

CLINICAL PROFILE AND OUTCOME OF MECHANICALLY VENTILATED CHILDREN ADMITTED IN PAEDIATRIC INTENSIVE CARE UNIT AT GOVERNMENT THOOTHUKUDI MEDICAL COLLEGE AND HOSPITAL: A PROSPECTIVE OBSERVATIONAL STUDY

B.Naresh¹, Kavitha R.², Akash T.³

Received : 28/08/2026
Received in revised form : 22/09/2026
Accepted : 06/10/2026

Keywords:

Respiration, Artificial; Intensive Care Units, Pediatric; Child; Hospital Mortality; Organ Dysfunction Scores; Pneumonia, Ventilator-Associated; Intubation, Intratracheal; Treatment Outcome.

Corresponding Author:

Dr. Akash T,
Email: thilagarakash@gmail.com

DOI: 10.47009/jamp.2026.8.5.118

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (5); 749-756



¹Associate Professor, Department of Pediatrics, Government Tirunelveli Medical College, Tamilnadu, India

²Associate Professor, Department of Pediatrics, Government Thoothukudi Medical College, Tamilnadu, India

³Assistant Surgeon, Department of Pediatrics, Peraiyur Government Hospital, Tamilnadu, India

ABSTRACT

Background: Mechanical ventilation is the most prevalent kind of organ support in pediatric critical care; nevertheless, the majority of data about it originates from well-equipped facilities. There are few series from government-affiliated teaching hospitals in southern India, and they vary in their case compositions. **Materials and Methods:** A prospective study was conducted on fifty consecutive pediatric patients, aged 30 days to 12 years, who were ventilated for more than six hours at a government medical college hospital's pediatric critical care unit in Tamil Nadu, from August 2022 to May 2024. Demographic data, indications, physiological condition at the time of intubation, ventilatory parameters, complications, and outcomes were documented from the first day of ventilation. The Pediatric Sequential Organ Failure Assessment (pSOFA) was evaluated on the first day, while the Pediatric Risk of Mortality III (PRISM III) was assessed on days 1, 3, and 5. **Result:** The average age was 3.98 ± 3.25 years, with 26 (52.0%) being male. Respiratory failure was the most prevalent indication (18, 36.0%), whereas febrile status epilepticus was the most frequent diagnostic (7, 14.0%). Shock was seen in 35 individuals (70.0%), ventilation lasted beyond 72 hours for 43 individuals (86.0%), and 36 individuals (72.0%) had a complication related with the ventilator, mostly pneumonia. Thirty individuals perished, constituting 60.0%. On Day 1, the pSOFA scores were elevated in non-survivors (14.67 ± 2.34 compared to 9.30 ± 1.89 , $p = 0.001$), and PRISM III scores were also higher on days 1, 3, and 5 ($p = 0.002$). Mortality rates were 77.1% in cases of shock compared to 20.0% in the absence of shock ($p = 0.001$), with variations according on indication ($p = 0.004$). **Conclusion:** The mortality rate was elevated and mostly affected children who were already critically compromised at the time of intubation. Day-1 pSOFA and serial PRISM III effectively distinguished survivors from non-survivors without additional apparatus.

INTRODUCTION

Mechanical ventilation is the defining intervention of paediatric intensive care. Between a quarter and a third of children admitted to a paediatric intensive care unit (PICU) receive invasive ventilation at some point, a proportion that has changed little across three decades of multicentre survey work.^[1,2] It is also the intervention that most reliably separates children who will survive from those who will not, because the decision to intubate marks the point at which a child's

own respiratory or neurological reserve has been exhausted.

Outcomes after this point depend on the treatment setting. Multicentre European and Latin American cohorts report PICU mortality of about 15% among ventilated children.^[1] While 19.4% in a Turkish PICU, where sepsis was the strongest correlate of death, and 21.1% in an Ethiopian PICU, where mechanical ventilation independently predicted mortality.^[3,4] Resource disparities are even more pronounced in the ISARIC analysis of children hospitalized with COVID-19. Mortality was 43.6%

in low- and middle-income countries versus 7.2% in high-income countries, with LMIC status independently associated with death (adjusted hazard ratio 4.73, 95% CI 3.16–7.10).^[5] Similar disparities have been reported for paediatric traumatic brain injury across Asia and Latin America, with children in lower sociodemographic settings experiencing poorer functional outcomes and greater intensive-care needs.^[6] These differences reflect not only illness severity but also variations in trained staffing, monitoring and consumables.^[7]

The paediatric acute respiratory distress syndrome in admissions had 17% mortality, and showed that severity assessed six hours after diagnosis discriminates outcome better than severity at diagnosis.^[8] The second consensus conference has extended those criteria and set out graded recommendations on tidal volume, positive end-expiratory pressure and oxygenation targets.^[9,10] A Cross-sectional study found wide variation in mode, tidal volume and adjunctive therapy for children with acute lung injury, with no consistent relationship between positive end-expiratory pressure and inspired oxygen.^[11] Most of this literature also assumes that many district-level units do not have access to blood gas analysis, imaging and protocolised weaning.

The Pediatric Risk of Mortality III score was derived to quantify physiological derangement in the first hours of intensive care.^[12] and has been recalibrated.^[13] While the paediatric Sequential Organ Failure Assessment score was adapted with age-adjusted cardiovascular and renal cut-offs and validated against in-hospital death.^[14] The 2024 international consensus criteria for paediatric sepsis reinforced how strongly setting modifies the meaning of a given degree of organ dysfunction: children meeting the Phoenix criteria had in-hospital mortality of 7.1% in higher-resource settings and 28.5% in lower-resource settings.^[15]

Ventilator-associated pneumonia (VAP) remains the most common device-associated infection in ventilated children. A meta-analysis of five randomised trials found no reduction in VAP with antiseptic oral care.^[16] Training and bundle adherence may improve outcomes, with simulation-based VAP-bundle training in an Indian PICU.^[17] Cuffed tubes are used in 95% of North American PICUs versus approximately half of non-North American units, with lower use associated with more tube exchanges.^[18] Evidence comparing cuffed and uncuffed tubes is of low certainty but suggests fewer tube exchanges with cuffed tubes and no clear difference in post-extubation stridor.^[19,20] Extubation failure occurs in 2%–20% of ventilated children, most commonly due to upper airway obstruction.^[21,22]

There is limited data on the clinical profile, outcomes, early predictors of mortality, ventilator practices, and complications among mechanically ventilated children in government tertiary-care PICUs, particularly in the South Indian setting.

Existing studies have largely focused on individual aspects such as mortality, severity scores, ventilator-associated infections, or specific respiratory conditions. Therefore, this study was undertaken to assess the clinical profile and outcomes of mechanically ventilated children admitted to the Paediatric Intensive Care Unit at Government Thoothukudi Medical College and Hospital. The study also aimed to identify clinical and severity-related factors associated with mortality, describe ventilator modes and settings used in relation to the clinical conditions requiring ventilation, and determine the complications associated with mechanical ventilation.

MATERIALS AND METHODS

Study design and setting: This prospective observational study was conducted in the paediatric intensive care unit of the Department of Paediatrics, Government Thoothukudi Medical College Hospital, Thoothukudi, Tamil Nadu, India, over 22 months from August 2022 to May 2024. The unit is the referral PICU for the district and receives children from peripheral government facilities, private nursing homes and the hospital's own emergency room.

The study was approved by the Institutional Ethics Committee of Government Thoothukudi Medical College Hospital, and written informed consent was obtained from a parent or guardian of every child before enrolment.

Participants: Consecutive children older than 30 days and younger than 12 years who required invasive mechanical ventilation in the PICU were eligible. Children ventilated for less than six hours, those ventilated at another facility and referred for continuing care, those who died within six hours of intubation, and those with congenital anomalies affecting the respiratory tract were excluded. Fifty children met the criteria and all were followed to hospital discharge or death.

Data collection: A structured proforma was completed from the first day of ventilation. Maternal interview provided age, sex and socioeconomic class, and the clinical record provided the presenting complaint, comorbidities, the provisional diagnosis on the day of intubation and the final diagnosis. The indication for ventilation was assigned at intubation as respiratory failure, severe respiratory distress, unstable airway, poor Glasgow Coma Scale (GCS) score or decompensated shock. The presence of shock and the inotropes required to maintain perfusion were recorded.

Heart rate, blood pressure, spontaneous respiratory effort, oxygen saturation and GCS score were documented immediately before and after intubation. The place of intubation, the size and type of endotracheal tube, the use of rapid sequence intubation and any desaturation during the procedure were noted. Mode of ventilation and the phase variables of the mandatory breath, comprising peak

inspiratory pressure, positive end-expiratory pressure, inspiratory to expiratory ratio and fraction of inspired oxygen, were recorded serially on day 1, on subsequent days and immediately before extubation or death. The ratio of peripheral oxygen saturation to fraction of inspired oxygen was derived at the same time points.

Complete blood count, random blood sugar, renal function tests, serum electrolytes, coagulation profile, chest radiograph and arterial blood gas analysis were obtained on day 1 and repeated as clinically indicated. Sedation use, duration of ventilation, complications attributable to ventilation, the weaning device used, extubation failure and reintubation within 48 hours, and the final outcome were recorded throughout the PICU stay.

Severity scoring: The paediatric Sequential Organ Failure Assessment score was calculated on day 1 of ventilation from the respiratory, cardiovascular, coagulation, hepatic, neurological and renal components using age-adjusted cut-offs.¹⁴ The Pediatric Risk of Mortality III score was calculated from clinical examination and laboratory data on days 1, 3 and 5 of ventilation.¹² Children who died or were extubated before day 3 or day 5 contributed no score at that time point, which accounts for the falling denominators across the three occasions.

Sample size calculation: The sample size was estimated for a single proportion using the formula: $Z^2 p (1 - p) / e^2$.

The confidence level was 95%, a margin of error of 5%, an assumed population proportion of 4.5% and a finite population of 400, the latter representing the approximate annual paediatric intensive care admission load of the unit. On substitution, it provides a sample size of 57.

Statistical analysis: Data were entered in Microsoft Excel and analysed using IBM SPSS Statistics version 21.0 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean $\pm$ standard deviation with range and categorical

variables as frequency and percentage. Categorical variables were compared using the Pearson chi-square test, or the Fisher exact test where expected cell counts were small. Continuous variables were compared between survivors and non-survivors using the independent samples t test. A two-sided p value below 0.05 was taken as statistically significant.

RESULTS

Demographic and baseline clinical profile: Fifty children were studied. The mean age was 3.98 ± 3.25 years, with a median of 4.00 years and a range of 0.08 to 11.00 years. Twenty-six children (52%) were boys and 24 (48%) were girls. Forty children (80%) came from the lower or upper lower socioeconomic class, 8 (16%) from the lower middle class and 2 (4%) from the upper middle class. Respiratory failure was the commonest indication for ventilation, in 18 children (36%), followed by severe respiratory distress in 15 (30%), an unstable airway in 7 (14%), a poor GCS score in 6 (12%) and decompensated shock in 4 (8%). Shock was present at presentation in 35 children (70%), all of whom received inotropic support; adrenaline was used alone in 17 (48.6%) and in combination with another agent in a further 17, dopamine alone being used in the single remaining child. The mean duration of hospital stay was 11.40 ± 7.65 days, with a median of 9.50 days and a range of 2 to 34 days [Table 1].

Febrile status epilepticus was the commonest single underlying diagnosis, recorded in 7 children (14%). Acute central nervous system infection, hepatic encephalopathy, sepsis with acute respiratory distress syndrome and sepsis with multiple organ dysfunction syndrome each accounted for 3 children (6%). The remaining diagnoses were distributed across 26 further categories, no one of which accounted for more than 2 children.

Table 1: Demographic and baseline clinical profile of mechanically ventilated children (n = 50)

Variable	Category	n (%)
Age (years)	Mean $\pm$ SD	3.98 ± 3.25
	Median (range)	4.00 (0.08–11.00)
Sex	Male	26 (52%)
	Female	24 (48%)
Socioeconomic class	Lower	21 (42%)
	Upper lower	19 (38%)
	Lower middle	8 (16%)
	Upper middle	2 (4%)
Indication for ventilation	Respiratory failure	18 (36%)
	Severe respiratory distress	15 (30%)
	Unstable airway	7 (14%)
	Poor GCS score	6 (12%)
Shock at presentation	Decompensated shock	4 (8%)
	Present	35 (70%)
Inotrope used (of 35 with shock)	Absent	15 (30%)
	Adrenaline alone	17 (48.6)
	Adrenaline + dopamine	6 (17.1)
	Adrenaline + noradrenaline	4 (11.4)
	Adrenaline + dopamine + noradrenaline	3 (8.6)
	Adrenaline + dobutamine	2 (5.7)
	Adrenaline + dobutamine + noradrenaline	2 (5.7)

	Dopamine alone	1 (2.9)
Duration of hospital stay (days)	Mean $\pm$ SD	11.40 $\pm$ 7.65
	Median (range)	9.50 (2.00–34.00)

SD, standard deviation. Percentages for inotrope use are calculated on the 35 children who had shock; all other percentages are of the full cohort of 50.

Physiological status and intubation characteristics: Before intubation, 41 children (82%) were tachycardic, 30 (60%) were hypotensive and 25 (50%) had poor spontaneous respiratory effort. Mean oxygen saturation was $86.42 \pm 15.50\%$ and the mean GCS score was 7.68 ± 2.32 . After intubation the proportion who were tachycardic fell to 30 (60%) and the proportion who were

hypotensive to 27 (54%), while mean oxygen saturation rose to $95.50 \pm 2.92\%$. Thirty-three children (66%) were intubated in the PICU and 17 (34%) in the emergency room. Cuffed and uncuffed tubes were used in equal numbers. Rapid sequence intubation was used in 31 children (62%), sedation was given to 38 (76%) and desaturation occurred during the procedure in 11 (22%) [Table 2].

Table 2: Physiological status before and after intubation, and characteristics of the intubation episode (n = 50)

Variable	Category	Pre-intubation, n (%)	Post-intubation, n (%)
Heart rate	Tachycardia	41 (82%)	30 (60%)
	Normal for age	9 (18%)	20 (40%)
Spontaneous respiratory effort	Poor	25 (50%)	21 (42%)
	Increased	15 (30%)	13 (26%)
	Adequate	10 (20%)	16 (32%)
Blood pressure	Hypotensive	30 (60%)	27 (54%)
	Normotensive	20 (40%)	23 (46%)
Oxygen saturation (%)	Mean $\pm$ SD (range)	86.42 ± 15.50 (30–98)	95.50 ± 2.92 (88–99)
GCS score	Mean $\pm$ SD (range)	7.68 ± 2.32 (5–12)	—
Place of intubation	PICU	33 (66%)	—
	Emergency room	17 (34%)	—
Endotracheal tube	Cuffed	25 (50%)	—
	Uncuffed	25 (50%)	—
Intubation technique	Rapid sequence intubation	31 (62%)	—
	Sedation used	38 (76%)	—
	Desaturation during intubation	11 (22%)	—

PICU, paediatric intensive care unit; SD, standard deviation. Glasgow Coma Scale score, place of intubation, tube type and intubation technique were recorded once and are shown in the pre-intubation column.

Mode of ventilation and ventilator settings: On day 1, 38 children (76%) were ventilated in a pressure-controlled mode and 12 (24%) in a time-cycled pressure-limited mode; no child was on pressure-support intermittent mandatory ventilation. The distribution was almost unchanged on subsequent days. Immediately before extubation or death the pattern had shifted, with 22 children (44%) on pressure-controlled ventilation, 19 (38%) on pressure-support intermittent mandatory ventilation and 9 (18%) on time-cycled pressure-limited ventilation.

Mean peak inspiratory pressure rose across the three time points, from 16.94 ± 2.51 cmH₂O on day 1 to

17.80 ± 3.42 cmH₂O on subsequent days and 18.14 ± 4.42 cmH₂O before extubation or death, and the upper end of the range widened from 24 to 28 cmH₂O. Mean positive end-expiratory pressure followed the same direction, from 5.62 ± 1.07 to 6.10 ± 1.53 and then 6.28 ± 1.71 cmH₂O. The mean fraction of inspired oxygen fell from $56.60 \pm 11.89\%$ on day 1 to $54.20 \pm 11.97\%$ on subsequent days before returning to $56.82 \pm 17.62\%$, the widened standard deviation reflecting divergence between children being weaned and those deteriorating. The mean S/F ratio improved from 1.60 ± 0.50 to 1.74 ± 0.49 and then 1.91 ± 0.84 [Table 3].

Table 3: Mode of ventilation and ventilator settings over the course of ventilation (n = 50)

Variable	Day 1	Other days	Pre-extubation or death
Pressure-controlled ventilation, n (%)	38 (76%)	37 (74%)	22 (44%)
Pressure-support intermittent mandatory ventilation, n (%)	0 (0%)	1 (2%)	19 (38%)
Time-cycled pressure-limited ventilation, n (%)	12 (24%)	12 (24%)	9 (18%)
Peak inspiratory pressure (cmH ₂ O), mean $\pm$ SD	16.94 ± 2.51	17.80 ± 3.42	18.14 ± 4.42
Peak inspiratory pressure, range	14.0–24.0	14.0–26.0	12.0–28.0
Positive end-expiratory pressure (cmH ₂ O), mean $\pm$ SD	5.62 ± 1.07	6.10 ± 1.53	6.28 ± 1.71
Positive end-expiratory pressure, range	5.0–9.0	5.0–11.0	5.0–11.0
Fraction of inspired oxygen (%), mean $\pm$ SD	56.60 ± 11.89	54.20 ± 11.97	56.82 ± 17.62
Fraction of inspired oxygen, range	40.0–80.0	30.0–80.0	21.0–80.0
S/F ratio, mean $\pm$ SD	1.60 ± 0.50	1.74 ± 0.49	1.91 ± 0.84
S/F ratio, range	0.3–2.2	1.0–3.1	1.1–4.7

SD, standard deviation; S/F ratio, ratio of peripheral oxygen saturation to fraction of inspired oxygen. Percentages are of the full cohort of 50 at each time point.

Duration of ventilation, complications and laboratory findings: Ventilation lasted more than 72 hours in 43 children (86%), 48 to 72 hours in 5 (10%) and less than 48 hours in 2 (4%). Thirty-six children (72%) developed at least one ventilator-associated complication. Ventilator-associated pneumonia was the commonest, occurring in 24 children in all: alone in 17 (34%), with pneumothorax in 4 (8%), with post-extubation stridor in 2 (4%) and with lobar collapse in 1 (2%). Isolated lobar collapse occurred in 6 children (12%) and isolated pneumothorax in 4 (8%) [Figure 1]. Nineteen children reached extubation. High-flow nasal cannula was the weaning device in 13 of them (68.4%) and continuous positive airway pressure in 6 (31.6%). Five children (26.3% of those extubated) failed extubation and were reintubated

within 48 hours, three because of recurrent seizures and two because of persistent desaturation. Leukocytosis was present in 35 children (70%), anaemia in 32 (64%), thrombocytopenia in 19 (38%) and biochemical acute kidney injury in 16 (32%). Hypoglycaemia during ventilation occurred in 14 children (28%). Electrolytes were normal in 31 children (62%), with hyperkalaemia in 12 (24%) and hyponatraemia in 6 (12%). Arterial blood gas analysis showed metabolic acidosis in 26 children (52%), respiratory alkalosis in 12 (24%), respiratory acidosis in 11 (22%) and a normal pattern in 1 (2%). Enteral feeding was established in 26 children (52%). Thirty children died and 20 were discharged alive, a mortality of 60% [Table 4].

Table 4. Ventilator-associated complications, laboratory findings and outcome (n = 50)

Variable	Category	n (%)
Duration of ventilation	> 72 hours	43 (86%)
	48–72 hours	5 (10%)
	< 48 hours	2 (4%)
Ventilator-associated complication	None	14 (28%)
	Ventilator-associated pneumonia alone	17 (34%)
	Lobar collapse alone	6 (12%)
	Pneumothorax alone	4 (8%)
	Ventilator-associated pneumonia with pneumothorax	4 (8%)
	Ventilator-associated pneumonia with post-extubation stridor	2 (4%)
	Pneumothorax with subcutaneous emphysema	1 (2%)
	Post-extubation stridor alone	1 (2%)
	Ventilator-associated pneumonia with collapse	1 (2%)
Enteral feeding established	Yes	26 (52%)
Laboratory findings	Leukocytosis	35 (70%)
	Anaemia	32 (64%)
	Thrombocytopenia	19 (38%)
	Acute kidney injury	16 (32%)
	Hypoglycaemia during ventilation	14 (28%)
	Leukopenia	5 (10%)
	Thrombocytosis	4 (8%)
Dyselectrolytaemia	None	31 (62%)
	Hyperkalaemia	12 (24%)
	Hyponatraemia	6 (12%)
	Hypokalaemia	1 (2%)
Arterial blood gas pattern	Metabolic acidosis	26 (52%)
	Respiratory alkalosis	12 (24%)
	Respiratory acidosis	11 (22%)
	Normal	1 (2%)
Outcome	Died	30 (60%)
	Discharged alive	20 (40%)

Laboratory findings are not mutually exclusive and each is expressed as a proportion of the full cohort of 50; all other categories within a variable are mutually exclusive.

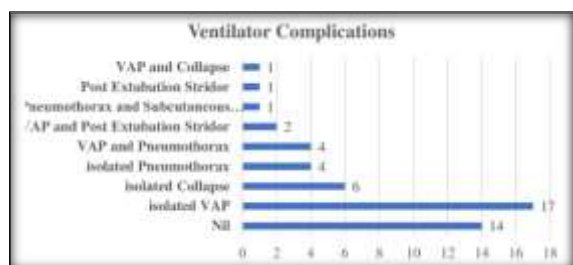


Figure 1: Distribution of ventilator-associated complications (n = 50).

Factors associated with outcome: The mean day-1 pSOFA score was 14.67 ± 2.34 among children who died and 9.30 ± 1.89 among those discharged, a

difference of 5.37 points ($p = 0.001$) [Figure 2]. PRISM III scores separated the two groups at every time point and the gap widened with time: 18.17 ± 4.78 versus 13.55 ± 5.33 on day 1 (difference 4.62, $p = 0.002$), 19.34 ± 4.93 versus 12.15 ± 6.12 on day 3 (difference 7.20, $p = 0.001$) and 20.19 ± 4.83 versus 11.00 ± 6.27 on day 5 (difference 9.19, $p = 0.001$). The mean score rose in the children who died and fell in the survivors across the first five days [Figure 3].

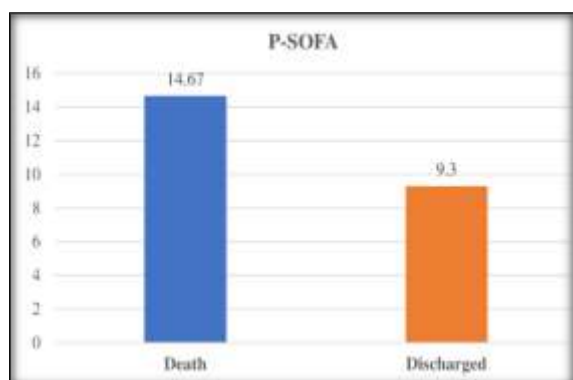


Figure 2: Mean day-1 paediatric Sequential Organ Failure Assessment (pSOFA) score by outcome (n = 50).

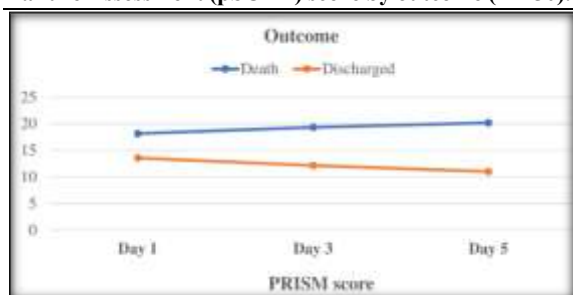


Figure 3: Mean Pediatric Risk of Mortality III (PRISM III) score on days 1, 3 and 5 of ventilation, by outcome.

Shock was strongly associated with death. Twenty-seven of the 35 children with shock died (77.1%) compared with 3 of the 15 without shock (20%, $p =$

0.001) [Figure 4]. Mortality also differed by indication for ventilation, being highest in children ventilated for a poor GCS score (5 of 6, 83.3%) and for decompensated shock (3 of 4, 75%), and lowest in those ventilated for respiratory failure (9 of 18, 50%) ($p = 0.004$). Socioeconomic class was not associated with outcome ($p = 0.133$).

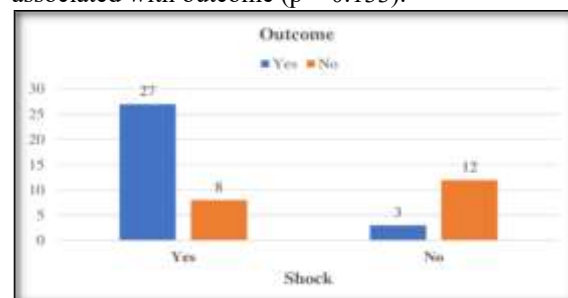


Figure 4: Outcome according to the presence of shock at presentation (n = 50).

Among the factors examined against ventilator-associated complications rather than death, only the type of endotracheal tube reached significance: complications occurred in 21 of 25 children with a cuffed tube (84%) compared with 15 of 25 with an uncuffed tube (60%, $p = 0.044$). Sedation (76.3% versus 58.3%, $p = 0.138$), enteral feeding (69.2% versus 75%, $p = 0.650$) and length of hospital stay (12.42 ± 8.21 versus 8.79 ± 5.39 days, $p = 0.133$) were not associated with complications [Table 5].

Table 5: Factors associated with mortality and with ventilator-associated complications

Variable	Category	Died / complication present	Survived / complication absent	p value
pSOFA score on day 1	—	14.67 ± 2.34 (n = 30)	9.30 ± 1.89 (n = 20)	0.001
PRISM III score, day 1	—	18.17 ± 4.78 (n = 30)	13.55 ± 5.33 (n = 20)	0.002
PRISM III score, day 3	—	19.34 ± 4.93 (n = 29)	12.15 ± 6.12 (n = 20)	0.001
PRISM III score, day 5	—	20.19 ± 4.83 (n = 26)	11.00 ± 6.27 (n = 20)	0.001
Shock	Present (n = 35)	27 (77.1)	8 (22.9)	0.001
	Absent (n = 15)	3 (20%)	12 (80%)	
Indication for ventilation	Poor GCS score (n = 6)	5 (83.3)	1 (16.7)	0.004
	Decompensated shock (n = 4)	3 (75%)	1 (25%)	
	Severe respiratory distress (n = 15)	9 (60%)	6 (40%)	
	Unstable airway (n = 7)	4 (57.1)	3 (42.9)	
	Respiratory failure (n = 18)	9 (50%)	9 (50%)	
Socioeconomic class	Upper middle (n = 2)	2 (100%)	0 (0%)	0.133
	Lower (n = 21)	14 (66.7)	7 (33.3)	
	Lower middle (n = 8)	5 (62.5)	3 (37.5)	
	Upper lower (n = 19)	9 (47.4)	10 (52.6)	
Endotracheal tube cuff	Cuffed (n = 25)	21 (84%)	4 (16%)	0.044
	Uncuffed (n = 25)	15 (60%)	10 (40%)	
Sedation	Given (n = 38)	29 (76.3)	9 (23.7)	0.138
	Not given (n = 12)	7 (58.3)	5 (41.7)	
Enteral feeding	Established (n = 26)	18 (69.2)	8 (30.8)	0.650
	Not established (n = 24)	18 (75%)	6 (25%)	
Hospital stays	—	12.42 ± 8.21 (n = 36)	8.79 ± 5.39 (n = 14)	0.133

pSOFA, paediatric Sequential Organ Failure Assessment; PRISM III, Pediatric Risk of Mortality III; SD, standard deviation.

*Independent samples t test. †Pearson chi-square test. ‡Fisher exact test.

§For these four variables the outcome compared is the presence or absence of a ventilator-associated complication, not death; all other rows compare death with survival.

DISCUSSION

Sixty per cent of ventilated children died, substantially exceeding the 15% mortality reported in a multicentre European and Latin American cohort and the 19.4% and 21.1% reported from Turkey and Ethiopia, respectively.^[1,3,4] Mortality among ventilated children in the ISARIC cohort was 43.6% in low- and middle-income countries (LMICs) versus 7.2% in high-income countries, with LMIC status independently associated with mortality.^[5] Similarly, 2024 paediatric sepsis criteria demonstrated mortality of 28.5% versus 7.1% for equivalent organ dysfunction in lower- versus higher-resource settings.^[15] These findings highlight the contribution of resource availability and late presentation to outcomes.

Children were severely compromised at intubation, with tachycardia in 82%, hypotension in 60%, mean oxygen saturation of 86.42%, and mean GCS of 7.68. Day-1 pSOFA was markedly higher among non-survivors (mean 14.67), exceeding the range in its original validation cohort, where overall mortality was 2.6%.^[14] Both pSOFA and PRISM III differentiated survivors from non-survivors from day.^[1] while the PRISM III difference increased from 4.62 points on day.^[1] to.^[9,19] by day.^[5] Serial assessment may therefore provide additional prognostic information by identifying children with persistent or worsening organ dysfunction. PRISM III was developed for early intensive-care assessment and recalibrated, while serial scoring requires no additional equipment.^[12,13]

Respiratory failure and severe respiratory distress accounted for approximately two-thirds of indications, but febrile status epilepticus was the most frequent individual diagnosis, with neurological and septic conditions predominating overall. Mortality was highest among children ventilated for depressed consciousness (83.3%) and lowest among those ventilated for respiratory failure (50.0%; $p=0.004$). Khemani et al. found mortality among children meeting ARDS criteria was 17%.⁸ Other studies reported that hospital mortality reaches 25% and deaths commonly follow refractory shock or multiple-organ dysfunction.^[23,24]

In our study, shock was present in 70% of children and was strongly associated with mortality (77.1% vs 20.0% without shock; $p=0.001$). All children with shock required inotropes, with adrenaline used in most cases, consistent with Weiss et al. favouring adrenaline or noradrenaline over dopamine.^[25] South Asia carries a high burden of sepsis incidence and mortality.^[26] suggesting that the high prevalence of shock may reflect delayed presentation and advanced illness rather than ventilation practice alone.

Complications were more frequent with cuffed than uncuffed tubes (84.0% vs 60.0%; $p=0.044$). Evidence shows no clear difference in post-extubation stridor and only low-certainty evidence favouring cuffed tubes for reducing tube exchanges.¹⁸⁻²⁰

Desaturation occurred during 22% of intubations, compared with 17% in North American and 13% in international PICUs.^[27]

Sedation was not associated with complications ($p=0.138$), consistent with findings from Curley et al.,²⁸ while randomised paediatric trials have not demonstrated shorter ventilation with protocolised weaning.^[29] Ventilator pressures remained relatively modest, with peak inspiratory pressure <19 cmH₂O and PEEP <7 cmH₂O, consistent with evidence that PEEP is often not titrated according to oxygenation requirements in children.^[10,11] The observed increase in ventilator settings before extubation or death should therefore be interpreted cautiously, as these trajectories combine successful weaning with clinical deterioration. Although pSOFA, PRISM III, shock and indication for ventilation were associated with outcomes, these findings do not establish that determinants of survival were definitively independent of ventilator-related factors.^[2,6,7]

Limitations: This single-centre study included 50 children, fewer than the 57 planned, limiting precision and making subgroup analyses, including mortality estimates based on very small groups, fragile. Findings from one district-level government PICU may not generalise to settings with different referral patterns or staffing. Analyses were univariate; because shock, ventilation indication and severity scores are interrelated, their independent effects cannot be determined. The association between cuffed tubes and complications may be confounded by indication, and cuff pressures were not measured. VAP was diagnosed clinically and radiologically without quantitative culture or ventilator-day denominators, limiting microbiological certainty and comparison with published incidence rates.

Post-day-1 severity scores were available only for children who remained ventilated, introducing selection bias into day-3 and day-5 comparisons. Extubation outcomes were limited by inconsistent denominators. Long-term neurological, functional and readmission outcomes were not assessed.

CONCLUSION

Ventilated children in the PICU had predominantly respiratory failure or distress, although febrile status epilepticus was the most common underlying etiology. Shock, poor GCS, and higher PRISM III and P-SOFA scores were significantly associated with poor outcomes. PRISM III and P-SOFA were useful predictors of mortality. VAP was the most common complication, highlighting the importance of strict aseptic practices. Cuffed ET tubes were associated with more ventilatory complications, particularly air-leak syndromes and post-extubation stridor. Anemia and leucocytosis were common laboratory findings, while socioeconomic status, sedation, enteral feeding, and duration of hospital

stay were not significantly associated with outcomes or complications.

REFERENCES

1. Farias JA, Frutos F, Esteban A, Flores JC, Retta A, Baltodano A, et al. What is the daily practice of mechanical ventilation in pediatric intensive care units? A multicenter study. *Intensive Care Med.* 2004;30(5):918-25.
2. Wolfler A, Calderoni E, Ottonello G, Conti G, Baroncini S, Santuz P, et al. Daily practice of mechanical ventilation in Italian pediatric intensive care units: a prospective survey. *Pediatr Crit Care Med.* 2011;12(2):141-6.
3. Durak C, Boydag G, Uvenç K. Clinical characteristics of mechanically ventilated children in pediatric intensive care unit: a single-center study. *North Clin Istanbul.* 2023;10(5):597-601.
4. Edae G, Tekleab AM, Getachew M, Bacha T. Admission pattern and treatment outcome in pediatric intensive care unit, tertiary hospital, Addis Ababa, Ethiopia. *Ethiop J Health Sci.* 2022;32(3):497-504.
5. Marwali EM, Kekalih A, Yuliarto S, Wati DK, Rayhan M, Valerie IC, et al. Paediatric COVID-19 mortality: a database analysis of the impact of health resource disparity. *BMJ Paediatr Open.* 2022;6(1):e001657.
6. Liang KWH, Lee JH, Qadri SK, Nadarajan J, Caporal P, Roa G JD, et al. Differences in clinical outcomes and resource utilization in pediatric traumatic brain injury between countries of different sociodemographic indices. *J Neurosurg Pediatr.* 2024;33(5):461-8.
7. Yager PH, Callans KM, Samost-Williams A, Bonilla JA, Flores LJG, Hasbun SCA, et al. Practical quality improvement changes for a low-resourced pediatric unit. *Front Public Health.* 2024;12:1411681.
8. Khemani RG, Smith L, Lopez-Fernandez YM, Kwok J, Morzov R, Klein MJ, et al. Paediatric acute respiratory distress syndrome incidence and epidemiology (PARDIE): an international, observational study. *Lancet Respir Med.* 2019;7(2):115-28.
9. Emeriaud G, Lopez-Fernandez YM, Iyer NP, Bembea MM, Agulnik A, Barbaro RP, et al. Executive summary of the second international guidelines for the diagnosis and management of pediatric acute respiratory distress syndrome (PALICC-2). *Pediatr Crit Care Med.* 2023;24(2):143-68.
10. Kneyber MCJ, de Luca D, Calderini E, Jarreau PH, Javouhey E, Lopez-Herce J, et al. Recommendations for mechanical ventilation of critically ill children from the Paediatric Mechanical Ventilation Consensus Conference (PEMVECC). *Intensive Care Med.* 2017;43(12):1764-80.
11. Santschi M, Jouvett P, Leclerc F, Gauvin F, Newth CJL, Carroll CL, et al. Acute lung injury in children: therapeutic practice and feasibility of international clinical trials. *Pediatr Crit Care Med.* 2010;11(6):681-9.
12. Pollack MM, Patel KM, Ruttimann UE. PRISM III: an updated pediatric risk of mortality score. *Crit Care Med.* 1996;24(5):743-52.
13. Pollack MM, Holubkov R, Funai T, Dean JM, Berger JT, Wessel DL, et al. The Pediatric Risk of Mortality score: update 2015. *Pediatr Crit Care Med.* 2016;17(1):2-9.
14. Matics TJ, Sanchez-Pinto LN. Adaptation and validation of a pediatric sequential organ failure assessment score and evaluation of the Sepsis-3 definitions in critically ill children. *JAMA Pediatr.* 2017;171(10):e172352.
15. Schlapbach LJ, Watson RS, Sorce LR, Argent AC, Menon K, Hall MW, et al. International consensus criteria for pediatric sepsis and septic shock. *JAMA.* 2024;331(8):665-74.
16. Oikawa H, Nozaki S, Furuichi M, Tomita K, Shinjoh M. Oral hygiene care for critically ill children to prevent ventilator-associated pneumonia: a systematic review and meta-analysis. *J Hosp Infect.* 2025;162:36-43.
17. Jeengar RK, Choudhary B, Khara D, Singh S, Purohit SP, Singh K. Ventilator-associated pneumonia bundle of care training of nursing officers using simulation and its impact on their knowledge and incidence of ventilator-associated pneumonia: a quasi-experimental study. *J Pediatr Intensive Care.* 2024;13(2):168-73.
18. Lee JH, Nuthall G, Ikeyama T, Saito O, Mok YH, Shepherd M, et al. Tracheal intubation practice and safety across international PICUs: a report from National Emergency Airway Registry for Children. *Pediatr Crit Care Med.* 2019;20(1):1-8.
19. De Orange FA, Andrade RGAC, Lemos A, Borges PSGN, Figueiroa JN, Kovatsis PG. Cuffed versus uncuffed endotracheal tubes for general anaesthesia in children aged eight years and under. *Cochrane Database Syst Rev.* 2017;11(11):CD011954.
20. Chambers NA, Ramgolam A, Sommerfield D, Zhang G, Ledowski T, Thurm M, et al. Cuffed vs. uncuffed tracheal tubes in children: a randomised controlled trial comparing leak, tidal volume and complications. *Anaesthesia.* 2018;73(2):160-8.
21. Newth CJL, Venkataraman S, Willson DF, Meert KL, Harrison R, Dean JM, et al. Weaning and extubation readiness in pediatric patients. *Pediatr Crit Care Med.* 2009;10(1):1-11.
22. Kurachek SC, Newth CJ, Quasney MW, Rice T, Sachdeva RC, Patel NR, et al. Extubation failure in pediatric intensive care: a multiple-center study of risk factors and outcomes. *Crit Care Med.* 2003;31(11):2657-64.
23. Weiss SL, Fitzgerald JC, Pappachan J, Wheeler D, Jaramillo-Bustamante JC, Salloo A, et al. Global epidemiology of pediatric severe sepsis: the sepsis prevalence, outcomes, and therapies study. *Am J Respir Crit Care Med.* 2015;191(10):1147-57.
24. Weiss SL, Balamuth F, Hensley J, Fitzgerald JC, Bush J, Nadkarni VM, et al. The epidemiology of hospital death following pediatric severe sepsis: when, why, and how children with sepsis die. *Pediatr Crit Care Med.* 2017;18(9):823-30.
25. Weiss SL, Peters MJ, Alhazzani W, Agus MSD, Flori HR, Inwald DP, et al. Surviving Sepsis Campaign international guidelines for the management of septic shock and sepsis-associated organ dysfunction in children. *Pediatr Crit Care Med.* 2020;21(2):e52-e106.
26. Rudd KE, Johnson SC, Agesa KM, Shackelford KA, Tsoi D, Kievlan DR, et al. Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study. *Lancet.* 2020;395(10219):200-11.
27. Nishisaki A, Turner DA, Brown CA 3rd, Walls RM, Nadkarni VM. A National Emergency Airway Registry for children: landscape of tracheal intubation in 15 PICUs. *Crit Care Med.* 2013;41(3):874-85.
28. Curley MAQ, Wypij D, Watson RS, Grant MJC, Asaro LA, Cheifetz IM, et al. Protocolized sedation vs usual care in pediatric patients mechanically ventilated for acute respiratory failure: a randomized clinical trial. *JAMA.* 2015;313(4):379-89.
29. Randolph AG, Wypij D, Venkataraman ST, Hanson JH, Gedeit RG, Meert KL, et al. Effect of mechanical ventilator weaning protocols on respiratory outcomes in infants and children: a randomized controlled trial. *JAMA.* 2002;288(20):2561-8.