



## Study of Psychological and Behavioral Outcomes in Children Admitted in PICU

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#### ABSTRACT

Pediatric Intensive Care Unit (PICU) admissions are essential for the treatment of critically ill children, but the psychological impact of this experience is often neglected, especially in resource-limited settings. The present study was undertaken to evaluate the psychological outcomes of PICU hospitalization, focusing on self-esteem, depression and post-traumatic stress in comparison to children admitted to the general pediatric ward. The study aimed to determine if PICU hospitalization is associated with adverse psychological outcomes and to identify factors contributing to psychological distress in PICU survivors and also to assess whether these psychological effects persist beyond hospitalization. A comparative study was conducted at Mamata Medical College and General Hospital, Khammam, between August 2022 and May 2024. The study included children aged 8 years or older who were admitted to either the PICU or the pediatric ward for at least 48 hours. Children with neurological abnormalities or previous psychiatric illness were excluded. Psychological outcomes were measured using the Rosenberg Self-Esteem Scale (SES), Birlson Depression Self-Rating Scale and Revised Impact of Event Scale (IES). Statistical analysis included t-tests and chi-square tests, with significance set at  $P \leq 0.05$ . The study found no significant difference in self-esteem between PICU children (mean  $30.72 \pm 4.41$ ) and ward children (mean  $30.4 \pm 2.83$ ,  $P > 0.05$ ). However, depression scores were significantly higher in the PICU group (mean  $7.27 \pm 3.71$ ) compared to the ward group (mean  $5.67 \pm 2.84$ ,  $P < 0.05$ ), with follow-up depression scores showing even greater differences ( $P < 0.001$ ). Post-traumatic stress symptoms were also more prevalent in PICU children, with significantly higher IES intrusion ( $P < 0.001$ ) and avoidance scores ( $P < 0.05$ ) compared to the ward children. PICU survivors exhibited a higher prevalence of depression and post-traumatic stress symptoms compared to children admitted to the general pediatric ward, although self-esteem levels were similar. These findings explain the need for early psychological interventions in PICU settings to address long-term mental health issues. A more comprehensive approach to PICU care, which includes attention to the emotional and psychological recovery of children, is recommended to improve overall patient outcomes.

## INTRODUCTION

The Pediatric Intensive Care Unit (PICU) is a critical care setting designed for the management of seriously ill or injured children. This environment, equipped with advanced technology and sophisticated medical interventions, is essential for stabilizing children in life-threatening situations<sup>[1]</sup>. However, the intensive nature of the care provided, including frequent invasive procedures such as intubation, central line placements and mechanical ventilation, as well as non-invasive interventions like continuous monitoring and oxygen therapy, can create a highly stressful and overwhelming experience for the child. For a physiologically unstable child, this unfamiliar and often chaotic environment can induce stress on multiple levels physical, psychological and social<sup>[2]</sup>.

It is well understood that the severity of a child's condition correlates with the intensity and frequency of medical interventions. These interventions, although necessary for survival, often contribute to the emotional trauma experienced by children in the PICU<sup>[3]</sup>. This trauma is not only a result of physical discomfort but also stems from feelings of fear, helplessness and isolation. In younger children, who may lack the verbal skills to express their distress, these psychological effects are often under-recognized<sup>[4]</sup>. Consequently, this unresolved trauma can manifest in various ways, leading to significant psychological disturbances, including anxiety, depression and post-traumatic stress disorder (PTSD), which may persist long after discharge<sup>[5]</sup>.

Despite these risks, emotional and psychological support for children in PICU remains a neglected aspect of care, particularly in resource-limited settings like India. The primary focus has traditionally been on the physical stabilization and survival of critically ill children, with less attention paid to the psychological after-effects of intensive care<sup>[6]</sup>. However, as pediatric critical care continues to evolve and mortality rates decrease due to advancements in medical technology and treatment, there is a growing recognition of the need to address not only physical recovery but also the mental health and emotional well-being of these children.

Recent studies from high-income countries suggest that children who survive critical illness are at risk of developing long-term psychological issues, including PTSD, behavioral changes and emotional disturbances<sup>[7]</sup>. These issues not only affect the child's quality of life but may also have lasting implications on their development and overall mental health<sup>[8]</sup>. In contrast, there is a notable gap in research within the Indian context, where the psychological outcomes of PICU survivors have not been extensively studied. Understanding the prevalence and nature of these psychological disturbances is crucial for developing

interventions that promote holistic recovery, ensuring both physical and emotional well-being.

This study is designed to fill this gap by determining whether PICU hospitalization is associated with adverse psychological outcomes in children. It aims to identify specific risk factors that contribute to psychological distress and assess whether these psychological effects extend beyond the period of hospitalization. By shedding light on this important but underexplored aspect of pediatric critical care, the study will help inform the development of targeted interventions that can mitigate psychological harm and improve the overall quality of care for critically ill children.

## MATERIALS AND METHODS

This was a comparative observational study aimed at assessing the psychological outcomes in children admitted to the Pediatric Intensive Care Unit (PICU) compared to those admitted to the general pediatric ward. The study was conducted in the Department of Pediatrics at Mamata Medical College and General Hospital, Khammam, Telangana, India. The study was carried out over a period of 22 months, from August 2022 to May 2024.

The study included children aged 8 years or older who met the inclusion criteria for PICU and general pediatric ward admissions. These children were divided into two groups:

- **PICU Group:** Children aged 8 years and older who were admitted to the PICU for at least 48 hours without neurological abnormalities.
- **Ward Group (Control Group):** Age- and sex-matched children admitted directly to the general pediatric ward for at least 48 hours, without any neurological conditions.

### Inclusion Criteria:

- Children aged 8 years or older.
- Admission to PICU or pediatric ward for at least 48 hours.
- Absence of neurological abnormalities.

**Exclusion Criteria:** Patients with the following conditions were excluded:

- Epilepsy syndromes.
- Cerebral palsy.
- Developmental delays.
- Mental retardation.
- Neurodegenerative disorders.
- Metabolic disorders.
- Neurotuberculosis and neurocysticercosis.
- Previous psychiatric illnesses.
- Any previous PICU admissions.

### Method of Data Collection:

**Study Setting:** The study was conducted at Mamata Medical College and Hospital, in both the PICU and general pediatric ward settings. There was no formal psychological counseling or preparation provided to children or their parents prior to PICU admission. However, one guardian (preferably female) was allowed to stay with the child throughout the day.

### Interviews and Assessments:

- **First Interview:** Children and their guardians were interviewed within 24 hours of discharge from the PICU or general pediatric ward.
- **Second Interview:** A follow-up interview was conducted one month after discharge. Both interviews assessed the psychological impact and were compared between the PICU and pediatric ward groups.

### Assessment Tools:

**Revised Impact of Event Scale (IES):** This validated 15-item questionnaire was used to assess psychological outcomes such as intrusive symptoms (e.g., nightmares, imagery and sleeplessness) and avoidance behaviors (e.g., emotional numbing and staying away from reminders of the hospital). Total IES scores were categorized as follows:

- **0-8:** Subclinical.
- **9-25:** Mild.
- **26-43:** Moderately severe.
- **44:** Severe.

**Birleson Depression Self-Rating Scale:** This 18-item scale evaluated symptoms such as disturbances in sleep, appetite, mood and interest. A score of 13 or higher indicated the presence of depression. This scale was validated for children aged 8-14 years.

**Rosenberg's Self-Esteem Scale (SES):** This tool was used to assess self-esteem levels, with a score below 23 indicating low self-esteem. The SES is a 10-item scale and was administered in the vernacular language, using visual analogues like smiling, sad and crying faces to simplify responses for children.

**Language Adaptation:** All questionnaires were translated into the local vernacular (regional language) and adapted using a visual Like rt scale for ease of comprehension by children. Simplified visuals (e.g., faces) were used for younger children to represent different levels of emotional response.

### Statistical Analysis:

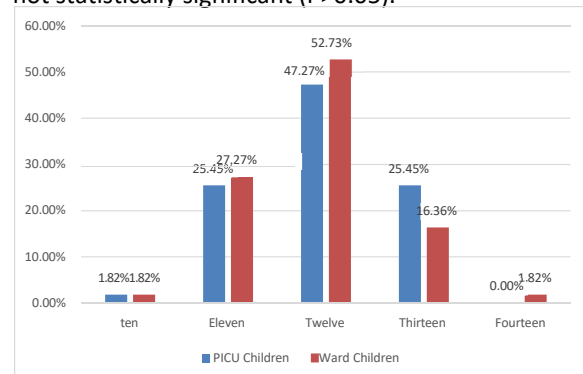
**Descriptive Statistics:** Continuous variables were summarized using averages and standard deviations. Categorical variables were expressed as percentages.

### Comparative Analysis:

- **Student's t-test:** This was used to compare continuous variables between the PICU and ward groups.
- **Chi-square ( $\chi^2$ ) test:** This test was used to compare categorical variables between the groups.
- **Significance Level:** A p-value of  $\leq 0.05$  was considered statistically significant in determining the differences between the groups.

### RESULTS AND DISCUSSIONS

The above table -1 compares the age of study subjects between the two groups. The mean age of children admitted in PICU was  $9.47 \pm 1.39$  years and mean age of children admitted in ward was  $9.89 \pm 1.39$  years. The difference between the mean ages of two groups was not statistically significant ( $P > 0.05$ ).



**Fig. 1:** Comparison of SES Between the two Groups (%)

The above Figure compares the total score between the PICU and Ward children. The total mean of PICU children was  $1.72 \pm 1.17$  and the same of the ward children was  $0.12 \pm 0.38$ . The difference of means between the two groups was statistically very highly significant ( $P < 0.001$ ).

**The Diagnoses of Both Groups Were Compared in the Above Table-3:** The results revealed that the diagnosis of both groups was differed and the difference between them was statistically very highly significant ( $P < 0.01$ ).

The table 3 states the comparison between the two groups IES intrusion scores. The mean IES intrusion of PICU was  $1.6 \pm 0.82$ . The mean intrusion of ward children was  $0.12 \pm 0.38$ . The difference between the means of IES intrusion was statistically very highly significant ( $P < 0.001$ ).

The above table 4 states the comparison between the two groups in respect of IES avoidance. The mean IES avoidance of PICU children was  $0.12 \pm 0.54$ . The mean IES avoidance of ward children was  $0.0 \pm 0.0$ . The difference of means between the two groups was statistically significant ( $P < 0.05$ ).

The above table -8 compares the total score between the PICU and Ward children. The total mean of PICU

**Table 1: Comparison of Age of Children Between PICU and Ward Admissions**

	PICU Children		Ward Children	
Age(years)	Frequency	%	Frequency	%
8	19	34.55%	9	16.36%
9	12	21.82%	19	34.55%
10	9	16.36%	6	10.91%
11	9	16.36%	11	20.00%
12	6	10.91%	10	18.18%
Total	55	100.00%	55	100.00%
Mean±SD	9.47±1.39		9.89±1.39	
Significance	t=1.569,df=108,P=0.120			

**Table 2: Comparison of two Groups According to Their Diagnosis**

Diagnosis	PICU		Ward		Total	
	No	%	No	%	No	%
Acute Tonsillitis	0	0.00%	2	3.64%	2	1.82%
Acute rheumatic fever	3	5.45%	0	0.00%	3	2.73%
Acute Urticaria	0	0.00%	5	9.09%	5	4.55%
AFI	9	16.36%	11	20.00%	20	18.18%
AGN	3	5.45%	0	0.00%	3	2.73%
Bronchial Asthma	4	7.27%	3	5.45%	7	6.36%
Bronchopneumonia	4	7.27%	2	3.64%	6	5.45%
Dengue fever	13	23.64%	3	5.45%	16	14.55%
Enteric fever	1	1.82%	6	10.91%	7	6.36%
Hepatitis	1	1.82%	7	12.73%	8	7.27%
HSP	0	0.00%	2	3.64%	2	1.82%
Left side empyema	1	1.82%	0	0.00%	1	0.91%
Meningitis	2	3.64%	0	0.00%	2	1.82%
Right side empyema	1	1.82%	0	0.00%	1	0.91%
ITP	1	1.82%	0	0.00%	1	0.91%
Snakebite	2	3.64%	0	0.00%	2	1.82%
Naphthalene Poisoning	2	3.64%	0	0.00%	2	1.82%
MALARIA	2	3.64%	1	1.82%	3	2.73%
Nephrotic syndrome	2	3.64%	4	7.27%	6	5.45%
Urticaria	1	1.82%	0	0.00%	1	0.91%
Thalassemia	2	3.64%	2	3.64%	4	3.64%
UTI	1	1.82%	7	12.73%	8	7.27%
Total	55		55		110	100%

 $\chi^2=45.83$ df=1P=0.0013**Table 3: Comparison of IES Impact of Event Scale-Intrusion Between the two Groups**

IES Intrusion Score	PICU Children		Ward Children	
	Frequency	%	Frequency	%
0	5	9.09%	49	89.09%
1--4	50	90.91%	6	10.91%
Total	55	100.00%	55	100.00%
Mean±SD	1.6±0.82		0.12±0.38	
Significance	P<0.001.			

**Table 4: Comparison of IES Impact of Event scale-Avoidance Between the two Groups**

	PICU Children		Ward Children	
IES Avoidance Score	Frequency	%	Frequency	%
0	52	94.55%	55	100%
2	2	3.64%	0	0%
3	1	1.82%	0	0%
Total	55	100.00%	55	100%
Mean±SD	0.12±0.54		0.0±0.0	
Significance	P=0.037			

**Table 5: Comparison of Total Scores IES Between PICU and Ward Children**

	PICU Children		Ward Children	
Total Score	Frequency	%	Frequency	%
0	5	9.09%	49	89.09%
1-5	49	89.09%	6	10.91%
5-7	1	1.82%	0	0.00%
Total	55	100.00%	55	100.00%
Mean±SD	1.72±1.17		0.12±0.38	
Significance	P<0.001.			

**Table 6: Comparison of Birleson Depression Scale Between the two Groups**

	PICU Children		Ward Children	
Birleson Depression Score	Frequency	%	Frequency	%
0	1	1.82%	0	0.00%
1-10	44	80.00%	50	90.91%
10-20	10	18.18%	5	9.09%
Total	55	100.00%	55	100.00%
Mean±SD	7.27±3.71		5.67±2.84	
Significance	P=0.019.			

**Table 7: Comparison of Self-Esteem (SES) Between the PICU and Ward Children**

Self-Esteem Scale Score	PICU Children		Ward Children	
	Frequency	%	Frequency	%
25-30	39	70.91%	39	70.91%
30-35	5	9.09%	13	23.64%
35-40	11	20.00%	3	5.45%
Total	55	100.00%	55	100.00%
Mean±SD	30.72±4.41		30.4±2.83	
Significance	P=0.644			

**Table 8: Comparison of FU (FollowUp)-IES Avoidance Between the two Groups**

FU-IES Avoidance Score	PICU Children		Ward Children	
	Frequency	%	Frequency	%
0	55	100.0	55	100.0
Total	55	100.0	55	100.0
Mean±SD	0.0		0±0	
Significance				

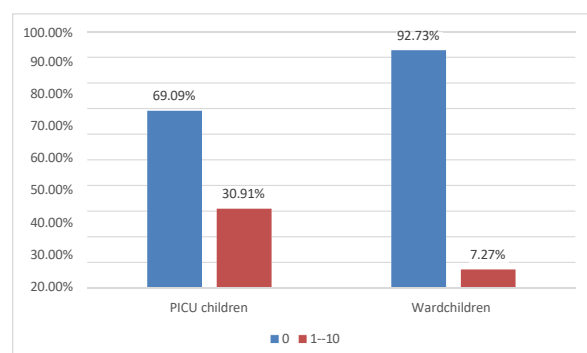
**Table 9: Comparison of FU (Follow Up)-Birleson Depression Scale Between the two Groups**

FU-Birleson Depression Score	PICU Children		Ward Children	
	Frequency	%	Frequency	%
0	1	1.82%	0	0.00%
1-10	52	94.55%	55	100.00%
10-12	2	3.64%	0	0.00%
Total	55	100.00%	55	100.00%
Mean±SD	5.12±2.44		2.43±1.04	
Significance	P<0.001			

children was  $1.72 \pm 1.17$  and the same of the ward children was  $0.12 \pm 0.38$ . The difference of means between the two groups was statistically very highly significant ( $P < 0.001$ ).

The table 6 compares the Birleson depression scale between the two groups of PICU and ward children. The mean of the PICU children was  $7.27 \pm 3.71$  and ward children was  $5.67 \pm 2.84$ . The difference between the means was statistically significant ( $P < 0.05$ ).

The above table 7 compares the self-esteem of both groups. The mean self-esteem of PICU children was  $30.72 \pm 4.41$ . The mean self-esteem of ward children was  $30.4 \pm 2.83$ . The difference between the means was not statistically significant ( $P > 0.05$ ).

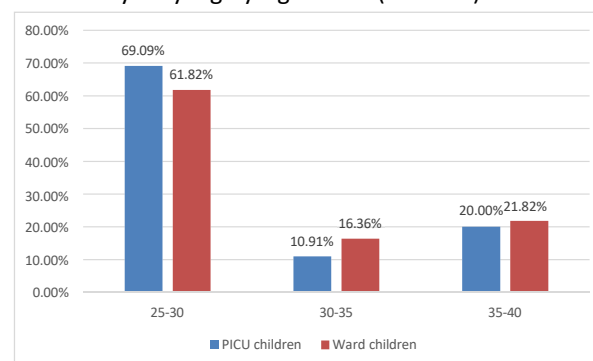


**Fig. 2: Comparison of FU (Follow Up)-IES Intrusion Between the two Groups**

The above figure states the comparison of FU IES intrusion between the two groups. The mean of PICU group was  $0.23 \pm 0.511$  and the mean of ward group was  $0.07 \pm 0.26$ . The difference between the mean of both groups was statistically very highly significant ( $P < 0.001$ ).

The above table 8 states the comparison of FU IES avoidance between the two groups. Both groups had recorded centum of NIL score.

The table 9 shows the FU Birleson depression between the two groups. The mean of PICU group was  $5.12 \pm 2.44$  and the ward group was  $2.43 \pm 1.04$ . The difference between the two groups means was statistically very highly significant ( $P < 0.001$ ).



**Fig. 3: Comparison of FU (Follow Up) Self Esteem Scale Between the two Groups**

The follow-up self-esteem scores showed that 69.09% of PICU children and 61.82% of ward children scored between 25-30. The mean score for PICU children ( $31.96 \pm 4.94$ ) was higher than for ward children ( $30.07 \pm 2.79$ ). A significant difference was found between the groups ( $t = 2.468$ ,  $p = 0.015$ ), indicating PICU children had significantly higher self-esteem scores during follow-up.

This study explored the psychological outcomes of children admitted to the Pediatric Intensive Care Unit (PICU) compared to those admitted to the general pediatric ward. Various parameters, such as self-esteem, depression and post-traumatic stress symptoms, were assessed using validated scales, including the Rosenberg's Self-Esteem Scale (SES), Birleson Depression Self-Rating Scale and the Revised Impact of Event Scale (IES).

The follow-up self-esteem scores showed no significant difference between PICU and ward children, with the mean scores being  $30.72 \pm 4.41$  and  $30.4 \pm 2.83$ , respectively ( $P > 0.05$ ). This result aligns with earlier studies, such as Ko *et al.* (2021), which also reported that self-esteem levels in PICU survivors did not differ significantly from non-PICU patients in the long term<sup>[9]</sup>. The psychological resilience of children and the absence of major neurological or psychiatric conditions in the study population may have contributed to this finding.

The Birlleson Depression Self-Rating Scale showed a statistically significant difference between PICU and ward children, with the mean score for PICU children being higher ( $7.27 \pm 3.71$ ) compared to ward children ( $5.67 \pm 2.84$ ,  $P < 0.05$ ). The follow-up assessment showed an even greater difference ( $5.12 \pm 2.44$  in PICU vs.  $2.43 \pm 1.04$  in the ward group,  $P < 0.001$ ), indicating that depression was more prevalent in PICU survivors. This aligns with studies such as those by Muranjan *et al.* (2014), which demonstrated that PICU survivors were at a higher risk of developing depression due to the traumatic experiences they encountered during critical care<sup>[10]</sup>.

Post-traumatic stress was assessed using the Revised Impact of Event Scale (IES). The IES intrusion scores were significantly higher in PICU children (mean  $1.6 \pm 0.82$ ) compared to ward children (mean  $0.12 \pm 0.38$ ,  $P < 0.001$ ). Similarly, IES avoidance showed a significant difference between PICU and ward children (PICU mean  $0.12 \pm 0.54$  vs. ward mean  $0.0 \pm 0.0$ ,  $P < 0.05$ ). This suggests that children who experience critical care in the PICU are at a higher risk of developing intrusive and avoidance symptoms related to post-traumatic stress. These findings are consistent with the work of Rees *et al.* (2004), who found that a considerable number of PICU survivors exhibited post-traumatic stress symptoms months after discharge<sup>[11]</sup>.

The diagnoses of children in both groups varied significantly ( $P < 0.01$ ). This difference might have contributed to the variation in psychological outcomes, as children with more severe or life-threatening conditions, often admitted to PICU, tend to have higher psychological stress, leading to poorer outcomes. Studies such as those by van Silver *et al.* (2018) have indicated that the severity of illness is directly related to the psychological distress experienced by the child, supporting the significant differences observed in our study<sup>[12]</sup>.

The mean age of children admitted to PICU was  $9.47 \pm 1.39$  years, while the ward group had a mean age of  $9.89 \pm 1.39$  years. The difference between the two groups was not statistically significant ( $P > 0.05$ ), indicating that age was not a contributing factor to the observed psychological outcomes. Previous research has also demonstrated that while younger age may

contribute to increased emotional vulnerability, children across age groups can experience psychological trauma after a PICU admission<sup>[13]</sup>.

## CONCLUSION

This study highlights the psychological impact of PICU hospitalization on children, particularly in terms of increased depressive symptoms and post-traumatic stress. While self-esteem differences were not significant between PICU and ward children, PICU survivors exhibited significantly higher levels of depression and post-traumatic stress, suggesting the need for early psychological intervention and follow-up care for these patients. The findings are consistent with earlier studies, emphasizing that while critical care improves survival rates, there is an urgent need to focus on reducing long-term psychological morbidity. A comprehensive approach to PICU care should include not only life-saving interventions but also measures aimed at supporting the mental health and emotional recovery of critically ill children.

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