



Original Research Article

STUDY ON USE OF ACUTE ILLNESS OBSERVATIONAL SCALE (AIOS) IN PREDICTING THE OUTCOME OF COMMUNITYACQUIRED PNEUMONIA (CAP) IN CHILDREN AGED 2 MONTHS TO 5 YEARS

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ABSTRACT

Background: Aim: To confirm the accuracy of the Acute illness Observation Scale (AIOS) in predicting the severity of disease and the clinical outcome of community-acquired pneumonia in children admitted to Siddhartha Medical College between 2023 and 2024, in age ranged from two months to five years.

Objective: The objective of this study is to examine the correlation between the radiological outcome with the acute illness observational scale in children with community-acquired pneumonia at tertiary health care center aged two months to five years.

Materials and Methods: A prospective hospital-based descriptive observational study was conducted among 100 children aged 2 months to 5 years admitted with CAP to the Department of Paediatrics, Siddhartha Medical College Hospital, between March 2023 and April 2024. Children presenting with fever, cough, and features such as tachypnea, chest in drawing, lethargy, or inability to drink were enrolled after institutional ethics approval and informed parental consent. Clinical evaluation, AIOS scoring, pulse oximetry, laboratory investigations, chest radiography, and treatment outcomes were recorded.

Results: Lethargy (45%) was the most frequent danger sign, followed by inability to drink (17%) and grunting (16%). Oxygen saturation was <85% in 2% of children, 85–92% in 59%, and >92% in 39%. Chest radiographs showed infiltrates in 52% and consolidation in 16% of cases. Leukocytosis was present in 34% of children. Based on IMNCI criteria, 22% had pneumonia and 78% had severe pneumonia. At presentation, 45% had abnormal AIOS scores (≥ 16), 15% scored 11–15, and 40% had near-normal scores (≤ 10), with a mean AIOS score of 14.65. Children with AIOS ≥ 16 had significantly higher rates of grunting (100%), crepitations (70%), and lethargy (53.3%). Among severe pneumonia cases, 95.6% had AIOS scores ≥ 16 , demonstrating a strong association between higher AIOS scores, severe disease, abnormal radiological findings, and prolonged hospital stay.

Conclusion: AIOS is a simple, reliable bedside tool for predicting the severity and outcome of community-acquired pneumonia in children aged 2–59 months. Higher AIOS scores correlate significantly with WHO pneumonia grading, abnormal chest X-ray findings, and longer hospitalization, making AIOS valuable for early risk stratification and management in resource-limited settings.

Keywords: Acute Illness Observation Scale, AIOS, Community-acquired pneumonia, Children, Chest X-ray, Prognosis, Hospital stay.

INTRODUCTION

The term "community acquired pneumonia" (CAP) describes the lung inflammation caused by an infection by a range of bacteria that were obtained outside of the hospital.

Community-acquired pneumonia (CAP) is one of the main reasons for the mortality of babies and young children.^[1]

India is among the nations with the highest rates of pneumonia-related mortality, Thus it's critical to maximize the standards for triage, early referral, hospitalization, and therapy.

Out of every 1000 babies born each year, 12–20 die before they reach 5 years of age.^[2] This indicates that around 21% of these childhood fatalities are related to pneumonia. Therefore, it's critical to set the standards for the best possible care of pneumonia in developing nations.^[3]

The Integrated Management of Neonatal and Childhood Illness (IMNCI) approach, which streamlines the severity categorization process for severe acute pediatric illnesses like pneumonia, has facilitated this.^{3,4} An illness severity rating system that can swiftly assess the degree of disease severity at every step from beginning to recovery will enhance the efficacy of the IMNCI approach. In this context, it is considered to be helpful to employ the Acute illness Observation scale (AIOS), a general illness severity measure created by P.L. McCarthy that is based on straightforward observations rather than intricate symptomatology.^[5] The six immediately observable components of AIOS, when combined, provide a sensitive indicator of a serious disease in children. The AIOS total score spans from 6 to 30.^[6,7] if a feverish child scores 10 or below, the incidence of a serious bacterial infection is less than 2-3%; if the child scores 11–15, it is 26%; and if the child scores 16 or above, it is 92%.^[8]

McCarthy et al. had previously shown that AIOS can be helpful in determining whether children with fever are suffering from serious illnesses.^[7,8]

This study helps to improve the outcome and triage the patients for early intervention. AIOS is helpful for referrals in the peripheral health sectors as well.

The current study set intended to validate the AIOS score in children with CAP in order to evaluate the severity of the illness and the clinical outcome.

Aims & Objectives

Aim

To confirm the accuracy of the Acute illness Observation Scale (AIOS) in predicting the severity of disease and the clinical outcome of community-acquired pneumonia in children admitted to Siddhartha Medical College between 2023 and 2024, in age ranged from two months to five years.

Objective

The objective of this study is to examine the correlation between the radiological outcome with the acute illness observational scale in children with

community-acquired pneumonia at tertiary health care center aged two months to five years.

MATERIALS AND METHODS

Study Design: Prospective Hospital based descriptive observational study

Study period: March 2023 to April 2024.

Study population: descriptive study done in a cohort of 100 children at the Department of Paediatrics, Siddhartha medical college hospital, a tertiary care centre.

Ethics: The study was conducted after institutional ethical clearance and obtaining informed consent signature from children's parent/guardian.

Sampling technique:

- Purposive sampling technique on consecutive cases.

Source of the data: Department of Pediatrics, SMC, Vijayawada, NTR Dist. A.P.

Inclusion Criteria

Children between 2 months to 5 years presenting with fever and cough with any of the following: fast breathing, chest indrawing, lethargy and inability to drink.

Exclusion Criteria

- Diagnosed case of bronchiolitis,
- Congenital anomalies of lung,

Data source:

A predesigned proforma was used to obtain the information. A thorough clinical history was collected.

Procedure: If they met the inclusion criteria, children between the ages of 2 months and 5 yrs who presented to the outpatient department (OPD) with probable pneumonia were enrolled in the study with parental agreement. Each subject receives AIOS scoring on days 1, 2, and 5 by two people working concurrently in a moderately quiet environment.

Every patient's vital signs, respiratory parameters, and pulse oximeter reading are recorded using the data collecting form. Within 24 hours of hospitalization, a full blood count, a blood culture, and a chest X-ray were performed. A radiologist who was blinded to the study's purpose analyzed the chest X-ray using the WHO's standards for X-ray interpretation in pediatric pneumonia. Documents include the progress of the disease, treatment, and investigations according to the data collecting form. Patient is followed up until discharge or death.

- CBP
- CRP
- Chest X ray
- Blood culture

Outcome

- Successfully discharged
- Increased hospital stay -death

Statistical Analysis: Data was gathered, entered into an Excel sheet, & documented in a proforma. For regularly distributed continuous variables, the

data was summarized using the mean $\pm$ standard deviation, and for skewed distributions, the median with the interquartile range (IQR). Percentages were given for categorical features. For categorical variables, we applied Fisher's exact test; for continuous variables, we applied Student's test.

Statistical analysis is performed using the Windows program SPSS version 26.0 (SPSS Inc., Chicago, IL, USA). The ANOVA and t-test were the tests employed to compare the means. To compare the relationships between the groups, the Kruskal-Wallis and Chi-square tests were employed.

RESULTS

Table 1: Age distribution in the study population

Age	Number	Percentage (%)
2 – 12 months	44	44.00
13 – 36 months	39	39.00
37 – 60 months	17	17.00
TOTAL	100	100.00

Table 2: Sex distribution in the study population

Sex	Number	Percentage (%)
Male	64	64.00
Female	36	36.00
TOTAL	100	100.00

Table 3: Weight for age percentile distribution among the children

Weight in percentile	Number	Percentage (%)
< 3	15	15.00
3-15	33	33.00
15-50	21	21.00
50-85	28	28.00
> 85	03	3.00
TOTAL	100	100.00

Table 4: Common presenting complaints

Symptoms	Mean duration	Std. Dev.
Fever	1.81	0.706
Cough	2.53	0.797
Breathlessness	1.48	0.502

Table 5: Danger signs

Danger Signs	Number	Percentage (%)
Lethargy	45	45.00
Inability to drink	17	17.00
Grunt	16	16.00
Convulsion	0	0.00

Table 6: Common presenting complaints

Symptoms	Mean	Std.Dev.	Range
Respiratoryrate (Min)	53.39	7.97	41-70
Temperature(0C)	38.21	0.39	37.2-39.4
Heartrate(Min)	116.95	11.22	99-140
SBP(mmHg)	89.41	6.39	70-100
DBP(mmHg)	58.30	3.91	50-65

Table 7: Respiratory parameters in the study group

Respiratory Signs	Number	Percentage (%)
Respiratory Rate 40-50		
50-60	43	43.00
> 60	32	32.00
	25	25.00
Subcostal / Intercostal Recession	59	59.00
Grunt	16	16.00
Cyanosis	2	2.00
Convulsion	0	0.00
Inability to drink	17	17.00
Decreased breath sound	13	13.00
Crepitations	20	20.00
Wheeze	24	24.00
Vocal Resonance (Increased)	13	13.00

Table 8: SPO2 distribution in the study

SPO2	Number	Percentage (%)
< 85	2	2.00
85-92	59	59.00
> 92	39	39.00
Total	100	100.00

Table 9: CXR Findings of CAP children

CXRFindings	Number	Percentage(%)
Normal	32	32.00
Infiltrates	52	52.00
Consolidation	16	16.00
Total	100	100.00

Table 10: Blood investigation of CAP children

Investigations	Number	Percentage (%)
Leucocytosis	34	34.00

Table 11: Diagnosis of CAP according to IMNCI

Diagnosis	Number	Percentage (%)
Pneumonia	22	22.00
Severe Pneumonia	78	78.00
Total	100	100.00

Table 12: Treatment required for the subjects

Treatment Done	Number	Percentage (%)
Antibiotics		
Oral Intravenous	20	20.00
Nasal O2	80	80.00
Intravenous Fluids	58	58.00
Nebulisation	67	67.00
Mechanical Ventilation	25	25.00
Complication	2	2.00

Table 13: Individual AIOS variables correlation

Items	Normal (=1)	Abnormal score (=3 & 5)
Quality of cry	33 (33.0%)	67 (67.0%)
Response to parent stimulation	14 (14.0%)	86 (86.0%)
State variation	32 (32.0%)	68 (68.0%)
Colour	95 (95.0%)	5 (5.0%)
Hydration	65 (65.0%)	35 (35.0%)
Response to Social Overtunes	2 (2.0%)	98 (98.0%)

Table 14: AIOS score and duration

Score	Day 1	Day 5
<= 10	40 (40.0%)	98 (98.0%)
11-15	15 (15.0%)	2 (0.0%)
>= 16	45 (45.0%)	0 (0.0%)

Table 15: Association between Age group and AIOS score at Day1

			AiOS_D1			Total
			< 10	11-15	>= 16	
Age_Gro up	2-12 Months	Count	19	6	19	44
		% within Age_Group	43.2%	13.6%	43.2%	100.0%
		% within AIoS_D1	47.5%	40.0%	42.2%	44.0%
	13-36 Months	Count	14	7	18	39
		% within Age_Group	35.9%	17.9%	46.2%	100.0%
		% within AIoS_D1	35.0%	46.7%	40.0%	39.0%
	37-60 Months	Count	7	2	8	17
		% within Age_Group	41.2%	11.8%	47.1%	100.0%
		% within AIoS_D1	17.5%	13.3%	17.8%	17.0%
Total		Count	40	15	45	100
		% within Age_Group	40.0%	15.0%	45.0%	100.0%
		% within AIoS_D1	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

Value		df	P-value
Pearson Chi-Square	.740a	4	.946
Likelihood Ratio	.741	4	.946
Linear-by-Linear Association	.120	1	.729
N of Valid Cases	100		

a. 1 cells (11.1%) have expected count less than 5. The minimum expected count is 2.55

Table16: Association between Breathlessness duration and AIOS score at Day1

			AIOS D1			Total
			<10	11-15	>=16	
Breathlessness duration	1	Count	15	7	30	52
		%within Breathlessness duration	28.8%	13.5%	57.7%	100.0%
		%withinAIOS D1	37.5%	46.7%	66.7%	52.0%
	2	Count	25	8	15	48
		% within Breathlessness duration	52.1%	16.7%	31.3%	100.0%
		%withinAIOS D1	62.5%	53.3%	33.3%	48.0%
Total	Count	40	15	45	100	
	%within Breathlessness duration	40.0%	15.0%	45.0%	100.0%	
	%withinAIOS D1	100.0%	100.0%	100.0%	100.0%	

Chi-SquareTests			
	Value	df	P-value
PearsonChi-Square	7.419 ^a	2	.024
LikelihoodRatio	7.530	2	.023
Linear-by-Linear Association	7.196	1	.007
NoValid Cases	100		
a.0 cells(0.0%)have expected countless than 5. The minimum expected count is 7.20.			

Table 17: Association between Lethargy and AIOS score at Day1 & 5

			AIOS D1			Total
			< 10	11-15	>= 16	
Lethargy – Day 1 & 5	No	Count	22	12	21	55
		% within Lethargy – Day 1 & 5	40.0%	21.8%	38.2%	100.0%
		% within AIOS D1	55.0%	80.0%	46.7%	55.0%
	Yes	Count	18	3	24	45
		% within Lethargy – Day 1 & 5	40.0%	6.7%	53.3%	100.0%
		% within AIOS D1	45.0%	20.0%	53.3%	45.0%
Total	Count	40	15	45	100	
	% within Lethargy – Day 1 & 5	40.0%	15.0%	45.0%	100.0%	
	% within AIOS D1	100.0%	100.0%	100.0%	100.0%	

Chi-Square Tests

Value		df	P-value
Pearson Chi-Square	5.051a	2	.080
Likelihood Ratio	5.381	2	.068
N of Valid Cases	100		

0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.75

Table 18: Association between Grunt and AIOS score at Day1

			AIOS D1			Total
			< 10	11-15	>= 16	
Grunt – Day 1	No	Count	40	15	29	84
		% within Grunt – Day 1	47.6%	17.9%	34.5%	100.0%
		% within AIOS D1	100.0%	100.0%	64.4%	84.0%
	Yes	Count	0	0	16	16
		% within Grunt – Day 1	0.0%	0.0%	100.0%	100.0%
		% within AIOS D1	0.0%	0.0%	35.6%	16.0%
Total		Count	40	15	45	100
		% within Grunt – Day 1	40.0%	15.0%	45.0%	100.0%
		% within AIOS D1	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

Table 19: Association between Inability to drink and AIOS score at Day1

Value		df	P-value
Pearson Chi-Square	23.280a	2	.000
Likelihood Ratio	29.360	2	.000
N of Valid Cases	100		

cells (16.7%) have expected count less than 5. The minimum expected count is 2.40.

DISCUSSION

Numerous illnesses have been associated with the majority of symptoms of CAP. In order to overcome this, WHO brought a strategy for effective case management that had marked impact on mortality of under 5 yr children due to pneumonia in India.

Most of the presenting symptoms in young infants (or) children may be associated with different illness or more than one illness.

Therefore, an efficient strategy which may target children under the age of five years old is required for the early detection and rapid care of illness.

This has been made easier by the IMNCI approach, which streamlines the process of classifying the severity of important acute pediatric illnesses, such as pneumonia. When used in conjunction with a primary care hospital's AIOS, which can rapidly assess an illness's severity at every step from onset to recovery, the IMNCI strategy for managing pneumonia is more successful.

When compared to IMNCI, it performed poorly in terms of sensitivity and specificity when detecting severe pneumonia.

The most accurate and sensitive method for classifying pneumonia is still the IMNCI. Even though our study demonstrated the high levels of internal consistency and external validity of the AIOS scoring system, its applicability as a sensitive tool for evaluating severe diseases should be limited to patients presenting with feverish illnesses that do not exhibit any infection-related foci.

In order to evaluate the severity of the illness and the clinical outcome, the current study was conducted to verify the AIOS score for community-acquired pneumonia (CAP) in children under the age of five.

In all, 100 children between the ages of two and sixty months were included in our study. Thirteen to thirty-six months old children were the most affected (39%).

In pediatric pneumonias, age has a significant role in predicting morbidity and mortality. In contrast, the majority of children with pneumonia were in the age range of less than 1 year, with prevalences of 63.2% & 52.2%, respectively, in studies conducted by Reddaiah VP et al,^[13] and Sehgal V et al,^[14] (52.2%) in studies under 5 children with ARI.

The study conducted by Siromani et al,^[9] indicates that the primary cause of death for children under the age of five years.

According to a study by Maria Siromani et al,^[9] 57% of the study population was in the age range of two months to one year. Among those aged one to five years 43% were included. There were 32.5%

females and 67.5% men. On day five, 58.75% of the study sample reported ongoing distress.

Sex:

Among the 50 children enrolled in the study, 64% were male and 36% were female. The incidence of boys (62%) was greater than that of females (38%).

In terms of sex distribution, males made up 58.25% of the sample population in the Sehgal V et al.⁴⁴ study, which also showed an occurrence of a greater male to female ratio. Regarding the nutritional status, the majority of the children (33%), those below the third percentile were 15%, and those above the 85th percentile were 3%, according to the WHO.

This study included children who came to the outpatient department complaining of fever, cough, and dyspnea.

All children presenting with fever, cough, and dyspnea were included in the current study; however, tachypnea (100%) and chest retractions (60%) were the critical indicators for determining a clinical diagnosis of pneumonia. According to Palafox et al., tachypnea (as defined by the WHO) exhibited a 74% sensitivity and a 67% specificity for pneumonia that was determined radiologically.

The mean duration of the presenting complaints:

Lethargy was the most common warning indicator among the children (45%), followed by the inability to drink (17%) and grunting (16%). Not a single children experienced convulsions.

Regarding vital signs, the average heart rate was 116.95, the average temperature was 38.21, and the average respiratory rate was 53.39±7.97.

Upon admission, all children with tachypnea had a respiratory rate of around 43% between 40 and 50, and 25% above 60. About 59% of cases also had intercostal or subcostal retractions; grunts occurred in 16% of cases, cyanosis in 2 children, and incapacity to drink occurred in 17% of instances. 20% of the children had abnormal breath sounds such as crepitations, 24% had wheezes, and 13% had reduced breath sounds.

The children's pulse oximetry values were measured on admission, day 2, and day 5. Children with $spO_2 < 85$ were found to have cyanosis; only two cases had cyanosis with saturation 85%; the remaining 39% of children had saturation $> 92\%$, and 59% of children had saturation between 85 and 92%.

Every individual had a chest X-ray performed when they were admitted. Approximately 32% of the children had normal results, 52% had infiltrates, and 16% had consolidation.

Leukocytosis was observed in 34 percent of the children in the other studies; a total count of more than 11,000 cells was deemed indicative of

leukocytosis. 22% of them had fever, cough, and tachypnea, and were diagnosed with pneumonia, according to the IMNCI classification, while the remaining 78% of the children experienced discomfort combined with retractions, grunts, or lethargy, and were classified with severe pneumonia.

Applying the AIOS score to the patients, around 45% of the children received a score of ≥ 16 , 40% received a score of ≤ 10 , and the remaining 15% had a score between AIOS scores 11 and 15. In the AIOS individual item analysis, the color and hydration status variables were scored normally in 95% and 65% of the affected children, respectively. On the other hand, the majority of children had the lower scores when it came to the responsiveness to social overtures

According to a research by Paul L. McCarty, the combined use of these six criteria had a specificity of 88% and a sensitivity of 77% for significant. When applied to the AIOS score, a study by Lingaraj et al. revealed that 88.9% & 80% of

children respectively received normal color and hydration scores, which was in line with our findings.

2% of children with an AIOS score of more than 16 required inotropic support for shock management, and 2% of children required mechanical ventilation due to respiratory failure during their course of treatment. In 58% of cases, nasal oxygen was given due to significant respiratory distress.

For the majority of children, approximately 67% needed continuous IV fluids due to respiratory distress, dehydration, or refusal of feeding. The majority of patients (80%) received parenteral antibiotics, while the remaining patients (20%) receiving oral antimicrobial therapy.

Shock was one of the complications that 2% of the children had while in the hospital. After receiving therapy, 55% of the children were discharged from the hospital after an average stay of 6.73 days. Throughout the disease duration, there were no fatalities.

AIOS & its associations with the illness

AIOS is a generic illness severity scale developed by P.L. McCarthy.

AIOS is a 3 point scale for six -ordinal variables & total score range from 6-30.

SCALE	Acute Illness Observation Scale
VARIABLES INCLUDED	Quality of cry Response to parent stimulation State variation Color Hydration Response to social overtures
SCORE INTERPRETATION	Each item scored as normal (1) Moderate (3) & severe impairment (5)
TOTAL SCORE	6 = best score 30 = worst physical score
CHANCE OF ILLNESS	Score ≤ 10 : 2-3% Score 11-15: 26% Score ≥ 16 : 92%

Score correlation among the study population:

			AIOS D1			Total
			< 10	11-15	≥ 16	
Age Group	2-12	Count	19	6	19	44
up	Months	% within	43.2%	13.6%	43.2%	100.0%
		Age Group				
		% within	47.5%	40.0%	42.2%	44.0%
		AIOS D1				
	13-36	Count	14	7	18	39
	Months	% within	35.9%	17.9%	46.2%	100.0%
		Age Group				
		% within	35.0%	46.7%	40.0%	39.0%
		AIOS D1				
	37-60	Count	7	2	8	17
	Months	% within	41.2%	11.8%	47.1%	100.0%
		Age Group				
		% within	17.5%	13.3%	17.8%	17.0%
		AIOS D1				
Total		Count	40	15	45	100
		% within	40.0%	15.0%	45.0%	100.0%
		Age Group				
		% within	100.0%	100.0%	100.0%	100.0%
		AIOS D1				

In our research, around 45% of children with AIOS scored abnormally (≥ 16) at their first presentation, 15% scored between 11 and 15, and 40% scored close to normal (≤ 10). The majority of children in

the 12- to 36-month age range had abnormally scores (≥ 16) when they first appeared. At the first presentation, the average AIOS score was 14.65. Analysis of individual variables

95% and 65% of the impacted children received normal scores for the AIOS individual item analysis for the variables of color and hydration status, respectively. However, the majority of children had the lowest scores when it came to the responsiveness to social advances characteristic.

33% of cases had a normal quality of cry score (=1) at the time of initial presentation, whereas 67% of children had an aberrant score (= 3/5). Regarding the reaction to parental stimulation, 86% of the children showed aberrant scores. While the majority of children got normal scores for factors like color and hydration, 68% of them scored abnormally for state fluctuation. However, the vast majority of children (98%) had the lowest social score.

Symptoms correlation with the AIOS

When the respiratory morbidities of the children were compared to the scores at the time of their

initial presentation, the children with AIOS > 10 showed significant differences in lethargy ($p<0.05$) and grunting ($p<0.05$), but not in the inability to drink or in convulsions. Higher scores were observed to have a substantial correlation with pneumonia's clinical characteristics.

Children who scored more than 16 at the time of admission had a significantly higher number of children with grunts (100%), crepitations (70%), and lethargy (53.3%) in our study of severe pneumonia.

Children who scored ≥ 16 at the time of admission had a considerably higher percentage of grunts (55.5%), retractions (55.5%), and tachypnea, according to a research by Bharti et al on the role of AIOS in controlling severe pneumonia.

Grading of pneumonia at the time of admission

	AIOS at admission	Frequency	Percent
Siromani, etal ⁹ study	1-10	41	51.25%
	11-20	20	25.00%
	21-30	19	23.75%
Current study	< 10	40	40%
	11-15	15	15%
	≥ 16	45	45%

According to Siromani et al,^[9] study, 51.25% of patients scored between 1 and 10, with 25 percent and 23.75 percent of cases falling between 11 and 20. 36.25% of cases had severe pneumonia and 53% of cases had pneumonia. Ten percent of people did not have pneumonia. Upon X-ray analysis, 45% of the cases showed end point infiltration, 22.50% showed hyperinflation, 13.75% showed non-end point infiltration, and 2.50% showed pleural effusion. X-ray results were normal in 16.25% of cases.

According to a study by Siromani et al,^[9] 72.50% of the study sample experienced no problems. In 20% of instances, shock and in 7.5% of cases, emphysema occurred. 45% of hospital stays were between six and fourteen days, whereas 28.75% stayed for one to five days. 26.25% of the cases had stays longer than or equal to 15 days. Comparison of X-ray

Findings

In our study, 100% (n=15) of Severe Pneumonia patients scored between 11 and 15, 50% (n=20) of Pneumonia cases scored near normal (≤ 10), and 95.6% (n=43) of Severe Pneumonia cases AIOS scored abnormally (≥ 16) at the initial presentation.

AIOS correlation with signs

Children who scored more than 16 showed a strong association ($p<0.05$) between reduced breath sounds and crepitations when compared to the physical symptoms and AIOS. The majority of these children had decreased breath sounds as a result of either consolidation or infiltrates. Increased voice resonance ($p<0.05$) and bronchial breath sounds ($p<0.05$) were found in 28.9% (n=13) of children with AIOS ≥ 16 , indicating statistical significance. AIOS and its correlation with Pulse Oximetry values

In the context of the association between AIOS and pediatric pulse oximetry readings, two children (4.4%) with saturation < 85% were found to have severe hypoxemia, while 38 (64.4%) of the children had saturation between 86 and 92, ($p<0.05$) indicating significance and higher AIOS scores (≥ 16), and 72.5% (n=29) of the children had normal AIOS with saturation > 92.

Smyth et al.'s study from Zambia on clinical predictors of hypoxemia in pneumonia found that when hypoxaemia (spo2 <92) was present, the severity of the illness and the likelihood of death from pneumonia were significantly higher ($p<0.05$).²⁵

AIOS & its correlation with Investigations

Upon admission, all subjects underwent a complete blood count and blood culture. Children with AIOS greater than 16 demonstrated a statistically significant correlation for leukocytosis ($p<0.05$).

CHEST- X- Ray correlation with AIOS

72.5% (n=29) of children with normal X ray had scored AIOS < 10, whereas children 64.6% (n=29) children with infiltrates had scored ≥ 16 , & those with consolidation had major significance with all of them scoring AIOS ≥ 16 with ($p<0.05$).

According to a Murali et al,^[11] study at KIMS, Karnataka on AIOS vs. IMCI, 53.2% of children had aberrant X-ray findings with a score > 16. This demonstrates that when the score was high, the relevance of X-ray abnormalities increased.

According to the Sivakami M et al,^[12] study, seven children received a score of 10 and did not exhibit any clinical signs of respiratory distress. There was mild to moderate respiratory discomfort in 12 children who scored 11–15, while 41 children who scored >16 had severe respiratory distress. Ten

percent of the sixty children had normal x-rays. In sixteen children, hyperinflation relevant to bronchiolitis was seen. There were 16 children with hyperinflation (bronchiolitis), of which 3 (19%) had a score of 11–15. Of the patients, 12 (75%) belonged to the >16 group. 33 patients had radiological abnormalities suggestive of pneumonia, of which 8 children (24%) were in the 11–15 age range and 22 (66%) had an AIOS score of greater than 16. The frequency of x-ray abnormalities varied noticeably across children who received a score of 16.

Association between AIOS & treatment

When it came to choosing the first treatment modality, 39 of the 58 children (58.2%) who required IV fluids also had an AIOS score of ≥ 16 . Of the 58 children, 58% (n=58) required Nasal O₂ due to respiratory distress, of which 41.1% had this score.

When it came to the beginning of antibiotics, 45 out of 80 children who received IV antibiotics had scores ≥ 16 , indicating a significant connection ($p < 0.05$). In contrast, 20 children who received oral antibiotics had scores < 10 .

A study by Bharti et al.⁵ found that there was a strong association between the AIOS score and the parenteral antibiotic use of 83.3% of children with scores greater than 16.

AIOS on Day 1 & Day 5

Ninety-eight percent of patients on day five had a score of less than 10, compared to forty percent on day one. When comparing the 11–15 score, 15% of the score was on day 1. On day 1, 45% of patients scored more than 16, while on day 5, none of the patients scored more than 16. In all three measures, there was a statistically significant decrease in score between day 1 and day 5 ($p < 0.05$). Throughout the hospital stay, none of the children's scores declined. Two children whose AIOS score was more than 16 at the time of arrival required shock treatment and a mechanical ventilator in response to a prediction of problems that did not demonstrate statistical significance ($p > 0.05$).

Correlation between AIOS at the time of admission with outcome parameters:

The AIOS score and the WHO grading (severity) have been found to have a linear+ve connection ($r = 0.695$). This illustrates how the severity of the condition, as determined by the WHO grading system, develops in tandem with the AIOS score. AIOS score and WHO grading (severity) are found to be statistically significantly ($P < 0.00001$) correlated. The length of hospital stay and the AIOS score have a positive correlation ($r = 0.472$). This illustrates that the length of hospital stay will increase in tandem with an increase in the AIOS score. The length of hospital stay and the AIOS score were found to be statistically significantly correlated ($P < 0.00001$).

Association between AIOS at the time of admission and outcome

The average AIOS score for all cases those were discharged was 14.65 ± 6.95 .

One hundred percent of the study population recovered and left the hospital. At the time of admission, the mean AIOS score for cases of severe pneumonia was higher than that of cases of pneumonia. With a P value of less than 0.0001, the relationship between the differences in the means of the AIOS score at the time of admission and the outcome (discharged) is statistically significant.

Clinical Outcome vs AIOS:

Out of the 50 patients who experienced discomfort on Day 1, only two patients (with AIOS scores between 11 and 15; $p < 0.05$) still experience distress, diminished breath sound, or crepitations on Day 5. Four patients (with scores between 11 and 15) continue to have persistent wheeze on Day 5. Not a single patient had fatigue, cyanosis, a grunt, prolonged CRT, or any of these symptoms until Day 5.

40% of patients had a score of less than 10 on day 1, compared to 98% on day 5 with a score of less than 10. On day 1, 45% of the children scored higher than 16, but on day 5, none of the children did. There was a statistically significant decrease in three scores ($p < 0.05$) between day 1 and day 5, and there was also a strong correlation between the respiratory parameters. Thus, there is a strong correlation between the AIOS score and the clinical outcome.

AIOS vs Complications

Children with a score of less than 10 did not have any complications, but those with a score of more than 16 did have one, in the form of shock.

Hospital stay & Outcome

After the course of treatment, all 100 individuals were discharged from the hospital, with a mean hospital stay of 6.73 days (range: 5–12 days), following an assessment of the disease's lessened severity. No deaths had occurred in any of the AIOS groups.

AIOS and hospitalization

A statistically significant connection ($p < 0.005$) was found between the mean hospital stay of 7.04 ± 1.5 days for 45% of patients with AIOS scores ≥ 16 and the mean hospital stay of 7.13 ± 0.915 days for 15% of cases with AIOS scores 11–15 and the mean hospital stay of 6.23 ± 1.025 days for 40% of cases with AIOS scores < 10 .

The length of hospital stay and the AIOS score had a linearly positive relationship with a correlation coefficient of 0.5 and a $P < 0.0001$, respectively. A linear positive correlation with a correlation coefficient of $r = 0.7$, $p < 0.001$, was found between the AIOS score and the WHO grading (severity).

CONCLUSION

Both external validity and internal consistency of AIOS scoring were very strong. AIOS and the initial SpO₂ value had a strong association. AIOS has a strong correlation with abnormal X-ray results and

type of treatment modalities. AIOS is a useful tool for prognosticating hospitalized children with pneumonia and choosing treatment options. When the children between the ages of 2 and 59 months has an acute respiratory disease, AIOS scoring can help predict the abnormal x-ray findings. In hospital care settings, AIOS can be utilized as an indicator to predict the patient's outcome & length of stay. The AIOS score and the WHO's pneumonia grade, as well as radiological outcome all were statistically significant, and correlated better.

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