

Clinico-laboratory correlation with outcome in Paediatric Intensive Care Unit of Western Nepal

Ganesh BK, Eva Gauchan, Mukunda Timilsina,

Department of Pediatrics, MCOMS, Pokhara, Nepal

Corresponding Author: Dr. Ganesh BK, Email/Contact: ganesh3bk@yahoo.com; 9846085226

ABSTRACT

Background: Intensive care has become an important part of the management of critically ill children. These patients need better care and management for good outcomes. The objective of this study is to identify the clinical and laboratory characteristics which can influence on the outcome of patients, morbidities and mortality and help in the improvement of the quality of care to the child.

Methods: This is a prospective study conducted over a period of 6 months from January 2018 to June 2018 in the PICU. Children admitted in PICU in the age range of one month to fifteen years were enrolled after taking consent from the parents'

Results: The majority of the patients (23 each in the group) belong to the age group of 1 month to 1 year. The most common systemic presentations were respiratory 38(38%), neurological 24(24%), gastrointestinal 9(9%), and poisoning 9(9%). Serum Urea level of 48.46 ± 4.61 mg/dl and creatinine level of 1.27 ± 1.48 mg/dl in poor outcome group was found to be significantly greater than urea level of 33.98 ± 2.58 mg/dl and creatinine level of 0.84 ± 0.242 mg/dl in good outcome group with a p-value of 0.0001 and 0.0453 and

Conclusion: Most of the children were of age <5 years. High total count shows a significant association with the poor outcome compared to other laboratory parameters. Patients in the poor outcome group presented with higher total counts, serum urea, and creatinine levels than those in the good outcome group. Hospital stay was longer in the good outcome group compared to the poor outcome group.

Keywords: critical care, length of stay, treatment outcome

ARTICLE INFORMATION	Source of Support: Self	Conflict of Interest: None
Received: 12 September 2021	Accepted: 22 April 2022	Published Online: 30 April 2022
Copyright: © 2021 by the author(s) in which author(s) are the sole owners of the copyright of the content published. Licensing: The Journal follows open access publishing policy, and available free on the website of the Journal and is distributed under the terms of the Creative Commons Attribution International License 4.0 under the CC-BY 4.0  license, and the author(s) retain the ownership of the copyrights and publishing rights without restrictions for their content and allow others to copy, use, print, share, modify, and distribute the content of the article even in commercial purpose as long as the original authors and the journal are properly cited. Disclaimer: The statements, opinions, and data contained in this publication are solely those of the individual author(s) and contributor(s). Neither the publisher, editor nor reviewers are responsible for errors in the contents nor any consequences arising from the use of the information contained in it. The Journal, as well as publisher, remain neutral with regards to any jurisdictional claims in any published articles, their contents, and the institutional affiliations of the authors.		

INTRODUCTION

Intensive care is the most important part of management of critically sick child. Effective care and early intervention help reduce the morbidity and mortality. The pediatric intensive care unit (PICU) is a part of the hospital where critically ill pediatric patients age range from 1 month to 15 years who require advanced airway, respiratory and hemodynamic supports are usually admitted for better outcome than the patients admitted in other parts of the hospital.¹ Management of sick and critically ill child is one of the most demanding and challenging aspect of the sub-specialty.

Data provided by UNICEF for under five mortality is 41 deaths per 1000 live births in 2016.² Nearly 5-6 million children died before the age of five in 2016. Every day around 15000 under five children die study done in sub-Saharan region.³ Children lives can be saved in developing countries like ours by providing basic intensive care services such as intravenous fluid, appropriate antibiotics, oxygen and ventilator support. Due to the lack of modern advanced equipment, infrastructure and adequate medical staffs in the management of critically sick child, we have to depend on clinical presentation and laboratory findings and limited available resources which can also influence the outcome of the patients.

The aim of this study is to identify the clinical and laboratory characteristics which can influence on the outcome of patients, morbidities and mortality and help in the improvement of the quality of care to the child. As fewer studies and research has been done in our part regarding sick child requiring intensive care.

MATERIALS AND METHODS

This was a prospective cross-sectional study conducted over a period of 6 months from January 2018 to June 2018. Manipal Teaching Hospital is a tertiary referral care center of western Nepal. This hospital has a well-equipped ten bedded PICU with two pediatric ventilators, three syringe pump, one infusion pump, and cardiac monitor in each bed. Children admitted in PICU in the age range of one month to fifteen years were enrolled after taking consent from the parents. Less than 1 month child and above 15 years child are excluded.

PICU records of all admission, transfer out, discharges, left against medical advice, referred and death were utilized for the purpose of study. The clinical profile such as age, sex, history, comorbid conditions, source of admission and provisional diagnosis were noted. Relevant investigations include hemoglobin, total count, differential counts, platelets count, electrolytes, urea, creatinine, blood sugar, chest x-ray and blood culture done. Treatment of the child was done according to the standard protocol. Duration of hospital stay and outcome was also recorded in final diagnosis. Normal discharge from the hospital after completion of treatment is categorized as good outcome and those LAMA (left against medical advice), referred and death as bad outcome at the initial phase of treatment in hospital though we are unable to trace the further health condition of LAMA and referred child. Ethical clearance taken from the ethical committee of the institution. The data obtained were entered into the SPSS version 25 and analysis was done. Sample size was calculated using Cochran's formula as $n_0 = z^2 pq / e^2$ assuming maximum variability of 50%, confidence interval of 95% and precision of ± 5 , the sample size for infinite population is $N_0 = (1.96)^2 (0.5)(0.5) / (0.05)^2 = 384$ Total number

of children admitted was 160. So using 160 as total population the sample size is calculated as $n = n_0 / (1 + (n_0 - 1) / N) = 384 / (1 + (384 - 1) / 160) = 113$.

So, a total of 100 children included in our study. Continuous data was recorded as mean $\pm$ S.D. and categorical variables as number and percentage. Chi square and independent-t test were used as appropriate. Level of significance was taken at p value less than 0.05.

RESULTS

A total of 100 patients were included in the study of which 34 (68%) were male and 16 (32%) were female in good outcome and 31 (62%) male and 19 (38%) in poor outcome group. The proportion of males and females was 1.8:1.

Majority of the patients (23 in each group) were of age 1 months to 1 year. Mean age was 2.87 ± 3.67 years in good outcome and 2.78 ± 3.69 years in poor outcome group. 55% of the patients were admitted from emergency, 31% shifted in from general ward and the rest 14% were admitted from the out patient's department. The most common admitted children had respiratory 38%, neurological 34%, alimental 9% and poisoning 9% cases. The mean

length of hospital stay was 6.82 ± 2.608 days in good outcome group and 4.68 ± 3.28 days in poor outcome which is statistically significant with a p value of 0.005. The number of patients requiring mechanical ventilator was 5 (10%) in good outcome group and 15 (30%) in poor outcome with a p value of 0.012. Inotropes were used in 18 (36%) of poor outcome group and 4 (8%) of good outcome with a p value of 0.001. Equal number of patients required oxygen in both the groups. Out of 50 children in poor outcome: 19 lefts against medical advice, 17 died and 14 were referred.

The mean value of TLC is 13040 ± 518 /mm³ and 14806 ± 734 /mm³ in good and poor outcome groups respectively (p=0.0001). Polymorphonuclear cells, c- reactive protein, random blood sugar, platelets, hemoglobin, sodium, potassium has not shown correlation in the outcome.

Serum urea was (33.98 ± 2.58) mg/dl in good outcome and (48.46 ± 4.610) mg/dl in poor outcome group with a p value of 0.0001. Creatinine level in good outcome group was (0.84 ± 0.242) mg/dl and (1.27 ± 1.48) mg/dl in poor outcome and p-value of 0.0453.

Table 1: Baseline characteristics

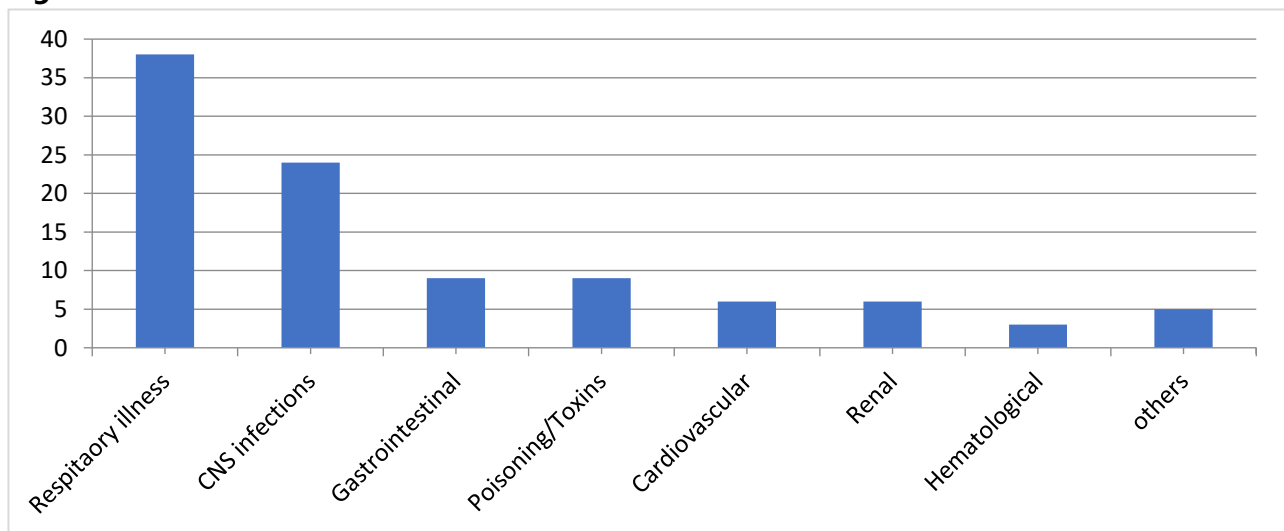
Particulars		Category 1 (Good Outcome) Total -50	Category 2 (Poor Outcome) Total -50
Age (year)		2.87 ± 3.67	2.78 ± 3.69
Sex	Male	34 (68%)	31 (62%)
	Female	16 (32%)	29 (58%)
Source of admission	ER	26 (52%)	29 (58%)
	OPD	6 (12%)	8 (16%)
	Ward	18 (36%)	13 (26%)
Age < 1 year		23 (46%)	23 (46%)
1-5 year		8 (16%)	16 (32%)
> 5 year		19 (38%)	11 (22%)

Table 2: Clinical Characteristics

Particular	Category 1(Good outcome) Total -50	Category 2(Poor outcome) Total -50	P-Value
Mechanical Ventilator	5(10%)	15(30%)	.012
Required Oxygen supplementation	28(56%)	28(56%)	1
Inotropes	4(8%)	18(36%)	.001
Length of hospital stay (days)	6.82±2.608	4.68±3.28	.005

Table 3: Laboratory characteristics

Particulars	Category 1(Good outcome)	Category 2(Poor outcome)	P value
Hemoglobin (gm/dl)	10.4±1.58	10.5±2.47	0.8099
TLCs (Mean±S.D) (/mm ³)	13040±518	14806±734	0.0001
Platelets (×10 ⁴ /mm ³)	3.48±1.2	3.298±1.41	0.4887
CRP (mg/l)	19.96±24	21.55±26.37	0.7532
RBS (mg/dl)	115±22.4	112±42.9	0.6621
Urea (mg/dl)	33.98±2.58	48.46±4.61	0.0001
Creatinine (mg/dl)	0.84±0.242	1.27±1.48	0.0453
Sodium (meq/l)	139±7.2	139.44±6.33	0.7462
Potassium (meq/l)	4.5±6.60	4.69±0.75	0.8401
Calcium (meq/l)	8.9±0.26	8.67±0.9	0.0857

Figure 1: Distribution of Diseases

DISCUSSION

There are very few studies of this type conducted in PICU in our part of the country. Children <5 years were the majority of patients included in

our study. In our study, we have taken 100 children over a period of six months in PICU. Majority of patients were male (65%) 34 in good outcome and 31 in poor outcome group which

was similar to that of study done by Shah and Shah.⁴ Another study done by Sahoo B et al found 61.3%.⁵ Our study reveal male to female ratio to be 1.8:1. Blessing et al found male: female ratio 1.49:1.⁶ Other study from Nepal by Gauri S. Shah et al found the male: female ratio 1.7:14. Under 5 aged children constitutes 70 (70%) cases. The finding in our study is comparable to a study published by Michel et al from Brazil reported (73.8%).⁷ A similar study revealed 72.4% patients aged less than 5 years.⁶ A study done in by Anwarul Haque et al found 62.5% of the patients were under 5 yrs.⁸ In our study 46% were infants which was similar to finding recovered by Haque and Banoo and Rady⁹, and Lanetzki et al.¹⁰ Mean duration of stay in PICU was 6.82 ± 2.608 in good outcome and 4.68 ± 3.28 in poor outcome group. In a study done in Brazil by Batista et al.¹¹ length of stay in PICU was 6.9 ± 5.5 days which was similar to our finding.

Since patients included in poor outcome group were in critical condition, they either died, got referred or left against medical advice. So the length of hospital stay is significantly shorter in patients in poor outcome group compared to those in good outcome group. In this study, most of the cases admitted in PICU belonged to the respiratory system (38.2%), central nervous system (24%), gastrointestinal and poisoning (9%), cardiovascular and renal (6%). This was comparable to study by Shah et al which found respiratory disease (33%), followed by CNS (18.6%), infectious disease (11.3%), gastrointestinal (7.4%), CVS (6.5%) and poisoning (8%).⁴ A study done in south India by SK Earan et al also found respiratory was the most common system affected (40.2%).¹² In contrast another study showed most common neurological (28%), followed by respiratory (24.4%).⁸ A study by blessing et al found CVS

(41%) followed by neurological (12%), respiratory (10%) as common conditions of PICU admission.⁶

In our study, mean TLC in good outcome is $13040 \pm 518/\text{mm}^3$ where as in poor outcome $14806 \pm 134/\text{mm}^3$ which is statistically significant. Higher TLC is associated with higher morbidity and mortality as seen in poor outcome. Platelet count in poor outcome and good outcome shows no statistical significant which shows no correlation with outcome of patients. A study done by Kaur et al shows survival did not differ from non-survivors in term of age gender, TLC, platelet count, PH, lactate and lactate clearance.¹³

In our study out of 100 patients admitted in PICU, 17 patients died. Study from Brazil found the mortality in their centre to be 10.3%.⁷ whereas from Pakistan by Anwarul Haque et al found 11.9% mortality.⁸ Gauri s. shah et al found in their Centre mortality was 12.6%.⁴ Some other studies have reported mortality similar to our study. D. Kapil and A. Bagga found mortality of 23.3% in their centre in 1993.¹⁴

In contrast to our study a study from Pakistan by A. Haque and suarya Baso¹⁵ found mortality of 35% and in a study from Africa by Jean ph et al reported overall outcome of 35.44%.¹⁶ In our study we found lower mortality. One reason for this could be due to inability to trace the consequences in LAMA and referred patients. If mortality in those groups of patients was also included mortality rate would have been higher.

The main limitation of this study is its small size and short duration. We also could not broaden the scope of this study to compare further investigations due to financial constraints.

CONCLUSION

High total count shows significant association with the poor outcome compare to other laboratory parameters. Patients in poor outcome group presented with higher total counts, serum urea and creatinine levels than those in good outcome group. Hospital stay was longer in good outcome group compared to poor outcome group. In our study we have found lower mortality.

Some of the clinico- laboratory parameters seem to have influential effects in the overall outcome which may be the predictors in critically ill child. Well-equipped PICU with modern and innovative intensive care greatly facilitates the care of critically ill patients giving desirable outcome.

Acknowledgement: Sincere thanks to Dr Sudhir Adhikari for his commendable efforts in preparation of this article.

REFERENCES

1. WHO. Under five mortality. [Accessed 28 Jan 2021] Available from: www.who.int>gho>child-Downes JJ. Development of pediatric critical care medicine In: Wheeler D, Wong H, Shanely T, eds. Paediatric Critical Care Medicine: Basic Science and Clinical Evidence. London: Springer; 2007:3–32.
2. UNICEF. Under-five mortality. [Accessed 28 Jan 2021] Available from: <https://data.unicef.org/topic/child-survival/under-five-mortalityhealth>morality/mortality under five text/en/>
3. Shah GS, Shah BK, Thapa A, Shah LR, Mishra OP. Admission Patterns and Outcome in a Pediatric Intensive Care Unit in Nepal. British Journal of Medicine & Medical Research. 2014; 4(30):4939-4945. <https://doi.org/10.9734/BJMMR/2014/10318>
4. Sahoo B, Patnaik S, Mishra R, Jain MK. Morbidity pattern and outcome of children admitted to a paediatric intensive care unit of Eastern India. International Journal of Contemporary Pediatrics. 2017;4:4869. <https://dx.doi.org/10.18203/2349-3291.ijcp20170694>
5. Blessing I. Abhulimhen – Iyoha, Suneel Kumar Pooboni and Nanda Kishore Kumar Vuppali. Morbidity Pattern and Outcome of Patients Admitted into a Pediatric Intensive Care Unit of India. Indian Journal of Clinical Medicine 2014;5:1-5. <https://doi.org/10.4137/IJCM.S13902>
6. Georges M, El Halal DS, Barbieri E, Filho RM, Trotta EA, Carvalho PRA. Admission source and mortality in a pediatric intensive care unit. Indian Journal of Critical Care Medicine. 2012;16(2):81-86. <https://doi.org/10.1111/anae.13710>
7. Haque A, Siddiqui NR, Jafri SK, Hoda M, Bano S, Asad Mian. Clinical Profiles and Outcomes of Children Admitted to the Pediatric Intensive Care Unit from the Emergency Department. Journal of the College of Physicians and Surgeons Pakistan. 2015; 25(4):301-303. https://ecommons.aku.edu/pakistan_fhs_mc_women_childhealth_paediatr/203
8. Rady HI. Profile of patients admitted to pediatric intensive care unit, Cairo University Hospital: 1-year study. Ain-Shams Journal of Anaesthesiology. 2014;7:500. <https://doi.org/10.4103/1687-7934.145680>
9. Lanetzki CS, de Oliveira CA, Bass LM, Abramovici S, Troster EJ. The epidemiological profile of pediatric intensive care center at hospital Israelita Albert Einstein. Einstein (Sao Paulo). 2012;10:16-21. <https://dx.doi.org/10.1590/S1679-45082012000100005>
10. Batista NO, de Rezende Coelho MC, Trugilho SM, Pinasco GC, de Sousa Santos EF, Ramos-Silva V. Clinical-epidemiological profile of hospitalised patients in paediatric intensive care unit. Journal of Human Growth and Development. 2015;25:187-93. <https://dx.doi.org/10.7322/JHGD.103014>

11. Earan K, Dhandapani LM, Arunagirinathan A, Kantamneni S. Clinical Spectrum and Epidemiological Profile of Patients Admitted to Pediatric Intensive Care Unit at a Tertiary Care Centre in South India. International Journal of Scientific Study. 2016;4(3);187-191. <http://doi.org/10.17354/ijss/2016/349>
12. KaurG, Mittal K, Kaushik JS, Aamir M. Clinical outcome and predictors of mortality in children with sepsis, severe sepsis, and septic shock from Rohtak, Haryana: A prospective observational study. Indian Journal of Critical Care Medicine. 2014;18(7):437-41. <https://doi.org/10.4103/0972-5229.136072>.
13. Kapil D, Bagga A. The Profile and Outcome of Patients admitted to a Pediatric Intensive Care Unit. Indian Journal of Pediatrics. 1993;60:5-10. <https://dx.doi.org/10.1007/BF02860496>
14. Haque A, Bano S. Improving outcome in Pediatric Intensive Care Unit in Academic Hospital in Pakistan. Pakistan Journal of Medical Science. 2009;25(4):605-608. [\[Full Text\]](#)
15. Jenna PM, Wesley AG, Coovadia HM. Admission patterns and outcomes in a Paediatric Intensive Care Unit in South Africa over a 25-years period (1971 – 1995). Intensive Care Medicine. 1991;25(1):8894. <https://doi.org/10.1007/s001340050792>