Characteristics of Critical Illness and Short Term Outcome of Adolescents Admitted to Paediatric Intensive Care Unit in Dhulikhel Hospital, Kathmandu University Hospital

Poudyal P,[1] Karki R,[1] Bhandari PR,[1] Kushwaha DK[2]

[1]Department of Pediatrics,

Dhulikhel Hospital, Kathmandu University Hospital,

Kathmandu University School of Medical Sciences,

Dhulikhel, Kavre, Nepal.

[2]Public Service Commission

Gandaki Province, Nepal.

Corresponding Author

Prithuja Poudyal

Department of Pediatrics,

Dhulikhel Hospital, Kathmandu University Hospital,

Kathmandu University School of Medical Sciences,

Dhulikhel, Kavre, Nepal.

E-mail: prithuja@yahoo.com

Citation

Poudyal P, Karki R, Bhandari PR, Kushwaha DK. Characteristics of Critical Illness and Short Term Outcome of Adolescents Admitted to Paediatric Intensive Care Unit in Dhulikhel Hospital, Kathmandu University Hospital. *Kathmandu Univ Med J.* 2025; 93(5): 21-5. (Special Issue)

ABSTRACT

Background

Adolescents constitute a distinct cohort within pediatric critical care and delineating the trajectories of critical illness and outcomes in this age group is pivotal for optimization of intensive care management and resource allocation. However, data on adolescents admissions to intensive care units in Nepal remain sparse.

Objective

To elucidate clinical features, therapeutic interventions and short term outcomes of adolescents requiring intensive care management at Dhulikhel Hospital.

Method

Retrospective observational study was conducted in patients aged 10 to 17 years admitted to intensive care unit and high dependency unit of Paediatrics Department at Dhulikhel Hospital from January 2023 to December 2024. Data were retrieved using register entries and electronic medical records and retrospectively collated the data in a password protected Microsoft excel sheet and analyzed descriptively in Stata 13.

Result

Among 127 patients admitted between 1st January 2023 to 31st December 2024, mean age group was 13.9 ± 1.79 years. The male to female ratio was 1.08 : 1 with male preponderance (51.97%). In the intensive care unit, Poisoning cases constituted the highest proportion of admissions (29.31%) and respiratory causes (24.63%) predominated admission in high dependency unit. The majority of cases attained successful discharge after treatment in intensive care unit and ward (82.76% from intensive care unit and 88.40% from high dependency unit). Unfortunately, one patient (0.78%) expired after four days of intensive care management.

Conclusion

The study underscores the need of early intervention, preventive care and targeted health education during adolescence so as to mitigate preventable causes of critical care admission.

KEY WORDS

Adolescents, Critical care, Intensive care, Paediatrics

INTRODUCTION

Adolescence defined by World Health Organization as the second decade of life (10-19 years of age) is a time of profound physical, psychological, and social transformation.[1,2] According to Nepal's latest census, the population includes 5,876,269 adolescents compromising 20% of the country's total population.[3]

A significant numbers of children with childhood-onset chronic illnesses are surviving into adulthood requiring ICU admission.[4] Approximately 70 percent of young people reside in developing countries, where social, economic and health challenges are more pronounced than industrialized nations.[5] Adolescents increasingly need targeted attention in preventive health care and access to services.[6]

A study in the United Kingdom assessed admissions of adolescents aged 12-19 years and reported 50.6% were admitted to PICUs. Respiratory disease was the predominant cause for admission (25%) with overall mortality rate of 5.7%.[7]

Understanding adolescent needs is crucial for planning effective services at Dhulikhel Hospital, which serves a large and diverse population. Because adolescent-specific health data in Nepal is limited, Dhulikhel Hospital is well positioned as a major tertiary and teaching center to generate high-quality evidence to address this gap.

Hence, this study aims to identify the aspects of intensive care admission in adolescents and explore possible management strategies for identified causes so that preventable cause can be modified.

METHODS

Retrospective observational study was conducted over a period of 2 years beginning, from January 2023 in children, aged 10 to 17 years admitted in Intensive Care Unit and High Dependency Unit of Department of Paediatrics of Dhulikhel Hospital. Individual data were retrieved from the medical records. For missing data, contact was made through the registered number and data was collected via telephone follow up. A unique case number was assigned to each participant's records with information being accessible solely to the principal investigator and co-investigators involved. The study evaluated the demographic profile, presenting complains, cause of admission, investigations, diagnosis, treatment and short term outcome. Empirical antibiotic therapy was initiated as per protocol when indicated and subsequently tailored according to culture and sensitivity findings and improvement of the child's condition. Seizure was managed using standard antiepileptic agents such as midazolam, levetiracteam, valproate, phenobarbitone. Vasopressor support, including dopamine, dobutamine, or epinephrine, was provided as clinically required and tapered with improvement. Short term outcome was defined as the immediate result of the intervention noted at the time of discharge.

Study was commenced after taking approval by the Institutional Review Committee (IRC), with reference number 234/23. Informed consent was taken over the phone, during which detailed information regarding the research was shared with participant's informant.

Inclusion criteria:

Children aged 10 to 17 years
Children with critical illness requiring Intensive Care And High Dependency Unit

Exclusion criteria:

Children admitted to General ward and later transferred to intensive care due to impending complications.

The data was entered in microsoft excel sheet and variable were assigned in Stata 13. Descriptive statistics (mean, frequency, standard deviation, and percentage) was applied.

RESULTS

The demographic profile of the children aged 10 years to 17 years who received intensive care management during the study period has been presented in table 1. Out of 127 cases, 69 (54.33%) were managed in High Dependency Unit with intensive care and 58 (45.67%) were admitted in Pediatrics Intensive Care Unit.

Table 1. Demographic Profile of cases admitted in PICU and HDU

	PICU (n=58)	HDU (n=69)
	n (%)	n (%)
Gender		
Male	30 (51.72%)	36 (52.17%)
Female	28 (48.28%)	33 (47.83%)
Age Distribution		
10 years	3 (5.17%)	1 (1.45%)
11 years	7 (12.07%)	3 (4.35%)
12 years	7 (12.07%)	12 (17.39%)
13 years	6 (10.34%)	9 (13.04%)
14 years	9 (15.52%)	18 (26.09%)
15 years	9 (15.52%)	10 (14.49%)
16 years	15 (25.86%)	16 (23.19%)
17 years	2 (3.45%)	0 (0%)
Address		
Bhaktapur	1 (1.72%)	4 (5.80%)
Dhading	0	1 (1.45%)
Dhanusha	1 (1.72%)	1 (1.45%)
Dolakha	7 (12.07%)	4 (5.80%)
Kavrepalanchowk	23 (39.66%)	40 (57.96%)
Mahottari	0	1 (1.45%)
Okhaldhunga	0	1 (1.45%)
Ramechhap	5 (8.62%)	2 (2.90%)
Sindhuli	8 (13.80%)	8 (11.60%)
Sindhupalchowk	13 (22.41%)	7 (10.14%)

Figure 1 depicts the total number of cases across various systems admitted to the Intensive Care Unit (ICU) and High Dependency Unit (HDU. In the ICU, poisoning cases accounted for the highest proportion of admissions (29.31%), followed by infectious cases (15.52%) whereas respiratory causes were the most common reason for admission (24.63%), followed by central nervous system infections (17.39%) in the HDU. Significant past history of intentional suicidal attempt was present in 4 cases with accident and poisoning while 4 cases had aggressive behaviour and anger issues.

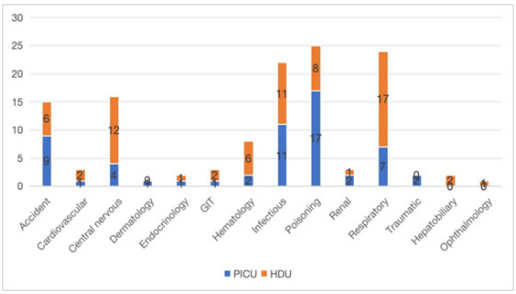

Figure 1. Distribution of causes of admission by system involvement

Among the 40 cases attributable to accidents and poisoning, psychiatric and psychological consultations were instituted in 20 patients, reflecting the imperative of addressing concomitant mental health concerns in this subgroup. The opinions regarding psychiatric management are summarized in the table below (Table 2).

Table 2. Psychiatric intervention for accidents and poisoning cases

Intervention	Number (n)	Percentage (%)
Refused admission	6	30%
No intervention	4	20%
Denied psychiatry treatment	3	15%
Anger management techniques	2	10%
Tab sertaline	2	10%
Strict vigilance at home	1	5%
Observation	1	5%
Refused psychiatry consultation	1	5%

Respiratory support was required in 32 ICU cases and 17 HDU cases. Notably, no HDU admissions necessitated Venturi therapy or advanced ventilatory support (Fig. 2).

A total of 25 cases required inotropic support, comprising 19 in the ICU and 6 in the HDU. Among these, 9 ICU cases and 1 HDU case necessitated the use of multiple inotropic agents (Fig. 3).

Patients were admitted to the ICU and HDU and subsequently transferred to the general ward once clinically stabilized and no longer requiring ventilator or hemodynamic support. The mean duration of hospital stay for ICU and HDU cases were 215.58 hours (± 156.92)

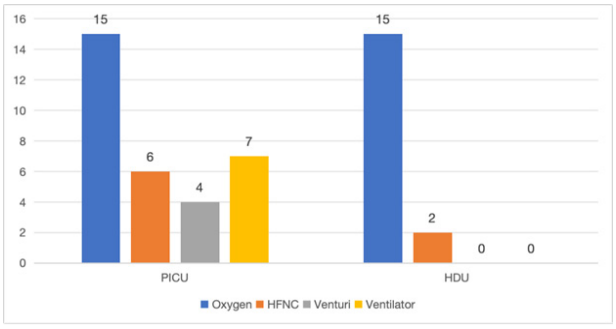

Figure 2. Requirement for respiratory support during intensive care.

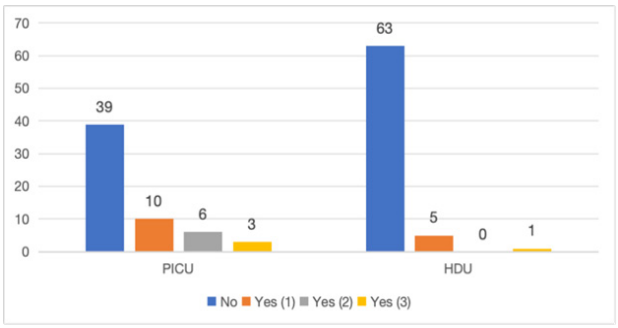

Figure 3. Cardiovascular support during ICU management

and 116.86 hours (± 77.97) with maximum patients being discharged following appropriate consultation and counselling. The mean ICU stay was 116.68 hours ± 96.57 hours and HDU stay was 60.17 hours ± 40.03 hours.

A substantial proportion of patients from both the ICU and HDU achieved favorable outcomes, with the majority being successfully discharged. With deep grief, one patient (0.78%) out of 127 cases unfortunately expired after four days of intensive care management. The case involved a 14-year-old male child referred from Dhanusha, who presented with partial hanging and post-cardiopulmonary resuscitation (CPR) status. He was diagnosed with supra ventricular tachycardia (SVT) and acute kidney injury (AKI), necessitating ventilator and cardiovascular support throughout his ICU stay (Fig. 4).

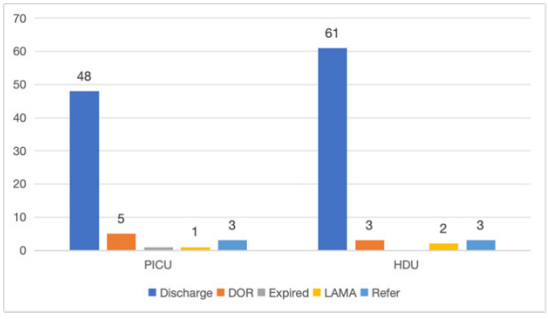

Figure 4. Short term clinical outcome of admitted patients

A subset of patients necessitated multidisciplinary intervention beyond critical care. From the ICU, three cases warranted referral for further specialized management one each to hematology, neurosurgery, and cardio-thoracic surgery while from the HDU, two cases were directed to hematology and one to cardio-thoracic surgery.

DISCUSSIONS

This study aims to characterize the demographic profile, admission indications, and short-term outcomes of critically ill adolescents admitted to the Intensive Care Unit and High Dependency Unit of a tertiary care hospital in the Kavre district.

The outcome of intensive care hinges on not only infrastructural capacity, clinical expertise, and timeliness of intervention, but also on the case-mix shaped by physicians' initial referral decisions.

Our study encompassed 127 children less than 18 years of age admitted over 2 years period. Mean age group was 13.9 ± 1.79 years. The male to female ratio was 1.08:1 with male preponderance of 51.97%. An five-year observational study from Italy reported that 1265 children less than 15 years were admitted to 125 ICUs, with male predominance of 59.5%.[8] In a 5-year study period from Riyadh, 276 eligible patients were enrolled with a mean age of 17.0 ± 1.7 years; 105 patients were aged 14 - 16 years and 171 patients were17 - 19 years.[9] In Nepal, a retrospective descriptive study conducted among 413 children admitted to the PICU found that 26.2% of the cases were in the age group above 10 years, with males and females comprising 14.5% and 11.6% of the total admissions, respectively.[10] The male predominance across these ICU admission studies appears multifactorial, influenced by biology (hormones, immune response), behavioral tendencies (risk-taking, delayed care seeking), disease patterns and societal determinants (healthcare access, provider bias).

In our study, poisoning was the most common reason for ICU admission (19.68%), while the majority of respiratory cases (24.63%) were managed in the HDU. The heightened incidence of poisoning cases can be ascribed to the easy accessibility to insecticides in agrarian nation, improper insecticide storage, disposal and the concomitant emotional and mental changes that occur during adolescence. In a study by Wood et al., respiratory diagnoses were the leading cause of Paediatric Intensive Care Unit (PICU) admission in children aged 12-15 years, whereas trauma and intoxication were other most common reasons for Adult Intensive Care Unit (AICU) admission among 16-19 years.[7] In a retrospective cohort study in Saudi Arabia, trauma was the most frequent reason for admission (123/276, 44.6%), followed by sepsis (55/276, 19.9%) and pneumonia (42/276, 15.2%).[9] Reliance on firewood for cooking, exposure to secondhand smoke, and inadequate knowledge about vaccination for respiratory diseases in Nepal are key factors underlying the increased burden of respiratory conditions necessitating ICU admission.

According to mental health survey 2020 in Nepal, the prevalence of mental disorder among adolescents was found to be 5.2% and the most commonly affected age group was 17 years (7.7%).[11] In our study, the most common reason for PICU admission was poisoning (29.31%). The most common driving factor for suicide was conflict with family members. Mishra et al. reported academic failure to be the common reason for suicide in nearly 16% of cases in adolescents, predominantly high during declaration of exam results of whom 47% were students of grade.[10] Further young people with had also history of parental abuse (13.5%), teacher's abuse (2%).[12]

In the present study, 32.76% of patients in the ICU and 8.70% in the HDU required cardiovascular support with inotropes, whereas mechanical ventilation was necessary for seven ICU patients (12.06%). In a retrospective study of 276 adolescents requiring intensive care, 39.1% received vasopressor therapy, and 58% required invasive mechanical ventilation.[9] This may be attributed to delayed hospital presentation and complications related to the underlying cause of intensive care admission.

The mortality rate was 0.78% in the present study. The hospital mortality among adolescents aged 14 - 19 years admitted in ICU was 16.7%, with no difference between the younger and older subsets.[9] In a large study from the United Kingdom, the ICU mortality rate was close to 6%.[7] Clinical events, quality of pre-ICU Care admission, and the length of ICU stay are interrelated factors influencing patient outcomes.[13,14] The lower mortality rate observed in our study may be influenced by differences in case mix, such as a higher proportion of patients with less severe disease, or variations in demographic and clinical characteristics that inherently carry a better prognosis. Additionally, the sample size may have affected the mortality estimates; smaller samples can lead to greater variability and may underrepresent more severe cases. Improvements in clinical management, timely interventions, and adherence to standardized treatment protocols could also contribute to the reduced mortality observed in the study.

Establishing and rigorously applying evidence based management protocols, complemented by strengthened documentation practices has the potential to substantially improve the prognosis of ICU patients, particularly in resource-constrained healthcare environments. At the individual, institutional, and systemwide levels, certain impediments challenge the ability to ensure an adequately prepared workforce ready to meet the often complex biopsychosocial needs of adolescents. By taking a coordinated approach that addresses each part of the health system, Nepal can build a more accessible and resilient mental health system. Long-term efforts that prioritize training, financing, service delivery, and essential resources can help make mental health services an integral part of Nepal's healthcare landscape and ensure better mental health outcomes for all.[15]

This single-center, retrospective study may limit the generalization of findings due to its small sample size and potential recall bias due to telephonic follow-up for missing data. It focused only on short-term outcomes, without

assessing long-term effects (previous decisions regarding referral were not considered and timeliness of referral was unknown). The absence of standardized illness severity scores, along with unmeasured confounding factors, such as socioeconomic status and time to presentation, may have influenced the results.

CONCLUSION

The study underscores the importance of early intervention, preventive care, and targeted health education during adolescence to reduce avoidable admissions to critical care units. By fostering awareness of both physical and mental health, adolescents can learn to recognize early warning signs, seek timely support, and adopt healthier coping mechanisms. Such proactive measures have the potential to substantially reduce morbidity and mortality associated with intensive care admissions.

ACKNOWLEDGEMENTS

We sincerely thank the Department of Paediatrics team at Dhulikhel Hospital for providing both the opportunity and essential clinical data for this study. Their cooperation and support made this research possible. We also extend our gratitude to Mrs. Beena Prajapati for her valuable contributions as data analyst.

REFERENCES

1. Richter LM. Studying adolescence. Science. 2006 Jun 30;312(5782):1902-1905. doi: 10.1126/science.1127489.
2. Blum RW, Mmari K, Moreau C. It Begins at 10: How Gender Expectations Shape Early Adolescence Around the World. *J Adolesc Health*. 2017 Oct;61(4 Suppl):S3-S4. doi: 10.1016/j.jadohealth.2017.07.009.
3. Ghimire A, Bhattarai D, Karki B, Bhattarai S, Acharya M, Rai A, et al. Adolescent well-being in Nepal: findings from GAGE Midline Evidence. *Report.* 2024. London: Gender and Adolescence: Global Evidence (https://www.gage.odi.org/publication/adolescent-well-being-in-nepal-findings-from-gage-midline-evidence/)
4. Edwards JD, Houtrow AJ, Vasilevskis EE, Dudley RA, Okumura MJ. Multi-institutional profile of adults admitted to pediatric intensive care units. *JAMA Pediatr.* 2013 May;167(5):436-43. doi: 10.1001/jamapediatrics.2013.1316.
5. Patton GC, Coffey C, Sawyer SM, Viner RM, Haller DM, Bose K, et al. Global patterns of mortality in young people: a systematic analysis of population health data. *Lancet.* 2009 Sep 12;374(9693):881-92. doi: 10.1016/S0140-6736(09)60741-8.
6. Department of Health. You're welcome – Quality criteria for young people friendly health services, Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/216350/dh_ 127632.pdf. Published April 2011, (accessed 28 April 2016).
7. Wood D, Goodwin S, Pappachan J, Davis P, Parslow R, Harrison D, et al. Characteristics of adolescents requiring intensive care in the United Kingdom: A retrospective cohort study. *J Intensive Care Soc*. 2018;19:209. doi: 10.1177/1751143717746047.
8. Cogo PE, Poole D, Codazzi D, Boniotti C, Capretta A, Langer M, et al. Outcome of children admitted to adult intensive care units in Italy between 2003 and 2007. *Intensive Care Med.* 2010 Aug;36(8):1403-9. doi: 10.1007/s00134-010-1914-5.
9. Al-Dorzi HM, Yaqoub AS, Aldokhel FT, Alshuwaier KM, Almujarri SF, Alkhaldi FA. Characteristics and outcomes of adolescents requiring admission to the intensive care unit: A retrospective cohort study. *Saudi Crit Care J*. 2023;7:23-8. DOI:10.4103/sccj.sccj_9_23
10. Sharma AK, Gurung B. Profile and Outcome of Patients Admitted to Pediatric Intensive Care Unit at a General Referral Hospital. JIOM Nepal. 2019;41(3):17-23. DOI: https://doi.org/10.59779/jiomnepal.1056
11. National Mental Health Survey. Report of National Mental Health Survey 2020. 2020. Accessed July 3, 2023. https://nhrc.gov.np/wp-content/uploads/2022/10/National-Mental-Health-Survey-Report2020.pdf
12. Mishra N, Shrestha D, Poudyal RB, Mishra P. Retrospective study of suicide among children and young adults. *J Nepal Paediatr Soc.* 2013;33(2):110-6.
13. Helmy A, Vizcaychipi M, Gupta AK. Traumatic brain injury: Intensive care management. *Br J Anaesth.* 2007;99:32 42. DOI: 10.1093/bja/aem139
14. Williams TA, Ho KM, Dobb GJ, Finn JC, Knuiman M, Webb SA, et al. Effect of length of stay in Intensive Care Unit on hospital and long term mortality of critically ill adult patients. *Br J Anaesth.* 2010;104:459-64. DOI: 10.1093/bja/aeq025
15. Paudel S, Chalise A, Khatri D, Poudel S, Khanal A. Nepal's mental health system from public health perspective: a thematic synthesis based on health system building blocks. *Lancet Reg Health Southeast Asia*. 2025 Apr 30;36:100588. doi: 10.1016/j.lansea.2025.100588. PMID: 40370428; PMCID: PMC12076720.