Kufa Medical Journal | Vol. 20, No. 1, 2024

Original Article | DOI: https://doi.org/10.36330/kmj.v20i1.16144

p-ISSN: 1993-517X

e-ISSN: 2709-4464

Admission Pattern and Treatment Outcome in Pediatric Intensive Care Unit in Al Zahraa Teaching Hospital, Iraq, Najaf

Neam Arkan Mohsen[1] and Alaa Jumaah Manji Nasrawi[2]

[1,2] *University of Kufa, Faculty of Medicine, Department of Pediatrics, Iraq.*

E-mail: alaaj.nasrawi@uokufa.edu.iq

ABSTRACT

Background: *The Pediatric Intensive Care Unit (PICU) represents a specialized healthcare setting dedicated to providing critical care for infants, children, and adolescents facing severe and life-threatening medical conditions. The rate of pediatric mortality in the Pediatric Intensive Care Unit (PICU) varies worldwide, reflecting the diverse healthcare landscapes and socioeconomic factors influencing pediatric critical care outcomes. The objective of this study was to describe the pattern of admission and outcome of patients who received intensive care.*

The objective of this study *was to describe the pattern of admission and outcome of patients who received intensive care.*

Patients and methods: *A retrospective study in which records of admissions (from 1st of January 2019 to 31 December 2023) were obtained from the PICU patient's file in Al Zahraa Teaching, Najaf, Iraq. Data used from the records included age, sex, residency, address, source of admission, diagnosis, duration of stay in the unit, need for intubation and mechanical ventilation, and patient outcome.* ***Results:*** *A total number of 1501 patients were admitted to the PICU during the study period. The patients were referred mainly from the Emergency Room 47% followed by the neonatal intensive care unit 21%. The case fatality rate was 54.1%. the main cause of death was RDS, sepsis, meningitis, and congenital heart diseases (29.2, 8.5, 6.6, and 6.6% respectively). 47.9% of PICU deaths occurred in patients admitted from the ER followed by NICU 24.2%. (P value 0.043, OR 1.082, 95% CI 1.002-1.168). The mean age of dead PICU patients was 15.697±32.79 months versus 23.301±39.91 months for discharged outcome (P value 0.000). Hospital stay length mean for PICU dead patients was 5.1±3.8 days versus 6.173±3.8 days for discharged patients (P value 0.000). That means the smaller age patients carry a higher risk of death in PICU, also the situation with fewer hospital stays days.*

Conclusions: *This study showed the case fatality rate was high (54.7%.). The most common causes of admission and death were RDS (22.7% and 29.2% respectively). The highest percentage of death occurs in the infant age group (78.1%). Neither gender nor residency represents a risk factor for PICU patient's death but endotracheal intubation does. The fewer days of hospital stay carry a higher risk factor for death.*

Keywords: PICU, NICU, Mortality, Outcome, Cause of death.

Article Information

Received: March 25, 2024; Revised: May 30, 2024; Online: June, 2024

INTRUDUCTION

The Pediatric Intensive Care Unit (PICU) represents a specialized healthcare setting dedicated to providing critical care for infants, children, and adolescents facing severe and life-threatening medical conditions. Essential for managing a diverse range of cases, including respiratory distress, cardiac emergencies, neurological disorders, and traumatic injuries, the PICU serves as a vital component within the broader healthcare system [(1)]. Research plays a pivotal role in enhancing the care provided in Pediatric Intensive Care Units (PICUs) and ultimately contributes to improving pediatric mortality outcomes. [(6)]. Translating research findings from the Pediatric Intensive Care Unit (PICU) into clinical practice is a critical step in improving patient outcomes. Successful translation involves collaboration among healthcare professionals, administrators, and researchers to overcome barriers and facilitate the adoption of proven interventions [(2)]. Continuous education and training programs ensure that healthcare providers are informed about the latest evidence and can apply it in real-world patient care [(3)].

Aims of the Study

The objective of this study was to describe the pattern of admission and outcome of patients who received intensive care.

PATIENTS AND METHODS

A retrospective study in which records of admissions (from 1st of January 2019 to 31 December 2023) were obtained from the PICU records in Al Zahraa Teaching Hospital for child health and maternity. This hospital is a tertiary care center in Al Najaf city, Iraq. It is equipped with a six-bedded modern PICU, which admits pediatric patients from both medical and surgical subspecialties for immediate critical postoperative care. PICU records of all admissions, transfer out, discharges, and deaths were used for this study. Data used from the records included age, sex, residency, address, source of admission, diagnosis, duration of stay in the unit, need for intubation and mechanical ventilation, and patient outcome.

Ethical approval was given by the Ethics Committee of the pediatrics department.

The data obtained were entered into the Statistical Package for Scientific Solutions (SPSS) version 28.0 spreadsheet and analyzed. Means, standard deviations, percentages, and ranges were used as appropriate to describe continuous variables

RESULTS

A total number of 1501 patients were admitted to the PICU in Al Zahraa Teaching Hospital for Child Health and Maternity in a period between 1st of January 2019 to 31 December 2023. See Figure 1.

The patient's age ranges from 1 to 288 months with an average of 19.2 ± 36.4 months. They had stayed in PICU for an average of 5.6 ± 3.48 days ranging from 30 to 1 day. About Forty percent of patients who admitted to PICU were lived outside Al Najaf city. Other Socio-demographic variables are shown in Table 1.

The main cause of PICU admission was respiratory distress syndrome (RDS), 22.7% followed by pneumonia 7.8%. Other causes are shown in Table 2 in sequences.

The most common body system involved in patients who had been admitted to PICU was the Respiratory system 47.7% followed by surgical cases 14.1%. Other systems involved are shown in Figure 2.

The main hospital department that referred most of the patients to the PICU was the Emergency Room 47% followed by neonatal intensive care unit 21%. Other department percentages are shown in Figure 3.

The case fatality in Al Zahraa Teaching Hospital is 54.7%. About 54% of PICU patients required endotracheal intubation and mechanical ventilation. The case fatality in Al Zahraa Teaching Hospital is 54.7%. About 54% of PICU patients required endotracheal intubation

and mechanical ventilation. 64.4% of intubated patients died versus 41.8% discharged (P value 0.000, OR 0.403 95%CI 0.325-0.501). Other patient's characteristics pose no risk factor for death as shown in Table 4.

Respiratory distress syndrome (RDS) followed by sepsis represents the main cause of death in PICU, 29.2% and 8.5% respectively. (P value 0.000, OR 1.058, 95%CI 1.042-1.074). Other diagnoses of PICU patients with their frequencies and percentages are stated in Table 5. , 54.3% of deaths were due to diseases of the respiratory tract followed by the central nervous system at 12.9%. (P value 0.630, OR 0.986, 95% CI 0.932-1.044). Other systems involved are described in table 6.

47.9% of PICU deaths occurred in patients admitted from the emergency room (ER) followed by neonatal intensive care unit (NICU) 24.2%. (P value 0.043, OR 1.082, 95% CI 1.002-1.168). Other referral wards and their contribution to PICU deaths are shown in Table 7., The mean age of dead PICU patients was 15.697±32.79 months versus 23.301±39.91 months for discharged outcome. (P value 0.000). Hospital stay length also represents a risk factor for PICU patient's death as shown in Table 8.

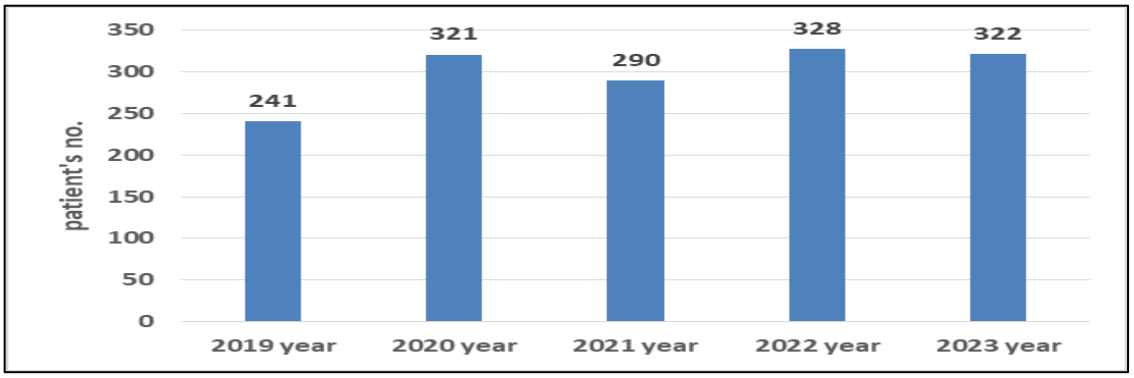

Figure 1: Number of patients admitted to PICU for each year.

Table 1: Socio-demographic variable of PICU patients.

Age group (months)	Patient no.	%
< 12	1109	73.9
13 to 59	192	12.8
60 to 120	168	11.2
> 120	32	2.1
Gender		
Male	828	55.2
Female	673	44.8
Residency		
Rular	842	56.1
Urban	659	43.9
Address		
Najaf	876	58.4
Diwaniyah	303	20.2
Samawah	224	14.9
Hila	54	3.6
Baghdad	36	2.4
Others	8	0.5
Total	1501	100

Table 2: The causes of PICU admission.

Diagnosis	Frequency	Percent
RDS	340	22.7
Pneumonia	117	7.8
CHD	99	6.6
Sepsis	94	6.3
Meningitis	81	5.4
Intussusception	79	5.3
DKA	67	4.5
Renal Failure	61	4.1
Status Epilepticus	50	3.3
Pneumothorax	49	3.3
Diaphragmatic Hernia	46	3.1
Surgical Cases	45	3.0
ICH	40	2.7
Metabolic	34	2.3
Unknown	30	2.0
HIEP	28	1.9
TEF	23	1.5
Electrical Shock	22	1.5
Poisoning	20	1.3
Hepatic Failure	20	1.3
Severe Dehydration	20	1.3
Scorpion Bite	18	1.2
COVID-19	16	1.1
Status Asthmaticus	16	1.1
GBS	14	0.9
Submersion	14	0.9
CRRT	11	0.7
Gastroschisis	10	0.7
Omphalocele	9	0.6
Burn	9	0.6
HBV	6	0.4
Croup	5	0.3
Tetanus	4	0.3
Drug Poisoning	2	0.1
Miscellaneous	2	0.1
Total	1501	100.0

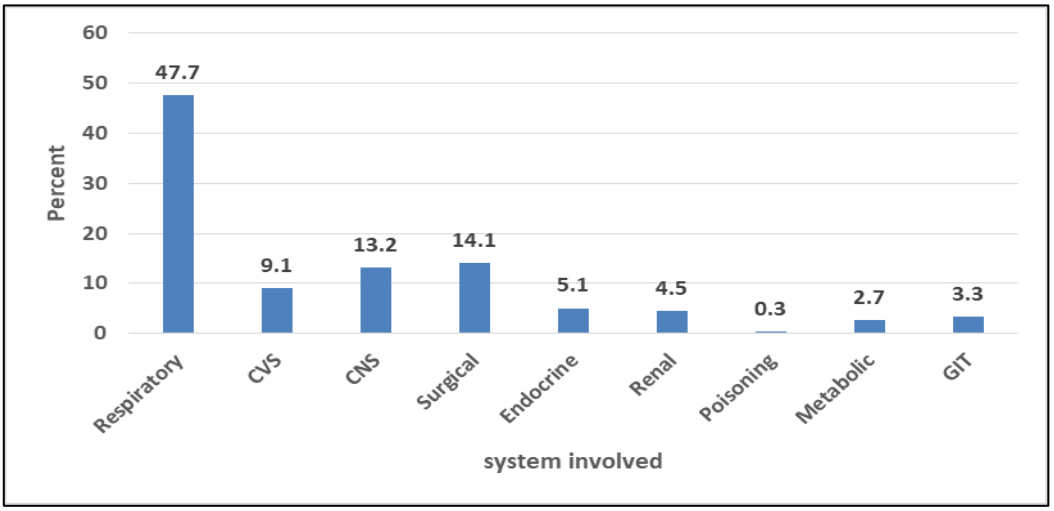

Figure 2: System involved in patients admitted to PICU.

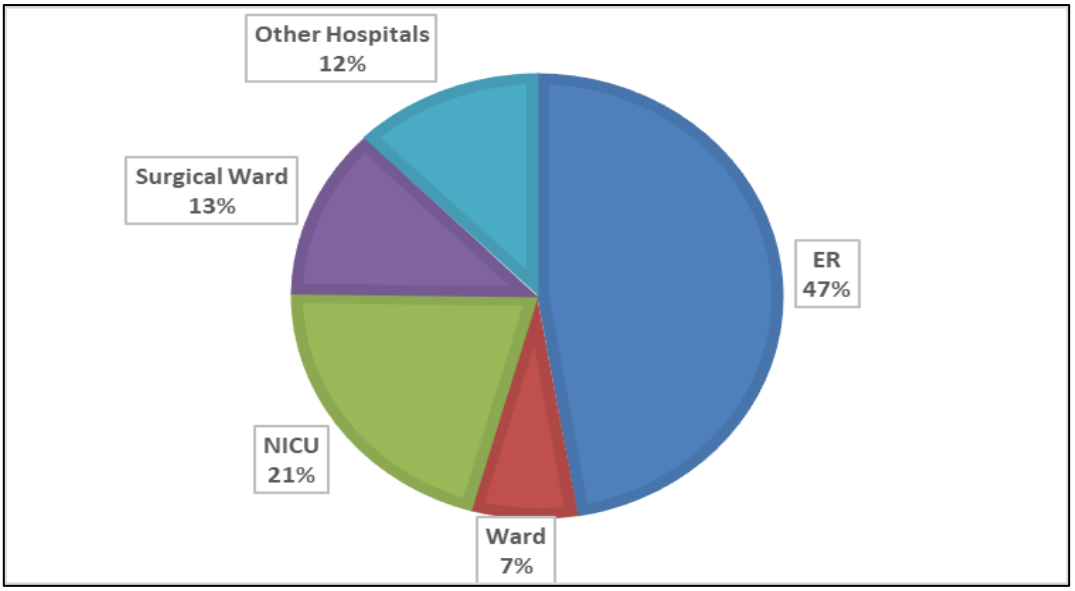

Figure 3: the main hospital departments that referred patients to PICU.

Table 3: The outcome of patients admitted to PICU.

Variables		Frequency	Percent
ET	No	687	45.8
	Yes	814	54.2
Fate	Dead	821	54.7
	Discharged	680	45.3
Total		1501	100.0

Table 4: Socio-demographic variable and outcome of patients in PICU.

		Fate				P value	OR	95% CI	
		Dead		Discharged					
		N	%	N	%			Lower	Upper
Gender	Male	442	53.8	386	56.8	0.197	0.859	0.683	1.082
	Female	379	46.2	293	43.2				
Residency	Rular	471	57.4	370	54.5	0.298	1.130	0.898	1.422
	Urban	350	42.6	309	45.5				
ET	NO	292	35.6	395	58.2	0.000	0.403	0.325	0.501
	Yes	529	64.4	284	41.8				
Age Groups (months)	< 12	641	78.1	468	68.9	0.004	1.253	1.077	1.458
	13 to 59	99	12.1	93	13.7				
	60 to 120	66	8	101	14.9				
	> 120	15	1.8	17	2.5				

Table 5: Diagnosis of patients admitted to PICU and their outcome.

	Fate						P value	OR	95% CI	
	Dead		Discharged		Total					
Diagnosis	N	%	N	%	N	%			Lower	Upper
Unknown	30	3.7	0	0	30	2	0.000	1.058	1.042	1.074
Meningitis	54	6.6	27	4	81	5.4				
RDS	239	29.2	101	14.9	340	22.7				
Pneumothorax	16	2	33	4.9	49	3.3				
CHD	54	6.6	45	6.6	99	6.6				
Sepsis	70	8.5	24	3.5	94	6.3				
Surgical Cases	15	1.8	30	4.4	45	3				
GBS	12	1.5	2	0.3	14	0.9				
Renal Failure	42	5.1	19	2.8	61	4.1				
Status Epilepticus	13	1.6	37	5.4	50	3.3				
Pneumonia	51	6.2	65	9.6	116	7.7				
DKA	21	2.6	46	6.8	67	4.5				
Poisoning	13	1.6	7	1	20	1.3				
TEF	16	2	7	1	23	1.5				
Intussusception	39	4.8	40	5.9	79	5.3				
Diaphragmatic Hernia	18	2.2	28	4.1	46	3.1				
Omphalocele	2	0.2	7	1	9	0.6				
Metabolic	28	3.4	6	0.9	34	2.3				
Electrical Shock	7	0.9	15	2.2	22	1.5				
ICH	22	2.7	18	2.7	40	2.7				
Burn	4	0.5	5	0.7	9	0.6				
HBV	2	0.2	4	0.6	6	0.4				
Scorpion Bite	1	0.1	17	2.5	18	1.2				
Submersion	6	0.7	8	1.2	14	0.9				
Hepatic Failure	5	0.6	15	2.2	20	1.3				
HIEP	19	2.3	9	1.3	28	1.9				
COVID-19	6	0.7	10	1.5	16	1.1				

Gastroschisis	1	0.1	9	1.3	10	0.7				
Status Asthmaticus	3	0.4	13	1.9	16	1.1				
Drug Poisoning	2	0.2	0	0	2	0.1				
Tetanus	4	0.5	0	0	4	0.3				
Severe Dehydration	2	0.2	18	2.7	20	1.3				
Croup	2	0.2	3	0.4	5	0.3				
CRRT	0	0	11	1.6	11	0.7				

Table 6: Body systems involved and PICU patient outcomes.

System Involved	Fate				P value	OR	95% CI	
	Dead		Discharged				Lower	Upper
	N	%	N	%				
Respiratory	446	54.3	269	39.6	0.630	0.986	0.932	1.044
CVS	65	7.9	72	10.6				
CNS	106	12.9	92	13.5				
Surgical	89	10.8	122	18				
Endocrine	27	3.3	49	7.2				
Renal	40	4.9	28	4.1				
Poisoning	3	0.4	2	0.3				
Metabolic	33	4	7	1				
GIT	12	1.5	38	5.6				

Table 7: Referral wards to PICU and patient outcomes.

Referral Ward	Fate				P value	OR	95% CI	
	Dead		Discharged				Lower	Upper
	N	%	N	%				
ER	393	47.9	317	46.7	0.043	1.082	1.002	1.168
Ward	56	6.8	49	7.2				
NICU	199	24.2	114	16.8				
Surgical Ward	72	8.8	114	16.8				
Other Hospitals	101	12.3	85	12.5				

Table 8: hospital stay and patient age in relation to their outcome.

	fate	N	Mean	Std. Deviation	P value
hospital stay (days)	Dead	821	5.107	3.8	0.000
	Discharged	676	6.173	3.8	
Age (months)	Dead	821	15.697	32.79	0.000
	Discharged	677	23.301	39.91	

DISCUSSION

This study looked at treatment outcomes and associated factors in pediatric patients admitted to the PICU. The PICU is a special unit that focuses on the care of critically ill patients. To achieve a positive outcome, all aspects of patient management must be thoroughly understood. [4]A pediatric intensive care unit's goal is to prevent death by closely monitoring and treating critically ill children who are considered to be at higher risk of death.

During the study period (from 2019 till 2023) a total number of 1501 patients had been admitted to PICU. This admission rate was less than that described by Parasher et al [5] who counted 2810 patients admitted into PICU in Udaipur district of Rajasthan in India from January 2016 to December 2020. However, their PICU was of ten beds and the city has a higher population number. The highest percentage of patients age group admitted to PICU was infants (73.9%), this goes with Parasher et al [5], Edae et al [6], and Gresh et al [7].

Of PICU patients, 55.2% were male versus 44.8% female. Male predominance also has been described by Parasher et al [5], Edae et al [6], and Abhulimhen-Iyoha [17 8]. Male gender is a known risk factor for many diseases. [9] Rural residents resemble 56.1% versus 53.9% of urban residents. This finding is against Dendir et al [10] who count 53.3% urban versus 46.7% rural residents. A total percent of 43.6 PICU patients were outside Najaf city, many of them from rural areas in which the health care standards are below optimum.

The main cause of PICU admission was respiratory distress syndrome (RDS), 22.7% followed by pneumonia, congenital heart diseases, and sepsis, 7.8%, 6.6%, and 6.3% respectively. Parasher et al [5] describes a 39.2% of admission were due to surgical diseases followed by pneumonia 17.3% and sepsis 15.2%. Edae et al [6] show that 14.2% of patients were admitted due to acute kidney injury followed by meningitis and pneumonia, 12.3% and 11.5% respectively. This difference may be attributed to the presence of assisted ventilation facilities within neonatal intensive care in these hospitals which is not the situation in ours that required referral of neonates with RDS to PICU. According to the above-mentioned findings, logically respiratory system is the most involved system in PICU patients accounting for 47.7%. Tazebew et al [11], also describe that the respiratory system is the mainly involved system in PICU patients in Addis Ababa, the capital city of Ethiopia but with a lower percentage (10%). Unlike Abhulimhen-Iyoha [8] who stated that 41.1% of PICU patients in India were admitted due to cardiovascular diseases.

By far, the emergency room (ER) was the main referral hospital ward to PICU with 47% followed by NICU at 21%. This is quite logical and supported by Edae et al [47] who found that 52.3% of PICU patients were referred from ER. The case fatality in Al Zahraa Teaching Hospital PICU was 54.7%. this mortality rate is lower than that found by Dendir et al [10] (71.8%) and much higher than that found by Parasher et al [14 5] and Abhulimhen-Iyoha [8], 2.1% and 2.4% respectively. I think that adding the NICU critically ill patients to the PICU may augment its mortality rate as the highest death in the pediatric age group is during the neonatal period.

54.2% of PICU patients required intonation and mechanical ventilation, again this is logical because the main system involved was the respiratory. This is close to Dendir et al [10] findings, of 43.4%, and against Tazebew et al [11] who count only 10% of PICU patients who need mechanical ventilation.

Neither gender nor residency resembles a risk factor for death in PICU patients (P value 0.197, OR 0.859, 95% CI 0.683-1.082, P value 0.298, OR 1.130, 95% CI 0.898-1.422 respectively). These findings are in agreement with Edae et al [6], Abhulimhen-Iyoha [17 8]., and Tazebew et al [11]. We have found that 64.4% of intubated

PICU patients, were died (P value 0.000, OR 0.403, 95% CI 0.325-0.501). This came in agreement with Dendir et al [10] who found that 61% mortality rate in PICU intubated patients. The infant age group resembles 78.1% of the case mortality rate in comparison to other age groups in PICU patients. A closer mortality rate for this age group was also described by Parasher et al [5] and Edae et al [6].

We have found that the main cause of death in PICU patients was RDS followed by sepsis, meningitis, congenital heart disease, and pneumonia (29.2%, 8.5%, 6.6%, 6.6%, and 6.2% respectively). According to Parasher et al [5], 38% of PICU deaths were due to sepsis, followed by meningitis (32.2%), congenital heart disease (29.9%), and pneumonia (22%). If we omit the burden of NICU-referred patients we can match the results of the leading cause of death. According to the above-mentioned results, the main system involved in PICU death was the respiratory system (54.3%) followed by the central nervous system, surgical cases, and cardiovascular systems (12.9%, 10.8%, and 7.9 respectively).

Out of total PICU death; 47.9% occurred in patients admitted from the emergency room (ER) followed by neonatal intensive care unit (NICU) 24.2%. (P value 0.043, OR 1.082, 95% CI 1.002-1.168). both of these wards deal with critically ill patients and resemble the main referral source for PICU admission. Edae et al [6] have found that 52% of PICU patients were admitted from ER, however, NICU contributed to only 1.2%.

The mean age of dead PICU patients was 15.697±32.79 months versus 23.301±39.91 months for discharged outcome (P value 0.000). Hospital stay length mean for PICU dead patients was 5.1±3.8 days versus 6.173±3.8 days for discharged patients (P value 0.000). That means the smaller age patients carry a higher risk of death in PICU, also the situation with fewer hospital stays days. Tazebew et al [11] state that the majority of the children (84.2%) stayed in the ICU for less than seven days.

CONCLUSIONS

In conclusion, this study showed the case fatality rate was high (54.7%.). The most common causes of admission and death were RDS (22.7% and 29.2% respectively). The highest percentage of death occurs in the infant age group (78.1%). Nearly half of PICU cases were referred from ER (47%) followed by NICU (21%). Neither gender nor residency represents a risk factor for PICU patient's death but endotracheal intubation does. The fewer days of hospital stay carry a higher risk factor for death

RECOMMENDATIONS

1. Minimizing the death rate in Pediatric Intensive Care Units (PICU) involves a multifaceted approach that includes:
   A. Improving Quality of Care: Implementing evidence-based clinical guidelines, continuous staff education, and training can enhance patient care.
   B. Early Recognition and Management: Prompt identification and treatment of critical conditions can improve outcomes. This includes the use of early warning systems and rapid response teams.
   C. Regular Audits and Feedback: Conducting regular audits of PICU practices and outcomes, followed by feedback, can help identify areas for improvement.
2. Respiratory support by mechanical ventilation should be settled within the NICU to minimize the burden upon the PICU.
3. More focus should be directed toward the main cause of PICU death namely RDS, by revision of standard management consequences and staff training.

Limitations

Paperwork with patient's files is time-consuming with missing information. An electronic database may give more accurate and easy-to-access patient information.

REFERENCES

1. Tasker R. C., & Pediatric Intensive Care Society Study Group. (2005). Paediatric intensive care: principles of practice. Pediatric Anesthesia, 15(10), 801-805.
2. Curley, M. A. Q., Wypij, D., Watson, R. S., Grant, M. J., Asaro, L. A., Cheifetz, I. M., ... & Matthay, M. A. (2016). Protocolized sedation vs usual care in pediatric patients mechanically ventilated for acute respiratory failure: a randomized clinical trial. JAMA, 315(5), 456-465.
3. Kleinpell, R., Ely, E. W., Williams, G., Liolios, A., Ward, N., & Tisherman, S. A. (2017). Promoting evidence-based practice and nursing research through a mentoring program for acute care nurse practitioners. AACN Advanced Critical Care, 28(4), 359-366.
4. Downes JJ. Development of pediatric critical care medicine—how did we get here and why? In: Science and Practice of Pediatric Critical Care Medicine. Springer; 2009:1–28.
5. Parasher, V., Shaha, S., Khatri, R., Yadav, S., Das, S., & Mittal, U. (2021, April 27). Pattern of admission and clinical outcome of patients admitted in pediatric intensive care unit of a rural tertiary health care centre. International Journal of Contemporary Pediatrics, 8(5), 849. https://doi.org/10.18203/2349-3291.ijcp20211675.
6. Edae, G., Tekleab, A. M., Getachew, M., & Bacha, T. (2022). Admission Pattern and Treatment Outcome in Pediatric Intensive Care Unit, Tertiary Hospital, Addis Ababa, Ethiopia. Ethiopian journal of health sciences, 32(3), 497–504. https://doi.org/10.4314/ejhs.v32i3.4.
7. Gresh, H., & Othman, R. (2018, December 31). Admission Patterns and Outcome in a Pediatric Intensive Care Unit at Tobruk Hospital. Al-Mukhtar Journal of Sciences, 33(4), 298–305. https://doi.org/10.54172/mjsc.v33i4.293.
8. Abhulimhen-Iyoha, B. I., Pooboni, S. K., & Vuppali, N. K. K. (2014, January). Morbidity Pattern and Outcome of Patients Admitted into a Pediatric Intensive Care Unit in India. Indian Journal of Clinical Medicine, 5, IJCM.S13902. https://doi.org/10.4137/ijcm.s13902.
9. Vlassoff C. (2007). Gender differences in determinants and consequences of health and illness. Journal of health, population, and nutrition, 25(1), 47–61.
10. Dendir, G., Awoke, N., Alemu, A., Sintayhu, A., Eanga, S., Teshome, M., Zerfu, M., Tila, M., Dessu, B. K., Efa, A. G., & Gashaw, A. (2023, March). Factors Associated with the Outcome of a Pediatric Patients Admitted to Intensive Care Unit in Resource-Limited Setup: Cross-Sectional Study. Pediatric Health, Medicine and Therapeutics, Volume 14, 71–79. https://doi.org/10.2147/phmt.s389404.
11. Tazebew A, Tilahun BC, Heye TB. Admission Pattern and Outcome in a Pediatric Intensive Care Unit of Gondar University Hospital. Ethiop Med J. 2019;57(2).