological abnormalities in acute respiratory illness in 2-59 months. In the x-ray abnormalities the most common were end point infiltrates (33%), hyperinflation (25%) and non end point infiltrates (23%). It was found that in the cases of hyperinflation (bronchiolitis) 76% of the findings were in children who scored >16. Likewise 54.54% of end point infiltrates (lobar pneumonia) and 65.22% of non end point infiltrates (bronchopneumonia) were in the patients who scored >16. That is the frequency of abnormal radiological findings were more if they scored >16 of AIOS score in a acute respiratory infections. This correlation was found to be significant (p value=0.003).Similar observation was noticed in Murali B.H. et al.[13] study were

when the AIOS score was <10 in cases of community acquired pneumonia 77.5% of x-rays were normal.

Conclusion

AIOS scoring is useful in predicting abnormal x-ray findings and severity of disease in respiratory illness in 2-59 months old children .

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