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RESEARCH ARTICLE
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A STUDY OF CLINICAL PROFILE AND OUTCOME OF CHILDREN WITH RESPIRATORY DISTRESS ADMITTED TO PAEDIATRIC INTENSIVE CARE UNIT IN A TERTIARY CARE HOSPITAL

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Abstract
Respiratory distress (RD) is characterized by increased work of breathing and manifests as tachypnea , grunting, chest retractions, and often has reduced air entry and cyanosis[1]. Respiratory diseases like Bronchiolitis and Bronchopneumonia are the most common cause for respiratory distress in children[2]. In the present study results showing a maximum distribution of 60.7% is seen among 1 month to 1 year, 25.3% among 1 to 5 years , 11.3% among 6 to10years, and 2.7% among 10 to 18 years. In the present study, the respiratory system is the leading cause of respiratory distress (77.3%) followed by others like sepsis, chemical pneumonitis etc. (12%), and cardiovascular system (6.6%) and the central nervous system contributes only(4%) and 14.7% children got ventilated, 7.3% required noninvasive modes of ventilation like CPAP ,while remaining 78% required oxygen support with nasal prongs and oxygen mask. In the present study, there is a mortality rate of 7% in the study population presented with respiratory distress. Bronchopneumonia was the leading cause, accounting to 38% followed by Bronchiolitis accounting for 18%. This study showed data how to prevent mortality and how early we can intervene to prevent morbidity and mortality due to respiratory tract infections and also the severity of infections.

Key words: Bronchiolitis, Bronchopneumonia, Chest retractions, CPAP, Cyanosis, Grunting, Pneumonitis, Respiratory distress, sepsis, Tachypnea.

INTRODUCTION:

Respiratory distress (RD) is characterized by increased work of breathing (WOB) and manifests as tachypnea, grunting, chest retractions, and often has reduced air entry and cyanosis[1]. Respiratory

distress is a common cause for admission in the PICU. Respiratory diseases like Bronchiolitis and Bronchopneumonia are the most common cause for respiratory distress in children[2]. Significant respiratory distress and failure were experienced by almost one-third of the children who died. One of the leading causes of death in pediatric intensive care units was pneumonia, which accounted for over two-thirds of all fatalities[3].

Etiology of respiratory distress in children[4]

Table 1:

Respiratory causes	Bronchiolitis , Bronchopneumonia, Lobar pneumonia, CROUP, Bronchial asthma, WALRI, Foreign body aspiration, Pulmonary TB, Empyema thoracis, Pneumo thorax
CVS causes	Myocarditis, Dilated Cardiomyopathy
GIT causes	Acute liver failure with hepatic encephalopathy, Intestinal obstruction, Acute gastroenteritis
CNS causes	Encephalitis, Intracranial bleed, Meningitis, Pontine glioma
Endocrinology causes	Diabetic ketoacidosis
Metabolic causes	Inborn errors of metabolisam
Hematology causes	Anemia
Renal causes	Nephrotic syndrome, Acute glomerulonephritis, Wilms tumor
Others	Severe dengue, OP poisoning ,Anaphylactic shock

Features suggestive of severe respiratory distress (danger signs)include[5]

1. Inability to feed or drink and vomiting everything
2. Convulsions
3. Abnormal sleepiness
4. Stridor in a calm child
5. Severe malnutrition

AIMS AND OBJECTIVES :

- To describe clinical profile of children admitted with Respiratory distress.
- To determine the outcome with respect to etiology and treatment modality

MATERIALS AND METHODS:

This study was conducted in Department of Pediatrics(PICU), PES INSTITUTE OF MEDICAL SCIENCES, a tertiary care hospital in Kuppam.

Study Design:

- It is a Prospective observational study

Sample size:

- 150 children with respiratory distress.

Study period:

- Study period from October 2022 to October 2023, over one year of study.

Inclusion criteria:

- All children between 1 month and 18 years admitted to PICU with clinical features of respiratory distress like tachypnoea, bradypnoea , noisy breathing ,chestindrawing ,low oxygen saturation are included.

Exclusion criteria:

- Patients not willing for the study and respiratory distress due to traumatic causes are excluded from the study.

Patients and Methods:

- All children aged from 1 month to 18 years showing signs of respiratory distress such as tachypnoea, retractions, etc. caused by various conditions, admitted to PICU are identified and studied.
- Signs of respiratory distress , vital parameters, systemic examination findings were documented in data collection form.
- After stabilizing the patient relevant investigations like complete blood picture, Biochemical analysis, chest x ray, and other investigations as and when required were done to identify the cause of respiratory distress.
- Patients were followed up till they are discharged and their outcome with respect to etiology and treatment modality was observed.
- Consent taken from parents and proforma is filled, which had a questionnaire regarding necessary details for assessment of all the factors helping in determining the clinical profile and outcome of respiratory distress.
- Data collected were filled in proforma

Statistical methods used:

- The data was entered into the latest version of Excel and further analysis was conducted using SPSS (version 23.0; SPSS Inc., Chicago, IL, USA).

Descriptive Analysis:

- For categorical variables, frequencies and percentages will be calculated, and appropriate graphs such as bar charts or pie charts will be generated to visualize the distribution.
- For continuous variables, the mean ± standard deviation will be computed, and histograms or box plots will be created to illustrate the distribution and central tendency.
- A 'p' value less than 0.05 is taken to denote a significant relationship. If the value of 'p' is more than 0.05, then it is considered to indicate the absence of a relationship between the two variables

Ethical Considerations:

Institutional Human Ethics Committee of PESIMSR, Kuppam provided ethical approval to the study and all the research procedures were carried out according to the ethical guidelines. All parents of participants gave informed consent, i.e. they understood the purpose of the study, their right to confidentiality and their right to withdraw at any time without consequence. Confidentiality was maintained throughout the study and all personal data were anonymized to protect the identities of the participants.

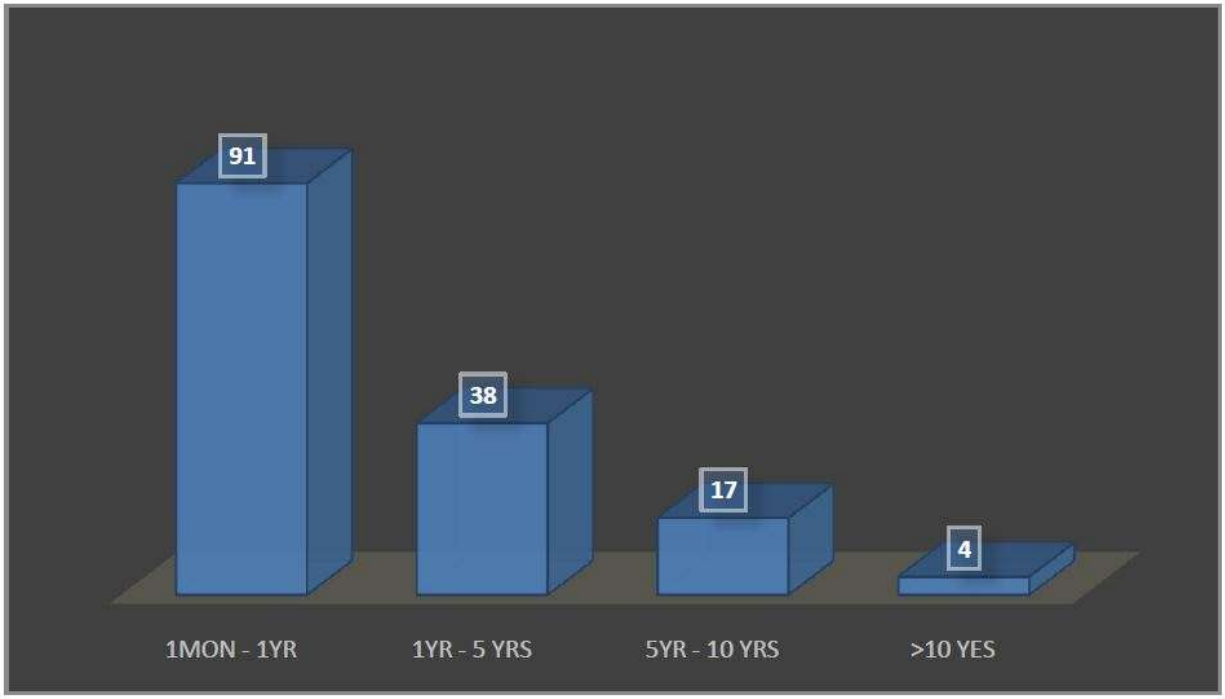
Results:

In the present study 150 children identified to have respiratory distress among who got admitted to PICU.In the present study Table 2 shows a maximum distribution of 60.7% is seen among 1 month to 1 year, 25.3% among 1 to 5 years ,11.3% among 6 to10years, and 2.7% among 10 to 18 years.

TABLE 2: AGE-WISE DISTRIBUTION OF THE STUDY POPULATION

Age of the child	Number	%
1month-1year	91	60.7
1 – 5 years	38	25.3
6-10 years	17	11.3
>10 years	4	2.7
total	150	100

GRAPH 1:AGE-WISE DISTRIBUTION OF STUDYPOPULATION

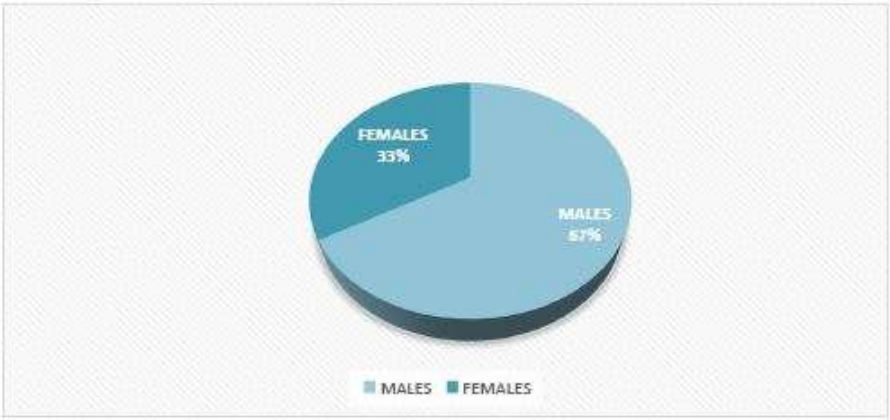


Following Table 3 showing sex wise distribution among the study population, males are 66.7% and females are 33.3% , with female to male ratio of 1:2.

TABLE 3: SEX WISE DISTRIBUTION OF THE STUDY POPULATION

SEX	NUMBER	%
MALE	100	66.7
FEMALE	50	33.3
TOTAL	150	100

GRAPH 2: SEX WISE DISTRIBUTION OF THE STUDY POPULATION

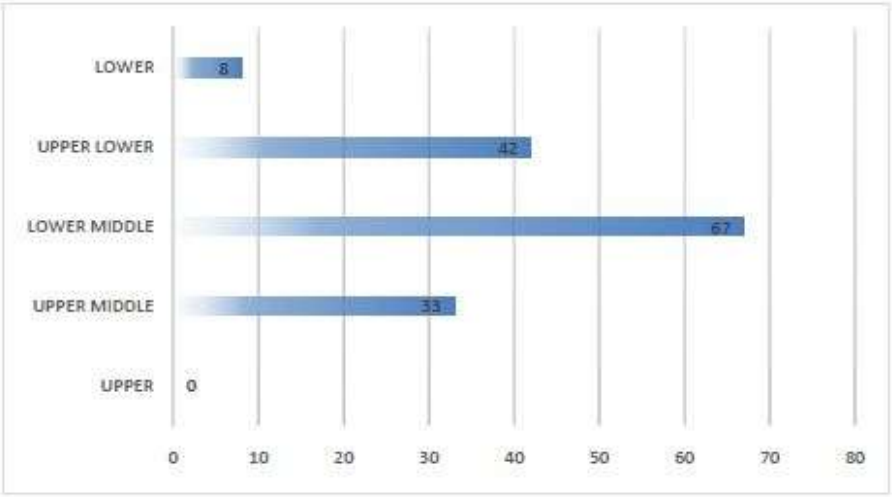


Following Table 4 showing socioeconomic status of the study population, Based on the modified Kuppuswamy socioeconomic status of the study population is divided into upper(0%), upper-middle(33%), lower-middle(67%), upper-lower (42%), and lower (8%). Most of the children belong to the lower- middle class.

TABLE 4 :SOCIOECONOMIC STATUS OF THE STUDYPOPULATION

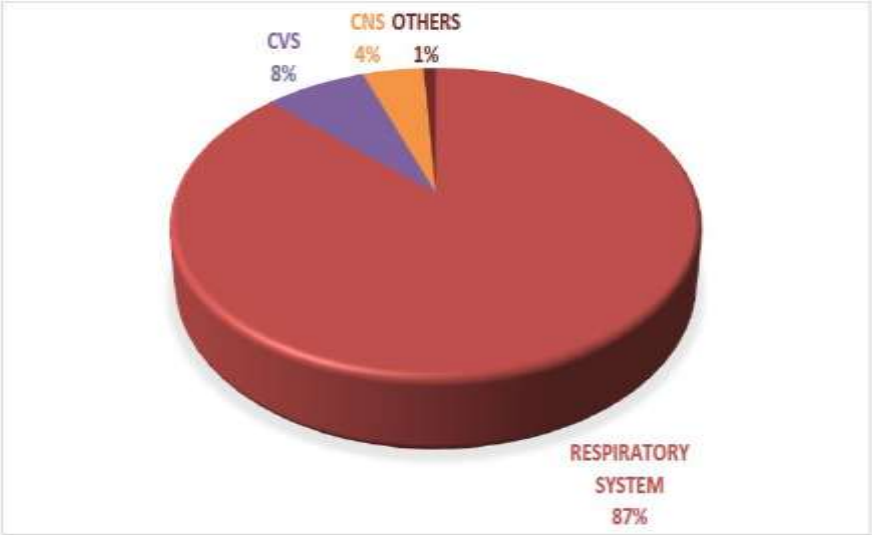
Socioeconomic status	Number	%
UPPER	0	0
UPPER MIDDLE	33	22
LOWER MIDDLE	67	44.67
UPPER LOWER	42	28
LOWER	8	5.33
TOTAL	150	100

GRAPH 3: DISTRIBUTION OF STUDYPOPULATION BASED ON SOCIOECONOMIC STATUS



Following Table 5 showing distribution based on the primary system leading to respiratory distress, the respiratory system is the leading cause of respiratory distress (77.3%) followed by others like sepsis, chemical pneumonitis etc. (12%), and cardiovascular system(6.6%) and the central nervous system contributes only (4%)

GRAPH 4:DISTRIBUTION BASED ON THE PRIMARY SYSTEM LEADING TO RESPIRATORY DISTRESS

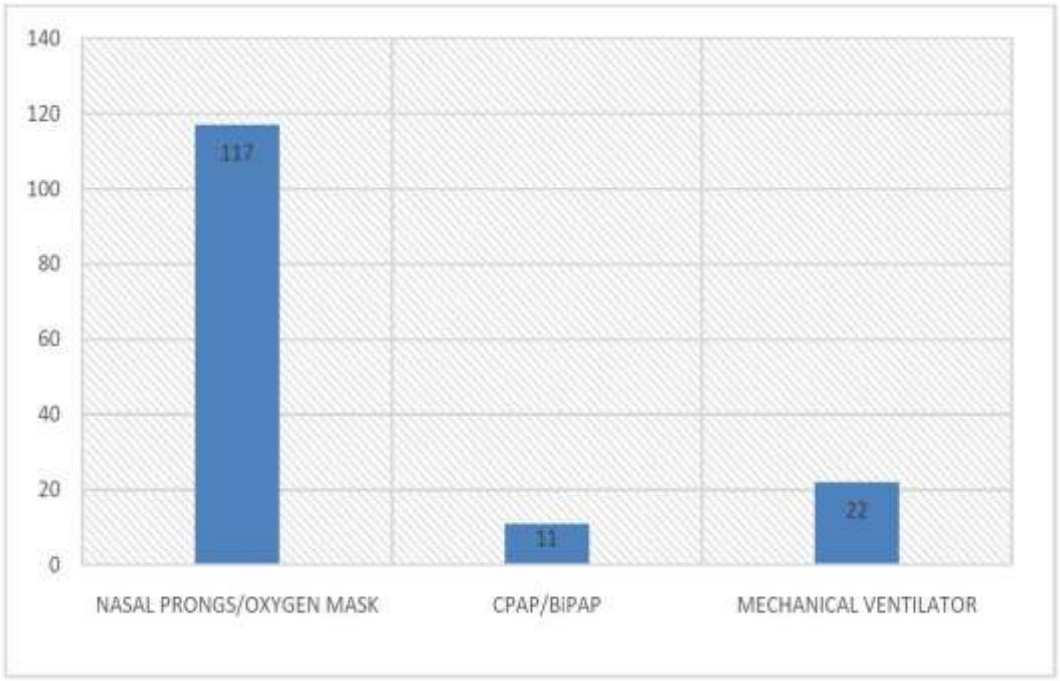


Following Table 6 showing distribution based on oxygen requirement of the study population, 14.7% got ventilated, 7.3% required noninvasive modes of ventilation like CPAP ,while remaining 78% required oxygen support with nasal prongs and oxygen mask.

TABLE 6: DISTRIBUTION BASED ON OXYGEN REQUIREMENT OF THE STUDY POPULATION

Type of oxygen supplementation	Number	%
NASAL PRONGS/ OXYGEN MASK	117	78
CPAP	11	7.3
MECHANICAL VENTILATION	22	14.7
Total	150	100

GRAPH 5: DISTRIBUTION BASED ON OXYGEN REQUIREMENT TO THE STUDY POPULATION

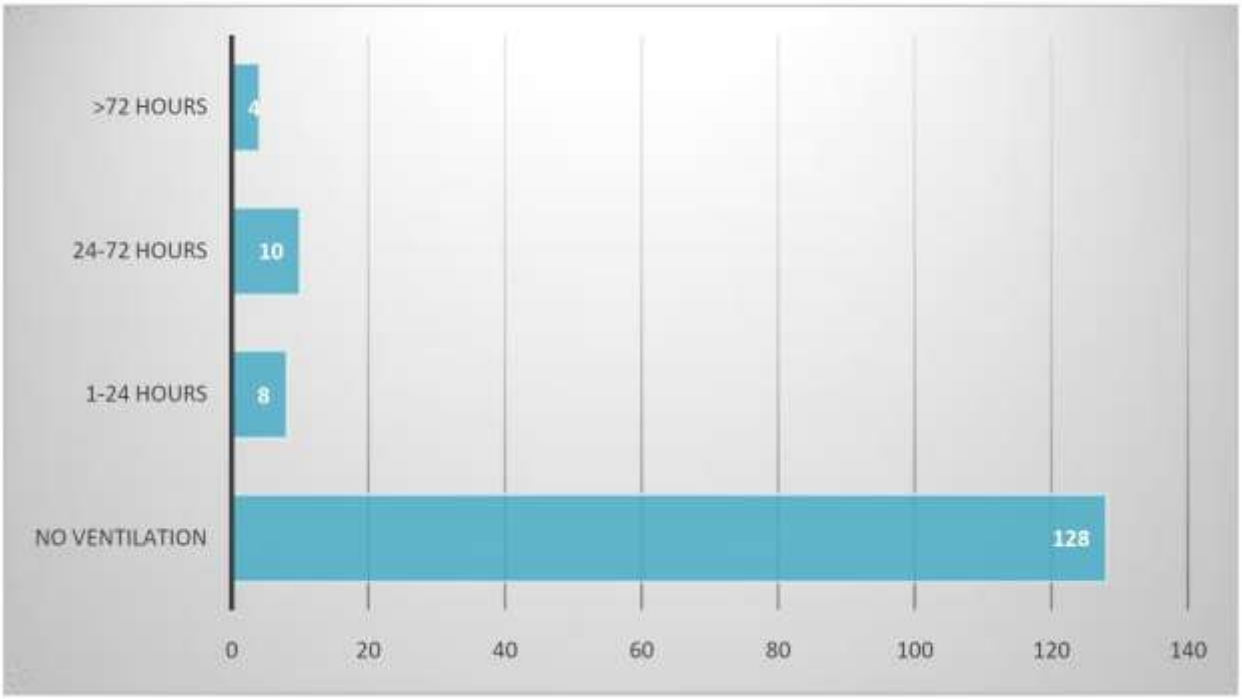


In the present study , 2.66% required mechanical ventilation for more than three days,6.66% ventilation needed for 1 to 3 days, 5.3% required for less than one day,85.3% required no ventilation as they are treated with noninvasive modes

Table 7: DISTRIBUTION BASED ON THE DURATION OF VENTILATOR REQUIREMENT

Duration	Number	%
No ventilation	128	85.3%
1-24 hours	8	5.3%
24-72 hours	10	6.66%
>72 hours	4	2.66%
Total	150	100

GRAPH 6: DISTRIBUTION BASED ON DURATION OF VENTILATOR REQUIREMENT

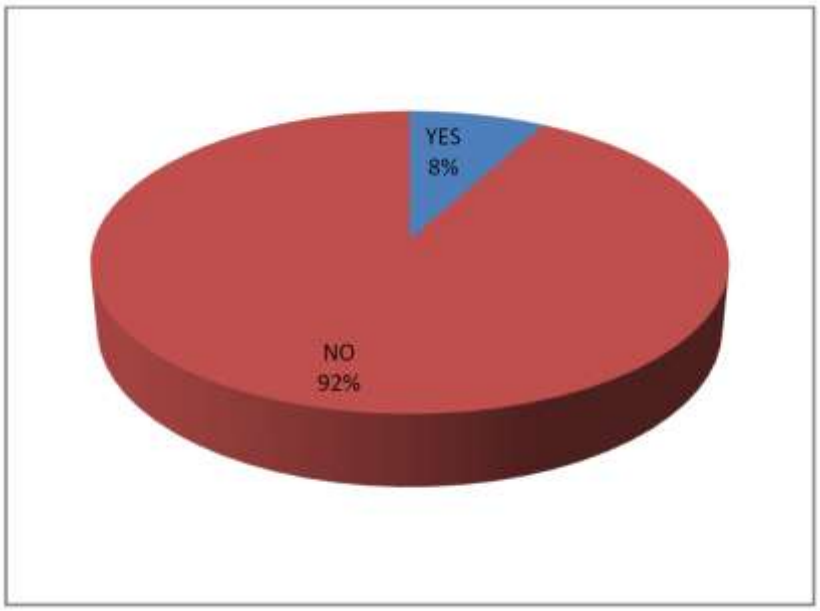


In the present study, 8% required inotrope support, 92% do not require inotrope support

TABLE 8: DISTRIBUTION BASED ON THE REQUIREMENT OF INOTROPES

Inotropes required	Number	Percentage %
YES	12	8%
NO	138	92%
TOTAL	150	100%

GRAPH 7: DISTRIBUTION BASED ON THE REQUIREMENT OF INOTROPES



In the present study following table 9 shows there is a mortality rate of 7% in the study population presented with respiratory distress.

TABLE 9: OUTCOME OF RESPIRATORY DISTRESS

OUTCOME	NUMBER	%
ALIVE	139	92.7%
DEAD	11	7.3%
TOTAL	150	100%

GRAPH 8: OUTCOME OF RESPIRATORY DISTRESS

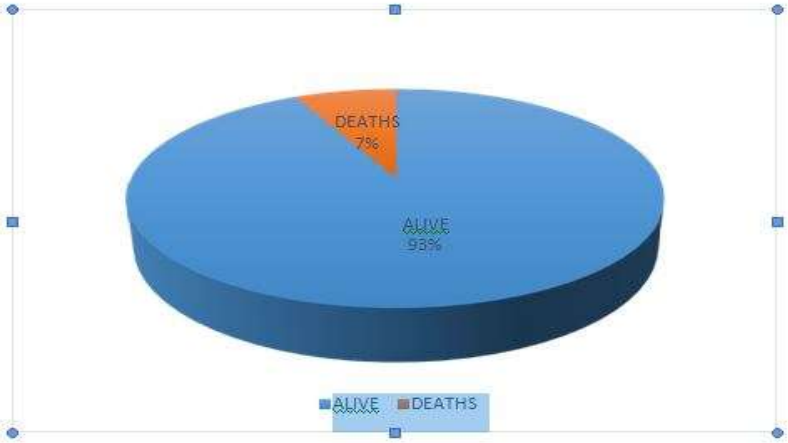


TABLE 10 : SYMPTOMS AT PRESENTATION

Following table in the study shows 94% of children present with breathlessness and 20.67% present with other symptoms.

SYMPTOM	NUMBER	%
COUGH	129	86%
NASAL DISCHARGE	107	71%
FEVER	110	73%
NOISY BREATHING	95	63.33%
BREATHLESSNESS	141	94%
OTHERS	31	20.67%

GRAPH 9: SYMPTOMS AT PRESENTATION

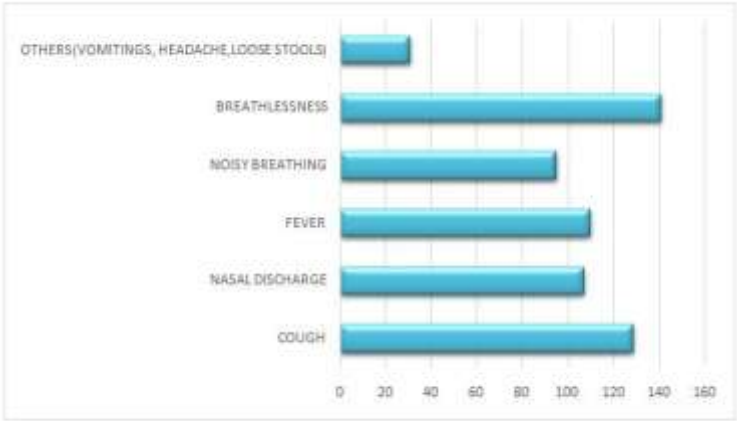


TABLE 11: DISTRIBUTION OF CASES AS PER CHEST X- RAY FINDINGS

Among the chest x-ray findings major finding is bilateral non homogenous opacities which constitutes 31.3% followed by homogenous opacity involving single or multiple lobes (21.3%) and bilateral prominent bronchovascular markings (20%)

CXR FINDING	NUMBER	PERCENTAGE
CONSOLIDATION/ HOMOGENOUS OPACITY	32	21.3%
NON HOMOGENOUS OPACITIES	47	31.3%
B/L PROMINENT BRONCHOVASCULAR MARKINGS	30	20%
B/L PLEURAL EFFUSION	6	4%
PULMONARY EDEMA	2	1.3%

TABLE 12 : AGE AND OUTCOME OF CASES

In the present study, there is high rate of mortality in the age >5 years. The outcome is comparatively good in 1-5 years group. And there is no statistically significant relationship between age and outcome as p-value is >0.05(0.253)

AGE	TOTAL	DEATHS	ALIVE
1month – 1 year	91	7(7.69%)	84(92.3%)
1-5 years	38	1(2.63%)	37(97.3%)
>5 years	21	3(14.28%)	18(85.7%)
total	150	11(7.33%)	139(92.66%)

CHI SQUARE = 2.7471 , P VALUE=0.253(ns)

GRAPH 10: AGE AND OUTCOME OF CASE

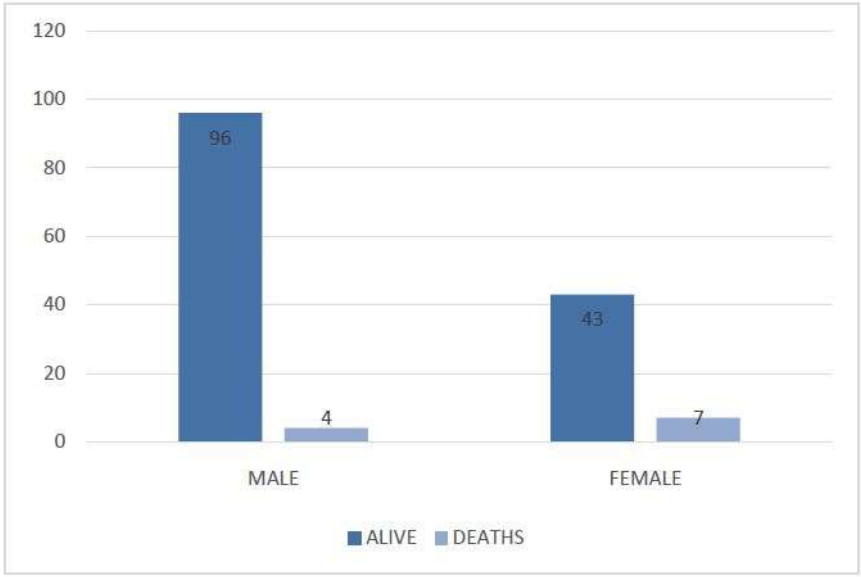


TABLE 13: OXYGEN SUPPLEMENTATION AND OUTCOME

In the present study, there is high mortality on the ventilator (50%). Early intervention and usage of noninvasive modes of ventilation decreased mortality to a significant level, and there is a statistically significant relationship between usage of noninvasive modes of ventilation and outcome as p-value is <0.05(0.001)

CHI SQUARE=69 P-VALUE=0.0001(S)

Oxygen supplementation	Total	Death	Alive
Nasal prongs/Oxygen mask	117	0(0%)	117(100%)
CPAP	11	0(0%)	11(100%)
Ventilator	22	11(50%)	11(50%)
Total	150	11	139

GRAPH 11: OXYGEN SUPPLEMENTATION AND OUTCOME

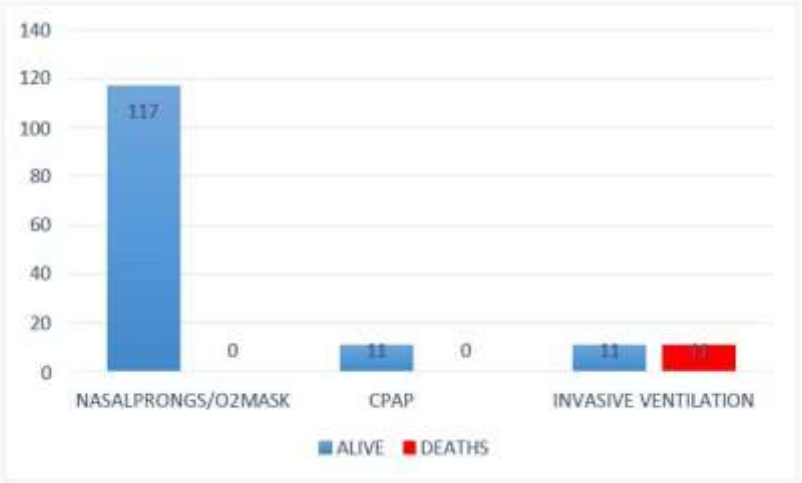


TABLE 14: DURATION OF VENTILATION AND OUTCOME

In the present study, there is an increased rate of mortality as the duration of ventilation increases from 12.5% to 100%, and there is a statistically significant relationship between duration of ventilation and outcome as p-value is <0.05(0.012)

Duration of ventilation	Total	Death	Alive
1-24 hours	8	1(12.5%)	7(87.5%)
24-72 hours	10	6(60%)	4(40%)
>72 hours	4	4(100%)	0(0%)
Total	22	11	11

CHI SQUARE=8.900 P VALUE = 0.012(S)

GRAPH 12: DURATION OF VENTILATION AND OUTCOME

TABLE 15: PRIMARY SYSTEM INVOLVED AND OUTCOME

In the present study, the incidence of mortality is more in central nervous system involvement, and there is a statistically significant relationship between outcome and system involved. In the present study in other causes mortality is high in cases of sepsis with multi organ failure.

PRIMARY SYSTEM	TOTAL	DEATH	ALIVE
RESPIRATORYSYSTEM	116	5(4.31%)	111(95.68%)
CVS	10	2(20%)	8(80%)
CNS	6	2(33.33%)	4(66.66%)
OTHERS	18	2(11.11%)	16(88.88%)
TOTAL	150	11	139

CHI SQUARE = 10.2676 ,P VALUE = 0.016(S)

GRAPH 13: PRIMARY SYSTEM INVOLVED AND OUTCOME

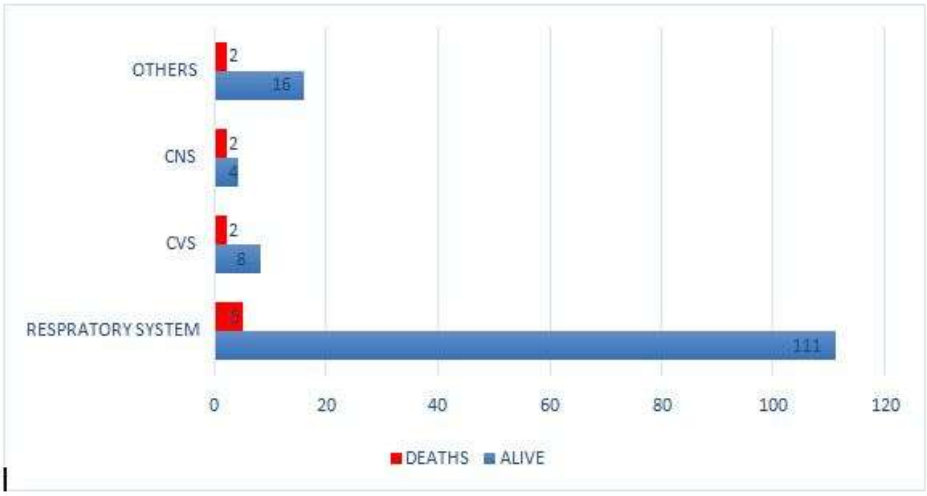


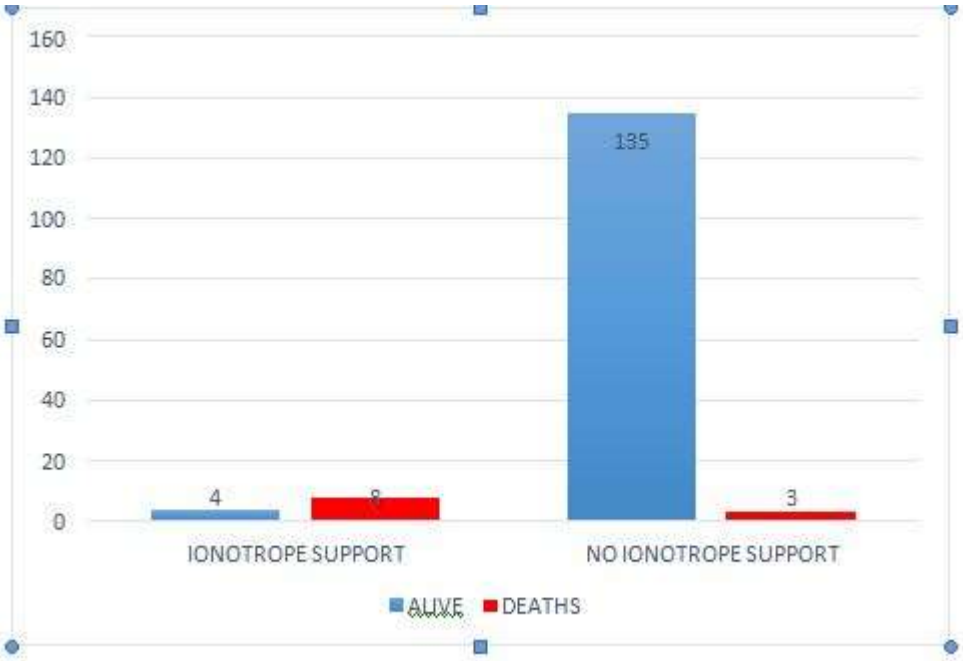
TABLE 16 : USE OF INOTROPES AND OUTCOME

In the present study, there is an increased mortality rate with the use of inotropes (66.66%), and there is a significant relationship between the use of inotropes and outcome as a p value <0.05(0.000).

Inotropes	Total	Death	Alive
Yes	12	8(66.66%)	4(33.33%)
No	138	3(2.17%)	135(97.82%)
Total	150	11	139

CHI SQUARE= 67.5719, P VALUE =0.000(s)

GRAPH 14: USE OF INOTROPES AND OUTCOME



DISCUSSION

The research was conducted from October 2022 through October 2023 at the Paediatric Intensive Care Unit of Paediatrics department at PES Hospital.

Approximately one hundred fifty children that met the inclusion criteria from October 2022 to October 2023 were examined. A predefined proforma has been used to record details on children with respiratory distress. The results of the studies were evaluated, and the children's outcomes were determined by whether they survived or not. The average amount of time patients required mechanical breathing and complications that may arise were also studied. The underlying condition dictated the initial settings of the time-cycled pressure-limited continuous flow ventilator. We tracked non-invasive oxygen saturation continuously

Age Group:

The current research shows that the distribution is as follows: 60.7% in the 1 month to 18 year age group, 25.3% in the 1 year to 5 year age group, 11.3% in the 6 to 10 year age group, and 2.7% in the 10 to 18 year age group. The work of Rohit Bhandar, Venkata Krishna Munagala, and Anusha Lekshminarayanan.[5,6,7] is comparable to this.

According to Rohit Bhandar, 110 patients (or 53.9% of the total) presented with respiratory distress between the ages of 1month and 1yr.
Based on the data collected by Venkata Krishna Munagala, the age group 1-4 years old accounted for 46.67 percent of the total, with 25.6% of the total falling into the next most prevalent category.
Among them, 47% were between the ages of one month and one year, according to research by Anusha Lekshminarayanan. Several variables influence the frequency of RTI in a given location, including the time of year the research is conducted, regional climate, cultural and customary practices.
Babies are more likely to exhibit signs of respiratory distress than older children because their airways are smaller, their metabolic needs are higher, their respiratory reserves are lower, and their compensatory systems are less developed.

Socioeconomic Status
The study population is classified into upper (0%), upper-middle (33%), lower-middle (67%), upper-lower (42%), and lower (08%), based on the modified Kuppuswamy socioeconomic status. The lower-middle class comprises the majority of the children.
Children from low-income families disproportionately had respiratory distress, which was worsened by many risk factors including overcrowding, hunger, and lack of vaccination. It is within the lower socioeconomic status that these risk variables are most often identified. Our research confirms the findings by showing that 67% of people in the lower-middle income class suffer from lower respiratory tract infections (LRTIs).
Krishna Munagala Venkata.et.al[6] :Research has shown that low-income families are more likely to experience overcrowding, under-immunization, hunger, and restricted access to health care.

Clinical features
In the present study, around 100% presented with tachypnea, 79% with retractions, 73% with tachycardia, 18% with grunting, and 5.33% with stridor and altered sensorium, 4 % with sweating, 2% with cyanosis. This is similar to other studies .
Rohit Bhandar and colleagues found that a high fever (77.45%), a cough (79.90%), and fast breathing (87.74%) were the most common symptoms. There was research by K. Researchers Uma maheswaraRao and colleagues[8] discovered that almost all individuals (97%) had dyspnea and a similar number (93%) had cough. Ninety percent of patients presented with a fever.
In the research conducted by K. Umamaheshwara.et.al., the most prevalent presenting symptoms were difficulty breathing (97%), coughing (93%), and fever (90%). In Research by Uma maheswara Rao and colleagues added breath sounds were detected in 96% of the cases, reduced air entry was seen in 20% of cases, hepatomegaly in 22.7%, decreased GCS in 5.33% of cases, and a murmur in 4% of patients (three with grade 2 ejection systolic and two with pan systolic murmurs).
Lekshminarayanan A et al.[7] conducted a research in which Grade 2 PEM was seen in 6 cases (66.7%), whereas grade 1 PEM was in 6 cases (33.3%). Our research found that 138 individuals, or 67.64 percent, had anemia as an associated finding. A correlation was found with study ,Lekshminarayana et al in which 34(66.7%) had anemia with a severe anemia rate of 5.9% . Out of 126 patients 82 patients (62.1%) tested positive for tuberculosis and began anti-tuberculosis therapy. The most prevalent result on chest X-rays, according to the research by Munagala VK et al[9], was unilateral pulmonary infiltration (33.6% of cases), followed by bilateral infiltration (22.9% of cases).

Inotropes Support
In the present study, 8% required inotropes support, 92% do not require inotropes support. According to Rohit Bhandar and colleagues,Inotropic support was required in 18(8.82%) patients.[5]

Treatment

In the present study, 14.7% got ventilated, 7.3% required noninvasive modes of ventilation like CPAP,while remaining 78% required oxygen support with nasal prongs and oxygen mask. These findings are similar to other studies , Rohit Bhandar, Venkata Krishna Munagala and Anusha Lekshminarayanan. [5,6,7]Rohit Bhandaret al showed among 204 patients in the study, nebulisation was required in 163(79.9%), oxygen in 182(89.2%), NIV in 72(35.3%) and invasive ventilation in 30(14.7%).Aafrin Bari et al [13]showed that Out of the 28 patients with severe asthma who were admitted during the study, 3 had to be ventilated and all three survived.

According to the findings of a study carried out by D.Tzira and colleagues[2,] the oxygen was necessary in 82 (45%), non-invasive ventilation in 12(6.5%),invasive ventilation in 87(47.8%), ICD insertion in 30(15%),and tracheostomy in 6(3%).According to the findings of a study carried out by Lekshminarayanan A et al.[7], nebulization was necessary in 26 patients (51%), while inotropic support was necessary in 13 patients (25.5%).

Mortality Rate

In the present study, there is a mortality rate of 7% in the study population presented with respiratory distress. In the present study,there is high rate of mortality in the age >5 years.The outcome is comparatively good in1-5 years group and there is no statistically significant relationship between age and outcome as p-value is>0.05(0.253)

Jatinder Singh et al[10] found that all-around mortality was14.14 percent. According to Rohit Bhandar and colleagues in the age groups of 1month to1 year and 1 year to 5 years, the mortality rate was higher, accounting for 6 deaths (42.85%) in each age group. Male patients had a higher mortality rate of 8 (57.16%) compared to female patients, who had a mortality rate of 6 (42.85%).Bronchopneumonia, which accounted for 28.57 percent of all deaths, and lobar pneumonia, which accounted for 14.28 percent, were the most common causes of death.

In the present study, there is high mortality in females (14%) as compared to males (4%), and there is statistically significant relationship between sex and outcome as p- value is <0.05(0.027). According to the findings of Dhruba jyoti Debnathet al[11]. children who were not fully immunized for their age suffered from severe forms of acute respiratory infections (ARI), and this variation was statistically significant. Despite the fact that the ratio of males to females was 1.4:1, the CFR was significantly greater in females, and this difference was supported by statistical evidence. This is an example of the gender imbalance that occurs when female children are neglected and brought to a health care facility late while they are sick[11].According to Rohit Bhandar and colleagues The mortality was more in male patients 8(57.16%) compared to female patients 6(42.85%).[5]

In the present study ,there is a high incidence of mortality in upper lower class(12%), compare to other groups, and there is no statistically significant relationship between socio-economic status and outcome as p-value is >0.05(0.535).

In the present study, there is mortality rate of 7% in the study population presented with respiratory distress.

According to a study that was carried out by Supriya A. Patil[12], 82% of cases were entirely recovered, 8.8% of cases went against the advice of medical professionals and 9.2% of cases died. 18 patients, or 8.45%, of the 213 patients who arrived with respiratory distress died, according to a study that was carried out by M.Suhasini and colleagues.[3]

SUMMARY AND CONCLUSION

- The study was conducted in the Pediatric Intensive Care Unit, Pediatrics department, PES Hospital, from October 2022 to October 2023.
- The study included 150 children, assessed their survival or death, mean duration of ventilation needed, and associated complications.
- The majority of children were male, with a 2:1 male to female ratio.

- The socioeconomic status of majority of the study population was lower-middle.
- The respiratory system was the leading primary system of respiratory distress (77.3%), followed by others (sepsis, chemical pneumonitis) and cardiovascular system (6.6%).
- 14.7% of the children received ventilation, 7.3% required noninvasive ventilation, and 78% required oxygen support.
- 2.66% required mechanical ventilation for more than three days, 6.66% for 1 to 3 days, 5.3% for less than one day, and 85.3% required no ventilation.
- 8% required inotrope support, 92% did not require it.
- A mortality rate of 7% was reported.
- Majority of the cases presented with tachypnea, retractions, tachycardia, grunting, stridor, altered sensorium, sweating and cyanosis.
- 96% of the cases had added breath sounds, 20% had decreased air entry, 22.7% had hepatomegaly, 5.33% had decreased GCS and 4% had murmur.
- Bronchopneumonia was the leading cause, accounting to 38% followed by Bronchiolitis accounting for 18%.
- High mortality rates were observed in children over 5 years, females (14%), upper lower class (12%) and those on ventilators (50%).
- The use of noninvasive ventilation and lesser duration of ventilation significantly decreased mortality rates.
- Mortality was more prevalent in cases of central nervous system involvement and sepsis with multi-organ failure.
- Inotrope use was associated with increased mortality rates.

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