



## Study of Pattern of Respiratory Illnesses Admitted to Picu in Children 1 Month -5 Years.

### KEYWORDS

Respiratory distress, pneumonia, infants <1yr, respiratory failure.

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### ABSTRACT

#### Objective

To study the pattern and outcome of respiratory diseases in children presenting to the pediatric intensive care unit (PICU) of the government general hospital Kurnool, over a period of 12 months from March 2013 to February 2014.

#### Materials method

329 children were included in the study. The study population divided into 3 groups,,

According to age, Two groups according to clinical presentation, four groups based on anatomy of the respiratory system involved

& 3 categories, depending on the risk factors. Information was recorded on a structured Proforma by questionnaire method, and analysed by relevant statistical method applying Chi-square test. The study was approved by the Ethics Committee of the hospital and informed consent of the parents was obtained.

#### .Participants

Among those 1260 were between age group of 1 month to 5 years. Out of these 353 children fulfilled the inclusion criteria among them 24 children left against medical advice, and remaining 329 children were included in the study.

#### Outcome:

This study is done to ascertain the pattern of respiratory diseases in children presenting to the pediatrics intensive care unit (PICU) of the government general hospital Kurnool. , and to study the outcome in relation to age of presentation, pattern of illness, location of the disease .

#### Results

Incidence of respiratory illnesses among total PICU admissions between 1m-5yrs was 329 (26.11%). In our study 329 cases of respiratory illnesses were studied. 173 (52.58%) were males, 156 (47.42%) were females. Male to female ratio was 1.1:1. 180 children were < 1 yr, constituting 54.71% 1-3yrs constituting 26.44% ,62 were between 3-5 years constituting 18.84%. In a total of 329 cases 213 (64.74%) cases presented with respiratory distress., 116 (35.26%) cases presented with respiratory failure, among these < 1yr were 75 (64.65%), 1-3 yrs were 30(25.86%) Respiratory failure at time of presentation was commonly found in children aged less than 1 yr.

#### Conclusion

Respiratory diseases contributed to 1/4th of total burden in PICU Between 1 month to 5 years. Infants contributed more than 1/2 of the respiratory burden in PICU. Pneumonia with or without pleural involvement contributed to 1/2 of the respiratory burden in PICU

. More cases presented during period of monsoon & winter. Respiratory diseases contributed to 1/3rd of total mortality in PICU in children between 1 month to 5 years. Infants contributed to 2/3rd of respiratory disease mortality in PICU. More than 1/3rd of deaths observed in children presented with respiratory failure.

Inclusion criteria –Children 1m-5yrs of age presenting with age specific increase in respiratory rate (according to WHO), spo2 < 92% at room air and clinical and/or radiological pulmonary involvement.

#### Exclusion criteria-

. Age < 1 month and > 5 years, Respiratory distress of non-respiratory origin like DKA, RTA, CCF, metabolic acidosis, anaemia. Those who left against medical advice are excluded.

#### Introduction-

Respiratory diseases remain a major cause of morbidity and mortality in children especially among children less than five years old <sup>1</sup>. The spectrum of respiratory illnesses is wide and includes diseases of upper and lower airways, communicable and non-communicable types<sup>2,3</sup> like croup,

bronchiolitis, pneumonia, asthma, pneumothorax, pleural effusion, empyema, foreign body etc. The World Health Organization (WHO) estimates that approximately 10.6 million children under five years of age die each year, acute respiratory infection (ARI), especially pneumonia <sup>1</sup>, contributes about 19% of the total number of deaths.

Millennium Development Goals adopted by the United Nations in 2000 aim to decrease child deaths worldwide by 2015<sup>4</sup>. 6.3 million children under the age of five died in 2013. More than half of these early child deaths are due to conditions that could be prevented or treated with access to simple, affordable interventions. This study is done to ascertain the pattern and outcome of respiratory diseases in children presenting to the pediatric intensive care unit(PICU) of the government general hospital Kurnool. The value of data in present study on respiratory diseases is that it enhances knowledge on the types and burden of the categories of diseases that affect the respiratory system in PICU, This will help in developing intervention measures like introduction of vaccines, by which vaccine preventable disease both at the institutional and national Levels are brought under control, and helps a lot to achieve millennium development goal 4.

**Materials method**

329 children were included in the study. the study population divided into 3 groups,,

According to age, Two groups according to clinical presentation, four groups based on anatomy of the respiratory system involved

&3 categories, depending on the risk factors. Information was recorded on a structured Proforma by questionnaire method, and analyzed by relevant statistical method applying Chi-square test. Those were age < 1 yr, 1-3 yrs, 3-5 yrs. According to mode of presentation, divided study population into 2 groups. Respiratory distress& Respiratory failure . Based on anatomy of respiratory system divided respiratory illnesses among study population into 4 categories. Those are Extra thoracic airway disease(ETAD), Intra thoracic airway diseases(ITAD,)Pulmonary parenchyma disease (PPD) like pneumonia, & ,Pleural disease. Also .divided the study population according to risk factors into 3 categories, No risk factors,single risk factor , children with more than one risk fact. Information was Recorded on a structured Proforma by questionnaire method. Information related to age, sex, duration of symptoms, pasthistory, immunization history, developmental history, , nutrition history, antenatal ,natal ,post natal history, treatment history ,socio economic status of parents etc was considered. Findings were analyzed by relevant statistical methods applying Chi-square test. The study was approved by the Ethics Committee of the hospital and informed consent of the parents was obtained.

**Results**

Among 180 cases below 1 year of age pneumonia was predominant cause constituting 88 cases (48.88%), followed by bronchiolitis 65(36.11%) in frequency .87 cases have presented between age group of 1-3 yrs, Predominantly constituted by bronchiolitis 30(34.8%), followed by pneumonia 19 (21.84).62 cases were between age group of 3-5 yrs. Among these pneumonia were 17 (27.42%)predominantly

**Frequency table in relation to age and specific diagnosis.**

	SD	AGE			TOTAL
		1M-1Y	1-3Y	3-5Y	
ETAD	Croup	3	6	2	11 (3.34%)
	Diphtheria	0	2	2	4 (1.21%)
ITAD	Bronchiolitis	65	30	0	95 (28.87%)
	EVW	6	10	15	31 (9.42%)
	MTW	2	6	3	11 (3.34%)
	Asthma	0	0	4	4 (1.21%)
	Foreign body	1	2	2	5 (1.51%)
PPD	Pneumonia	88	19	17	124 (37.69%)
PD	Empyema	9	8	6	23 (6.99%)
	Pleural effusion	4	2	8	14 (4.25%)
	pneumothorax	2	2	3	7 (2.12%)
		180	87	62	329

**Frequency table in relation to season and specific diagnosis**

In our study 74(22.49%) cases presented in summer, 123 (37.38%) presented in monsoon, 132(40.12%) presented in winter. In croup 2 (18.18%) cases presented in summer, 3 (27.27%) cases in monsoon and 6 (54.54%) cases in winter. Diphtheria 1 (25.00%) case presented in summer, 1 (25.00%) case in monsoon and 2 (50.00%) cases in winter. 20 (21.05%) cases of Bronchiolitis presented in summer, 49 (51.57%) in monsoon and 26 (27.36%) in winter. In EVW 5 (16.13%) cases presented in summer, 16 (51.61%) in monsoon and 10 (32.25%) in winter. In MTW 1 (9.09%) case presented in summer, 4 (36.36%) in monsoon and 6 (54.54%) in winter. In asthma 2 (50.00%) cases presented in monsoon and 2 (50.00%) in winter. In foreign body 2 (40.00%) cases presented in summer, 2 (40.00%) in monsoon and 1(20.00%) in winter. In pneumonia (uncomplicated & complicated) 43 (25.59%) cases presented in summer, 46 (27.38%) cases in monsoon and 79 (47.02%) in winter.

AD	SD	SEASON			TOTAL
		summer	Monsoon	Winter	
ETAD	Croup	2	3	6	11
	Diphtheria	1	1	2	4
ITAD	Bronchiolitis	20	49	26	95
	EVW	5	16	10	31
	MTW	1	4	6	11
	Asthma	0	2	2	4
	Foreign body	2	2	1	5
PPD	Pneumonia	23	30	71	124
PD	Empyema	10	6	7	23
	Pleural effusion	8	6	0	14
	Pneumothorax	2	4	1	7
		74 (22.49%)	123 (37.38%)	132 (40.12%)	329

**Frequency table in relation to anatomical diagnosis and duration of oxygen therapy.**

In our study 110 (33.43%) cases required oxygen therapy for less than 24 hours, 126 (38.29%) cases required oxygen therapy for 1- 3 days 76 (23.10%)

Cases required oxygen therapy for 3-5 days, 17 (5.16%) cases required > 5 days of oxygen therapy. Requirement of oxygen therapy for more than 3 days is more for PPD & PD (uncomplicated & complicated pneumonia) than for other diseases in the study group.

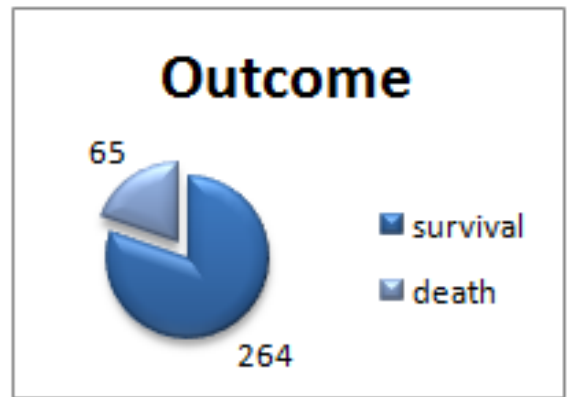
AD	Duration of oxygen therapy				Total
	<24hrs	1-3d	3-5d	>5d	
ETAD	0 (0%)	12 (9.52%)	2 (2.63%)	1 (5.88%)	15
ITAD	82(74.54%)	47 (37.30%)	14 (18.42%)	3 (17.64%)	146
PPD & PD	28 (25.45%)	67 (53.17%)	60 (78.94%)	13 (76.47%)	168
	110 (33.43%)	126 (38.29%)	76 (23.10%)	17(5.16%)	329

**Frequency table in relation to anatomical diagnosis and duration of PICU stay.**

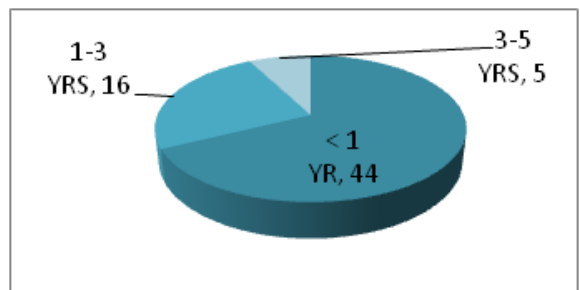
In our study 107(32.52%) cases required <24 hrs of PICU stay,116(35.25%) cases required 1- 3 days of PICU stay,74(22.49%) cases required 3-5 days of PICU stay,32(9.72%) cases required >5 days of PICU stay. Requirement of PICU stay for more than 3 days was more for PPD & PD (uncomplicated & complicated pneumonia) than for other diseases in the study group.

AD	DURATION OF PICU STAY				TOTAL
	<24hrs	1-3d	3-5d	>5d	
ETAD		11 (9.48%)	3 (4.05%)	1 (3.12%)	15
ITAD	82 (76.63%)	45 (38.79%)	11 (14.86%)	8 (25.00%)	146
PPD&PD	25 (23.36%)	60 (51.72%)	60 (81.08%)	23 (71.87%)	168
	107 (32.52%)	116 (35.25%)	74 (22.49%)	32 (9.72%)	329

In a total of 1260 PICU admissions between 1m-5 yrs of age 205 (16.26%) children died. Among these deaths, respiratory diseases constituted 65 (31.70%), and remaining 140 (68.29%) cases were due to other illnesses



In study population of 329 children with respiratory diseases, mortality rate was (19.76%). Of these 44 (67.69%) deaths occurred in < 1 yr of age, 16 (24.62%) deaths in 1-3 yrs of age and 5 (7.69%) deaths in 3-5 yrs of age. More number of deaths occurred in < 1 yr of age, than any other age group .



**Frequency table in relation to mode of presentation and outcome.**

In a total of 213 children who were presented with respiratory distress,18 (8.45%) were died and 116 children who presented with respiratory failure 47 (40.51%) were died

There were more number of deaths in children presented with respiratory failure than who presented with respiratory distress.

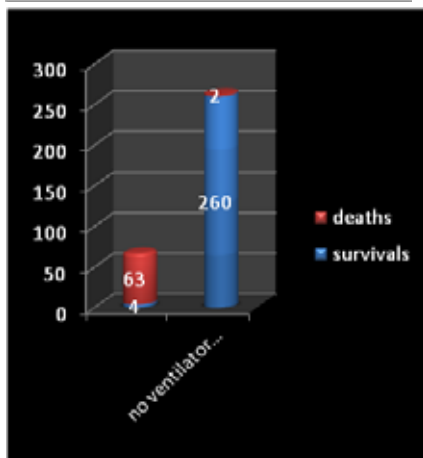
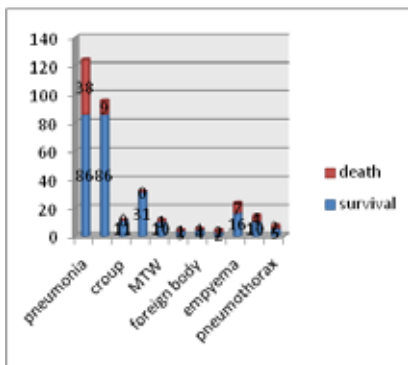
**Frequency table in relation to anatomical diagnosis and outcome.**



There were 2 (13.33%) deaths in ETAD, 12 (8.22%) deaths in ITAD, 38 (30.64%) deaths in PPD, 13 (29.54%) deaths in PD. 51 children have died due to Uncomplicated and complicated pneumonia's constituting 60.18% deaths in study population.

Anatomical diagnosis	Outcome		Total
	Survival	Death	
ETAD	13 (86.66%)	2 (13.33%)	15 (4.56%)
ITAD	134(91.78%)	12(8.22%)	146 (44.37%)
PPD	86 (69.35%)	38 (30.64%)	124 (37.69%)
PD	31 (70.45%)	13 (29.54%)	44 (13.37%)

Among the total number of deaths, 51 (78.46%) children died with pneumonia {uncomplicated (58.46%) & complicated (20.00%) }, 9 (13.84%) with bronchiolitis, 1 (1.53%) each in MTW, asthma and foreign body, 2 (3.07%) in diphtheria and no children died with croup and EVW. Among the children who presented with uncomplicated and complicated pneumonia there were 51 (30.35%) deaths {uncomplicated 38 (22.61%) & complicated 13 (7.73%)}. Out of 124 cases of uncomplicated Pneumonia there were 38 (30.64%) deaths and out of 44 cases of complicated pneumonias there were 13 (29.54%) deaths. In a total of 95 children with bronchiolitis 9 (9.47%) children have died. Out of 11 cases of MTW there was 1 (1.09%) death, in 4 cases of asthma there was 1 (25.00%) death, in 5 cases of foreign body there was 1 (20.00%) death, in 4 cases of diphtheria there were 2 (50.00%) deaths .In total of 329 children 67 (20.36%) cases required ventilator therapy, among these 63 (94.02%) children died, 262 (79.63%) cases not required ventilator therapy, among these 2 (0.76%) children died. There were more deaths in children who required ventilator therapy compared with those who does not require.



**Discussion-**

A Total of 1260 children between 1 month to 5 yrs were admitted in PICU during study period. Among them 329 children have presented with respiratory illnesses constituting 26.11%. It indicates that more than 1/4<sup>th</sup> of PICU admissions were because of respiratory illnesses in the age group of 1 month to 5 years. Oguonu et al<sup>5</sup>, studied in the age group of 1 month to 5 years. Oguonu et al<sup>5</sup>, studied pattern of respiratory diseases, showing incidence as 24.7% correlated with our study. In our study more number of cases presented in the age group of < 1 yr (n=180) constituting 54.71%. It indicates that more than half of children under 5 years of age with respiratory illnesses requiring PICU care were infants (< 1 yr). This highlights the vulnerability of the < 1 yr age group to respiratory illnesses that may be related to less mature immune systems as well as less compliant lungs which increase their susceptibility to infections and other air way diseases.

In our study 64.74% (n=213) children presented with respiratory distress, 35.26% (n=116) children with respiratory failure. It indicates 1/3<sup>rd</sup> of children requiring PICU care due to respiratory diseases had respiratory failure and 2/3<sup>rd</sup> had respiratory distress. Among children who presented with respiratory failure 2/3<sup>rd</sup> (64.65%, n=75) were infants indicating that age is one of the major risk factor for severity of respiratory illnesses.

Among respiratory illnesses requiring PICU care extra thoracic airway diseases like croup and diphtheria contributed to 4.5% (n=15) of cases, intra thoracic diseases like Bronchiolitis, recurrent wheezing, asthma and foreign body contributed to 44.38% (n=146) of cases. Pulmonary parenchymal diseases with or without pleural involvement contributed to 51.06% (n=168). We found almost similar results with Oguonu et al<sup>5</sup>.

There were 11 cases of croup admitted during the study period constituting 3.34%. Among ETAD requiring intensive care croup was the major cause constituting 73.33%.

In our study bronchiolitis constituted 95 cases which contributed 28.8% of respiratory disease burden in PICU and major contributor in ITAD constituting 65.06% of cases. More cases of bronchiolitis were seen in < 1 yr of age group (n=65) which contributed to 68.42%.

Incidence of bronchiolitis was more in males, male: female ratio was. DESHPANDE et al<sup>6</sup>. and ANDREW BUSH et al<sup>7</sup>. cited the annual incidence of 11.4% in children younger than 1 year and 6% in those aged 1 to 2 years. This was in concordance with the studies by JOHNTJ ET AL<sup>8</sup> and YOELEKER et al.<sup>9</sup> MARMAIS ET AL<sup>10</sup> observed increased incidence of bronchiolitis among males with male to female ratio was 1.5:1. Children with bronchiolitis who required PICU admissions had multiple risk factors like preterm, low birth weight, NICU care, congenital RS & CVS abnormalities, lower socioeconomic state etc. Pezzotti et observed autumn/winter period, low birth wt, low Apgar score and male gender as significant risk factors for hospitalization.

Recurrent wheezing episodes and asthma combined together constituted 31.50% (n=46) in ITAD category requiring PICU care. Gold DR et al<sup>11</sup>, Copenhagen CC et al<sup>12</sup>, Haby MM et al<sup>13</sup>, conducted Studies evaluating the prevalence of recurrent wheezing in children younger than 1 year old had found rates varying from 10% to 42%. In our study incidence of recurrent wheezing episodes in infants was 19.04%. The lack of a standardized and properly validated

method capable of identifying wheezy babies may account for the scarcity and wide variability of data available.

In our study there were 5 cases of foreign body constituting 3.42% of ITAD requiring PICU care, with male to female ratio of 1.5:1. Mean age of presentation in our study group is 32 months. Mortality rate 20.00%. According to Reilly et al.<sup>14</sup>, children  $\leq$  4 years are more susceptible to FB injuries due to their lack of molar teeth, oral exploration, and poor swallowing coordination. In India, children between the ages of 1 and 3 years were found to be very vulnerable for aspiration and the majority of the children were boys.

In our study pneumonia (PPD&PD) constituted 51.06% of all respiratory illnesses requiring PICU admissions between 1 month to 5 years. Ogunuet al<sup>15</sup> observed 39.39% of pneumonia cases in < 5 yrs. Preponderance of pneumonia in our study was related with multiple risk factors like younger age, lack of breast feeding, lack of immunization, malnutrition, lower socio economic status which enhances the spread of infection. The combination of the factors and the high incidence noted in this study portray the inadequacy of ameliorating measures and demands more effort in control measures such as provision of immunization and health education to reduce the burden.

Among total deaths in study population, pneumonia (uncomplicated & complicated) constituted 51 cases (78.46%). Among the children who died of pneumonia 80.39% had multiple risk factors and 70.58% presented with very severe pneumonia. Sehgal V et al<sup>15</sup> studied multiple risk factors for mortality in pneumonia (severe & very severe) and observed there were more number of deaths in children less than one year, inability to feed, malnutrition etc.

There were seasonal variation in pattern of admissions for specific illnesses; children with pneumonia were seen more during winter constituting 79 (47.02%) while bronchiolitis during monsoon constituting 49(51.57%). Desaluet al<sup>16</sup> reported a seasonal variation of respiratory diseases in

## Nigeria.

In our study 64.74 % (n=213) of cases presented with respiratory distress, among them 8.45% (n=18) of children have died and 35.26% (n=116) of cases presented with respiratory failure, among them 40.51% (n=47) of children have died. It indicates 3/4<sup>th</sup> of total deaths occurred in children who presented with respiratory failure. This highlights the importance of early recognition of signs and symptoms of respiratory distress and education of parents and health personnel in peripheries and early referral to reduce mortality. We found more number of deaths (94.02%, n=63) in children who required ventilator therapy than who didn't require ventilator therapy (0.76%, n=2). Padmanabhan Ramachandran et al<sup>17</sup>, found that assisted ventilation was independent risk factor for mortality in cases of childhood pneumonia.

## CONCLUSIONS

Respiratory diseases contributed to 1/4<sup>th</sup> of total burden in PICU Between 1 month to 5 years. Infants contributed more than 1/2 of the respiratory burden in PICU. Age < 1 year was a major risk factor for severity of respiratory illness. Pneumonia with or without pleural involvement contributed to 1/2 of the respiratory burden in PICU and involvement of pleura was seen increasingly more commonly with older age group. More cases presented during period of monsoon & winter. Respiratory diseases contributed to 1/3<sup>rd</sup> of total mortality in PICU in children between 1 month to 5 years. Infants contributed to 2/3<sup>rd</sup> of respiratory disease mortality in PICU. More than 1/3<sup>rd</sup> of deaths observed in children presented with respiratory failure. Almost 2/3<sup>rd</sup> of deaths were due to pneumonia with or without pleural involvement and made a major contribution to childhood mortality in PICU. There were more deaths in children requiring longer duration of oxygen therapy (>3 days), and need of assisted ventilation was risk factor for mortality.

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