

Disease Spectrum and Triage Assessment among Children Presenting to the Paediatric Emergency Department at a Tertiary Care Centre in Telangana, India

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ABSTRACT

Introduction: Triage is a sorting process to quickly assess patients upon their arrival in the emergency department which helps to stream them to an appropriate location and adequate treatment. Triage assessment helps in recognising the commonly presenting childhood emergencies to optimise quality of care delivered in the Paediatric Emergency Department. Priority attention can be given to the critically ill or injured patients as how long the patient can safely wait, is predicted by triage.

Aim: To provide data on disease spectrum and triage assessment of children presenting to an exclusive Paediatric Emergency Department.

Materials and Methods: This was a cross-sectional study which was conducted from October 2020 to September 2021 over a period of one year in the Paediatric Emergency Department at Niloufer Hospital, a tertiary care children hospital in Hyderabad, Telangana, India. All children in the age group of one month to twelve years triaged by five-level Canadian triage and acute scale were included in the

study. Data was collected from the register maintained at the Emergency Department. Descriptive statistics was used to analyse the data. Microsoft excel sheets were used for recording data.

Results: During the study period, 7986 children were admitted with 5718 (71.6%) males and 2268 (28.4%) females. A total of 4352 (54.5%) patients were less than one year age. Neurological emergencies, acute febrile illnesses, respiratory illnesses were most common reasons for emergency visits. The number of children presenting with triage level 1,2,3 were n=4369 (54.71%).

Conclusion: Majority of the patients attending the Emergency Department were less than one year old and acute febrile illnesses and seizures were the most common causes for admissions. Triage and prioritisation of pediatric emergencies is strongly recommended for early recognition of life threatening illnesses and to improve outcomes. Specially trained nurses, healthcare professionals trained in Basic Life Support (BLS) and Paediatric Advanced Life Support (PALS) will go a long way in reducing morbidity and mortality.

Keywords: Early recognition, Life threatening, Neurological, Prioritisation, Seizures, Severity

INTRODUCTION

Triage is a sorting process to quickly assess patients upon their arrival in the Emergency Department (ED) which helps to stream them to an appropriate location and adequate treatment. Triage assessment helps in recognising the commonly presenting childhood emergencies to optimise quality of care delivered in the Paediatric emergency department [1-3]. Priority attention can be given to the critically ill or injured patients as how long the patient can safely wait is predicted by triage. As the clinical presentation of emergencies in children are varied compared to adults, emergency room services of children should cater to these differences [4]. Majority of the children, who require emergency care are initially evaluated in community hospitals by physicians, nurses and other healthcare providers [5-7]. Availability of baseline data of various emergencies in children presenting to the emergency department and proper triage assessment helps in identifying children requiring urgent medical attention [8-9]. This helps in conserving manpower and finances and improving the outcome of acute severe illnesses in children in resource limited developing countries [10-11]. It improves communication and public relations and supports surveillance.

A previous published study noted the overcrowding of ED was associated with frequency of case discontinuation and mortality [8]. Another study from south India suggested identification of serious

illness in children is possible with simple clinical signs and symptoms [9]. Data on admissions in Paediatric Emergency Departments are sparse in Telangana.

Therefore, the aim of the present study was to determine the disease spectrum and triage patients presenting to the ED, and to study the most common reasons for admission and prioritise patients requiring immediate life saving interventions.

MATERIALS AND METHODS

This was a cross-sectional study conducted from October 2020 to September 2021 over a period of one year in the Paediatric Emergency Department in Niloufer hospital, a tertiary care children hospital in Hyderabad, Telangana, India. Ethical clearance was obtained from the Institutional Ethics Committee vide letter no IEC/OMC/2021/M.NO.(01)/Acad-02. The hospital is a 1000-bedded Paediatric teaching and referral centre, which caters to the patients from Telangana and neighbouring states of Andhra Pradesh, Karnataka, Bihar. Round the clock the emergency room is managed by paediatricians, residents, trained nursing and paramedical staff.

The Paediatric Emergency Department uses a five-level Canadian Emergency Department Triage and Acuity Scale (CTAS) [Table/ Fig-1] based on disease acuity and physiological status of the patients [12-14].

Inclusion and Exclusion criteria: All children in the age group of one month to twelve years were included in the study. Children with triage level 1, 2 or 3 were admitted in the emergency department. Trauma, burns cases which were managed at a concerned speciality hospital and children with triage level 4 or 5 who were sent home to attend outpatient departments or transferred to the inpatient wards after admission and stabilisation were excluded from the study.

Study Procedure

The Canadian ED triage and acuity system prioritises patient care by the severity of illness. The time to see a physician and timely intervention to improve outcome is the primary operational objective of this triage scale. This scale is widely acceptable and meta analyses suggest that this is a good reliable scale for triage assessment [15-17]. The junior resident supported by the postdoctoral senior resident does the initial triage assessment in the hospital. Based on the triage level assigned and the urgency of care, the management priorities are decided as both observational and admission facilities are available. Data including name, age, gender, date and time of admission, chief complaints, initial physiological categorisation as life threatening or non life threatening, primary (ABCDE) assessment, triage classification as level 1-5, were collected from the register maintained at the Emergency Department.

STATISTICAL ANALYSIS

Data was presented as frequencies and percentages. Descriptive statistics was used to analyse the data. Data was collected in microsoft excel sheets.

RESULTS

During the one year of study period, 7986 children were admitted in the ED. Of the total patients seen, there were 5718 (71.6%) males and 2268 (28.4%) females with a male to female ratio of 2.5:1. Among these children 4352 (54.5%) children were less than one year age, 1238 (15.5%) children were between 1-5 years and 2396 (30%) were between 6-12 years [Table/Fig-2].

Neurological emergencies were n=1861 (23.3%), of total cases, acute febrile illness comprised n=1836 (22.9%), respiratory cases were n=1812 (22.6%), gastrointestinal cases were n=625 (7.82%). Medicolegal emergencies accounted for n=528 (6.61%), renal emergencies were n=460 (5.76%), haematological emergencies were n=450 (5.63%), cardiovascular cases were n=414 (5.18%) of total cases. Among neurological emergencies seizures were n=1112 (59.7%), meningitis cases were n=304 (16.3%) encephalitis cases were n=155 (8.3%). Among seizures cases, n=496 (44.6%) of patients had simple febrile seizures.

Among respiratory emergencies pneumonia n=752 (41.5%) was the commonest of the respiratory illnesses that required an emergency visit. It was followed by bronchiolitis n=551 (30.4%) and acute asthma n=272 (15%). Acute diarrhoeal disease n=355 (56.8%) was the most common diagnosis among gastrointestinal illnesses seen in the Paediatric Emergency Department. Liver disorders n=84 (13.44%) were the other frequent diagnosis [Table/Fig-3]. The number of children presenting with triage level 1,2,3 according to Canadian triage and acuity scale accounted for 54.71% and the children presenting with triage level 4,5 accounted for 45.29% [Table/Fig-4].

DISCUSSION

The patients attending the Paediatric ED were triaged using the Canadian Emergency Department triage and acuity scale (CTAS) [12-14]. Jimenez and his colleagues found the scale to be a valid instrument for predicting rate of hospital admission, duration of stay in hospital and diagnostic utilisation. Several publications have also validated the reliability of the CTAS and its correlation with resource utilisation in ED's [15-17].

Among children presenting to the Paediatric ED seizures, septicaemia, pneumonia were the most common causes for admissions. Boys (71.6%) were brought to the emergency department in more numbers compared to the girls (28.4%). Infants accounted for more than half of total admissions (54.5%) to the Paediatric ED in the hospital indicating the need for triage equipment to cater to the needs of these patients.

Children presenting with acute febrile illnesses (22.9%) were the most common admissions to the emergency. Seizures (13.92%) were the second most common presentation to the emergency. In the emergency department of a Government hospital, which is resource limited, management of status epilepticus is particularly challenging. There is a need to develop feasible and relevant guidelines for seizure management based on availability of medications and capacity and facilities for supportive care such as invasive ventilation.

More than half of the patients (54.7%) presented in triage level 1,2,3 indicating the need for early recognition of life threatening abnormalities in oxygenation, ventilation, perfusion, neurological function. Rapid intervention to correct these abnormalities is the key to successful resuscitation and stabilisation of the Paediatric patient [18-20]. There is delayed presentation for care in low and middle income countries which increases the acuity of illness and associated complications. Mortality and morbidity arise from limited and delayed access to emergency care, lack of proper prehospital

Triage Level	Acuity	Description	Target time to treatment and reassessment	Examples	Remarks
Level 1	Resuscitation	Life threatening disease or injury requiring immediate treatment	Immediate and continuous (1 to 5 minutes)	Cardiac arrest, seizure, unresponsiveness, airway obstruction, hypothermia, GCS < 8, major burns, severe trauma, severe respiratory distress, shock	Need continuous assessment and intervention to maintain physiological stability
Level 2	Emergent	Significant health problems that could become life threatening or disabling	15 min	GCS < 13, severe dehydration, febrile child < 3 months old and temperature >38°C, inhalation or ingestion of toxic substances, acute bleeding, purpuric rash, burns >10%, abdominal pain with vomiting/diarrhoea or abnormal vitals	Any infant/child who require multiple interventions to prevent further deterioration
Level 3	Urgent	Significant health problems that are not immediately life threatening or disabling	30 min	Alert, oriented, with minor alteration in vitals, febrile child >3 months old with temperature >38.5°C, minor head trauma	Need care while awaiting careful planned assessment while awaiting care, since critical illness may present with common symptoms and may evolve rapidly
Level 4	Less urgent	Stable health conditions to be evaluated in ED	1 hour	Diarrhoea with no rehydration, laceration, sore throat, pain	
Level 5	Non urgent	Stable health conditions to be evaluated in ED/OPD	2 hours	Afebrile, alert, well-oriented, euhydrated, normal vitals	

[Table/Fig-1]: Canadian ED triage and acuity scale (CTAS) [12-14]. ED: Emergency department; OPD: Outpatient department

Age	Number	Percentage (%)
1 month-1 year	4352	54.5
1-5 years	1238	15.5
6-12 years	2396	30

[Table/Fig-2]: Age distribution of patients attending the Paediatric Emergency Department between October, 2020 and September, 2021.

Illnesses	Number of patients
Central nervous system	1861
Seizures	1112
Meningitis	304
Encephalitis	155
Others	290
Acute febrile illnesses	1836
Respiratory system	1812
Pneumonia	752
Bronchiolitis	551
Acute asthma	272
Gastrointestinal system	625
Acute diarrhoeal disease	355
Liver disorders	84
Others	186
Medicolegal cases	528
Poisoning	240
Non poisoning	288
Renal	460
Haematological	450
Cardiovascular	414
Acyanotic heart disease	174
Congenital cyanotic heart disease	81
Others	159

[Table/Fig-3]: Distribution of patients attending the Paediatric ED according to their illnesses.

Triage	Number	Percentage (%)
Level 1,2,3	4369	54.7
Level 4,5	3617	45.3

[Table/Fig-4]: Distribution of patients attending the Paediatric ED according to the triage classification.

care and delayed transport [21-23]. As acute illnesses in children can span the spectrum from simple viral infections to life threatening emergencies, there is an increased need for children attending the ED to have a structured approach for initial evaluation to recognise unstable children at the earliest [24-27]

Pneumonia and diarrhoea remain major killers of young children. Together, these diseases account for 29% of all deaths of children less than five years of age and result in the loss of 2 million young lives each year [28]. Use of vaccines against *Streptococcus pneumoniae* and *Haemophilus influenzae* type B, the two most common bacterial causes of childhood pneumonia, and against rotavirus, the most common cause of childhood diarrhoea deaths, substantially reduces the disease burden and deaths caused by these infectious agents. Water, sanitation and hygiene interventions, including access to and use of safe drinking-water and sanitation, as well as, promotion of key hygiene practices provide health, economic and social benefits [28].

Due to the Coronavirus Disease 2019 (COVID-19) pandemic, which had significant impact on society and healthcare there were less number of Paediatric ED visits and admissions in the hospitals. This could be because of less utilisation of healthcare services due to fear of hospital environment or decrease in communicable infectious

diseases [29]. There is an impact of pandemic on nutritional status of children due to change in economic status and lack of healthy lifestyle habits in children [30].

There was compromise in care and serious problem of overcrowding of ED causing delay to patients with acute emergencies as a large segment of patients had less acute complaints preoccupying medical staff time and resources. The data collected from the present study will help medical care to be delivered in a reasonable time frame due to knowledge of type of illnesses and implementation of an ideal triage system.

Limitation(s)

The data presented in the study was during the COVID-19 pandemic, when the patients attending the ED were comparatively less. The data was collected from only one Institution. So, the results cannot be generalised to other facilities.

CONCLUSION(S)

Majority of the patients attending the ED were less than one year old. Acute febrile illnesses and seizures were the most common causes for admissions. Based on the findings of the present study we can anticipate the resources needed and utilise space and resources effectively in the hospital. Specially trained nurses, healthcare professionals trained in BLS and PALS will go a long way in reducing morbidity and mortality. Parent awareness in handling febrile episodes by tepid sponging, improved hydration and to seek early healthcare advice, will help in preventing severe illnesses.

REFERENCES

- [1] Tamburlini G, Di Mario S, Maggi RS, Vilarim JN, Gove S. Evaluation of guidelines for emergency triage assessment and treatment in developing countries. *Arch Dis Child.* 1999 ;81(6):478-82. doi: 10.1136/adc.81.6.478. PMID: 10569961; PMCID: PMC1718144.
- [2] Krauss BS, Harakal T, Fleisher GR. The spectrum and frequency of illness presenting to a Paediatric emergency department. *Pediatr Emerg Care.* 1991;7(2):67-71. doi: 10.1097/00006565-199104000-00001. PMID: 1904578.
- [3] Zimmerman DR, Allegra JR, Cody RP. The epidemiology of Paediatric visits to New Jersey general emergency departments. *Pediatr Emerg Care.* 1998;14(2):112-15. doi: 10.1097/00006565-199804000-00006. PMID: 9583391.
- [4] Singhi S, Jain V, Gupta G. Paediatric emergencies at a tertiary care hospital in India. *J Trop Pediatr.* 2003;49(4):207-11. Doi: 10.1093/tropej/49.4.207. PMID: 12929880.
- [5] Gove S. Integrated management of childhood illness by outpatient health workers: Technical basis and overview. The WHO Working Group on Guidelines for Integrated Management of the Sick Child. *Bull World Health Organ.* 1997;75(Suppl 1):07-24. PMID: 9529714; PMCID: PMC2486995.
- [6] Ratcliffe J. Provision of intensive care for children. A geographically integrated service may now be achieved. *BMJ.* 1998;316(7144):1547-48. Doi: 10.1136/bmj.316.7144.1547. PMID: 9596587; PMCID: PMC1113194.
- [7] Kloos H. Utilization of selected hospitals, health centres and health stations in central, southern and western Ethiopia. *Soc Sci Med.* 1990;31(2):101-14. doi: 10.1016/0277-9536(90)90052-t. PMID: 2389147.
- [8] Jayashree M, Singhi SC. Initial assessment and triage in ER. *Indian J Pediatr.* 2011;78(9):1100-08. Doi: 10.1007/s12098-011-0411-3. Epub 2011 May 8. PMID: 21553208.
- [9] Santhanam I, Pai M, Kasturi K, Radhamani MP. Mortality after admission in the Paediatric emergency department: a prospective study from a referral children's hospital in southern India. *Pediatr Crit Care Med.* 2002;3(4):358-63. Doi: 10.1097/00130478-200210000-00006. PMID: 12780955.
- [10] Gove S, Tamburlini G, Molyneux E, Whitesell P, Campbell H. Development and technical basis of simplified guidelines for emergency triage assessment and treatment in developing countries. WHO Integrated Management of Childhood Illness (IMCI) Referral Care Project. *Arch Dis Child.* 1999;81(6):473-77. Doi: 10.1136/adc.81.6.473. PMID: 10569960; PMCID: PMC1718144.
- [11] Meehan TP, Hennen J, Radford MJ, Petrillo MK, Elstein P, Ballard DJ, et al. Process and outcome of care for acute myocardial infarction among Medicare beneficiaries in Connecticut: A quality improvement demonstration project. *Ann Intern Med.* 1995;122(12):928-36. Doi: 10.7326/0003-4819-122-12-199506150-00007. PMID: 7755229.
- [12] Beveridge R, Clark B, Janes L, Savage N, Thompson J, Dodd G, et al. Canadian emergency department triage and acuity scale: implementation guidelines. *Can J Emerg Med.* 1999;1(suppl):01-40.
- [13] Canadian Association of Emergency Physicians. Canadian Paediatric triage and acuity scale: Implementation guidelines for emergency departments. *Can J Emerg Med.* 2001;3(4 suppl):01-40.

- [14] Warren D, Jarvis A, Leblanc L, members NTTF. Canadian paediatric triage and acuity scale: implementation guidelines for emergency departments. *Canadian Journal of Emergency Medicine*. 2001;3(suppl 4):S1-27.
- [15] Jimenez JG, Murray MJ, Beveridge R, Pons JP, Cortes EA, Fernando Garrigos JB, et al. Implementation of the Canadian emergency department triage and acuity scale in the Principality of Andorra: Can triage parameters serve as emergency department quality indicators? *Can J Emerg Med*. 2003;5(5):315-22.
- [16] Stenstrom R, Grafstein E, Innes G, Christenson J. Real-time predictive validity of the Canadian Triage and Acuity Scale (CTAS). *Acad Emerg Med*. 2003;10(5):512.
- [17] Murray MJ, Levis G. Does triage level (Canadian Triage and acuity Scale) correlate with resource utilization for emergency department visits? *Can J Emerg Med* 2004;6(3):180.
- [18] Rothschild M, Gilboa S, Sagi H, Berger I, Wolach B. Referral, admission, and discharge patterns in a Paediatric emergency department in Israel. *Pediatr Emerg Care*. 1993;9(2):72-76. Doi: 10.1097/00006565-199304000-00003. PMID: 8483783.
- [19] Kirkwood BR, Gove S, Rogers S, Lob-Levyt J, Arthur P, Campbell H, et al. Potential interventions for the prevention of childhood pneumonia in developing countries: A systematic review. *Bull World Health Organ*. 1995;73(6):793-98. PMID: 8907773; PMCID: PMC2486683.
- [20] Kliegman R. Nelson Textbook of Paediatrics. 2nd ed. Philadelphia: Elsevier Health Sciences; 2020.
- [21] Praveen K, Nallasamy K, Jayashree M, Praveen. Brought in dead cases to a tertiary referral paediatric emergency department in India: A prospective qualitative study *BMJ Paediatrics Open*. 2020;4:e000606. Doi: 10.1136/bmjpo-2019-000606.
- [22] Sankar J, Singh A, Narsaria P, Dev N, Singh P, Dubey N, et al. Prehospital transport practices prevalent among patients presenting to the Paediatric emergency of a tertiary care hospital. *Indian J Crit Care Med*. 2015;19(8):474-78. Doi: 10.4103/0972-5229.162469. PMID: 26321808; PMCID: PMC4548418.
- [23] Bhalla K, Sriram V, Arora R, Ahuja R, Varghese M, Agrawal G, et al. The care and transport of trauma victims by layperson emergency medical systems: A qualitative study in Delhi, India. *BMJ Glob Health*. 2019;4(6):e001963. doi: 10.1136/bmjgh-2019-001963. PMID: 31803512; PMCID: PMC6882548.
- [24] World Health Organization & United Nations Children's Fund (UNICEF). Management of the child with a serious infection or severe malnutrition: Guidelines for care at the first-referral level in developing countries. World Health Organization. 2000. <https://apps.who.int/iris/handle/10665/423359>.
- [25] Integrated management of childhood illness: Field test of the WHO/UNICEF training course in Arusha, United Republic of Tanzania. WHO Division of Child Health and Development & WHO Regional Office for Africa. *Bull World Health Organ*. 1997;75(Suppl 1):55-64. PMID: 9529718; PMCID: PMC2486999.
- [26] World Health Organization. The treatment of diarrhoea: a manual for physicians and other senior health workers, 4th rev; 2005. World Health Organization. <https://apps.who.int/iris/handle/10665/43209>.
- [27] World Health Organization. Programme of Acute Respiratory Infections. (1990). Acute respiratory infections in children: case management in small hospitals in developing countries, a manual for doctors and other senior health workers. World Health Organization. <https://apps.who.int/iris/handle/10665/61873>.
- [28] Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al.; Maternal and Child Undernutrition Study Group. Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet*. 2008;371(9608):243-60. Doi: 10.1016/S0140-6736(07)61690-0. PMID: 18207566.
- [29] Kruizinga MD, Peeters D, van Veen M, van Houten M, Wieringa J, Noordzij JG, et al. The impact of lockdown on Paediatric ED visits and hospital admissions during the COVID-19 pandemic: A multicenter analysis and review of the literature. *Eur J Pediatr*. 2021;180(7):2271-79. doi: 10.1007/s00431-021-04015-0. Epub 2021 Mar 15. PMID: 33723971; PMCID: PMC7959585.
- [30] Coker M, Folayan MO, Michelow IC. Things must not fall apart: The ripple effects of the COVID-19 pandemic on children in sub-Saharan Africa. *Pediatr Res*. 2021;89:1078-86.. <https://doi.org/10.1038/s41390-020-01174-y>.

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