Journal of Endocrinology, Tropical Medicine, and Infectious Disease (JETROMI)
Journal homepage: https://talenta.usu.ac.id/jetromi

Emergency Profile of Pediatric Patients Based on Pediatric Early Warning Score in the Emergency Department of the Adam Malik Hospital

Grace Danau Arta[1], Ririe Fachrina Malisie[2*], Arlinda Sari Wahyuni[3], Fauriski Febrian Prapiska[4], and Irma Sepala Sari Siregar[5]
[1]*Faculty of Medicine, Universitas Sumatera Utara, Medan, North Sumatera, Indonesia*
[2]*Departement of Pediatric, Faculty of Medicine, Universitas Sumatera Utara, Medan, North Sumatera, Indonesia*
[3]*Departement of Community Medicine, Faculty of Medicine, Universitas Sumatera Utara, Medan, North Sumatera, Indonesia*
[4]*Department of Surgery, Faculty of Medicine, Universitas Sumatera Utara, Medan, North Sumatera, Indonesia*
[5]*Department of Parasitology, Faculty of Medicine, Universitas Sumatera Utara, Medan, North Sumatera, Indonesia*
[*]Corresponding Author: danauisrare@gmail.com

ARTICLE INFO
Article history:
Received December 20, 2023
Revised January 19, 2024
Accepted April 04, 2024
Available online May 12, 2024

E-ISSN: 2686-0856
P-ISSN: 2686-0872

How to cite:
Arta GD, Malisie RF, Wahyuni AS, Prapiska FF, Siregar ISS. Emergency Profile of Pediatric Patients Based on Pediatric Early Warning Score in the Emergency Department of the Adam Malik Hospital. Journal of Endocrinology, Tropical Medicine, and Infectious Disease (JETROMI). 2024 May 12;6(2):48–53. DOI: 10.32734/jetromi.v6i2.14952.

ABSTRACT

Background: High morbidity and mortality rates in pediatric patients indicate the necessity of a Pediatric Early Warning Score (PEWS) capable of early clinical deterioration identification and providing an opportunity for healthcare professionals to promptly manage patients. This study aimed to serve as foundational data and as an evaluative tool to enhance the proficiency of healthcare workers in assessing patient deterioration.
Methods: This study utilized a descriptive method with a cross-sectional design and consecutive sampling technique who were treated from January to December 2022.
Results: there were 119 samples, the majority of gender was male (54.6%), the majority of the age group was 1-4 years old (37.8%), and the majority of the disease group was infection (31.1%). Both male and female majority had green PEWS (54.6%) and (45.4%), the majority of patients with an age range of 1 month to 5 years had red PEWS, the majority of infectious disease group had green PEWS, and the majority of patients with green PEWS had discharge outcome.
Conclusion: This study provides an overview of characteristics in pediatric patients and shows the majority of pediatric emergency department patients come with non-emergency conditions.
Keywords: Pediatric, PEWS, patient, deterioration, early detection, ED.

ABSTRAK

Latar Belakang: Angka morbiditas dan mortalitas yang tinggi pada pasien anak menunjukkan perlunya Skor Peringatan Dini Anak (PEWS) yang mampu mengidentifikasi kerusakan klinis dini dan memberikan kesempatan bagi profesional kesehatan untuk segera mengelola pasien. Penelitian ini bertujuan untuk berfungsi sebagai data dasar dan sebagai alat evaluatif untuk meningkatkan kemampuan petugas kesehatan dalam menilai perburukan pasien
Metode: Penelitian ini menggunakan metode deskriptif dengan desain cross sectional dan teknik consecutive sampling yang diolah pada bulan Januari sampai Desember 2022.
Hasil: ada 119 sampel, mayoritas jenis kelamin adalah laki-laki (54,6%), mayoritas kelompok usia berusia 1-4 tahun (37,8%), dan mayoritas kelompok penyakit adalah infeksi (31,1%). Baik mayoritas pria dan wanita memiliki PEWS hijau (54,6%) dan (45,4%), mayoritas pasien dengan rentang usia 1 bulan hingga 5 tahun memiliki PEWS merah, mayoritas kelompok penyakit menular memiliki PEWS hijau, dan

mayoritas pasien dengan PEWS hijau memiliki hasil pemulangan.
Kesimpulan: Penelitian ini memberikan gambaran karakteristik pada pasien anak dan menunjukkan mayoritas pasien gawat darurat anak datang dengan kondisi non-darurat.
Kata kunci: Anak, PEWS, pasien, kerusakan, deteksi dini, ED

1. Introduction

An emergency is an occurrence that happens rapidly and unexpectedly. Therefore, emergencies require prompt and appropriate handling [1]. In managing emergencies, adults and children have different approaches due to differences in body size and physiological conditions [2]. The most common diseases experienced by children admitted to the Emergency Department (ED) include upper respiratory tract infections, asthma, and non-bacterial gastroenteritis [3]. The morbidity and mortality rates for children in Indonesia in 2021, according to the *Badan Pusat Statistik (BPS),* were 25.08% and 16.85%, respectively. Cardiac arrest is rare in pediatrics with an incidence rate of approximately 0.7% to 3% among all hospitalized pediatric patients but cardiac arrest results in poor outcomes with only 15%-36% surviving [4]. The knowledge and skills of health workers in the clinical assessment of patients will facilitate the treatment of those experiencing rapid deterioration [5]. The clinical deterioration of hospitalized pediatric patients is associated with a mortality rate of approximately 5% to 15% [6].

Various scoring systems have been developed to assist clinicians in identifying patients experiencing clinical deterioration, such as the Pediatric Observation Priority Score (POPS), Pediatric Early Warning Score (PEWS), and Pediatric Approach Triangle (PAT) [7]. Wati et al compared the diagnostic value of POPS and PEWS at H. Adam Malik Medan, POPS has a slightly higher diagnostic value for predicting the likelihood of hospitalization compared to PEWS. The difference lies in the fact that the POPS assessment system is conducted only once while the PEWS assessment system follows a regular monitoring format. Another distinction is that the POPS assessment system includes several parameters measured subjectively whereas all PEWS assessment parameters are measured objectively. PEWS is widely used worldwide and has been implemented in several Indonesian hospitals, including Haji Adam Malik Hospital in Medan, where it has been in use since July 2018 [8]. The Pediatric Early Warning Score (PEWS) assessment system consists of three components: behavior, cardiovascular status, and respiratory status [9]. The goal of PEWS is to identify early signs of deterioration in pediatric patients and provide healthcare professionals with an opportunity for early intervention to reduce morbidity and mortality rates in children [10].

Patients admitted to the ED undergo PEWS calculation and are categorized by green, yellow, orange, and red labels. Patients with green labels (PEWS 0-2) can be discharged if the condition is stable. Patients with yellow and orange labels (PEWS 3-5) are recommended for hospitalization. Patients with red labels (PEWS ≥6) require intensive care [11]. Implementation of PEWS, the number of patients admitted to the Pediatric Intensive Care Unit (PICU) decreases and the length of patient hospitalization shortens [1]. Early detection of deterioration will prompt quicker interventions, such as increased monitoring and preparation for treatment by healthcare workers ultimately enhancing patient outcomes. This study serves as foundational data for the Department of Pediatrics at H. Adam Malik Hospital Medan and as an evaluative tool to enhance the proficiency of healthcare workers in assessing patient deterioration [12].

2. Methods

This study used a descriptive study and a cross-sectional method. The researcher collected medical record data to determine the emergency profile of pediatric patients based on PEWS in the Emergency Department of H. Adam Malik Hospital, Medan. The study was conducted from June to November 2023 in the medical records department of Haji Adam Malik Hospital, Medan. A total of 119 people were examined as the research sample. The population of this study includes patients aged 1 month to 18 years who were treated from January to December 2022. Patients who left the ED before being examined by the medical team and patients who arrived at the ED in a deceased condition were not included in the research sample. The obtained research data were subjected to univariate analysis to obtain the frequency distribution of variables in this study. The variables in this study include PEWS, gender, age, and patient outcomes. The study was conducted after obtaining approval from the Research Ethics Committee of Universitas Sumatra Utara.

Statistical Analysis
The research data were processed using statistical software in the form of the Statistical Package for the Social Sciences (SPSS) version 27. Categorical variables are presented with frequency (n) and percentage (%). The significance level is obtained if p-value <0.05.

3. Results
The obtained number of samples is 119 people and all samples have met the inclusion criteria for the study. The characteristics of the research samples are divided based on gender, age, and the patient's disease group. The number of male patients in this study reached 65 people (54.6%) and the number of female patients was 54 people (45.4%). Based on age group, the age group of 1-4 years old was the age group with the highest number of samples with 45 people (37.8%). This group was then followed by the age group 5-11 years with 36 people (30.3%), 12-18 years with 23 people (19.3%), and 1-11 months with 15 people (12.5%). Based on the distribution of the main disease, the most common patient main disease were infections with 37 people (31.1%), respirology with 31 people (26.1%), neurology with 15 people (12.6%), gastro hepatology with 14 people (11, 8%), malignancy with 5 people (4.2%), hematology with 4 people (3.4%), MODS with 3 people (2.5%), cardiology with 3 people (2.5%), surgery with 3 people (2.5%), nephrology with 3 people (2.5%), and ENT with 1 person (0.8%) (Table 1).

Table 1. Characteristics of Respondents

Characteristics	Frequency (n = 119)	Percentage (%)
Gender	65	54.6
Male	54	45.4
Female		
Age		
1-11 months	15	12.5
1-4 years	45	37.8
5-11 years	36	30.3
12-18 years	23	19.3
Main Disorder		
Infections	37	31.1
Respirology	31	26.1
Neurology	15	12.6
Gastrohepatology	14	11.8
Malignancy	5	4.2
Hematology	4	3.4
Multiple Organ Dysfunction Syndrome (MODS)	3	2.5
Cardiology	3	2.5
Surgery	3	2.5
Nephrology	3	2.5
Ear, Nose, Throat (ENT)	1	0.8

Based on table 2 indicates that the majority of male samples have a green label with 46 people (38.7%). The majority of female samples also have a green label with 42 people (35.3%). The distribution of color labels in PEWS varies in each age group of the samples. All age groups including the 1-11 months, 1-4 years, 5-11 years, and 12-18 years age groups mostly have green PEWS. The table also reveals that more severe PEWS colors, such as yellow, orange, and red are more commonly found in age groups under 5 years. The main disorder groups consisting of 10 groups including infection, respiratory, neurology, gastrohepatology, MODS, ENT, malignancy, hematology, cardiology, surgery, and nephrology mostly have green PEWS.

Table 2. Cross-tabulation of Characteristics with PEWS

Characteristics	PEWS			
	Green (%)	Yellow (%)	Orange (%)	Red (%)
Gender				
Male	46 (38.7)	15 (12.6)	1 (0.8)	3 (2.5)
Female	42 (35.3)	7 (5.9)	3 (2.5)	2 (1.7)
Age				
1-11 months	6 (5.0)	5 (4.2)	2 (1.7)	2 (1.7)
1-4 years	28 (23.5)	12 (10.1)	2 (1.7)	3 (2.5)
5-11 years	33 (27.7)	3 (2.5)	0 (0.0)	0 (0.0)
12-18 years	21 (17.6)	2 (1.7)	0 (0.0)	0 (0.0)
Main Disorder				
Infections	32 (26.9)	6 (5.0)	0 (0.0)	0 (0.0)
Respirology	20 (16.8)	5 (4.2)	1 (0.8)	2 (1.7)
Neurology	9 (7.6)	2 (1.7)	2 (1.7)	2 (1.7)
Gastrohepatology	12 (10.1)	2 (1.7)	0 (0.0)	0 (0.0)
Malignancy	0 (0.0)	3 (2.5)	1 (0.8)	1 (0.8)
Hematology	1 (0.8)	0 (0.0)	0 (0.0)	0 (0.0)
MODS	5 (4.2)	0 (0.0)	0 (0.0)	0 (0.0)
Cardiology	3 (2.5)	1 (0.8)	0 (0.0)	0 (0.0)
Surgery	0 (0.0)	3 (2.5)	0 (0.0)	0 (0.0)
Nephrology	3 (2.5)	0 (0.0)	0 (0.0)	0 (0.0)
ENT	3 (2.5)	0 (0.0)	0 (0.0)	0 (0.0)

Based on table 3 indicates that samples with green-labeled PEWS had outcomes of discharge with 50 people (42.0%), outpatient care with 12 people (10.1%), inpatient care with 24 people (20.2%), HCU care with 1 person (0.8%), PICU care with 1 person (0.8%). Samples with yellow-labeled PEWS had outcomes of discharge with 5 people (4.2%), outpatient care with 4 people (3.4%), inpatient care with 10 people (8.4%), PICU care with 1 person (0.8%), and exit with 2 people (1.7%). Samples with orange-labeled PEWS had outcomes of discharge with 1 person (0.8%), and PICU care with 3 people (2.5%). Samples with red-labeled PEWS had outcomes of discharge with 1 person (0.8%), PICU care with 3 people (2.5%), and exit with 1 person (0.8%).

Table 3. Cross-Tabulation of PEWS with Treatment Outcome

PEWS	Treatment Outcome					
	Discharge (%)	Outpatient (%)	Inpatient (%)	HCU (%)	PICU (%)	Exit (%)
Green	50 (42.0)	12 (10.1)	24 (20.2)	1 (0.8)	1 (0.8)	0 (0.0)
Yellow	5 (4.2)	4 (3.4)	10 (8.4)	0 (0.0)	1 (0.8)	2 (1.7)
Orange	1 (0.8)	0 (0.0)	0 (0.0)	0 (0.0)	3 (2.5)	0 (0.0)
Red	1 (0.8)	0 (0.0)	0 (0.0)	0 (0.0)	3 (2.5)	1 (0.8)

HCU, High Care Unit; PICU, Pediatric Intensive Care Unit

4. Discussion

Based on the research results, male patients outnumbered female patients. Differences in the distribution of patient genders in the Emergency Department of H. Adam Malik Hospital, Medan influenced by various factors including demographic factors. According to the *Badan Pusat Statistik Provinsi Sumatera Utara (2022)*, the male children population in the province is larger than the female population in North Sumatra Province [13]. This demographic dominance affects the gender distribution of patients seeking care in the emergency department. Additionally, social factors may also play a role. Male children tend to engage in physical activities that pose a risk of injury, making them more likely to seek treatment in the ED if they get injured [14].

Regarding age, the age group under 5 years old comprised the largest portion of the study sample. This reflects the vulnerability of preschool-aged children especially those under 6 years old to various diseases

due to their developing immune systems [15]. It emphasizes the need for special attention to this age group in preventing diseases and providing prompt emergency care.

In terms of disease groups, infectious diseases were the most common among the study sample. Factors such as the easy spread of viruses and bacteria in children's environments, their interactions in public places, and exposure to pathogenic microorganisms contribute to the high prevalence of infectious diseases in this age group [16]. Early and accurate intervention is crucial to reduce the disease burden in healthcare facilities.

Based on the research results, the majority of patients with green-labeled PEWS had a discharge outcome. Rejo et al study stated that patients with PEWS scores ≤ 2 were generally allowed to go home. It doesn't mean patients should be immediately discharged but the green label indicates that the severity of the patient's condition is not as critical as reflected by other colors like yellow, orange, or red [4]. Another study by Simon et al. indicated that high PEWS scores were associated with the need for immediate further treatment, such as admission to the ICU [7]. This corresponds to the table where most patients with yellow and red-labeled PEWS had outcomes in the PICU.

Agulnik et al, explained that a high PEWS score is correlated with the unplanned transfer of patients to the ICU. PEWS has an AUROC of 0.94, sensitivity of 88%, and specificity of 93%. A high PEWS score before ICU transfer was associated with increased morbidity and mortality [17]. Another study demonstrated that PEWS identified over 80% of patients who required transfer to the PICU as early as 11.5 hours before the actual ICU transfer [18].

Pediatric patients are referred for multiple reasons, either for better therapeutic services or diagnostic purposes. The clinical condition of patients at the time of referral can significantly affect the outcome of such patients and there is not much data on this aspect. The Irish PEWS score provides a rapid measure of the degree of sickness. Respiratory system disorders and neonatal illnesses were the most common illnesses observed. Most patients had low disease severity as per the Irish PEWS score. Patients with younger ages, higher scores, neonatal illnesses, and neurological disorders had a higher risk of mortality. Training of health personnel at primary and secondary levels in commonly encountered illnesses will improve the provision of care at the local level and decrease low-risk referrals [19].

Overall, the strength of this study lies in the professional expertise of trained doctors or nurses who have undergone training in vital signs assessment. They can respond quickly to abnormal fluctuations that may require immediate medical attention [20]. This study also predominantly included participants from a specific demographic, such as a particular age group or ethnicity, limiting the generalizability of the findings to a broader population. On the other hand, this study lacks comprehensive documentation regarding the nutritional status of pediatric patients. The current deficiency in comprehensive information poses a challenge to researchers attempting to construct a thorough and accurate profile of the patients under study. Therefore, it is anticipated that the medical records department will take steps to enhance documentation, ensuring detailed information is consistently recorded.

5. Conclusion

This study provides an overview of the characteristics of pediatric patients and their association with PEWS, as well as between PEWS and patient treatment outcomes. There is no major difference in the distribution of patient gender. Red-labeled PEWS are more commonly found in patients under the age of 5. The research also indicates that the majority of pediatric patients in the Emergency Department arrive with green-labeled PEWS, indicating a non-emergency condition that results in the majority of patients being discharged.

References

[1] I. Tridana, “Kejadian Kegawatdaruratan Berdasarkan Pediatric Assessment Triangle (PAT) Pada Anak Di Intalasi Gawat Darurat,” Journal of Borneo Holistic Health, 2022;5(2):189-96.

[2] S. Y. C. Yoong et al., “Common diagnoses among pediatric attendances at emergency departments,” BMC Pediatr, 2021;21(1):172, Dec., doi: 10.1186/s12887-021-02646-8.

[3] M. Ebrahimi, A. Mirhaghi, Z. Najafi, H. Shafaee, and M. Hamechizfahm Roudi, “Are Pediatric Triage Systems Reliable in the Emergency Department?” Emerg Med Int, 2020:1-8, doi: 10.1155/2020/9825730.

[4] R. Rejo, I. I. Nur Saputri, L. R. Sari, R. T. Handayani, and A. Widiyanto, “Sistem Peringatan Dini Anak: A Review,” Avicenna: Journal of Health Research Apr. 2020;3(1) doi: 10.36419/avicenna.v3i1.345.

[5] AC. Almblad, P. Siltberg, G. Engvall, and M. Målqvist, "Implementation of Pediatric Early Warning Score; Adherence to Guidelines and Influence of Context," J Pediatr Nurs, 2018;38:33–9, doi: 10.1016/j.pedn.2017.09.002.

[6] C. Phuaksaman and P. Sukboonthong, "Performance of Modified Pediatric Early Warning Score in General Medical Conditions and Disease Subgroups," Glob Pediatr Health, Jan. 2022;9:2333794X2211074, doi: 10.1177/2333794X221107487.

[7] H. Simon Junior, C. Schvartsman, G. de A. Sukys, and S. C. L. Farhat, "Pediatric emergency triage systems," Revista Paulista de Pediatria, 2023;41:e2021038, doi: 10.1590/1984-0462/2023/41/2021038.

[8] L. Wati, R. F. Malisie, and J. Harahap, "Pediatric Observational Priority Score and Early Warning Scoring System to Predict Admission Status in Pediatric Patients in Haji Adam Malik General Hospital," Open Access Maced J Med Sci, Jul. 2021;9(13):244-48, doi: 10.3889/oamjms.2021.6311.

[9] A. Rusmawati, A. D. Ellina, A. Fawzi, and K. Li. Musa, "Pediatric Early Warning Score (PEWS) Application Compliance with Response Time and Patient Safety," STRADA Jurnal Ilmiah Kesehatan, May 2022;11(1):37-44, doi: 10.30994/sjik.v11i1.889.

[10] Y. Krishnan, G. Sainulabdin, V. S. Uma, P. S. Sreedharan, and N. Warrier, "Clinical audit of a Paediatric Emergency Warning Score (PEWS) in the pediatric oncology unit of a newly established tertiary cancer institute," Pediatric Hematology Oncology Journal, Sep. 2020;5(3):69-74, doi: 10.1016/j.phoj.2020.06.006.

[11] Amalie Kibsgaard, Hege Ersdal, Jan Terje Kvaløy, et al. Newborns requiring resuscitation: Two-thirds have heart rate ≥100 beats/minute in the first minute after birth. Acta Paediatrica. 2023;112(4):697-705

[12] I Made Karma Setiyawan et al, "Validitas modified Pediatric Early Warning System/Score di Rumah Sakit Umum Pusat Sanglah.," Intisari Sains Medis, 2020;11(3):1443–50,

[13] Badan Pusat Statistik Provinsi Sumatera Utara (Statistics of Sumatera Utara Province)," 2024.

[14] Helmi Ismunandar, "Cedera Olahraga pada Anak dan Pencegahannya," JK Unila, , 2020;4(1):34

[15] Bintang Fauzia Mufikha, Reni Mareta, Sodiq Kamal. "Self efficacy ibu dalam upaya pencegahan ISPA pada balita di Danurejo Mertoyudan. Borobudur Nursing Review 2021; 01(02):67–76

[16] Meiwarti Kurniasih, Tursina, Tedy Rismawan. Diagnosis Penyakit Tropis Berbasis Web Dengan Metode Certainty Factor. Jurnal Coding, Diagnosis Penyakit Tropis Berbasis Web Dengan Metode Certainty Factor ," Jurnal Coding, Sistem Komputer Untan, 2017;05(3):64–71

[17] S. R. Brown, D. Martinez Garcia, and A. Agulnik, "Scoping Review of Pediatric Early Warning Systems (PEWS) in Resource-Limited and Humanitarian Settings," Front Pediatr, Jan. 2019;6 doi: 10.3389/fped.2018.00410.

[18] A. R. Kroeger, J. Morrison, and A. H. Smith, "Predicting unplanned readmissions to a pediatric cardiac intensive care unit using predischarge Pediatric Early Warning Scores," Congenit Heart Dis, Jan. 2018;13(1):98-104, doi: 10.1111/chd.12525.

[19] Brinda Eswaramoorthy, Ratan Gupta, Meenakshi Bhatt, Manas Pratim Roy. The Clinical Profile, Early Warning Score, and Outcome of Children Aged 0–12 Years Referred to a Tertiary Care Hospital in North India. J Child Sci; 2021;11:e193–e19., DOI: 10.1007/s13671-021-00351-4

[20] N. M. Fontenot, S. K. Hamlin, S. J. Hooker, T. Vazquez, and H. Chen, "Physical assessment competencies for nurses: A quality improvement initiative," Nurs Forum (Auckl), 2022;57(4):710–6, doi: 10.1111/nuf.12725.